Innovative Solutions for Printed Circuit Board Processing

- Deburring
- Cleaning/Deoxidising
- Resin Removal
- Finishing
- Pressplate Cleaning
Offers access to new ideas, economies of scale, and new techniques to master your surface treatment and finishing needs.

Operations in 14 Countries

Sales offices in 23 Countries

2,000 Employees worldwide

Servicing more than 120 Countries through numerous agencies and strong distribution networks. Providing insight into the customs and best practices necessary to succeed anywhere in the world.
Printed Circuit Board manufacturing has changed dramatically in recent years and production processes can no longer be simply described as deburring, cleaning or finishing. We have not only had to broaden our vocabulary but also extend and develop the range of brushing rollers used for mechanical surface processing.

Highly competitive global markets dictate that only the fittest survive hence high reliability, stability and long durability have become a necessity. We have a range of brushing rollers to meet these goals, all producing the same uniform performance, throughout a long service life. High quality materials tightly packed to maximum density offering the necessary “bite”. The three dimensional open web construction ensures a “self-cleaning action”, it prevents loading of contamination and the generation of excessive heat or “baking”.

New abrasive particles are continuously exposed to produce a consistent and uniform finish. Special treatments ensure that, even when wet, the rollers remain hard and resilient.

To the proven range of LIPPROX® Clean Deburring Rollers, there have been added the LIPPRITE® Super Cut Rollers, LIPPRITE® High Resolution Finishing Rollers and LIPPRITE® Soldermask Finishing Rollers. The LIPPRITE® Pressplate Cleaning Rollers complete this range.

Station 1: Top roller rotates with the board. Bottom roller rotates with the board.

Station 2: Top roller is counter rotating. Bottom roller is counter rotating.

A brushing machine with 4 heads is highly recommended for all brushing operations! The alternating direction of rotation is the distinct advantage of this set-up. Drilled holes are consistently deburred in the brushing direction. This set-up permits a considerable increase in feed rate. Brushing against feed direction on station 2 ensures that copper particles and brush debris are thrown behind the board.

To the proven range of LIPPROX® Clean Deburring Rollers, there have been added the LIPPRITE® Super Cut Rollers, LIPPRITE® High Resolution Finishing Rollers and LIPPRITE® Soldermask Finishing Rollers. The LIPPRITE® Pressplate Cleaning Rollers complete this range.

PRINCIPLES IN MANUFACTURING AND DEVELOPING SURFACE FINISHING ROLLERS

Operating Parameters

| Cutting speed | 12 – 16 | [m/s] | Brush speed is generally determined by the machine manufacturer |
| Pressure | 1.5 – 2.5 | [kN] | (load) |
| Oscillation frequency | 240 – 500 | [strokes/min] | |
| Oscillation path | 3 – 10 | [mm] | |
| Coolant | wet | | water |
| Resin on PCB | up to 60 | [bar] | i.e. full flow as determined by machine |
| No. of brushes | 4 – 8 | | 2 top / 2 bottom or 4 top / 4 bottom |

