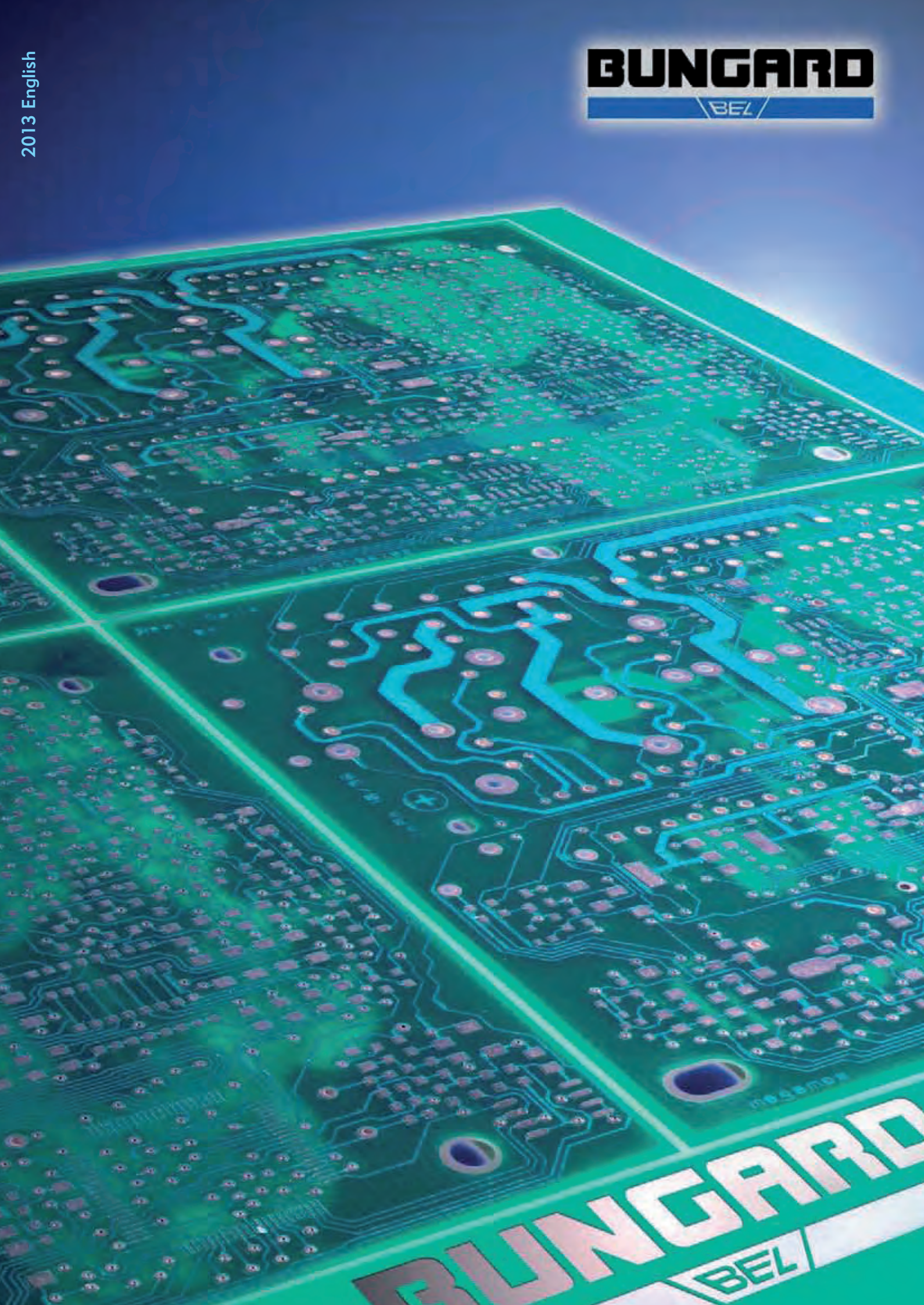
2013 English

BUNGARD

BEL



CONTENTS

CONTENTS

WORKFLOW

Professional PCB production including galvanic PTH soldermask... Components printing... upgradeable to multilayer

BASISLINE

raw material cut to size
(Ne-Cut)

⬇

CNC-drilling
(BUNGARD CCD/2)

⬇

brush cleaning
(RBM 300)

⬇

galvanic PTH
(Compacta L30 ABC)

⬇

brush cleaning
(RBM 300)

⬇

lamination of etch resist
(RLM 419p)

film production with Bungard Filmstar

⬇

vacuum exposure
(Hellas)

⬇

spray developing
(Splash / Jet 34D)

⬇

spray etching
stripping of etch resist
(Splash Center)

⬇

brush cleaning
(RBM 300)

⬇

electroless tin
(EG 02 / SUR-TIN)

⬇

lamination of solder mask
(RLM 419p)

⬇

exposure of solder mask
(Hellas)

⬇

spray developing
(Splash / Jet 34D)

⬇

curing of soldermask
(Hellas or hot air oven)

⬇

CNC-V-cut or CNC-routing
(Bungard CCD/2)

PROFILINE

raw material cut to size
(Ne-Cut)

⬇

CNC-drilling
(BUNGARD CCD)

⬇

brush cleaning
(RBM 402 F)

⬇

galvanic PTH
(Compacta L40 ABC)

⬇

brush cleaning
(RBM 402 F)

⬇

lamination of etch resist
(RLM 419p)

film production with Bungard Filmstar

⬇

vacuum exposure
(EXP 8000)

⬇

spray developing
(DL 500)

⬇

spray etching
stripping of etch resist
(DL 500)

⬇

brush cleaning
(RBM 400 / 402 F)

⬇

electroless tin
(EG 02 / SUR-TIN)

⬇

lamination of solder mask
(RLM 419p)

⬇

exposure of solder mask
(EXP 8000)

⬇

spray developing
(DL 500)

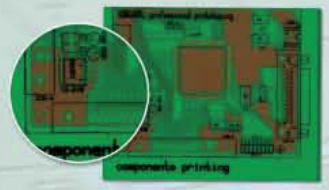
⬇

curing of soldermask
(EXP 8000)

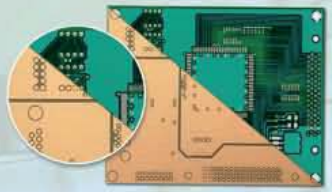
⬇

CNC-V-cut or CNC-routing
(Bungard CCD)

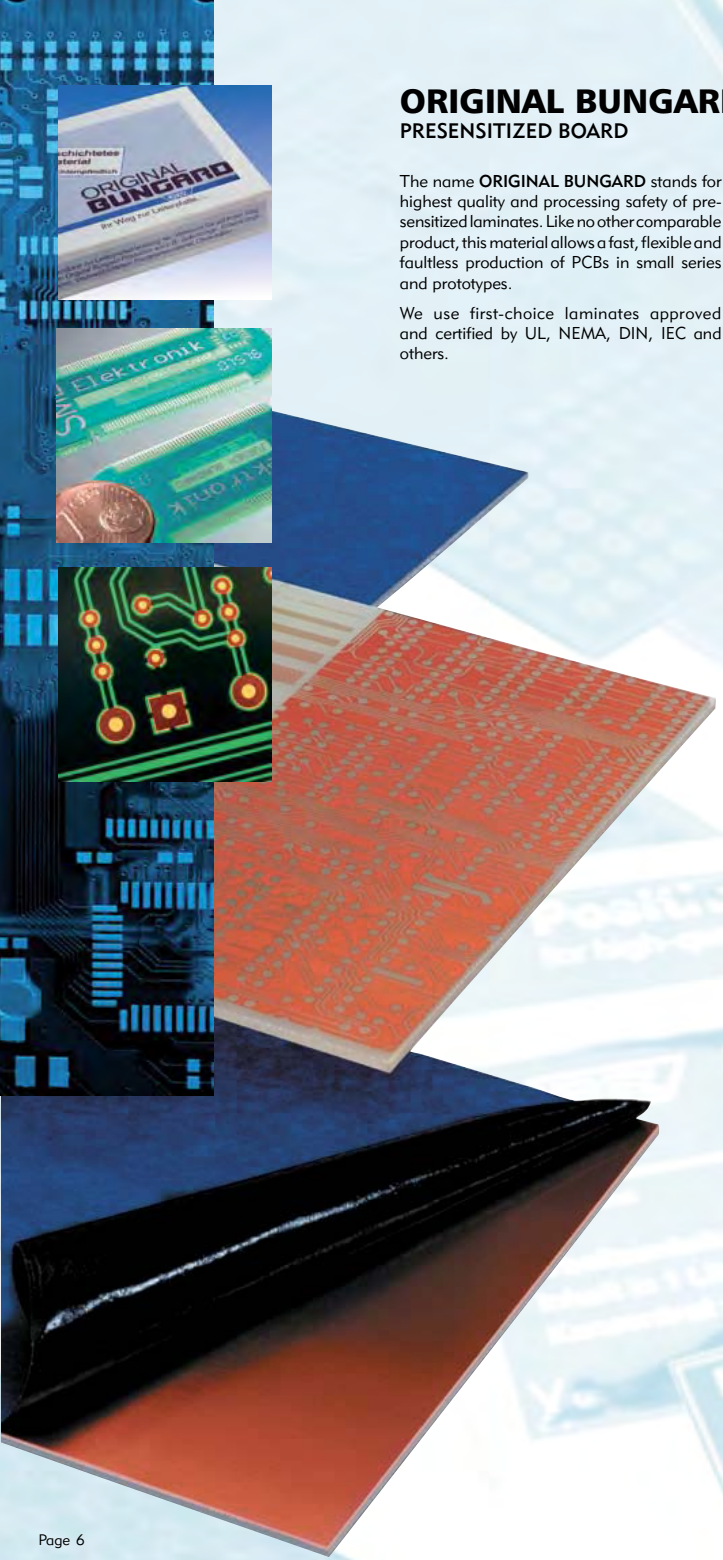
Sample Components printing



Sample outside multilayer



inside multilayer



ORIGINAL BUNGARD
PRESENSITIZED BOARD

The name **ORIGINAL BUNGARD** stands for highest quality and processing safety of pre-sensitized laminates. Like no other comparable product, this material allows a fast, flexible and faultless production of PCBs in small series and prototypes.

We use first-choice laminates approved and certified by UL, NEMA, DIN, IEC and others.

Several types of laminates, i.e. FR2, FR3, CEM1, FR4 and PTFE are available in thicknesses of 0.5, 0.8, 1.0, 1.6, 2.0 and 2.5 mm with either 18, 35 or 70 microns Copper. The max. panel size is 510 x 1150 mm. Our cutting service provides sheets down to 50 x 50 mm min. size, with an accuracy of 0.1 mm.

PHOTORESIST

We coat the laminates with a special positive working liquid resist made according to our own recipe. The resist features highest exposure sensitivity, short processing turns and large processing latitude. The equal and dust-free coating has a defined thickness of 5 µm. The maximum spectral response is in the range of 350 - 400 nm. The line resolution is limited only by the type of exposure unit. Typical exposure times are less than 90 seconds on a set with fluorescent vacuum tubes. The resist allows multiple exposure.

Referring to our special developer, at 20 °C the developing time is less than 45 seconds. On the other hand, the resist is absolutely stable for more than 5 minutes in the developer. It is resistant to acid etching or galvanic chemicals and even permits alcaline etching at a ph-level less than 9.5.

The boards are protected against mechanical damage and unwanted exposure by a special, blue coloured adhesive foil. Due to this protective foil, no flitters appear when cutting or milling the boards.

Each board is subjected to chemical and physical controls and tests before and after coating.

A shelf live of more than 1 year under normal storage conditions is guaranteed. Even 10 year old boards still work.

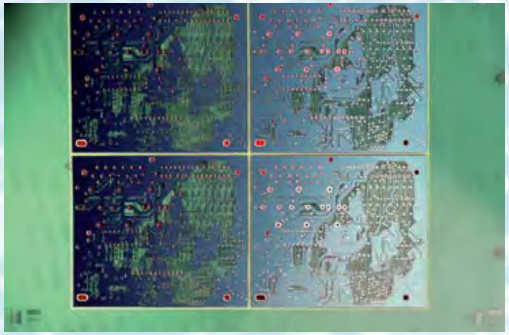
PRE-SENSITIZING SERVICE

We can coat boards that you supply with photoresist. The max. board size is 530 x 1160 mm, the min. board thickness is 0.3 mm. Our pre-sensitizing service includes cleaning, double sided coating in dip technology, pre-aging, optical control and protection foil. Attention: dip rim 10mm on top and drip rim of 10 mm at the bottom will reduce usable size by 20 mm on the short side (530 mm will go down to 510 mm). The rim is on request removed without charge.

