English

Diamond and Glass in Process

WENDT

WENDT - Profile

WENDT is a world leading manufacturer of grinding and abrasive tools. We also specialise in grinding machines for materials which are difficult to machine.

WENDT DIACRAFT
Wixom, MI
USA

WENDT DUNNINGTON
Royersford, PA
USA

Glass – a fascinating material

Glass is the oldest material entirely invented by man. Glass is not an element and comes in many forms. It may be, but does not have to be, transparent; it is brittle and fragile; it can be worked both into hollow containers of all kinds and into flat sheets. In ancient times glass was used for jewellery, jars and vases. Today glass has been developed into one of the most important materials in industry because of its light transmitting capacity, its refractive index and the many different forms it can take. It is in fact these very technical properties which make glass a difficult material to machine, which can only be economically worked using diamond-impregnated tools.

WENDT – Partner to the glass industry

For glass processing, WENDT is the preferred partner of numerous machine manufacturers and therefore experienced in the development of new abrasive finishing systems. A continuous dialogue with machine manufacturers and users enables us to establish the most important requirements for precision and quality and to satisfy the highest standards. An international network of engineering specialists, in close collaboration with our Customer Service Department, works out with our customers, on the spot, new solutions specially designed for the problem posed. WENDT is represented throughout the world, either by local sales teams or by technically qualified external consultants. Our know-how is second to none and gained by our international experience in the fields of drilling, milling, sawing, edge-processing, grinding, lapping and polishing.

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Description of grit size and bonding

Because of the particular properties of glass, diamonds are exclusively used in the glass industry. In respect of the grit sizes, a distinction is generally made between macro-grit sizes D (0) and micron-grit sizes MD (0). Whilst the macro-grit sizes are divided up from D46 to D1181 (more detailed information can be found in our leaflet "General Information"), in the glass industry a larger range of standard micron-grit sizes (Table 1) are usually used. Among the bondings a distinction is usually made between resin and metal bonds (1), Tables 2 and 3. The associated figure (2) gives information about the concentrations used. Within the bonding groups there is a grading system (3), according to the different degrees of hardness, into:

F very soft
J soft
N medium
R medium abrasion resistant
S hard
X,Y very abrasion resistant

Special bonds (4), which have been developed for special applications, are indicated by a "W" and a 3-place number. Galvanic bonds are distinguished only by their level of coating: GN 333 stands for a single layer and GN 666 for a multi-layer galvanic coating. The specification therefore reads:

single-layer: D46-GN333
multi-layer: D46-GN666

Micron-grit sizes

Description	Ø size in µm
MD4,0	3-6 µm
MD6,3	4-8 µm
MD10	6-12 µm
MD16	10-20 µm
MD16A	8-16 µm
MD25	20-30 µm
MD25B	15-30 µm
MD25C	20-40 µm
MD40	30-40 µm
MD40A	30-60 µm
MD40B	36-54 µm

Table 1: Micron-grit sizes for glass-working tools

Resin bonds for glass-working tools

D (0) 126 - (1) BG (2) 50 (3) S	Standard bonds
BG...F	very soft
BG...J	soft
BG...N	medium
BG...R	medium, abrasion resistant
BG...S	hard
BG...X	
BG...Y	very abrasion resistant
D (0) 91 - (1) B (2) 100 (4) W124	**Special bonds**

Table 2: Description of WENDT resin bonds

Sintered metal bonds for glass-working

D (0) 181 - (1) MG (2) 50 (3) S	Standard bonds
MG...F	very soft
MG...J	soft
MG...N	medium
MG...R	medium, abrasion resistant
MG...S	hard
MG...X	
MG...Y	very abrasion resistant
MD (0) 16 - (1) M (2) 100 (4) W243	**Special bonds**

Table 3: Description of WENDT sintered metal bonds

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Tolerances

Tolerances are determined by the customers requirements for a particular operation. Within this framework, however, tolerances must be kept as large as possible so as not to make the grinding and abrasive tools more expensive due to unnecessary restrictions. Size tolerances are given in Table 5. These tolerances are valid both for WENDT tools and also for the lengths, radii and angle measurements defined in the FEPA Standard diamond and CBN grinding tools. They also apply to tools that are ordered in non-metric units. In the case of run-out and concentricity tolerances (Table 4) a distinction is made between two classes (A and B). The narrower class A applies in each case to the grinding surface, hence the axial run-out in the case of cup grinding wheels and the concentricity in the case of circumferential grinding disks.
For precision profile grinding disks the definitions on the drawing provided are applicable. If tighter tolerances are required this may involve a price supplement, which has to be calculated in each individual case.