Surface Roughness Measurements

**Rz** Results (measured values) are calculated as mean values from 5 consecutive measurements

**Ra** The arithmetic average of the absolute values of the roughness profile ordinates

**Rt** Maximum roughness, the distance between the highest peak and the lowest valley within the evaluation length

Available grit sizes

<table>
<thead>
<tr>
<th>LIPPERT-UNIPOL specification</th>
<th>Quality (FEPA)</th>
<th>International specification</th>
<th>Cu</th>
<th>St. 1.4642</th>
</tr>
</thead>
<tbody>
<tr>
<td>RA</td>
<td>MEDIUM S</td>
<td>MED S</td>
<td>9.0 – 7.0</td>
<td>1.20 – 2.50</td>
</tr>
<tr>
<td>SB</td>
<td>MEDIUM S</td>
<td>MED S</td>
<td>3.0 – 5.0</td>
<td>0.25 – 1.5</td>
</tr>
<tr>
<td>SC</td>
<td>MEDIUM S</td>
<td>MED S</td>
<td>0.7 – 1.2</td>
<td>0.10 – 0.15</td>
</tr>
<tr>
<td>SI</td>
<td>MEDIUM S</td>
<td>MED A</td>
<td>1.60 – 2.00</td>
<td>0.15 – 0.30</td>
</tr>
<tr>
<td>SA</td>
<td>MEDIUM A</td>
<td>MED A</td>
<td>1.20 – 2.00</td>
<td>0.14 – 0.25</td>
</tr>
<tr>
<td>SC</td>
<td>MEDIUM A</td>
<td>MED A</td>
<td>1.00 – 1.60</td>
<td>0.13 – 0.15</td>
</tr>
<tr>
<td>SI</td>
<td>MEDIUM A</td>
<td>MED A</td>
<td>0.60 – 1.20</td>
<td>0.08 – 0.14</td>
</tr>
</tbody>
</table>

Roller Construction

Important:

Every LIPPROX® Roller is clearly marked with a directional arrow, rollers must rotate in the direction shown.

Flap Construction

Abrasive non-woven flaps are bonded to non-woven synthetic fibres with a resin adhesive. Different combinations of adhesive and abrasive together with nylon web generate diverse products to meet different demands.

Abrasive non-woven Abrasive particles are bonded to non-woven synthetic fibres with a resin adhesive. Different combinations of adhesive and abrasive together with nylon web generate diverse products to meet different demands.

Station 1 Station 2
LIPPROX® CDR
CLEAN DEBURRING ROLLER

LIPPROX® – burr removal prior to plating

Despite the introduction of high speed drills, an entirely burr free hole is rarely possible. To avoid subsequent errors, shorts or missing connections, it is necessary to ensure that the geometry of the hole edges is as precise as possible. Especially for this process, LIPPERT has developed the roller type LIPPROX®, already proven throughout the world.

LIPPROX®

A convolute non-woven roller. Non-woven material is wound around a tube and polymerised. LIPPROX® rollers are ideal for deburring since they offer considerably longer life and higher performance than comparable flap rollers.

Your advantages:

- uniform surface quality
- intense cleaning performance
- perfect preparation for electroplated copper coating
- minimal radiusing of the edges
- minimal brush debris
- drilled holes are not blocked by contamination from the boards or rollers
- no damage to the edges of the bore
- no clogging of brush surface
- extremely long life
- regular hardness and abrasion throughout the entire service life
- dynamic balancing available
- metal flanges for a perfect fit (no tolerance problems) and concentric run

LIPPROX® Clean Deburring Roller

产品推荐

<table>
<thead>
<tr>
<th>Roller Type</th>
<th>Surface Roughness Rz (µm)</th>
<th>Abrasive Material</th>
</tr>
</thead>
<tbody>
<tr>
<td>LIPPROX® CDR S8 H7 (super fine SiC 500/600)</td>
<td>2.0</td>
<td>SiC 500/600</td>
</tr>
</tbody>
</table>

Durability

LIPPROX® Clean Deburring Roller is enhanced by the special LIPPERT bonding system that ensures a high service life of over 50,000 m² panel surface.

Surface Roughness

<table>
<thead>
<tr>
<th>Brushing Roller Type</th>
<th>Expected surface roughness Rz (µm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>LIPPROX® CDR S8 H7 (super fine SiC 500/600)</td>
<td>2.0</td>
</tr>
</tbody>
</table>

Product Recommendation

LIPPROX® Clean Deburring Roller S8 C2 H6

*also available in S7 SiC 320/400 and S9 SiC 800/1000
LIPPRITE® SCR
SUPER CUT ROLLER

Your advantages:
• uniform surface quality
• intense cleaning performance
• increased micro roughness
• increased adhesion of ink resist
• remains hard under wet conditions
• low risk of hole blockage
• no damage to the bore edges
• no clogging of brush surface
• dynamic balancing available
• metal flanges for a perfect fit
  (no tolerance problems) and concentric run

Direction of brush rotation
Station 1 (and 3):
Top roller must rotate with the board.
Bottom roller must rotate with the board.
Station 2 (and 4):
Top roller must counter rotate.
Bottom roller must counter rotate.