STANDARD CUTTINGS FR4

Format (mm)

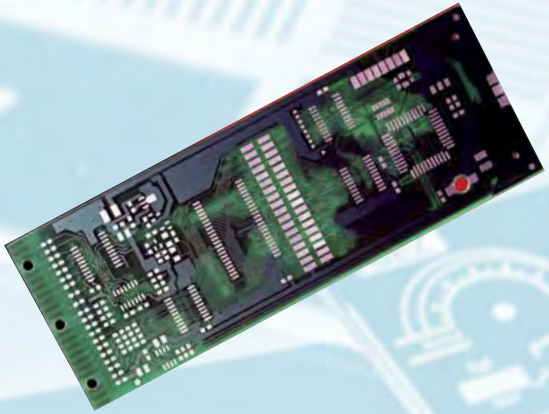
1.5 mm 35 µm Cu	**1.5 mm 70 µm Cu**
210 x 300	210 x 300
200 x 250	200 x 250
150 x 250	150 x 250
160 x 233.4	160 x 233.4
150 x 200	150 x 200
125 x 175	125 x 175
100 x 160	100 x 160
75 x 100	75 x 100



PANELS FR4

Format (mm)

0.5 - 1.5 mm 18 µm Cu	**0.5 - 2.5 mm 35 µm Cu**	**0.5 - 2.5 mm 70 µm Cu**	**1.5 mm 105 µm Cu**	**1.5 mm FR4 blue/black 35 µm**
510 x 1150 x 0.5	510 x 1150 x 0.5	510 x 1150 x 0.5	510 x 1150 x 1.5	510 x 1150 x 1.5
510 x 570 x 0.5	510 x 570 x 0.5	510 x 570 x 0.5		
510 x 1150 x 0.8	510 x 1150 x 0.8	510 x 1150 x 0.8		
510 x 570 x 0.8	510 x 570 x 0.8	510 x 570 x 0.8		
510 x 1150 x 1.0	510 x 1150 x 1.0	510 x 1150 x 1.0		
510 x 570 x 1.0	510 x 570 x 1.0	510 x 570 x 1.0		
510 x 1150 x 1.5	510 x 1150 x 1.5	510 x 1150 x 1.5		
510 x 570 x 1.5	510 x 570 x 1.5	510 x 570 x 1.5		
	510 x 1150 x 2.0	510 x 1150 x 2.0		
	510 x 570 x 2.0	510 x 570 x 2.0		
	510 x 1150 x 2.5	510 x 1150 x 2.5		
	510 x 570 x 2.5	510 x 570 x 2.5		



PANELS FR2

Format 480 x 1000 x 1.5 mm

35 µm Cu single or double sided

PANELS FR3

Format 510 x 1150 x 1.5 mm

35 µm Cu double sided

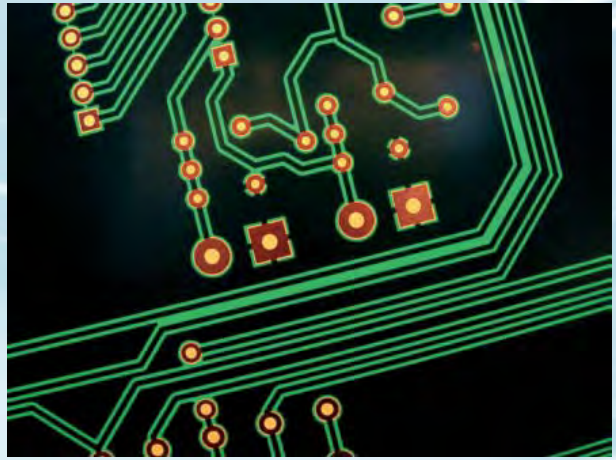
PANELS CEM1

Format 510 x 1150 x 1.5 mm

35 µm single sided

CUTTING SERVICE

We cut down all boards to non-standard sizes on request. The maximum board size is 510 x 1150 mm, the minimum size is 50 x 50 mm. Remains will be included. Boards >= 2 mm will be cut by saw. Saw cutting loss will be 3 mm per piece.



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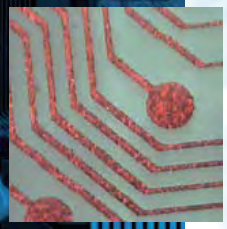


SPECIAL PURPOSE LAMINATES

Besides our ORIGINAL BUNGARD fotopositive coated base material we offer a wide range of laminates related to pcb manu-facturing.

Engraving plates

for Front Panel Engraving. Size approx. 500 x 1000 x 1.5 mm. Black and nature available.

Technical glass fibre laminate

no copper clad, no photoresist, size: 510 x 1150 x1.55 mm

Drill backing boards

Drill backing boards for drilling pcbs e.g. with the BUNGARD CCD.

in stock: 500 x 1000 x 2.5 mm

500 x 1000 x 6 mm

245 x 330 x 6 mm

Multilayer production

Prepregs (250 x 350 x 0.2 mm)

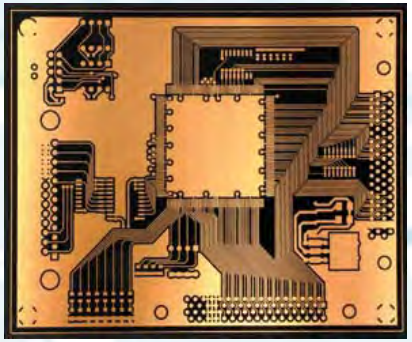
outer layer (FR4 250 x 350 x 0.3 mm 18/00)

inner layer (FR4 250 x 350 x 0.5 mm 18/18)

separation foil

(packing size for Prepregs and separation foil 50 pcs. each)

Copper clad laminates



FR4, CEM1, FR2, without photoresist. Approvals and standards as for pre-sensitized boards.

The copper surface is not yet brushed.

FR4, panel size 510 x 1150 mm,

- Thickness 0.5 mm; Copper clad 18µm, 35µm and 70 µm; single or double sided
- Thickness 0.8 mm; Copper clad 18µm and 35µm; single or double sided
- Thickness 1.5 mm; Copper clad 5µm; single sided; Copper clad 18µm, 35µm, 70 and 105µm; single or double sided
- Thickness 2.0 mm; Copper clad 35µm and 70µm; single or double sided
- Thickness 2.5 mm; Copper clad 35µm and 70µm; single or double sided

CEM1

panel size 510 x 1150 mm, Thickness 1.5 mm Copper clad 35µm single sided

NEW ! FR4 semi flexible laminates in thickness 0.125mm an 0.2mm

These presensitized ORIGINAL BUNGARD materials are made for easy production of inner layers of multilayer PCBs or for semi-flexibel applications.

Available board sizes:

100 x 160mm 35µm Cu

210 x 300mm 35µm Cu

510 x1150mm 35µm Cu

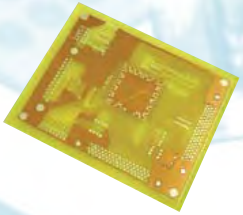
single and double sided.

Please note, that 100 x160 mm and 210 x 300 mm are sold in units of 8 pcs.

FR2

panel size 500 x 1000 mm, Thickness 1.5 mm Copper clad 35µm single sided or double sided.

FR2 is perfect for isolation milling, because routers and drills will last much longer.



SURFACE:

If you use **ORIGINAL BUNGARD** photopositive coated pcbs, there is a simple technical alternative to protect the surface of your pcb:

Step 1:

Etch your ORIGINAL BUNGARD PCB as usual.

Step 2:

develop the photoresist after etching once again with a negative film (solder PADs open).

Step 3:

apply our immersion tin SUR-TIN just to the now open PADs. The photoresist will stay on the tracks and protect them.

This procedure is not widely known, but gives excellent results. Good solderability on the pads, nice optic and no extra costs!

ALUCOREX

PRESENSITIZED ALUMINIUM

This product is perfectly suitable to manu-facture front panels, machine or information plates as well as tampon printing clichés. ALUCOREX consists of an aluminium alloy which is an-odized in a unique treatment sequence. After anodizing we coat the boards with a specially adjusted, high-resolution and resistant positive photo-coat. To protect the coat from mechanical damage or unintentional exposure we provide the boards with a light protection foil.

Making a front panel from ALUCOREX is simple and safe. The procedure takes only minutes and you need no equipment besides an exposure unit and a developing tray. The main steps,

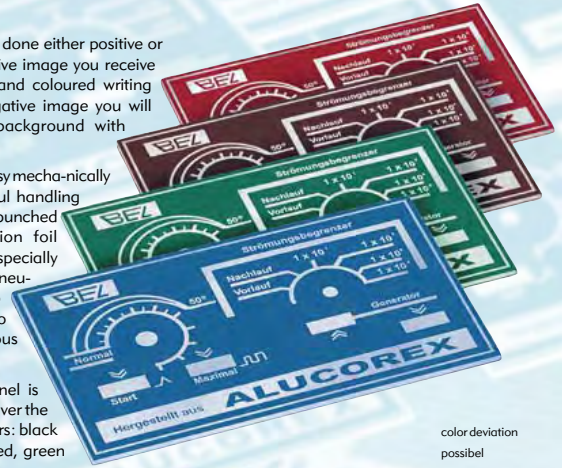
- exposure and
- developing

take together only 5 minutes.

The colour of the ALUCOREX-boards is already established in the scratch, light and chemical proof anodized layer. The exposed parts of this layer are removed during the developing process.

Image transfer can be done either positive or negative. With a positive image you receive a blanc background and coloured writing or image. With a negative image you will receive a coloured background with blanc writing.

The front panels can easy mecha-nically processed. With careful handling they can be drilled and punched through the protection foil before exposure. The specially adapted developer is neu-tralized after the job and can be disposed into the drain. No hazardous waste is created.



color deviation possibel

One ALUCOREX panel is 480 x 980 mm. We deliver the material in these colours: black matt, black brilliant, red, green and blue brilliant.

- Black matt is available in 0.5, 1.0, 1.5, 2.0, 2.5 and 3.0 mm thickness
- Black brilliant in 1.0, 1.5, 2.0 and 2.5 mm.
- Red and Blue brilliant (both sides are usable) is on stock in 1 mm thickness, as well as the green brilliant clichés, which is only single sided usable.

On request we cut down the boards according to your wishes till board size 50 x 50mm. Being stored in a cool and dry condition the material has a guaranteed shelf life warranty up to one year. Tests have shown that even 10 year old material can still be processed.

SMD STENCILS

FOR SOLDER PASTE APPLICATION

From now on, there is a quick, cheap and easy way to make your metal template on your own. With already existing machines and without interference of existing processes.

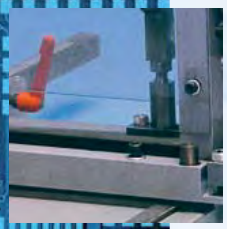
To do so we offer both positive or negative pre-sensitized metal templates in many dimensions, in different thicknesses and hardnesses.

Being coated with a chemically resistant photoresist of high line resolution and steepness, these templates offer you all the advantages already known from the pre-sensitized laminates for PCBs.

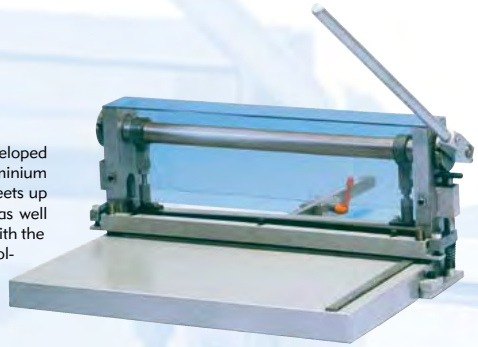
color deviation possibel

Brass boards are available in 500 x 1000mm. Thicknesses: 0.2, 0.3, 0.4, 0.5, 0.8 and 1.0 mm. Other thicknesses on request possible.

German Silver (CuNiZn) board size 280 x 1000. Thicknesses: 0.1, 0.15, 0.2, 0.3, 0.4 and 0.5. Other thicknesses on request possible.



