Electroplated Diamond and CBN Tools
For more than 100 years, the PFERD brand name has been synonymous with outstanding premium-quality tools. Today, our extensive range comprises more than 6,500 surface finishing and cutting tools. We are a “single stop” supplier in the true sense – for the benefit of our customers.

PFERD quality tools ensure exceptional results and unsurpassed cost-efficiency.

The PFERD Group employs over 1,700 people worldwide.

Our goal: Sincere and serious determination to satisfy the customer.
The PFERD quality management system is EN ISO 9001 certified.

A sophisticated and effective logistics system keeps PFERD tools readily available all over the world.

**Our goal:** Quick and prompt availability of PFERD-tools for our customers.
Electroplated Diamond and CBN Tools
Electroplated Bond, Diamond and CBN Abrasives

How can you tell an electroplated bond tool from other types?

**Abrasive structure**

Electroplated diamond and CBN tools have a monolayer abrasive coating on a metal substrate. The individual diamond or CBN crystals are bound by a nickel layer measuring roughly half the grain diameter in thickness. This keeps the abrasive particles securely in place but lets them project well out of the bond, thus creating a very open tool surface with exceptionally large chip spaces.

Since the grit is applied in a single layer, the profile of an electroplated tool is determined by the profile of the metal substrate.

As a result, electroplated tools are obviously unsuitable for dressing.

**Diamond and CBN Abrasives**

Diamond

- Occurs in nature but, like CBN, can also be produced synthetically.
- At extremely high pressures and temperatures, pure carbon (C) synthesizes to diamond, whereas the chemical elements boron (B) and nitrogen (N) synthesize to cubic crystalline boron nitride. Different cutting properties can be imparted to these abrasives by varying the process parameters during synthesis.

- As the graph shows, CBN is nearly as hard as diamond.

CBN (Cubic Boron Nitride)

- Are termed “superhard” because they are significantly harder than conventional abrasives, e.g., aluminium oxide and silicon carbide (see graph).
- Due to their monolayer structure, electroplated abrasive tools are comparatively low in cost. Moreover, the tool can be recoated with new abrasive (provided that the tool body is not damaged).

What are the advantages of electroplated diamond and CBN tools?

- Electroplated tools are characterized by their effective abrasive action and have a high stock removal characteristic. Electroplated bond tools will not load up, even at high stock removal rates.
- Sharp, superhard abrasive particles ensure maximum cutting performance without undesirable heat build-up.
- Virtually any substrate geometry can be coated. The laborious and costly dressing process known from multilayer-bonded diamond or CBN abrasive tools is eliminated.
- Due to their monolayer structure, electroplated abrasive tools are comparatively low in cost. Moreover, the tool can be recoated with new abrasive (provided that the tool body is not damaged).

What are the main properties of diamond and CBN abrasives?

**Diamond grit**

- Diamond occurs in nature but, like CBN, can also be produced synthetically.

**CBN grit**

- At extremely high pressures and temperatures, pure carbon (C) synthesizes to diamond, whereas the chemical elements boron (B) and nitrogen (N) synthesize to cubic crystalline boron nitride. Different cutting properties can be imparted to these abrasives by varying the process parameters during synthesis.

- As the graph shows, CBN is nearly as hard as diamond.

What are the advantages of superhard abrasives over conventional aluminium oxide or silicon carbide in abrasive tools?

- Excellent tool life and profile-holding properties
- Short machining times
- Reduced non-productive time
- No thermal damage to the workpiece due to lower grinding temperatures
- Constant quality over a large number of workpieces
- High stock removal performance
Electroplated Diamond and CBN Tools

Recommendations for Use of Diamond and CBN, Grit Size

What recommendations for use can be given for diamond and CBN tools?

Diamond and CBN abrasives do not compete, but complement each other.

Diamond is not suitable for machining steel, because a chemical reaction between the iron (Fe) in the steel and the carbon (C) in the diamond would cause exceedingly fast tool wear. Using diamond abrasives on steel will therefore not be cost-effective.