Machine set-up for:
• Removing residual copper “nodules” after plating
  (surface preparation prior to lamination)
• Removing black oxide from IVH and BVH process
• Removing black oxide from IVH and BVH process
• Removal of built-up resin ink spots in SBU process
• Burr removal prior to plating

Station 1:
LIPPRITE® Super Cut Roller
S8  D109  I2 2 SFN  (SiC 600) Rz = 2.0 µm
Station 2:
LIPPRITE® Super Cut Roller
S9  D109  I2 2 UFN  (SiC 800) Rz = 1.5 µm
Station 3:
LIPPRITE® Super Cut Roller
S7  D109  I2 2 VFN  (SiC 320) Rz = 2.5 µm
Station 4:
LIPPRITE® Super Cut Roller
S9  D109  I2 2 UFN  (SiC 800) Rz = 1.5 µm

A brushing machine with 4 heads is highly recommended!

Process/Product Recommendation

Surface leveling:
Ceramic roller
Station 1: Ceramic roller
Station 2: LIPPRITE® Super Cut Roller S7 D109 I22 VFN (SiC 320) Rz = 2.5 µm
Station 3: LIPPRITE® Super Cut Roller S9 D109 I22 UFN (SiC 800) Rz = 1.5 µm
Station 4: LIPPRITE® Super Cut Roller S9 D109 I22 UFN (SiC 800) Rz = 1.5 µm

Station 1:
LIPPRITE® Super Cut Roller
S8 D109 I22 SFN (SiC 600) Rz = 2.0 µm
Station 2:
LIPPRITE® Super Cut Roller
S9 D109 I22 UFN (SiC 800) Rz = 1.5 µm

LIPPRITE® SCR

• Removing residual copper “nodules” after plating
  (surface preparation prior to lamination)

After the panel plating process there may be copper “nodules” sticking to the surface. LIPPRITE® Super Cut Roller will reduce nodules to a minimum and smooth the gritty appearance.

• Removal of built-up resin ink spots in SBU process

To protect through plated holes from etchant used in the subsequent etching process, holes are filled with ink resin (UV-hardened or heat hardened). Intensive scrubbing power is required to remove mushrooms of resin from the boards. LIPPRITE® Super Cut Rollers produce a uniform, smooth and flat surface structure.

• Finishing for BGA process

This process demands the removal of excessive ink resin, either conductive or insulative, whilst increasing micro roughness for perfect adhesion of laminate.

• Removing black oxide from IVH and BVH process

After the black oxide process for internal via holes (IVH) and blind via holes (BVH), the black oxide must be removed. LIPPRITE® Super Cut Rollers provide maximum cleaning performance and uniform surface quality.

• Burr removal prior to plating
### LIPPRITE® HFR

**HIGH RESOLUTION FINISHING ROLLER**

**Your advantages:**
- Uniform surface quality
- Intense cleaning performance
- Increased micro roughness
- Increased adhesion of ink resist
- Suitable for fine line technology
- Low risk of hole blockage
- No damage to the bore edges
- No clogging of brush surface
- Dynamic balancing
- Metal flanges for a perfect fit (no tolerance problems) and concentric run

**With finer circuitry, the dry film lamination process has become very common.** Dry film must adhere perfectly to the copper surface of the laminate to ensure that there is neither contact failure nor under-etching during the subsequent etching process.

**Prerequisites include a clean, matt surface with no oxidation and minimal reflection properties.** LIPPRITE® High Resolution Finishing Rollers guarantee a defined and reproducible surface roughness.