NE-CUT
BOARD CUTTER

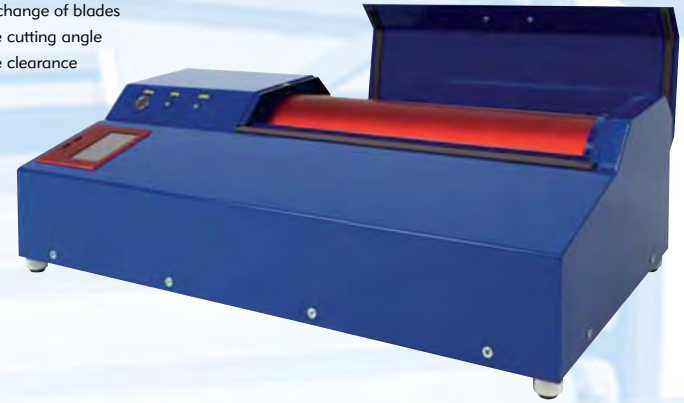


The Board Cutter Ne-Cut was specially developed to cut pcbs up 3.0 mm of thickness or aluminium up to 1.5 mm. If desired cutting of steel sheets up to 1mm or plastic up to 5 mm is possible as well as cutting of film sheet material or paper. With the transparent hood and the removable downholder you can cut pieces „on sight".

Features

- Cutting width max. 530 mm
- Two blades made of hardened and ground steel
- Spring loaded built-in clamping unit in the front (removable)
- Bedstop with metric scale in the right front
- Fully adjustable back stop with metric scale for batch work (0...300 mm)
- Angle and scale tolerance 0.1 mm
- Durable full steel construction
- All important parts angular adjustable
- Simple exchange of blades
- Adjustable cutting angle
- Adjustable clearance

NE-CUT	
Sizes (LxHxD):	74 x 29 x 45 cm
Weight:	66 kg



FILMSTAR-PLUS
PHOTOPLOTTER

Filmstar-Plus is the name of the next generation of our bitmap photoplotter series. Optimized for inhouse production of high end film layouts at reasonable price level the system can directly proceed (extended) Gerber files (RS 274X or RS 274C) or b/w bitmap (.bmp) files.

Filmstar, your nicely designed partner in cost effective production of your required film artworks.

Features:

- Film is fixed on a rotating drum. A highly focused red light laser diode is moving stepwise alongside that drum, driven by a precise stepper motor with worm and gear drive. Of course, all settings are software adjustable, calibrated and controlled.
- Film data read in either by USB connection to your computer or by USB stick.
- Full software package belongs to extend of delivery. It offers all required functionality like film arrangement, reverse and mirror image selection, preview, print preview, editing of aperatures (e.g. for soldermask films oversizing) and lots more.

FILMSTAR-PLUS
• Maximum film size: 395 x 385 mm
• Maximum plotting area: 365 x 340 mm
• output resolution is from 1625 ...16256 dpi x 12700 dpi (25400 dpi internally)
• Plotting speed: 7 mm of film width (x 365mm film lenght) per minute for 2032 dpi. (20% quicker at 1625dpi, half speed for 4064 dpi)
• Source of light: Laser diode 670 nm (red)
• Data input: Gerber (RS 274D, RS 274 X), high resolution BMP

- Photoplotter software, included on CD:
- Gerber viewer; Automatic aperture converter for all known Electronic CAD layout systems
- D-code editing, output preview & print
- Interactive, absolute or relative image positioning, film and drill panelization
- Reversed (negative) plotting, image mirroring
- Control software requires computer with Windows XP.. Windows 7 (64-bit), USB port

Dimensions (LxWxH):	700x350x200 mm
Weight:	approx. 20 kg
Power supply:	External power supply 110V-240V / 24V-2A

Coming soon:

FILMSTAR-PLUS XL for larger films:

- maximum film size is 470 x 385 mm (drum circumference x drum axis).
- Maximum plotting area is 445 x 340 mm (drum circumference x drum axis)

HELLAS
VACUUM EXPOSURE UNIT

High precision vacuum exposure unit especially designed for double sided contact exposure of presensitized base materials such as tampon printing clichés, PCBs, front-panels, daylight films and other UV sensitive coatings.

Features

- 2 x 6 superactinic UV-tubes, each 20 W
- Special reflectors for minimum undercut
- Analogue light emission display
- Lower exposure surface from 8 mm special glass
- Upper exposure area from structured mylar foil in a sturdy frame
- Working area 570 x 300 mm
- Suitable for fine-line PCBs
- Maintenance free vacuum (80%) with gauge display, 1380 l/hour continuous rating
- Digital timer 1 second - 9 min 59 sec. with count-down, auto-reset and beeper
- Built in cooling fan allows long time exposure or baking processes
- Separate choice of upper/low exposure possible
- Sturdy steel housing

HELLAS	
Dimensions (L x H x W):	62 x 24 x 65 cm
Weight:	40 kg
Power supply:	220V ~, 50 Hz, ca. 800 W

EXP 8000
PARALLEL BEAM EXPOSURE UNIT

The EXP 8000 is a high speed double sided exposure machine mainly designed for industrial production and equipped with two 4000 W mercury halide lamps. These lamps in about 90 cm distance from the PCB ensure almost parallel light.

Construction

Sturdy, welded tube frame with coated sheetplates. The chassis consists of a sliding drawer system. A yellow light table is an optional addon item for the machine's front.

Operation

EXP 8000 guarantees a perfect exposure within a minimum of time and energy consumption by two UV sensors. The required exposure energy is preset on a keyboard and shown on a digital readout. The two intelligent UV-light emission controllers (one per side) automatically measure the energy supplied per side and stop the exposure at preset energy amount.
A vacuum pump provides a close and uniform contact between artwork and board. The exposure cycle starts when the drawer is pushed in. At that moment the lamp shutters are opened and the lamp's powersupply is increased from stand-by to full power. In stand-by mode, the energy is reduced to 25% in order to save energy and avoid heat problems. The machines have powerful cooling fans. When the exposure is finished the vacuum is stopped.

Features EXP 8000:

- max. Working area 600 mm x 600 mm (recommended: 400 mm x 500 mm)
- Microprocessor controlled UV-light emission
- vacuum assisted drawer
- suitable for fine line PCBs
- Suitable for exposure and curing of solder mask.
- built-in yellow light table

EXP 8000	
Power suppy:	380 V, 50 Hz triple phase
L1/L2/L3:	5 A / 10 A / 5 A
Unit Size (W x H x L):	820 x 1950 x 1800 mm
Weight:	270 kg

EG02
UNIVERSAL TRAYS

These appliances are destined to substitute the simple plastic tray. They are suitable for all acid or alkaline chemicals, e.g. developer, etching medium.

There are two main advantages of the EG 02 trays. On the one hand, due to the integrated 'seesaw' with its handle, the user is able to move the boards up and down but will not get into contact with the filled in liquid. On the other hand, the chemicals will remain fresh for a longer time because the lid and the 'seesaw' reduce their exposition to air.

EG 02	
Sizes:	**49 x 10 x 35 cm**
Filling:	6,5 l
Weight:	4,5 kg

JET 34D
SPRAY ETCHING MACHINE

Powerful spray etching or spray developing machine mainly designed for use in pcb labs. Capacity up to 3m²/h possible (single-sided, positive material).

Features

- Maintenance free system with self-cleaning nozzles
- Etching speed of 35µm Cu within 90 seconds (warm Fe-III-Cl)
- Line resolution better than 0.1 mm
- Big lid for easy loading, with built-in security switch
- Maximum board size: 300 x 400 mm
- Small pcbs can be fixed on carrier with adjustable holder
- Easy and clean handling by hinge free lid and handle outside of machine
- If you turn the carrier you can etch double sided
- Overflow wash tank in the front for rinsing etched boards
- Digital timer with countdown, auto-reset and beeper
- Sturdy construction fully made of PVC and titanium
- Suitable for all common etchants. Also well suited for spray developing of dryfilm resist (anti-foam agent recommended)
- Strong 1000 W heater with thermostat and over-heat fuse
- 3 cog valves (etching tank, rinse overflow, rinse inlet)

JET 34D	
Dimensions (WxHxD):	ca. 60 x 110 x 70 cm
Working Level:	90 cm
Power supply:	220 V~, 50Hz, ca. 1.5 kW
Tank capacity:	16 l
Weight:	35 kg

SPLASH
SPRAY ETCHING MACHINE

Spray etching machine for laboratory use with integrated static rinse. Machine is suitable for double sided material. Special emphasis was put on ergonomical and clean etching and rinsing as well as on low chemical drag out.

Features

- Maintenance free system with self-cleaning nozzles and magnetic pump
- etching speed of 35 µm Cu within 90 seconds (warm Fe-III-CL).
- Big window to the etching chamber made from transparent pvc.
- maximum board size: 210 x 300 mm. Splash XL: 300 x 400 mm
- Line resolution better than 0.1 mm (100 µm)
- Suitable for all common etchants
- Lid to the etching chamber with safety switch
- Removable board holder made from Titanium and PVC. Can be locked in drip-off position
- Easy access to the etching chamber.
- Strong 1000 W Quarz heater, controlled by thermostat
- overheat fuse
- Digital timer with count down, auto reset and beeper.
- integrated rinsing zone with drip off holder.
- 3 cog valves for all tanks
- Suitable for spray developing

SPLASH	
Power supply:	230 V~, 50 Hz, approx. 1,5 kW
Dimensions(LxWxH):	60 x 66 x 120 cm
Working Level:	90 cm
Weight:	35 kg
Tank capacity:	ca. 25 l

SPLASH XL	
Power supply:	230 V~, 50 Hz, approx. 1,5 kW
Dimensions(LxWxH):	80 x 120 x 65 cm
Working Level:	90 cm
Etchingformat:	300 x 400 mm
Weight:	40 kg
Tank capacity:	ca. 40 l

SPLASH CENTER

SPRAY ETCHING MACHINE

Laboratory etching machine with static and spray rinse, integrated developer tank, a reserve tank for e.g. chemical tinning and a squeeze dryer. The Splash-Center is suitable for double-sided pcbs. Special emphasis was put on ergonomical and clean etching and rinsing as well as on low chemical drag out.

Etching compartment:

- maintenance free etching system with solid stream nozzles
- etching speed of 35 µm Cu within 90 seconds (warm Fe-III-CL).
- Big window to the etching chamber made from transparent pvc.
- maximum board size: 210 x 300 mm / Splash-Center XL: 300 x 400
- Line resolution better than 0.1 mm (100 µm)
- Suitable for all common etchants. Fe-III-Cl recommended
- Lid to the etching chamber with safety switch
- Removable board holder made from Titanium and PVC. Can be locked in drip-off position
- Easy access to the etching chamber.
- Strong 1000 W Quarz heater, etching temperature controlled by thermostat
- overheat fuse
- Digital timer with count down, auto reset and beeper.
- integrated rinsing zone with drip off holder.
- 3 cog valves for all tanks
- Suitable for spray developing

Developer and rinse compartment:

- Magnetic centrifugal pump to revolve developer
- two integrated static rinses, one can be used for neutralization purposes
- Fresh water spray zone activated by foot switch, including splash protection
- A reserve tank, e.g. for immersion tin
- 5 ball valves to drain all tanks, cover protected from the front side.
- all tanks with lids
- integrated drip tray for all tanks, sure-footed about 12 cm above the ground
- integrated mechanical squeeze dryer

SPLASH CENTER	
Power supply:	230 V~, 50 Hz, 1,5 kW
Dimensions (LxWxH):	100 x 67 x 120 cm
Working Level:	90 cm
Etchingformat:	210 x 300 mm
Tank capacity:	1 x 25 l + 1 x 9 l + 3 x 7 l
Weight:	46 kg

SPLASH CENTER XL	
Power supply:	230 V~, 50 Hz, 1,5 kW
Dimensions (LxWxH):	116 x 77 x 120 cm
Working Level:	90 cm
Etchingformat:	300 x 400 mm
Tank capacity:	1 x 40 l + 1 x 24 l + 3 x 15 l
Weight:	56 kg

DL 500

CONVEYORISED SPRAY ETCHING MACHINE

The DL 500 is a double sided conveyorised spray etching machine with integrated rinsing zone. This machine is easy to maintain and fits perfectly to a modern PCB laboratory. The maximum capacity within one hour is 10 m^2. Designed for being used for laboratory purposes, there are lots of different applications (e.g. spray developing of tenting or solder mask) and options available. Of course the machine can be modified according to your needs.