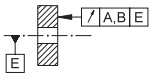
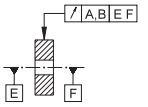
		Diameter D [mm]		
[mm]	Class		[mm]	Class
0,02	A	≤ 250	0,02	A
0,05	B		0,05	B
0,02	A	> 250	0,02	A
0,07	B		0,07	B

Table 4: Run-out and concentricity tolerances

External diameter D

Nominal diameter D [mm]	Deviations [mm]
≤ 6	+ 0,3 - 0
> 6 up to ≤ 30	+ 0,8 - 0
> 30 up to ≤ 120	+ 1,3 - 0
> 120 up to ≤ 400	+ 2,0 - 0
> 400	+ 4,0 - 0

Residual lengths (E, J, K, L1, L2)

Nominal diameter [mm]	Deviations [mm]
≤ 6	± 0,1
> 6 up to ≤ 30	± 0,2
> 30 up to ≤ 120	± 0,3
> 120 up to ≤ 400	± 0,4
> 400	± 0,6

Coating dimensions (T, U, X, W)

Nominal dimension [mm]	Deviations [mm]
≤ 3	+ 0,1 - 0
> 3 up to ≤ 6	+ 0,1 - 0
> 6 up to ≤ 30	+ 0,2 - 0
> 30	+ 0,2 - 0

Angle measurement (S, V)

Nominal size of shorter side [mm]	Deviations [′]
≤ 10	± 60′
> 10 up to ≤ 50	± 30′
> 50 up to ≤ 120	± 20′
> 120 up to ≤ 400	± 10′
> 400	± 5′

Radius R

Nominal size R [mm]	Deviations [mm]
≤ 3	± 0,1
> 3 up to ≤ 6	± 0,1
> 6 up to ≤ 30	± 0,1
> 30	± 0,2

Table 5: Dimensional tolerances

Description of Forms

Illustrated are the most important forms of tools, used in the glass industry. Other forms can be supplied on request. The first position in the form description (Table 6) distinguishes according to the type of bond, as well as the grinding agent and use of the grinding tool. The shaded background refers to the present catalogue. The other three positions you will find in the Overview of Forms on page 7. Here the forms in the first position are indicated by an '*', e.g. *18A. There the '*' is shown in place of one of the shaded characters from Table 6 (K, L, M or N). Please select the appropriate character corresponding to the type of bond. Example: If you decide on form *18A with a sintered metal bond for a circular cutting blade, the complete form description reads: L18A.

Material to be worked	Grinding agent	Type of bond			
		Resin	Metal	Galvanic	Ceramic
Hard material	DIA	A	B	C	D
Steel	CBN	F	G	H	J
Glass	DIA	K	L	M	N
Other	DIA	P	Q	R	S

Table 6: Form description, 1st position

Ordering Details

To establish and determine the optimum DIA-grinding tool for a specific application, the more information provided, the greater the certainty. To ensure all the details are given for determining a tool, please use our ordering format. Table 7 shows a few examples of these. By doing so you will facilitate the rapid, error-free processing of your orders. If there are any aspects which are still unclear, our technical customer service department is available for further clarification.

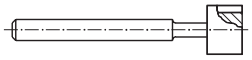
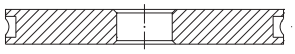
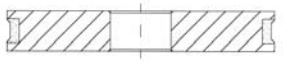
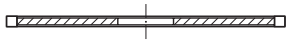
1	2	3	4	5	6	7
L30A	150	10	6	D76	MG30F	50
K18A	300	1,2	7	D107	BG50S	16
M10A	160	25	-	D427	GN333	30