**Multi Purpose**

LIPPRITE® High Resolution Finishing Rollers are ideal for:
- Cleaning and deoxidising prior to dry film resist
- Finishing prior to screen printing
- Finishing prior to liquid resist
- Finishing of inner layer
- Finishing of flexible printed circuit boards

**High Reliability**

The three-dimensional open web construction ensures a “self-cleaning action”;
- It prevents loading of surface contamination and generation of any excessive heat or “baking”.
- Resilient brush construction allows the brush to follow an irregular surface.
- New abrasive particles are continually exposed to the copper surface for a consistent and uniform finish.

**Stability and Durability**

LIPPRITE® High Resolution Finishing Roller is enhanced by our own synthetic resin based treatment I20. This special impregnation ensures improved cleaning performance, a better cushioning effect and longer service life.

A further advantage: the Printed Circuit Boards can be processed more quickly and there is a subsequent increase in productivity.

**Surface Roughness**

<table>
<thead>
<tr>
<th>Brushing Roller Type</th>
<th>Expected surface roughness Rz (µm)</th>
<th>Roughness Profile</th>
<th>R_a = 0.50 µm</th>
<th>R_z = 3.36 µm</th>
<th>R_max = 3.83 µm</th>
<th>P_out = 158 /C</th>
</tr>
</thead>
<tbody>
<tr>
<td>LIPPRITE® High Resolution S7 (very fine SiC 320)</td>
<td>2.5</td>
<td><img src="image1.png" alt="Graph" /></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>LIPPRITE® High Resolution S8 (super fine SiC 500/600)</td>
<td>2.0</td>
<td><img src="image2.png" alt="Graph" /></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>LIPPRITE® High Resolution S9 (ultra fine SiC 800/1000)</td>
<td>1.5</td>
<td><img src="image3.png" alt="Graph" /></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Surface roughness on copper**

**Experience**

On a perfectly flat surface (with no waviness included in measurements), the values should lie between Rz 1.5 – 3.0 µm.

Values determined in the transverse direction i.e. at 90° to the surface structure, are the most meaningful.

In the PCB industry this is the most common method of measurement, although seldom specifically mentioned.

Measurements determined in longitudinal direction (parallel to the surface structure) are generally lower than those in transverse direction and are usually only taken for control purposes.

These values are imprecise since it is almost impossible for measurements to be taken parallel to the brushing structure.

**Product Recommendation**

<table>
<thead>
<tr>
<th>LIPPRITE® High Resolution Finishing Roller</th>
<th>S7 D1 107/108 I20</th>
<th>SiC 320</th>
<th>R_z = 2.5 µm</th>
</tr>
</thead>
<tbody>
<tr>
<td>LIPPRITE® High Resolution Finishing Roller</td>
<td>S8 D1 109 I20</td>
<td>SiC 600</td>
<td>R_z = 2.0 µm</td>
</tr>
<tr>
<td>LIPPRITE® High Resolution Finishing Roller</td>
<td>S9 D1 109 I20</td>
<td>SiC 800</td>
<td>R_z = 1.5 µm</td>
</tr>
</tbody>
</table>

**RA = 0.50 µm**

**R_z = 3.36 µm**

**R_max = 3.83 µm**

**P_out = 158 /C**

**RA = 0.24 µm**

**R_z = 1.61 µm**

**R_max = 1.70 µm**

**P_out = 65 /C**

**Notes:** Due to waviness of the surface, surface roughness values appear higher than they really are.
**LIPPRITE® HFR**

**HFR® BLUE**

**HIGH RESOLUTION FINISHING ROLLER**

**LIPPRITE® SFR**

**SOLDERMASK FINISHING ROLLER**

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**Your advantages:**
- extra uniform surface quality without scratches
- intense cleaning performance
- increased adhesion of ink resist
- suitable for fine line technology
- low risk of hole blockage
- no damage to the bore edges
- no clogging of brush surface
- dynamic balancing
- metal flanges for a perfect fit (no tolerance problems) and concentric run

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**Surface roughness on copper**