Picture:
Option of DL500
(Front open)

Features:

- Working width 510 mm
- Adjustable conveyor speed 0 - 1.5 m/min.
- Joint free belt drive
- PCB is firmly secured by upper and lower transport rollers
- Powerful etchant pump (200 l/min)
- Double sided etching with 4 x 14 flat jet nozzles. Due to special nozzle pattern, there are 6 rows of nozzles for each side !!
- Adjustable spray pressure. As an option upper and lower spray pressure can be regulated separately
- Thermostat with digital read out and self-safe overheat cut-off
- integrated rinse zone. Optional fresh water rinse with solenoid valve or recycle water-tank
- Drying by squeezing rollers with tissue
- Sturdy stand alone construction from PVC and Titanium
- Transparent top with security switch
- Line definition down to 35 µm lines and spaces on 18 µm copper
- 1000W quartz heater
- Maintenance free design, just normal cleaning/refill
- Easy disassembly and full access to all inner parts without special tools
- suitable for all regular etching agents. We recommend to use ferric-chloride. Please pay attention to the special features of each etchant (crystallization of persulfates and ammonium, exothermic reactions while etching). For alkaline etching, machine must be modified.

DL 500	
Power supply:	230 V or 400 V, 50 Hz, 1.5 kW
Size (LxWxH):	120 x 67 x 129 cm
Etchingformat:	510 mm
Tank capacity:	55 l
Weight:	100 kg

Variants of the DL 500

Variant 1: Spray Developing Machine
The DL 500 can be used as a spray developing machine for negative and positive etch resist or solder mask without modifications. Simply change the media!

Variant 2: Spray Etching Machine
Standard variant

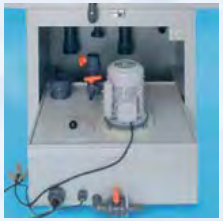
Variant 3: Spray Stripping Machine
This machine is equipped with an additional filter basket at the front side of the machine to remove residues of tenting or solder mask from the stripping liquid (see picture on the right).

Options for the DL 500

Option 1: Recycling Rinsing Tank

Recycling rinsing tank with magnetic centrifugal pump instead of fresh water. Saves water costs. With a cock drain valve the used rinsing water can be used to compensate evaporation losses or to make up new etching liquid. Waste water free rinsing technique. The magnetic valve from the standard version is here obsolete. The tank fits underneath the machine body of DL 500.

Format: 200 x 600 x 700 mm (LxHxW)



Option 2: Conveyorised Rinsing Unit

a.) conveyorised rinsing unit, stand alone version with adjustable conveyor speed, integrated magnetic valve for fresh water inlet (controlled by DL 500), squeeze drying roller. Transport width and height same as DL 500.

Format: 450 x 940 x 620 mm (LxHxW)

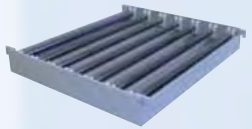
b.) as above but second stage cascade rinse (in combination with recycling rinsing tank and magnetic centrifugal pump), 3 way cock valve to bypass rinsing water e.g. to water treatment unit IONEX.

Format: 450 x 940 x 620 mm (LxHxW)

Option 3: Inspection Table

Control zone in form of a roller table (not conveyorised). This roller table can be mounted between two DL 500 (e.g. Developer and Etcher), between DL 500 and rinsing unit or as a single exit table.

Format ca. 620 x 530 x 50 mm (LxHxW)



Option 4: Production Line

3 DL 500 and the rinsing unit can be connected to a small production line (Developing – Etching – Stripping - Cleaning) coupled together with inspection tables. Of course other variants are possible as well.

Option 5: DL 500 S

This machine is equipped with an additional filter basket at the front side of the machine to remove residues of tenting or solder mask from the stripping liquid.

Option 6: DL 500 Vario

DL 500 Vario with separate adjustable spray pressure for the upper and lower side.

For physical reasons the etching result from the upper side is different from the lower side. Adjusting the spray pressure for one side may compensate this phenomena. In contrast to etching machines from competitors the PCB in the DL 500 is firmly fixed throughout the whole process by upper and lower transport rollers. This makes it possible to switch off completely the upper nozzles without lifting the PCB by the spray pressure of the lower nozzles.

Option 7: Cooler

Some etching agents as well as other chemicals tend to exothermic reactions and need to be cooled during the treatment process. For this purpose we offer a special cooler for the DL 500. The Cooler consists of a recycling rinsing tank with cooling coils for the etching liquid. With a cock valve the etching agent is adjustable bypassed through the cooler.

Option 8: DL 500 triple phases power supply

You can order the DL 500 either with a single phases or triple phases power supply.

Triple phase power supply is recommended by permanent use.

Option 9: Filter unit

On request you can equipp your DL 500 with one or two 10 „ filter units to remove residues from the etching process. You can easily adjust the filter throughput via cock valve. On the picture you can see a filter unit together with an exit table.

Option 10: Exit table

IONEX A, B, KA, KB

WASTE WATER TREATMENT SYSTEM

The name IONEX stands for ION-EXchanger, which is the very heart of this modern waste water treatment system. The Ionex is a modern and compact plant to treat rinsing water of a pcb laboratory. We offer 4 basic variants, which differ in rinsing water throughput and ion capacity. Type A and B are equipped with a cotton pre-filter, two cation columns and a ph neutralization column. Type KA and KB have three ion exchange columns.

The cation columns color red, when loaded with ferric ions and blue/green, when loaded with copper ions. Loading of anion column can be testet by measuring the conductance of the cleaned water. Loaded columns can be sent to Bungard for regeneration or we support you to do the regeneration yourself.

The drain water quality from this system is in accordance to German directives, which are of the highest standards world wide!

Features:

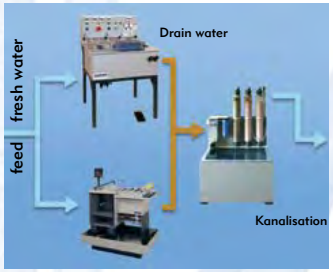
- For posttreatment of etching and galvanic rinsing water
- Removal of solids and all heavy metals
- closed water cycle possible (K-versions)
- Decrease of chemical oxygen demand
- Integrated storage sump with 110l (A/KA) or 220 l (B/KB) for collecting rinsing water
- Strong built-in hose pump
- Integrated cotton filter candle 10 µm (active carbon filter with K-versions)
- Significant change of color when loaded with metals
- Lower and upper sump level control switch
- Easy handling and operation
- Regeneration of ion exchange resins by supplier or by user at little cost
- IONEX A and B perform additionally PH neutralization and discharge to the drain

IONEX A / KA	
Power supply:	230 V, 50 Hz, 50 W
Weight:	30 kg
Tank capacity:	110 l
Cleaning capacity:	10 l / h
Size (HxDxL):	1400 x 425 x 600 mm

IONEX B / KB	
Power supply:	230 V, 50 Hz, 100 W
Weight:	60 kg
Tank capacity:	220 l
Cleaning capacity:	20 l / h
Size (HxDxL):	1400 x 850 x 600 mm

As an option the IONEX can be equipped with a conductance meter (IONEX KA/KB) or a ph-meter (IONEX A/B). This way you have the quality of the treated rinse water always under control.

IONEX Schema A-B

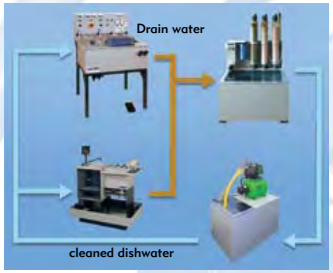


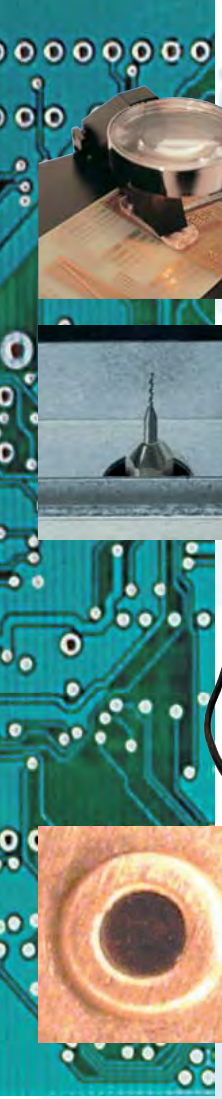
Of course the machines of the IONEX family can be adapted according to your needs. The IONEX XXL e.g. cleans 1500 l of rinsing water. The IONEX AU filters gold ions out of rinsing water from a nickel-gold-processing machine. These gold ions can be regenerated and returned to the gold bath.

Closed loop rinsing water:

IONEX KA and KB filter next to the metalic cations also the anionic halogens from the rinsing water, so you receive demineralized water. The demineralized water is collected and pumped back to the etching or through-hole-plating machine.

IONEX Schema KA-KB





VARIODRILL
PCB DRILLING SYSTEM

VARIODRILL is a PCB drilling machine for prototypes and small batch production.

The demand for operating comfort and high quality has led to an untraditional design which meets the necessary requirements for an ergonomic correct working position.

Features:

- comfortable working position, drill table can be tilted up to 30 °
- magnifyer optics directly over the drill hole (parallaxes free)
- Illuminated work area
- Motor controlled, adjustable stroke speed, spindle underneath the table
- Infinitely adjustable 10.000 .... 30.000 RPM
- AC Motor, 100 Watts / 230 Volt
- Including foot switch for easy operating
- Booth hands are free for positioning the PCB
- Complete system with integral dust extraction
- Including external vacuum cleaner
- Throat depth: 115 mm, max. board size 230 mm x endless
- Chuck: 1/8" (3.2mm)
- Drill size 0.6 to 3.2 mm

VARIODRILL	
Chuck:	3.175 mm
Size (LxWxH):	340 x 240 x 175 mm
Weight:	ca. 7 kg
Power supply:	220 V~, 50Hz, approx. 0,6 kW

FAVORIT
THROUGH-HOLE-PLATING

Hand-operated machine, especially for mechanical through-hole-plating purposes. Professional through-hole-platings by individual tools for each rivet diameter. Optimal contacts, even without soldering. Favorit offers high quality results at a low cost level.

Special features:

- Adjustable depth limiter
- Maximum board size: 400 mm

Extendet of delivery:

- The offered system includes complete press + tools
- Inclusive 1 x 1000 rivets
- Inclusive 1 set of tools
- Various tools and rivets are available
- Please specify the inner diameter you require
- Different tools have to be used for different diameters

FAVORIT						
Size (WxHxD):	ca. 9.5 x 21x 30 cm					
Working depth:	200 mm					
Weight:	ca. 4 kg					
Rivet with inner diameter/mm:	0.4	0.6	0.8	1.0	1.2	1.5
Required drill diameter/mm:	0.6	0.8	1.0	1.5	1.7	2.0

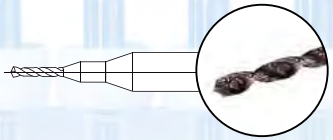
DRILLS AND ROUTERS
SOLID CARBIDE

High quality, precision ground solid carbide drill and routing bits with 3.175 mm (1/8") shaft.

All tools have 7.5 mm wide collets with a distance of 21 mm from the tip to the upper side of the collet.

The tools show the diameter or are colour coded and come in re-usable plastic boxes.

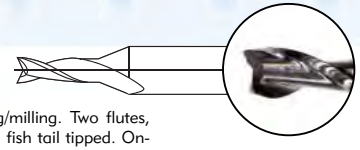
Within one class of price, tools with different diameters can be mixed to give one unit of 10pc.



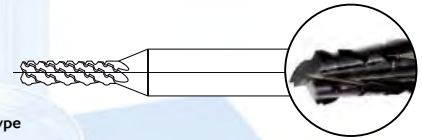
Tungsten Carbide Drills For drilling PCBs

Two flutes, righthand turn. Diameter: 0.3 ... 3.0 mm in 0.1 mm increments

Contour Routers - RPU Type



For Aluminium routing/milling. Two flutes, upward swarf ejection, fish tail tipped. On-stock diameters: 0.6, 0.8, 1.0, 1.2, 1.5, 2.0, 2.5, 3.0 mm



Contour Routers - SC/FT Type

For PCB routing, diamant shaped teeth, upward swarf ejection, fish tail tipped. On-stock diameters: 0.6, 0.8, 1.0, 1.3, 1.5, 2.0, 2.5, 3.0 mm

Special tools for isolation milling < 0,6mm

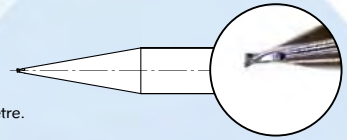
SC/FT Router cylindrical:

0.3 , 0.4 und 0.5 mm

Bungard Special isolation milling routers

0.1 and 0.2 mm

These routers are cylindrical only in the last Millimetre. This way there is a low risk of breaking the router.



or:

V-Cut Routers G30°N Type

For Isolation routing and fine engraving, two flutes, 30° tip angle. For Channels of 0.1 – 0.3 mm width (depending on cutting depth).