CBN fills this gap. It is only slightly less hard than diamond (see graph) but does not react with the iron (Fe) in the steel.

Diamond tools are suitable for machining:

- Thermoset plastics
- Ferrite
- Refractory materials
- Glass
- Glass-fibre reinforced plastics
- Graphite, synthetic carbon
- Carbides (sintered), Cermets, Cutting ceramics
- Carbides (green compacts)
- Ceramics (including engineering ceramics)
- Natural and synthetic stone
- Nickel-based and titanium alloys
- Porcelain
- Silicon
- Wear-resistant coatings

CBN tools are suitable for machining:

- High-speed steels (including powder metallurgy types)
- Tool steels
- Case-hardened steels
- Ball-bearing steels
- Chromium steels
- Hardened materials with a hardness exceeding approx. 60 HRC
- Lower hardness levels (40 ... 60 HRC) require special application conditions.

Grit size comparison FEPA:

<table>
<thead>
<tr>
<th>Grit sizes</th>
<th>Diamond</th>
<th>CBN</th>
</tr>
</thead>
<tbody>
<tr>
<td>D 46</td>
<td>B 46</td>
<td></td>
</tr>
<tr>
<td>D 54</td>
<td>B 54</td>
<td></td>
</tr>
<tr>
<td>D 64</td>
<td>B 64</td>
<td></td>
</tr>
<tr>
<td>D 76</td>
<td>B 76</td>
<td></td>
</tr>
<tr>
<td>D 91</td>
<td>B 91</td>
<td></td>
</tr>
<tr>
<td>D 107</td>
<td>B 107</td>
<td></td>
</tr>
<tr>
<td>D 126</td>
<td>B 126</td>
<td></td>
</tr>
<tr>
<td>D 151</td>
<td>B 151</td>
<td></td>
</tr>
<tr>
<td>D 181</td>
<td>B 181</td>
<td></td>
</tr>
<tr>
<td>D 213</td>
<td>B 213</td>
<td></td>
</tr>
<tr>
<td>D 251</td>
<td>–</td>
<td></td>
</tr>
<tr>
<td>–</td>
<td>B 252</td>
<td></td>
</tr>
<tr>
<td>D 301</td>
<td>B 301</td>
<td></td>
</tr>
<tr>
<td>D 357</td>
<td>B 357</td>
<td></td>
</tr>
<tr>
<td>D 427</td>
<td>B 427</td>
<td></td>
</tr>
<tr>
<td>D 502</td>
<td>–</td>
<td></td>
</tr>
<tr>
<td>D 602</td>
<td>–</td>
<td></td>
</tr>
<tr>
<td>D 852</td>
<td>–</td>
<td></td>
</tr>
</tbody>
</table>

Grit size recommendations for specific materials:

<table>
<thead>
<tr>
<th>Materials</th>
<th>Recommended Grit Size</th>
</tr>
</thead>
<tbody>
<tr>
<td>Camshafts / crankshafts</td>
<td>B 213 ... B 252</td>
</tr>
<tr>
<td>Cast iron, grey and nodular</td>
<td>D 427 ... D 602</td>
</tr>
<tr>
<td>Ceramics, oxide ceramics</td>
<td>D 64 ... D 427</td>
</tr>
<tr>
<td>Cermet</td>
<td>D 64 ... D 126</td>
</tr>
<tr>
<td>Dressing of Al2O3, SiC or CBN grinding tools</td>
<td>D 46 ... D 301</td>
</tr>
<tr>
<td>Electric carbon</td>
<td>D 64 ... D 213</td>
</tr>
<tr>
<td>Epoxy resin</td>
<td>D 126 ... D 301</td>
</tr>
<tr>
<td>Ferrites (soft and hard types)</td>
<td>D 64 ... D 213</td>
</tr>
<tr>
<td>Friction linings / brake pads</td>
<td>D 427 ... D 602</td>
</tr>
<tr>
<td>Glass, quartz glass</td>
<td>D 46 ... D 181</td>
</tr>
<tr>
<td>Glass or carbon fibre-reinforced plastics (GRP/CRP),</td>
<td>D 151 ... D 502</td>
</tr>
<tr>
<td>synthetic resins</td>
<td></td>
</tr>
<tr>
<td>Graphite</td>
<td>D 181 ... D 301</td>
</tr>
<tr>
<td>High pressure laminates, chipboard</td>
<td>D 301 ... D 602</td>
</tr>
<tr>
<td>High-speed tool steels (HSS) incl. powder metallu-</td>
<td>B 46 ... B 252</td>
</tr>
<tr>
<td>gical types</td>
<td></td>
</tr>
<tr>
<td>Magnetic materials</td>
<td>D 91 ... D 213</td>
</tr>
<tr>
<td>Plaster</td>
<td>D 181</td>
</tr>
<tr>
<td>Precious stones, watch bearing jewels</td>
<td>D 46 ... D 91</td>
</tr>
<tr>
<td>Printed circuit boards</td>
<td>D 181 ... D 213</td>
</tr>
<tr>
<td>Refractories</td>
<td>D 427 ... D 602</td>
</tr>
<tr>
<td>Rubber</td>
<td>D 91 ... D 213</td>
</tr>
<tr>
<td>PVC / polyester / polystyrene</td>
<td>D 181 ... D 427</td>
</tr>
<tr>
<td>Silicon</td>
<td>D 15 ... D 213</td>
</tr>
<tr>
<td>Thermal sprayed alloy coatings</td>
<td>D 76 ... D 213</td>
</tr>
<tr>
<td>Tool steel</td>
<td>B 64 ... B 151</td>
</tr>
<tr>
<td>Tungsten carbide and other hard metals, green or</td>
<td>D 91 ... D 181</td>
</tr>
<tr>
<td>sintered</td>
<td></td>
</tr>
<tr>
<td>Tungsten Electrodes</td>
<td>D 76 ... D 126</td>
</tr>
</tbody>
</table>
Electroplated Diamond and CBN Tools

Standard Range

Main application fields for electroplated bond and CBN tools:
- Electrical engineering & electronics / semiconductors
- Mouldmaking, toolmaking
- Hard metal manufacturing
- Hard metal toolmaking
- Wood and high-pressure laminate (HPL) processing
- Industrial ceramics, high-performance ceramics and special materials
- Automotive manufacturing and supplier industries (e.g., car mirror glass)
- Aerospace industry
- Mechanical engineering, process equipment fabrication
- Optical industry and precision engineering
- Friction linings, brake pads
- Plastics processors

Standard Range (Catalogue 205)

PFERD offers a standard range of electroplated diamond and CBN tools ex stock.

Diamond Files

Diamond grit is electroplated onto precision-forged and ground file blanks. The durable coating with its uniform density and good grip properties ensures outstanding file performance.

Diamond files are suitable for use on hardened (e.g., quenched and tempered) steels and hard metal components such as cutting, punching, press/extrusion and profiling dies, as well as for filing workpieces made of glass, ceramics, or fibre-reinforced plastics.

Workpiece materials:
- Heat-treated steels
- Tungsten carbide and other hard metals
- Glass
- Ceramics
- Fibre-reinforced plastics

Industry / target group
- Toolmaking
- Mouldmaking
- Precision mechanics

Diamond Escapement Files

Grit sizes D 25 and D 46 provide ultra-fine surface finishes. An even finer grit size (D 15) can be supplied upon request.

Diamond escapement files have a forged shank, which eliminates the need for a handle.

Available in a length of 140 mm, seven shapes and four grit sizes.

Diamond Needle Files

Diamond needle files are designed for general use in tool and die making.

These needle files are available ex stock in a length of 140 mm, in eleven shapes and three grit sizes.

They can be combined with the quick-mounting handle 210-1 or our needle file holder NFH 212.
**Diamond Riffler Files**

- DF 15 crossing oval
- DF 16 crossing oval
- DF 18 hand
- DF 20 square
- DF 22 three square
- DF 24 round
- DF 914 hand
- DF 918 hand

Diamond riffler files are used for work in hard-to-reach areas and on complex geometries. Diamond riffler files are available in a length of 150 mm, in eight shapes and three grit sizes.