<table>
<thead>
<tr>
<th>Brushing Roller Type</th>
<th>Expected surface roughness (µm)</th>
<th>Roughness Profile</th>
<th>$R_n = 0.34 \ µm$</th>
<th>$R_s R_m = 1.37 \ µm$</th>
<th>$P_n = 380 \ °C$</th>
</tr>
</thead>
<tbody>
<tr>
<td>LIPPRITE® HFR (super fine SiC 500/600)</td>
<td>&lt; 2.0</td>
<td>$R_{Z} = 1.57 \ µm$</td>
<td>$R_{MAX} = 1.78 \ µm$</td>
<td>$P_n = 380 \ °C$</td>
<td></td>
</tr>
</tbody>
</table>

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**Product Recommendation**

<table>
<thead>
<tr>
<th>LIPPRITE® Soldermask Finishing Roller</th>
<th>S8 D107 D20</th>
<th>SIC 500/600</th>
<th>$R_z = 2.0 \ µm$</th>
</tr>
</thead>
<tbody>
<tr>
<td>LIPPRITE® Soldermask Finishing Roller</td>
<td>S8 D107 D20</td>
<td>SIC 800/1000</td>
<td>$R_z = 1.5 \ µm$</td>
</tr>
<tr>
<td>LIPPRITE® Soldermask Finishing Roller</td>
<td>S8 D107 D20</td>
<td>SIC 500/600</td>
<td>$R_z = 2.0 \ µm$</td>
</tr>
<tr>
<td>LIPPRITE® Soldermask Finishing Roller</td>
<td>S8 D107 D20</td>
<td>SIC 800/1000</td>
<td>$R_z = 1.5 \ µm$</td>
</tr>
</tbody>
</table>

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*Note: Laminate type FR4 with 7 µm copper layer*
LIPPRITE® Pressplate Cleaning Rollers

Will remove resin that has become attached to the surface of the plates after pressing laminate or multi-layers. In the course of this process, the original surface roughness must remain unchanged.

LIPPRITE® Pressplate Cleaning Rollers have shown that in over 1,000 passes a constant brushing quality is maintained.

Your advantages:
- top brushing quality, clean surface
- no contamination of the pressplate
- precise abrasion over entire life of roller
- minimal brush debris
- no clogging of machine filter system
- concentric run
- dynamic balancing
- metal flanges for a perfect fit (no tolerance problems)