Contour Routers G60°N Type

For Isolation routing with or for engraving, two flutes, 60° tip angle. For Channels of 0.2 – 0.5 mm width (depending on cutting depth).

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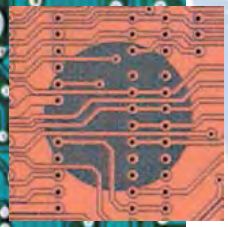


BUNGARD CCD /2
CNC MACHINE

This machine serves for drilling and routing PCBs and Aluminium and for isolation milling. It is fully equipped and easy to use. The extent of delivery contains the mechanics unit, the high frequency spindle, the integral control unit, a vacuum cleaner and the driver software for drilling and milling.

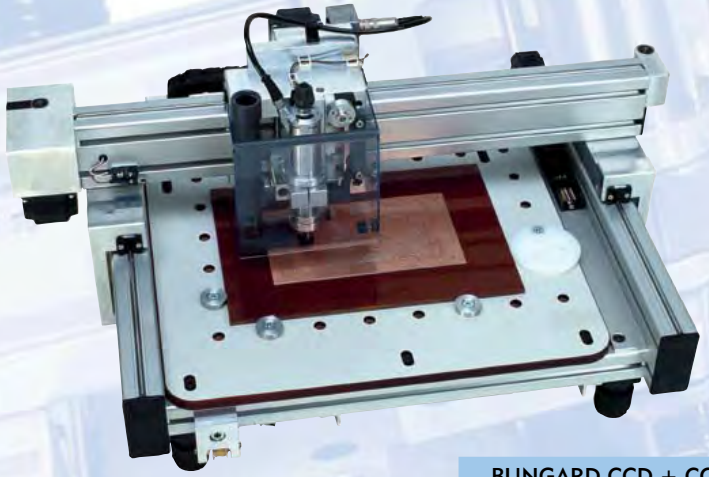
The axes are driven by stepper motors and precision belts. The positioning accuracy is +/- 1 step. The maximum speed is 130 mm/s. The Z axis as well has a stepper motor. Other than any solenoid or pneumatic drive, only a stepper motor allows active control over Z working depth and penetration speed. An additional mechanical depth limiter is included.

The machine comes with a high frequency spindle at 150 W and 60000 rpm. The tool change action is semiautomatic, with the driver software arresting the axes and prompting the user to change the tool. This is done right on the spot by a quarter turn of a knob, and no recalibration will discontinue the drill or mill job.

The machine table has a regular pattern of mounting holes where the board holders and clamps will go. The boards can be mounted to machine zero or to any relative position, but can also be put on base plates with fixing pins, as required for double sided isolation milling.

The driver software coming with the machine will run on any standard PC. It directly reads Excellon or Sieb & Meyer drill files, or HP/GL. One software option is IsoCAM, a program that you will need to convert Gerber board data into isolation milling outlines.

For furhter details see also page 28.



Picture of CCD /2

Picture of CCD /2 soundproof hood

BUNGARD CCD + CCD/2

Power supply:	110-240 V, 50-60 Hz, + vacuum cleaner (1500W)
Warranty:	1 year in-house warranty on parts and labour
Sizes (mechanics) CCD:	
(W x D x H)	70 x 80 x 30 cm
Board size max.:	325 x 495 x 37 mm³
Weight:	approx. 35 kg
Sizes mechanics CCD /2 :	
(W x D x H)	70 x 55 x 30 cm
Board size max.:	270 x 325 x 37mm³
Required desktop size:	approx. 80 x 80 cm
Weight:	approx. 30 kg

Available options:

Protective hood, CAM / Isolation software, monitor + camera, cooling device, compressor, etc.

Explains:

MTC = Manual Tool Change
ATC = Automatic Tool Change

BUNGARD CCD
CNC MACHINE

The Bungard CCD is a high quality Computer Controlled Drilling machine with Automatic Tool Change (ATC) or with Manual Tool Change (MTC).

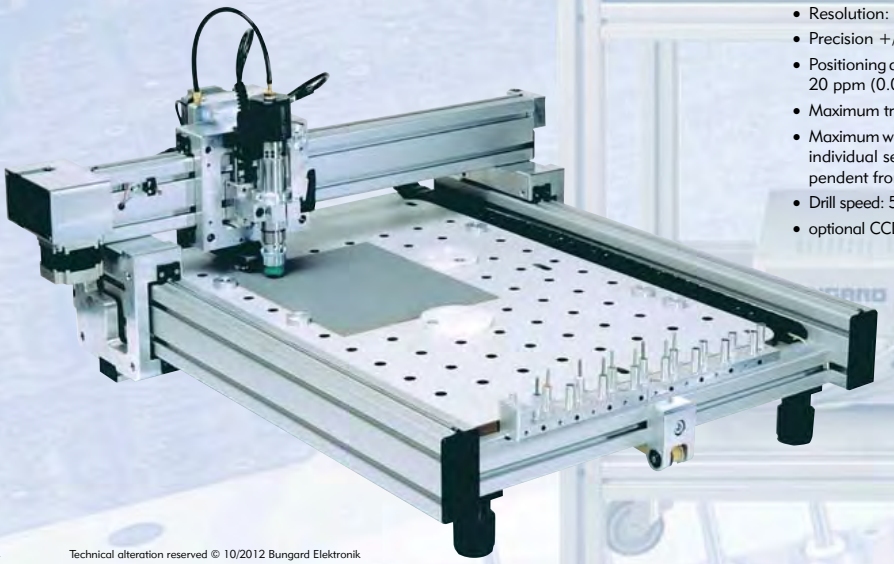
Extent of delivery:

- Mechanics unit
- Control unit, full set of cables
- High speed, long life spindle with quick stop brake and load control
- Automatic tool change, simultaneously 16 out of 99 tools per job (ATC)
- Manual semi automatic tool Change (MTC)
- Integral depth limiter and pressure foot
- Windows driver software RoutePro 2008 for drilling and routing
- Powerful 500-1500 Watt (adjustable) vacuum cleaner, remote controlled

Special features:

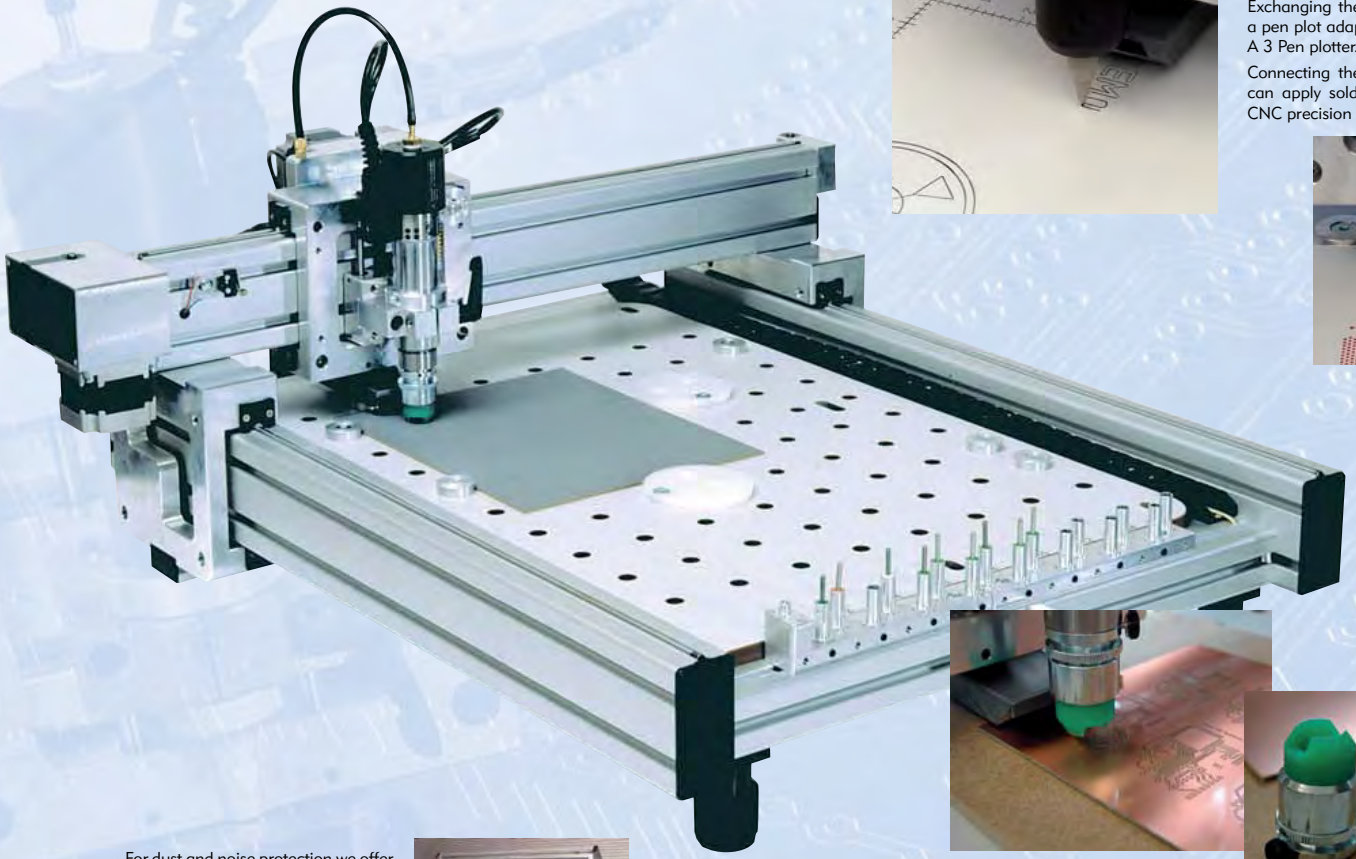
- Mechanics unit: rigid and flat construction with low moving weights and high quality bearings for high-speed positioning
- Machine bed with universal fixture system, suitable for clamp or span fixing or for reference pins (fiducials)
- KaVo high precision spindle motor, 150 Watt, 60 000 rpm, with heavy-duty long-life bearings, including 1/8" (3.2 mm) chuck
- Software controlled spindle speed. Electronic spindle load control with software feedback

- Spindle quick stop (1s) DC brake and speed-up booster
- Heavy duty 2x2 phase high-torque stepper motors on all 3 axes for true milling capability and correct tool speed
- All X/Y and Z traverse speed, working speed, working depth, spindle rpm and depth iterations individually configured on a per-tool basis, resulting in:
- Always adequate cutting speed over the entire spindle RPM range, no need for 100 K rpm spindles, no excessive wear to costy spindle bearings
- Standard travel area: 325 x 495 x 37 mm (larger and smaller machines available)
- Automatic tool change, simultaneously 16 out of 99 tools per job (ATC)
- Quick manual tool change by turning a knob, with machine position locked, no recalibration of height required
- Drill break detection and length control
- Smallest tool diameter: 0.1 mm (micro end mill at 60 000 rpm)
- Max. hole diameter: infinite
- Integral depth limiting device for isolation milling and engraving on uneven surfaces, work level setting by Z stepper motor, depth fine adjustment with micrometer screw
- Removable, spring-load pressure foot for drillng of flexible and uneven PCBs
- Stack processing of several boards at once (typical stack: three 1.6 mm thick boards plus one underlay/base sheet)
- Working depth not limited by depth sensor, only by tool flute length (standard: 5..10 mm)
- Uses all common PCB drills/mills with 1/8" shank, with industry-standard length setting by collar
- Board fixture by „fiducials" possible at no extra cost, using standard base sheet material
- Possibility of mounting boards to machine zero point. Clamp fixing devices included with machine, span fixing for heavy-duty milling is possible
- Vacuum board fixation not recommended due to problems with board penetration by drilling
- Stand alone control unit connects to all standard PCs with 1 free USB or serial port
- Routepro 3000 Windows driver software for Excellon, Sieb&Meyer or HP/GL data for real-time, on-line machine control, with comfortable user interface, including full tool management and plausibility control (see page 26)
- All machine parameters (speeds, acceleration ramps, X/Y/Z dimensions, scaling, tool change positions, drill detection level) software controlled and configurable
- Easy to use teach-in feature for drill data
- Step definition: Software selectable: 1 mil, 1/2 mil, 1/4 mil (= 6.35 micrometer)
- Resolution: 0.1 mil (= 2.54 micrometer)
- Precision +/- 1 step
- Positioning accurracy over entire workspace: 20 ppm (0.002%)
- Maximum traverse speed per axis: 130mm/s
- Maximum working speed per axis: 130 mm/s, individual setting on a per-tool basis, independent from traverse speed
- Drill speed: 5 hits/s (=18000 holes per hour)
- optional CCD noise and dust protection rack



Picture shows ATC

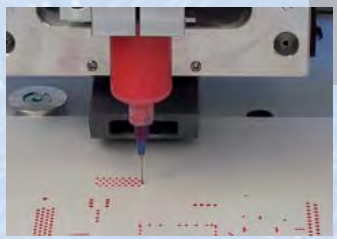
ACCESSORIES CCD

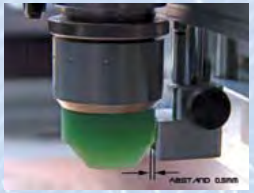


One integral part of the CCD is to keep it multifuctional.