**Diamond Handy Files**

- DF 2601 hand
- DF 2602 half round
- DF 2607 three square
- DF 2608 square
- DF 2610 round

Diamond handy files have a forged shank which eliminates the need for a handle. Available in a length of 215 mm, five shapes and two grit sizes.

**Diamond Machinist's Files**

- DF 1112 hand
- DF 1132 three square
- DF 1132 three square
- DF 1142 square
- DF 1152 half round
- DF 1152 half round
- DF 1162 round

Diamond machinist’s files are used, e.g., in the fabrication of large tools, jigs and fixtures. Their fairly coarse grit (D 251) also makes them suitable for filing filled and reinforced plastics. Diamond machinist’s files are supplied with ergonomic handle. Available in a length of 100 – 200 mm, five shapes and various lengths and grit sizes.

**Diamond Files for Manual Filing Tools**

- Hand, coated on one side DF 5301 - 5309
- Hand, coated on both sides DF 5310 - 5314
- Hand, both face sides coated DF 5316 - 5324
- Square DF 5390 - 5393
- Round DF 5331 - 5347
- Three square DF 5365 - 5375
- Crossing oval DF 5352 - 5362
- Knife DF 5380 - 5386
- Flat conical DF 0103, DF 0106

Diamond files for use with manual filing tools can be employed in machines as well as for hand filing. Available in seven shapes and various diamond coatings. Shank diameter: 3 mm.
Electroplated Diamond and CBN Tools

Standard Range

**Diamond and CBN Cut-Off Wheels**

Electroplated-bond diamond and CBN cut-off wheels are characterized by their particularly effective cutting performance. A single layer of diamond or CBN grit (refer to the sketch on p. 16) is deposited on a steel blank. This abrasive material is securely embedded in a metal bonding layer electroplated onto the blank.

Large chip spaces between the individual grains provide the tool with a very high cutting capacity. Wheels with coarse (e.g., D 357) diamond abrasive coatings are exceptionally suitable for cutting soft fibre-reinforced thermoset plastics.

**Diamond-Tipped Sabre Saw Blades**

Diamond-tipped blades for sabre saws with Bosch-type blade mounting can be used on fibre-reinforced (GRP/CRP) plastics.

Diamond-tipped sabre saw blades in electroplated bond are noted for their high cutting performance and long service life. Special applications include cutting of GRP panels and saving cutouts in tank and pressure vessel construction.

**Diamond and CBN Grinding Points**

The cylindrical shape ZA is suitable for grinding bores, radii and contours using stationary or handheld equipment.

**Diamond and CBN Grinding Points**

Our specially designed shape ZY points are suitable for grinding out slots and grooves in hard-to-reach areas.

**Diamond and CBN Grinding Points**

Cylindrical points with carbide shank are used for internal grinding on stationary machines.

The degree of elasticity of the carbide shank is approx. three times higher than that of a steel shank. The degree of elasticity indicates the amount of deformation which a body undergoes as a result of a given load.

**Diamant- und CBN-Schleifkörper**

Diamond grinding discs are intended for use in stationary machines. Their centring shoulder allows them to be accurately mounted and aligned on the machine spindle.

Combined with a strong mandrel, these tools are ideal for grinding in deep-set or long bores.
Spherical (ball shape) KU grinding points are commonly used in hand-guided deflashing of plastic shapes. They are also particularly well suited for engraving, contour grinding and tool deburring tasks.

Special shape KU points are commonly used in hand-guided deflashing of plastic shapes. These special-shape KU points are additionally grit-coated on the narrow shank section below the head. Their special geometry provides optimum results in machining shaped workpieces.

Cylindrical points with radius end (WR) are ideal for general-purpose deburring and grinding jobs performed with handheld machines. Cylindrical points with radius end (WR) are available exclusively with coarse D 357 grit. This product gives excellent results in machining fibre-reinforced plastics.