Product Recommendation

<table>
<thead>
<tr>
<th>LIPPRITE® Pressplate Cleaning Roller</th>
<th>Dia. [mm]</th>
<th>Width [mm]</th>
<th>Bore [mm]</th>
<th>Machine Type</th>
</tr>
</thead>
<tbody>
<tr>
<td>A4 D109 I22</td>
<td>90</td>
<td>610</td>
<td>15 mm</td>
<td>D1g</td>
</tr>
<tr>
<td>A5 D109 I22</td>
<td>100</td>
<td>608</td>
<td>1”</td>
<td>Hibass</td>
</tr>
<tr>
<td>A5 D109 I22</td>
<td>100 – 622 – 768</td>
<td>1” – 1.25”</td>
<td>Chemcut</td>
<td></td>
</tr>
<tr>
<td>A5 D109 I22</td>
<td>125</td>
<td>650</td>
<td>50 mm</td>
<td>Wesero Junker / Höhlmüller 45 / Schmid 450</td>
</tr>
<tr>
<td>A5 D109 I22</td>
<td>125</td>
<td>550</td>
<td>50 mm</td>
<td>Höhlmüller 55</td>
</tr>
<tr>
<td>A5 D109 I22</td>
<td>125</td>
<td>610</td>
<td>50 mm</td>
<td>15 Scrubber-5HD / Wesero 600 / Schmid 600</td>
</tr>
<tr>
<td>A5 D109 I22</td>
<td>125</td>
<td>650</td>
<td>50 mm</td>
<td>Schmid 650 / IS Scrubber-2000 / Höhlmüller 65 / Wesero U 600-1 / Pols &amp; Massa / Wise</td>
</tr>
<tr>
<td>A5 D109 I22</td>
<td>125</td>
<td>670</td>
<td>50 mm</td>
<td>Pols &amp; Massa / Wise</td>
</tr>
<tr>
<td>A5 D109 I22</td>
<td>125</td>
<td>750</td>
<td>50 mm</td>
<td>Wesero U700-1</td>
</tr>
<tr>
<td>A5 D109 I22</td>
<td>125</td>
<td>770</td>
<td>50 mm</td>
<td>Schmid 770 / IS Scrubber-3000 / Wise</td>
</tr>
<tr>
<td>A5 D109 I22</td>
<td>140</td>
<td>610</td>
<td>2”</td>
<td>Chemcut, Marecco</td>
</tr>
<tr>
<td>A5 D109 I22</td>
<td>152</td>
<td>610 – 710</td>
<td>2”</td>
<td>TTM, Bilko, Somaca, Chemut</td>
</tr>
<tr>
<td>A5 D109 I22</td>
<td>152</td>
<td>610 – 650 – 710</td>
<td>3”</td>
<td>Seiko, Marugen, IN, SD-1400, Inh Hyoki, Pioneer / Wise</td>
</tr>
<tr>
<td>A5 D109 I22</td>
<td>152</td>
<td>762</td>
<td>2”</td>
<td>Bilko, Marecco, Chemut</td>
</tr>
<tr>
<td>A5 D109 I22</td>
<td>170</td>
<td>585</td>
<td>3”</td>
<td>Banko</td>
</tr>
<tr>
<td>A5 D109 I22</td>
<td>170</td>
<td>610 – 710</td>
<td>3”</td>
<td>Inh Hyoki</td>
</tr>
<tr>
<td>A5 D109 I22</td>
<td>254</td>
<td>1143</td>
<td>5.75”</td>
<td>Pioneer</td>
</tr>
<tr>
<td>A5 D109 I22</td>
<td>300</td>
<td>1100 – 1500</td>
<td>5.75”</td>
<td>Century, Somaca</td>
</tr>
<tr>
<td>A5 D109 I22</td>
<td>305</td>
<td>1270</td>
<td>180 mm</td>
<td>Akai</td>
</tr>
<tr>
<td>A5 D109 I22</td>
<td>305</td>
<td>1100 – 1500</td>
<td>180 / 200 mm</td>
<td>Wesero, Curtis Hebert</td>
</tr>
</tbody>
</table>

Surface Quality of Pressplates

<table>
<thead>
<tr>
<th>Surface finish</th>
<th>Quality</th>
<th>Rz [µm]</th>
<th>Ra [µm]</th>
</tr>
</thead>
<tbody>
<tr>
<td>No. 1</td>
<td>ground grit 80</td>
<td>0.0 – 15.0</td>
<td>1.20 – 2.50</td>
</tr>
<tr>
<td>No. 2</td>
<td>ground grit 180</td>
<td>5.0 – 8.0</td>
<td>0.70 – 1.20</td>
</tr>
<tr>
<td>No. 3</td>
<td>ground grit 240</td>
<td>2.5 – 5.0</td>
<td>0.30 – 0.70</td>
</tr>
<tr>
<td>No. 4</td>
<td>fine ground grit 320</td>
<td>1.6 – 2.5</td>
<td>0.15 – 0.30</td>
</tr>
<tr>
<td>No. 5</td>
<td>fine ground grit 400</td>
<td>1.0 – 1.6</td>
<td>0.13 – 0.15</td>
</tr>
<tr>
<td>No. 6</td>
<td>fine ground grit 500</td>
<td>0.9 – 1.0</td>
<td>0.07 – 0.13</td>
</tr>
<tr>
<td>No. 7</td>
<td>bright polished</td>
<td>0.2 – 0.4</td>
<td>0.03 – 0.04</td>
</tr>
<tr>
<td>No. 8</td>
<td>mirror polished</td>
<td>0.1 – 0.2</td>
<td>0.01 – 0.03</td>
</tr>
</tbody>
</table>

Note: Rz on stainless steel 1.4542
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The Global Leader in Surface Treatment Solutions and Finishing Tools

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