Exchanging the high frequency spindle with a pen plot adapter changes the CCD into an A 3 Pen plotter.

Connecting the CCD with a dispenser, you can apply solder paste and adhesives with CNC precision

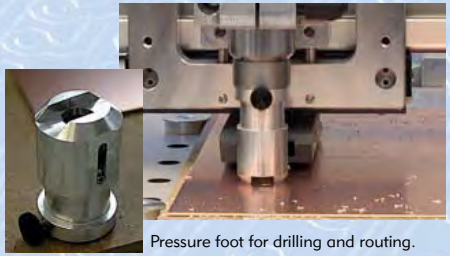




Optional enhanced dust extraction system (instead of standard nozzle) offers

- higher efficency
- lower noise
- more effective travel height

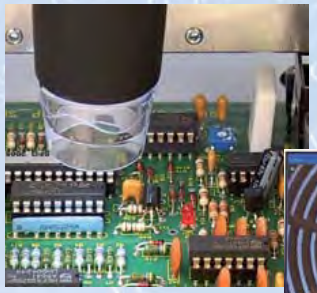
Depth limiter.



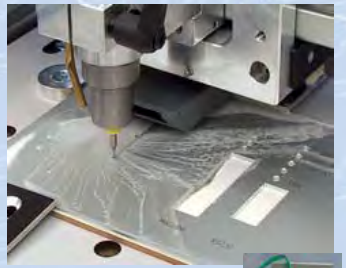
Pressure foot for drilling and routing.

For dust and noise protection we offer soundproofing hoods and racks.

On request the CCD is delivered with a vacuum table.



The USB camera will allow optical inspection of your board.



With few steps you can equip the CCD with a coolant supply.

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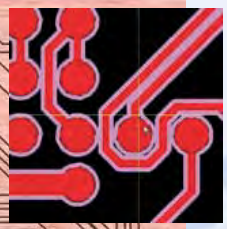
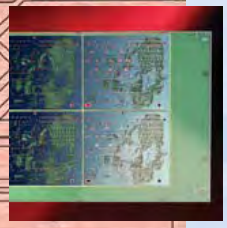


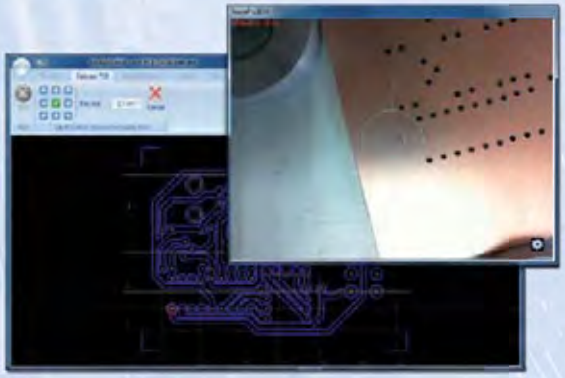


ROUTEPRO 3000

Software is extend of delivery of all new Bungard CCD systems for direct processing of drill- and routing data under Windows 7.

SOFTWARE:

- Driver software for Excellon, Sieb&Meyer or HP/GL data for real-time machine control under Windows XP...Windows 7 (32- or 64-bit), with comfortable user interface, including tool statistics and plausibility control
- drill and route data simultaniously displayed
- on-screen processing sequence display
- on-screen selection of drill and route vectors
- Automatic tool change, simultaneously 15+1 out of 99 tools per job.
- selectable tool change positions (for ATC machines only)
- Drill break detector
- Software controlled spindle, quick stop, DC brake and chuck
- All machine parameters software controlled and configurable
- Easy to use teach-in feature for drill data
- step definition: software selectable: 1 mil, 1/2 mil, 1/4 mil (= 6.35 micrometer)
- maximum working speed per axis: 130mm/s
- picture and target of optional USB camera will be shown on computer screen



NEW FEATURES IN ROUTEPRO 3000:

Routepro 3000 is working on all Bungard CNC machine sold later 2006.

This new standard combines all existing tools and add in items in one user platform:

- Drilling and routing of PCBs
- Isolation milling of PCBs
- Engraving of front panels

available options/add on items:

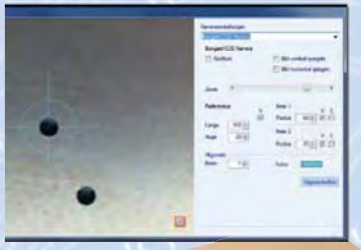
- Laser direct imaging of photoresists
- Dispensing
- Remote control

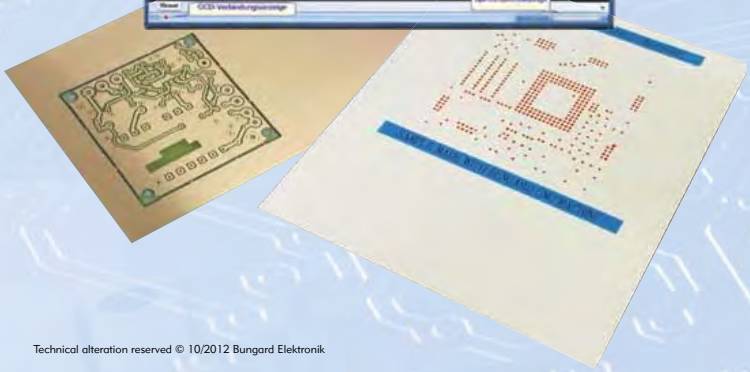
New: Fiducial recognition system with camera.

Special features:

- Wizard and fully developed, context sensitive user help leads through the program.
- Modern Win 7 surface
- Up to 4 different layers can be loaded at the same time
- Job related data storage
- plausibility control for data entries
- multiple, material related tool boxes
- selectable modules for different languages
- units switchable from metric to imperial
- online step by step instruction

Routepro 3000, another milestone in PCB-prototyping.

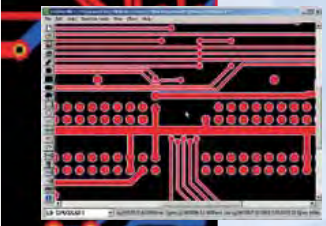




EXTENSION TO THE CCD:

Software DispPro

Make your CCD to a high speed dispensers. We provide the software DispPro, a switch output for the CCD to control a dispenser and, if desired, a suitable Dispensing machine. The software is easy to use analog to our proven software RoutePro. In contrast, no rounds per minute but dosing times, no drilling depths but dosing distances, no spindle delays but dosing delays may be set. Else you can use your drill file for dot dispensing and your milling file for line dispensing.



DATA CONTROL
CONVERSION
ISOLATION MILLING

ISOCAM

The situation:

You designed a PCB with your CAD package and now want to make a prototype or a small series by etching or by isolation milling.

Isocam 5.0 for Win XP...Win7 64 bit offers updated hardware drivers with improved dongle management. We recommend all existing ISOCAM users (that have a dongle = user identification already) to upgrade there system to this standard.

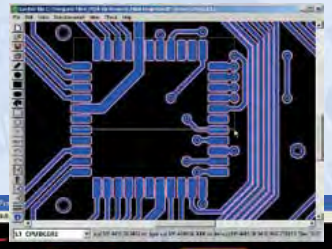
(Find download full version and demo version (for new users) on our website).

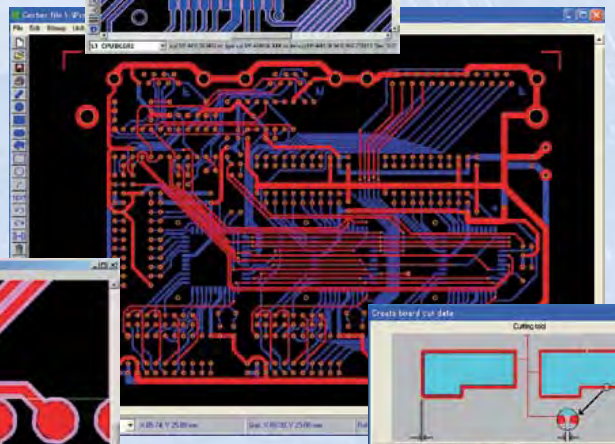
The questions:

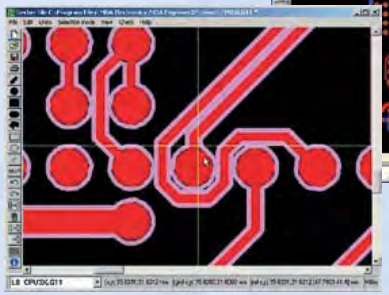
- How do you check and correct the drill-, route- and plot-data, their dimension and layer registration?
- Do you want to make your prototype by isolation milling?

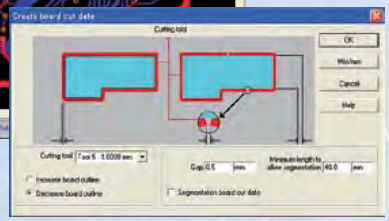
The answers:

- IsoCAM reads your Gerber, HP/GL, and drill files. It offers you editing facilities like shift, mirror, copy, paste, delete and more on single vectors, groups of elements or entire layers.
- IsoCAM can convert data into all of the above mentioned formats. Windows Postscript output allows making film artworks.
- IsoCAM comes with a worthy isolation milling converter with the feature of using two different tools in once and with the possibility of creating copper rubout areas.
- The aperture table and the tool rack can be edited, saved and printed. A converter automatically reads the aperture information from most CAD packages.
- optional up-grade to ISOCAM PRO enables to load .bmp and .dxf files

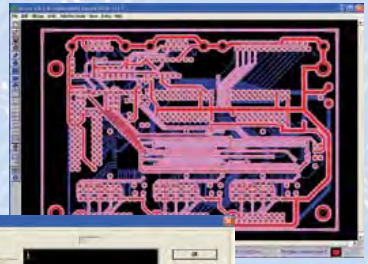


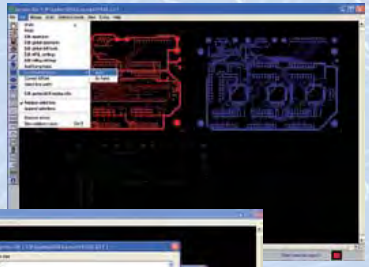


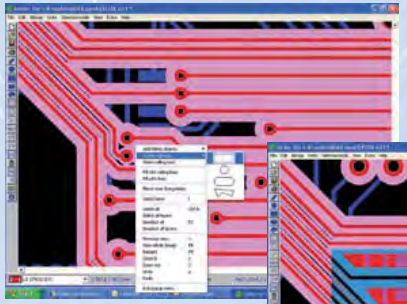


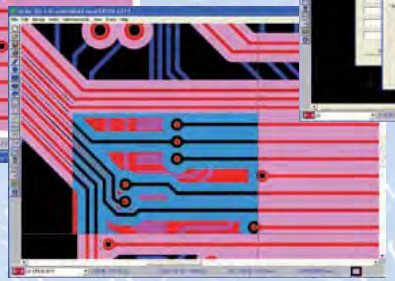


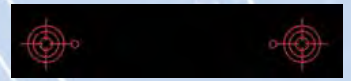
ISOCAM©	STANDARD	PRO
Gerber input / output (standard/extended)	YES	YES
HPGL input / output	YES	YES
Excellon output for milling data	NO	YES
DXF input / output	NO	YES
Bitmap input /output	NO	YES
Drill input / output	YES	YES
G-code output	YES	YES
ARC optimize	NO	YES
Scaling	NO	YES
Scale / auto-rotate bitmap	NO	YES
Auto detect drill holes in bitmap	NO	YES
Save Job file	YES	YES
Create milling data	YES	YES
Create milling data using two tools	YES	YES
Create milling data for selected object	NO	YES
Undo/Redo	YES	YES
Max. number of layers	32	64
Units: Mils / mm / Inch / HPGL	YES	YES
Design rules checker	YES	YES
Show milling direction	NO	YES
Change milling direction	NO	YES
Change starting point of milling chain	NO	YES
Select whole milling chain	NO	YES
Create solder mask	NO	YES
Snap to nearest endpoint	YES	YES
Auto synchronize layers	YES	YES
Add fixing holes	YES	YES
Create rub outs	YES	YES
Create board cuts	YES	YES
Mirror-function	YES	YES
Powerfill zoom function	YES	YES
Add objects	YES	YES
Select complete net	NO	YES











COMPACTA 30
THROUGH-HOLE-PLANTING LINE

This machine from the COMPACTA-series was consequently designed to meet the demands of professional direct metallization.