The pointed tree (SPG) shape is exceptionally well suited for machining small holes or bores.

Due to its special geometry, this tool provides optimum results on shaped workpieces.

Conical pointed SK tools are perfect for regrinding centering holes as well as for chamfering.
Electroplated Diamond and CBN Tools

Special Range – Application Examples

Special Range

For applications which cannot be effectively addressed with products from our standard range, PFERD can produce diamond and CBN tools in customised versions, whether as a one-off tool or in small batches. Shown below are a few examples of solutions not included in our standard tool range.

Application Examples

- Diamond grinding disc for profile grinding on brake pads
- Grinding of brake pads using a diamond grinding drum
- Diamond grinding disc for use on brake pads
- Diamond grinding disc for deburring gunmetal components
- Diamond grinding disc for machining abrasive belt material
- CBN grinding wheel in a knife grinding (first pass) application
Electroplated Diamond and CBN Tools

Application examples

- **Deburring of castings with diamond abrasive discs**
- **Diamond tools for use on castings**
- **Deburring of castings with diamond grinding points**
- **Local surface depolishing using a diamond tool**
- **Grinding of tools in a toolmaking application**
- **Diamond cut-off wheel for use on printed circuit boards**
- **Custom-shaped grinding discs (e.g., with hole pattern) for use in manufacturing processes**
- **Grinding of tungsten welding electrodes with a diamond grinding disc**
- **Grinding of glass or carbon fibre-reinforced plastics (GRP/CRP) using diamond abrasive tools**
- **Cutting-to-length of automotive metal-core seals with the aid of diamond and CBN abrasive discs**
**Special Tools Made to Customer Requirements**

**PFERD manufacturing strengths**

Manufacturing tools to customer specifications is one of PFERD’s particular strengths. Electroplated abrasive tools are fast-cutting products. Tool bodies of almost any geometry can be coated with diamond or CBN abrasive. As a result, this tool group is unsurpassed when it comes to manufacturing flexibility and sheer diversity of realizable tool shapes.

Due to their monolayer abrasive coating, electroplated bond tools are comparatively low-cost items. Their performance properties can be varied within a broad range through the appropriate choice of grit size.

While coarse-grit tools are have been found particularly effective on soft materials such as, e.g., glass-fibre reinforced plastics, much finer grit is needed to machine harder surfaces.

The electroplated nickel layer is extremely hard and wear-resistant. Given the resulting strong bond of the diamond and CBN particles in the coating, this manufacturing principle is suitable not just for grinding tools but also for making files. Diamond files are employed on hardened steels, tungsten carbide and other hard metals.

**Unlimited shapes and batch sizes**

Electroplated bond tools can be manufactured cost-efficiently in customised versions, whether as a one-off tool or in small batches. This allows us to respond very flexibly to individual customer needs.

Tool bodies of any shape and substrate material (e.g., steel, stainless steel, brass, etc.) can be coated with diamond or CBN abrasive material.

**PFERD manufacturing options**

1. **Complete new tool**
2. **Coating of new blank (NB)**
3. **Recoating (WB)**

Please include a technical drawing or fully dimensioned manual sketch with your purchase order and indicate the desired grit size and grit type. If possible, determine the material to be machined so that the abrasive coating can be perfectly matched to the particular application.

Abrasive material can also be applied to customer-supplied blanks. For this service, please specify the surface area to be coated as well as the desired grit size. Note that the thickness of the abrasive layer must be taken into account to meet final specification dimensions accurately.

Tools made of steel or stainless steel can be easily recoated several times provided the tool body contours are undamaged. The abrasive material can be applied continuously or in segments, whether along the circumference and/or on the face side(s) of the tool.

---

**PFERD Manufacturing Options**

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Tool body made by PFERD</td>
<td>Customer-supplied tool body (blank)</td>
<td>Cost-effective only with - tool bodies of high value / intricate design - complex contours Tool body must be intact. (Any requisite reworking will be separately invoiced).</td>
</tr>
<tr>
<td>Material: - Steel - Stainless steel - Brass - No aluminium - No hard metal</td>
<td>Material: - Steel - Stainless steel - Brass - No aluminium - No hard metal</td>
<td>Material: - Steel - Stainless steel - Brass - No aluminium - No hard metal</td>
</tr>
</tbody>
</table>
Electroplated Diamond and CBN Tools

Tool Body

Manufacturing capabilities for tool bodies and abrasive coatings:

- Our CNC lathes can handle tool bodies up to 500 mm diameter
- Milling operations in up to 5 axes are supported by our milling machines
- Any necessary grinding can be performed by PFERD

Information required for preparation of a quote

What information does PFERD need to quote for a custom-made tool?

- Dimensions (sketch, drawing, sample)
- Tool previously employed
- Product to be machined
- Machining allowance
- Surface finish to be produced
- Wet/dry use
- Manual/machine use
- Rotational speed (r.p.m.) of power source
- Realistic demand estimate
- Order lot size
- Delivery term

Please use the sample request form printed on the next page.
Sample Request 205 Estimate 205

To Sales Office

Customer Name: ____________________________
Contact: ________________________________

Machining application:
Material:  
- Thermosetting plastic
- Thermoplastic
- With glass fibres
- Other fibres
- No fibres
- Elastomer
- Hard metal
- Steel
- Tempered
- Non Tempered
- Other material

Use:
- Workpiece ______________________________________
- Cutting speed __________________
- Cooling __________________

Type/size
- Diamond: 46 107 301
- CBN: 54 126 357
- 64 151 427
- 76 181 602
- 91 252 852

Customer requirements: ____________________________________________

Currently employed (competitor-supplied) tool: __________________________
Sample available [ ] yes [ ] no

PFERD standard tools sampled to date and results achieved:
Type:
- Wear: too high [ ] o.k. [ ]
- Loading: yes [ ] no [ ]
- Stock removal: low [ ] o.k. [ ]
- Surface: too rough [ ] o.k. [ ]
- Other: __________________________________________

Sketch, other notes, particulars, customer requests:

PFERD Electroplated Diamond and CBN Tools

Other:
- Current price: _______ €/pc.
- Target price: _______ €/pc.
- Demand / year: _______ pcs.
- Desired date: ____________

Requester:
Name: ____________________________
Subsidiary/Branch office: ____________________________
Phone: ____________________________
Date: ____________

(Use additional page if necessary)
PFERD Tools

Premium Quality “Made by PFERD”

PFERD offers a full and comprehensive system range of high-grade products for cutting and machining materials to any desired finish, from coarse to mirror-polished.

Our product development and advanced manufacturing technology reflect the latest market standards and customer needs. Thus, every PFERD tool is optimized for unsurpassed application performance.

The most recent edition of the PFERD Tool Manual 2005, comprising our separate Catalogues 201E through 209, contains over 6,500 cutting, grinding, polishing, filing, milling and brushing tools, in addition to a full range of suitable power drives.

Product groups

- Catalogue 201E
  Machinist’s Files, Sharpening Files, Rasps and Precision Files
- Catalogue 202
  Tungsten Carbide Burrs, H.S.S. and Tool Steel (WS) Rotary Cutters, Hole Saws, Hole Cutters and Accessories
- Catalogue 203
  Mounted Points
- Catalogue 204
  Fine Grinding and Polishing Tools
- Catalogue 205
  Superhard Diamond and CBN Files, Grinding Tools and Cut-Off Wheels
- Catalogue 206
  Grinding and Cut-Off Wheels
- Catalogue 208
  Industrial Power Brushes
- Catalogue 209
  Tool Drives

Fields of application

- Cutting
- Grinding
- Milling
- Filing
- Brushing
- Polishing
- Cleaning
- Rust removal
- Deburring
- Matt finishing

At PFERD, we define quality as the most advanced, cost-efficient and personalized solution to the customer’s application problem.