It can take boards up to 210 x 300 mm² and has 5 treatment tanks (cleaning - pre-dip - catalyst - intensifyer - reserve tank) and one galvanic plating tank.

Two treatment tanks are thermostatically controlled and equipped with a teflon heater.

Bath movement on all tanks is performed with DC-gear motor. The stroke speed is stepless adjustable.

The galvanic plating tank comes with an integrated air injection and a stepless regulated rectifier. A Volt- and an Amperemeter show the current electric values.

Special emphasis was put on a unique rinsing technique. A double cascade rinse and a spray rinse, the latter activated via foot switch and a magnetic valve, are integral parts of the COMPACTA 30.

We also offer the COMPACTA as a complete system including chemicals, anodes, anode holders and board holders.

COMPACTA 30

Tank dimensions	treatment tanks	galvanic copper tank
Length:	400 mm	400 mm
Width:	100 mm	275 mm
Depth:	300 mm	300 mm
Capacity:	10 l	30 l

Total size (WxDxH):	88 cm x 100 cm x 135 cm
Working level:	95 cm
Weight:	approx. 80 kg
Heaters:	2 x 400 W
Rectifier:	1 x 6 V, 40 A
Bath movement:	DC-gear motor
Power supply:	230 V, 50 Hz, 6.3 A

Picture of COMPACTA 30

COMPACTA 40 2CU
THROUGH-HOLE-PLATING LINE

Based on the same principle of construction as our Compacta 30 series, the Compacta 40 2CU is optimized for higher productivity. You can manufacture boards with a maximum size of 300 x 400 mm² . This enlargement plus an integral, second plating bath leads to almost 4 times higher daily throughput with only little more space requirements.

Based on the COMPACTA-series we also produce machines for other chemical systems.

Alternatives for improved surface qualities:

Bungard is also experienced in galvanic nickel-gold-systems for long lasting, bondable surface quality. Moreover tin-, blackening- or sealbond-systems are available. Contact us for your individual, customized solution.

COMPACTA 40 2Cu

Tank dimensions	treatment tanks	galvanic copper tank
Length:	500 mm	500 mm
Width:	100 mm	300 mm
Depth:	450 mm	450 mm
Capacity:	20 l	60 l

Total size (WxDxH):	120 cm x 118 cm x 139 cm
Working level:	95 cm
Weight:	approx. 130 kg
Heaters:	2 x 800 W
Rectifier:	2 x 6 V, 80 A
Bath agitation:	DC gear motor
Power supply:	230 V, 50 Hz, 2,5 kW

Picture of COMPACTA 40 2CU

RBM 300
BRUSHING MACHINE

A professional brushing machine designed for use in small series production and laboratories. High quality wet-processing brushing machines for pcb production at low price are possible! The proof is the Bungard RBM 300. The smaller sister of our RBM 402 is reduced whereever possible but not at quality, endurance and high precision details.

Features:

- The RBM 300 has an oscillating brush with quick change device
- Oscillation fequency and transport speed are stepless adjustable
- Parallel height adjustment. In contrary to the single sided height adjustment, you will achieve a long term even brushing result only with double sided parallel height adjustment.
- Machine is equipped with a finishing brush used before laminating. Various brushes available.
- Working width 300 mm
- Despite its small size, the RBM 300 has a full scale squeeze-off and hot air drying compartment
- As bench top model the RBM 300 has no integrated water treatment. A closed loop rinsing tank is available as an option
- Single side action
- Aluminium, PVC, Stainless Steel construction
- Transparent top lid with security switch
- Mechanical drying by squeezing rollers

RBM 300	
Usable width:	300 mm
Board thickness:	0,3 - 3 mm
Brushing speed:	1360 rpm
Conveyor speed:	0.2 - 2 m/min
Oszillation stroke:	10 mm
Oszillation frequency:	ca. 10 - 110 1/min
Stroke speed:	ca. 0,2 - 2 m/min
Rinsing system water consumption:	6,8 l/min.
Power supply:	230 V~, 50 Hz
Size (L x W x H):	760 x 590 x 415 mm
Weight:	80 kg

Picture of RBM 300 KF

RBM 300 KF

- Closed loop water management with filtration.
- Stand alone with rack and integrated water tank.

RBM 402 KF
BRUSHING MACHINES

The RBM 402 KF series is the highest developed brushing machine in our range and can be used for practically all cleaning operation during pcb manifacturing. It is ideally suited for professional prototyping or smallbatch production in modern PCB laboratories. The RBM 402 consists of a double sided wet processing brush compartment, a rinsing and a following squeeze-off zone and hot air drying compartment. The solid construction guarantees proper function and a long life time with a minimum of maintainance.

Features:

- simple brush exchange via quick change device
- precise parallel brush adjustment with hand wheel
- Oscillation and transport are stepless adjustable
- Digital read out for board thickness and power consumption of the brush motor
- Upper and lower brushing rollers are adjustable in pressure and have a digital read-out for the settings.
- The wet-processing system comes together with a powerful squeeze + hot-air dryer.
- The „KF" is indicating an integral closed loop rinsing system. That is urgently recommended in order to comply with German and European waste water regulations.

RBM 402 KF	
Working width:	400 mm
Conveyor speed:	0.2 - 2 m/min
Oscillation stroke:	10 mm
Oscillation frequency:	10 - 110 lifts/min
Brushing roller length:	410 mm
Brushing roller outside diameter:	89 - 91 mm
Brushing speed:	1360 rpm
Board thickness (rigid boards only):	0.3 - 5 mm
Board sizes:	(min.) 80 x 175 mm
Rinsing system water inlet:	19 mm
Rinsing system water outlet:	40 mm
Rinsing system water consumption:	26 l/min.
Power supply:	230 V, 50 Hz, max. 16A
Dimensions (L x W x H):	111 x 75 x 116 cm
Weight:	220 kg (RBM 402KF) 170 kg (RBM 402 BLC)
Brushing stroke on upper roller:	max. 20 mm
Brushing stroke on lower roller:	max. 15 mm
Feed per turn of hand wheel:	0.266 mm
Brushing roller inner diameter:	35 mm
Rinsing system pressure: max.	1.5 bar

Also available version:

RBM 402 BLC:
bench-top low cost version

RBM 402 KF:
closed-loop version with tank and candle filters

Picture of RBM 402 KF

RLM 419 P
DRY FILM LAMINATOR

The RLM is a dry film laminator especially made for small companies, schools, research and development departments. All commercial laminates for PCB manufacture and mould-etching technique can be processed. Due to adjustable pressure control and adjustable laminating speed, solder mask application is also possible without problems.

Features:

- Easy and fast mounting of resist rollers of all common coil diameters
- Detachable inlet table for easy access to lower resist roll
- Infinitely adjustable laminating speed
- Electrically heated lamination rollers with uniform temperature distribution
- Separate transport rollers for non-creasing laminate transport
- Digital setting and read out of lamination temperature
- Manually adjustable lamination pressure
- For all common dry film resists
- Suitable for solder mask application

RLM 419 P	
Lamination width max.:	400 mm
Transport width max.:	440 mm
Lamination speed:	0,2-1,2 m/min adjustable
Resist tension:	adjustable
Lamination pressure:	adjustable
Temperature range:	20 - 199° C digital setting
Power supply:	230 V 50 Hz / 2 kW
Weight:	38 kg
Dimensions (WxDxH):	69x63x57cm

AIR 2000
CONVEYORIZED PCB DRYER

Air 2000 is a conveyorized PCB Dryer. Adjustable transport speed ensures perfect drying of holes and surfaces after all wet process sequences.

Features:

- Continuous drying
- Variable transport speed
- Suitable for different board thicknesses
- Low surface temperature
- Short heating-up time
- High throughput
- Bench top machine
- High quality construction

AIR 2000	
Working width:	300 mm
Board thickness:	0.2 - 4 mm
Minimum board length:	80 mm
Transport speed:	0.2 - 1,2 m/min
Heat up time:	5 sec.
Dimensions (WxDxH):	352x520x362 mm
Power supply:	230 V 50Hz

RDC 15
DIP COATER

The RDC 15 is a machine designed for laboratory dip coating of modern liquid photo-resist. Today a more and more popular application is the so called: „sol-gel-application". This machine was developed to meet the demand of a greater variety of speeds, iterations, dipping and drip off times and heavier workpieces.

Features:

- Lift bar for several workpiece fittings. The dipping height and the sizes of the aluminium profiles can be easily adapted to even dip-coat bulky items.
- The insertion and the drawing or coating speed is separately adjustable from 30 mm/min until 7200 mm/min.
- The dipping time as well as the drip-off-time (pause time up and down) is separately adjustable from 1 s up to 99h : 59min : 59s. This enables the machine not only to coat but to precisely develop. This is of great importance with certain photo coatings of the miniature etching technology.
- Up to 8 iterations are possible.
- The working range of the lift bar can be adjusted via the control panel. The maximum size of the workpiece is therefore only limited by the maximum lift range of the machine and the size of your cuvette.

RDC15	
Stroke length:	0 - 600 mm
Maximum load:	1,5 kg
Weight:	12 kg
Dimensions (BxTxH):	28 x 47 x 96 cm
Insertion speed:	Programmable von 30-7200mm/min
Drawing speed:	Programmable von 30-7200mm/min
Dipping Time:	0.5 s – 100 Std
Drip Off Time:	0,5 s – 100 Std
Iterations:	Up to 8 times
Power Suppley:	100 – 240V; 50-60 Hz 1.6 A, 100W

RDC 21-K

NEW! Up to 10 different program cycles can be stored and repeated at any time. NEW!

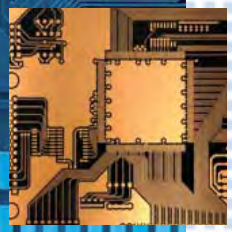
Advantages compared to RDC15:

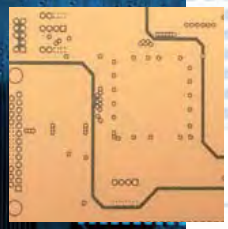
- Foil keyboard for easy data entry
- Virtual end switch avoids unnecessary drives
- Separate speed settings for dipping, coating and positioning drives possible
- Stronger Stepper motor enables a 4-times higher load (5 kg instead of 1,5 kg).
- Minimum speed down to 3 mm/min. As an option 1.5 mm minimum speed also possible
- Parameters are stored for the next job after switching off machine
- Controller is tiltable and removeable

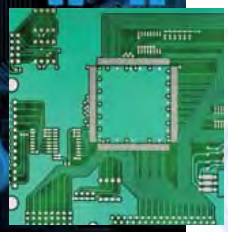
RDC 21-K	
Stroke length:	0 - 580 mm
Maximum load:	5 kg
Weight:	12 kg
Dimensions (BxTxH):	28 x 47 x 100 cm
Insertion speed:	Programmable from 3-3500 mm/min or 1.5 - 3500 mm/min
Drawing speed:	Programmable from 3-7000 mm/min or 1.5 - 3500 mm/min
Dipping Time:	0.5 s – 100 Std
Drip Off Time:	0,5 s – 100 Std
Iterations:	Up to 1000 times
Power Suppley:	100 – 240V; 50-60 Hz 3 A, 100 W

RDC 30 MULTIDIP

- Rotary table with 6 cups for multi-coating!
- Each dive individually programmable (diving, drawing speed, dipping and dropping time)
- integrated magnetic stirrer with programmatic function and speed (1 - 999 1/min)
- Diving and drawing speed between 3 - 7000 mm/min
- Save this job and job iterations possible







RMP 210
MULTILAYERPRESS

This high performance multilayer press was designed for PCB labs to enable quick prototyping of multilayer PCBs according to industry standards.

Number of layers is only limited by the maximum lift of the press plates (38 mm). Using separating metal sheets one can press a couple of boards over each other at the same time.

A compact and floor standing aluminium rack contains all parts of the unit including pressure supply, press plates and heaters.

The large loading door allows quick and easy access to the press chamber and is of course security switch protected.

A compressor, which is integral part of RMP 210 is stored in the back of the machine.

In the front, you will find additional storage room for tools or boards (lower door).

The unit is controlled by two digital and adjustable thermostates, one digital timer as well as a pressure valve with pressure meter.

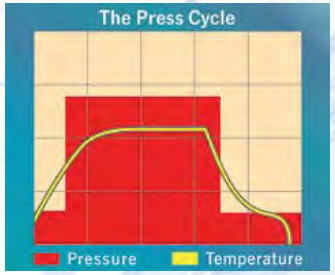
Four strong air ventilators are activated automatically during cooling cycle.

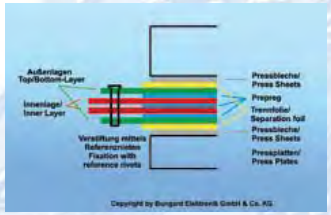
Steps of multilayer production with RMP 210:

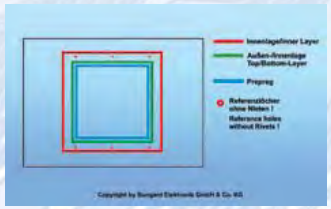
- Boards are pinned and stack is inserted into press plates.
- Pressure is created.
- Heater is activated.
- Heating up procedure.
- Press procedure at preset temperature.
- Cooling down under pressure.
- PCB stack is taken out of the machine.

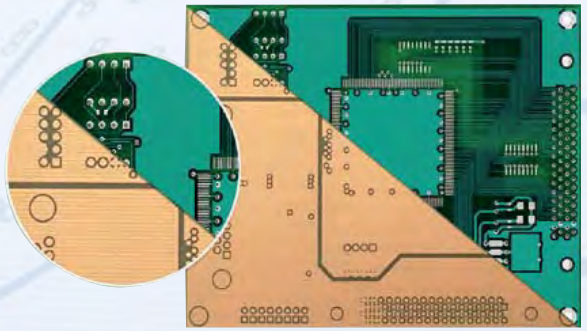
The entire sequence will take approx. 3 hours if you start at 20°C and take out the pcbs at a temperature of 30°C. If you take up protective measures, you can remove the boards at higher temperatures and insert a new stack. This way the press cycle reduces to approx. 45 min. Gross size of the PCBs is 250 x 350 mm which corresponds to a PCB net size of 210 x 300 mm. To register the layers of your multilayer you can use the register hole function of our software IsoCam and the Bungard Favorit fixes the layers with rivets.

RMP 210	
Board size:	250 x 350 mm gross 210 x 300 mm net
Pressure:	> 12 tons working (double pressure available upon request)
Temperature:	250 °C (adjustable)
Heating up:	30 min.
Pressure time:	60 min.
Cooling down:	approx.120 min.
Machine size (WxDxH):	65 x 65 x 130 cm
Weight:	130 kg net
Power supply:	230 V~, 50 Hz, 16 A



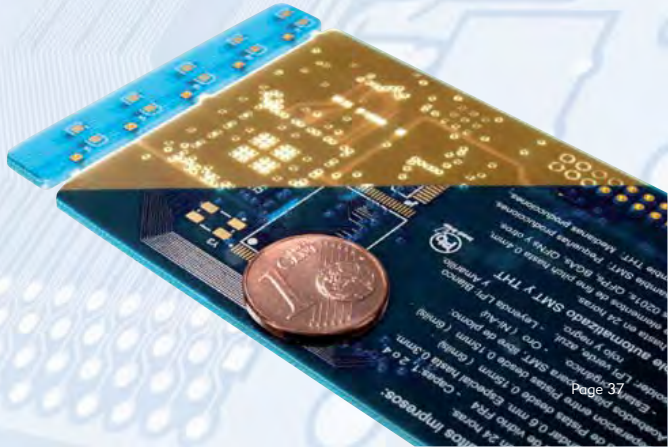






Schematic of a 6-layer and a 4-layer PCB

6-layer	4-layer
Top layer 18 µm CU 0.2 mm total thickness	Top layer 18 µm CU 0.3 mm total thickness
Prepreg 1 x 0.1	Prepreg 1 x 0.2 mm
Inner layer 2 x 35 µm CU 0.3 mm total thickness	Inner layer 2 x 35 µm CU 0,5 mm total thickness
Prepreg 1 x 0.2	Prepreg 1 x 0.2 mm
Prepreg 1 x 0.1	Bottom layer 18 µm CU 0.3 mm total thickness
Inner layer 2 x 35 µm CU 0.3 mm total thickness	
Prepreg 1 x 0.1	
Bottom layer 18 µm CU 0.2 mm total thickness	



GENERAL SALES CONDITIONS

July 2012

1. General

Our deliveries are exclusively subject to the conditions set forth herein which shall be deemed to be explicitly accepted by the purchaser. No conditions which may appear on the purchaser's order shall be binding on us, even without our express contradiction.

2. Quotations and orders

Our quotations are not binding on us. This applies also to information contained in price lists, leaflets etc.. Delivery dates stated in our quotations or given to the purchaser by any other means are approximate, and we endeavour to keep to them. Delays in delivery shall give no right to claims, unless we have explicitly confirmed such delivery dates and an adequate period of grace granted to us has expired. Orders shall only be binding on us when they are explicitly confirmed in writing, regardless of the form in which they have been placed with us. The data given in our catalogues are only product descriptions, and in no case they can be regarded as guaranteed characteristics. Furthermore the characteristics of our samples cannot be regarded as guaranteed characteristics.

3. Prices

Prices shall be valid only when confirmed by us in writing. They are exclusive of VAT at the current rate and incidentals such as postage and packing, freight, insurance etc..

4. Conditions of payment

4.1. Frequently buyers may be supplied on credit account. That must be negotiated before. Hight of credit lines are depending on yearly overturn with BUNGARD during the last 12 months.

4.2. New customers, buying from Bungard since less than 1 year will not be supplied on credit.

4.3. For orders of less than 25 000 Eur, we insist in prepayment by SWIFT to our international bank account. Payments costs are born to buyer.

4.4. For orders of more than 25 000 Eur, buyer has to open an irrevocable LC, available and confirmed by any German bank, preferably Deutsche Bank. All LC costs and banking fees inside and outside Germany are to opener's account.

5. Set-off, right to retention

Only uncontested or legally binding counterclaims may be offset against our invoices. Any right to a retention to be exercised by the purchaser in connection with our claims is explicitly excluded.

6. Delivery

Delivery of our goods is explicitly made on behalf of and at the risk of the purchaser. The risk shall pass on to the purchaser when the ordered goods leave our premises. The same applies if goods are collected in our premises after notification of their readiness. We decide at our discretion on the most economical delivery method without assuming any liability for the chosen means of delivery.

7. Reservation of proprietary rights

7.1 All goods supplied shall remain our property until all of our claims resulting from the contract have been paid in full. The purchaser is entitled to dispose of the purchased goods in the ordinary course of business transactions. Reservation of proprietary rights also applies to products resulting from processing, mixing up or combining our goods with goods of third parties, in which case we are considered as manufacturers. In the case where our goods are processed, mixed up or combined with goods of third parties, and the proprietary rights of such third parties remain in force, we are entitled to co-ownership according to the proportion of the amount invoiced for such processed goods. Such right to co-ownership shall be safeguarded by the purchaser.

7.2 The purchaser shall transfer to us, as a security, his claims against third parties resulting from the resale of our goods in full or in the proportion of our co-ownership (see subparagraph 7.1). He is entitled to collect the amount of such claims on our behalf until revoked or until cessation of his payments made to us. The purchaser is not entitled to assign these claims to third parties.

7.3 The purchaser is not entitled to mortgage or transfer the goods which are subject to reservation by way of security.

7.4 The purchaser shall advise us immediately at any seizure of our goods or of any infringement of our rights by third parties.

7.5 In case of a default in payment or a deterioration in the financial situation, we are entitled to request immediate handing over of the goods which are subject to reservation. Any time limited claims shall immediately become due.

7.6 If the value of the securities exceeds our claims by more than 20%, securities to a corresponding amount will be released by us on request at our discretion.

8. Warranty and transport damages

We supply all our machines under a 12 month in-house warranty on parts and workmanship. This means that in this period of time, we repair or, at our choice, exchange, defective parts free of charge and at our facilities. This warranty does not cover transport fees.

Any user intervention to the machine / appliance will void the warranty, if not explicitly requested by us. Normal wear (i.e. on drive belts or spindle bearings) or damage from user intervention (i. e. pulling pc boards from units under tension) are not covered by this warranty.

Our local representative / dealer is in charge of technical assistance in any case of damage. Details of repair / exchange measures and coverage of transport fees are to be handled between our representative and us.

The purchaser shall check possible damages of our supplied goods on transit or transport immediately upon receipt and inform us in writing of visible defects at the latest 8 days after receipt. Complaints made at a later date will not be accepted by us. The purchaser shall give us the opportunity to convince ourselves of the rightfulness of the claim. If a claim is justified, we may repair the damage, supply replacements or refund the purchase price at our discretion. Further claims of the purchaser, especially claims for damages, are explicitly excluded, unless certain features of the goods had been assured by us. Claims for faulty delivery will in any event come under the statue of limitation six months after delivery.

9. Withdrawal

When delivery in accordance with the contract is not possible for reasons beyond our control, we are entitled to withdraw from the contract. Such withdrawal shall not entitle the purchaser to assert any right against us.

10. Place of performance and jurisdiction, applicable law

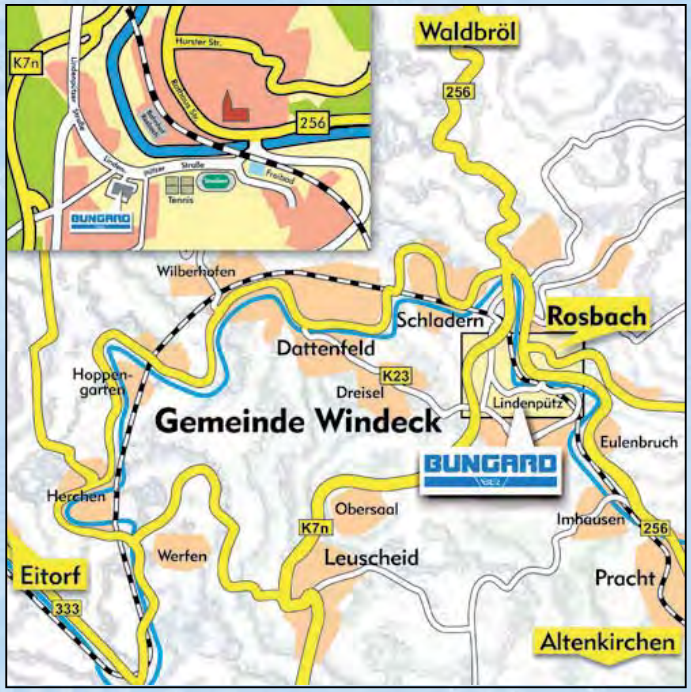
The exclusive place of performance and jurisdiction for both parties shall be 51570 Windeck Germany. Any contract shall be governed by the law of the Federal Republic of Germany.

11. Severability clause:

If any clause herein is or will become invalid, such clause shall not affect the validity of the remaining clauses. The invalid paragraph shall be replaced by a valid clause which shall meet as closely as possible the legal and commercial purpose of the original one.

Bungard GmbH & Co KG

51570 Windeck



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