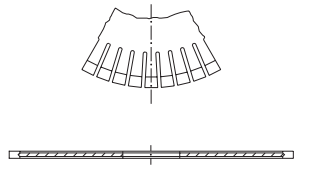
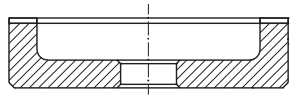
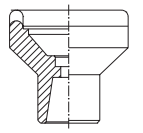
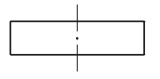
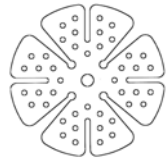
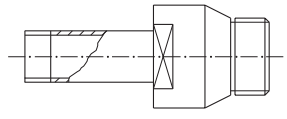
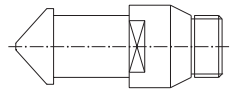
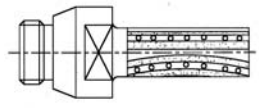
1 = WENDT-form-description
2 = Outside diameter
3 = Grinding layer width
4 = Grinding layer thickness
5 = Grinding agent (Diamond) and grit size
6 = Bond and concentration
7 = Bore diameter

Table 7: Examples for ordering

WENDT

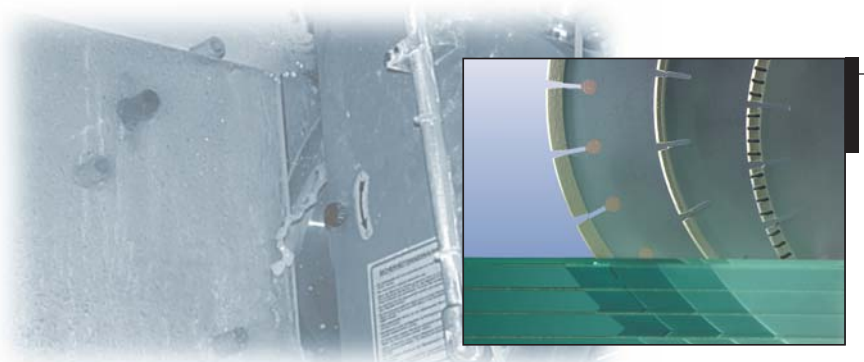
Overview of Forms

Form	WENDT	FEPA
	*10A	1A1
	*12A	1A1W
	*13B	1FF1
	*14B	14EE1
	*15A	1V1
	*16A	1J6Y
	*16E	1DD6Y
	*18A	1A1R

Forma	WENDT	FEPA
	*18C	1A1RSS
	*30A	6A2
	*64B	2FF2
	*80A	
	*83A	
	*90A	
	*91E	
	*94A	

Cutting glass

Due to the continuous development of our products, our own machinery programme and collaboration with renowned manufacturers of cutting machines, WENDT has at its disposal comprehensive experience and know-how for the most diverse cutting operations on glass. For this WENDT offers a complete range of diamond cutting tools.



WENDT

Metal-bonded circular cutting blades with a continuous rim

For cutting hollow objects such as vases and lighting units made of soda, crystal and opal glass.

Resin-bonded circular cutting blades with a continuous rim

For cutting pipes, tubes and components made of quartz, borosilicate and special glasses, as used in the lamp and electronics industries.

Metal-bonded circular cutting blades with a segmented edge

For laminated glass, fireproof glass, thick window glass and optical glass blocks.

Galvanic cutting tools

Circular cutting blades with internal holes for thin cuts in expensive special glass.

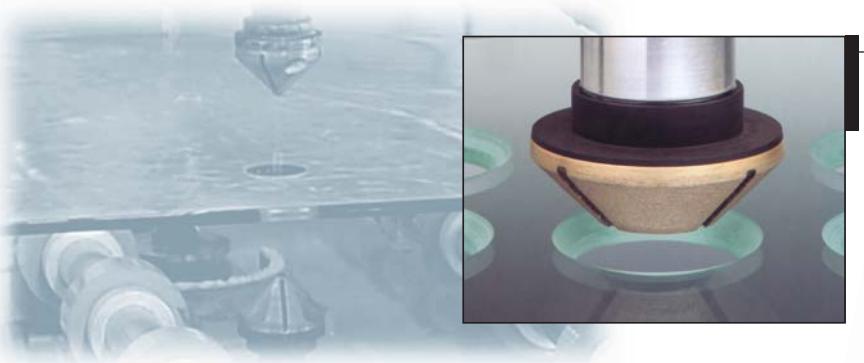
Band saws for cutting large cross-sections and shape cutting for all kinds of glass materials.

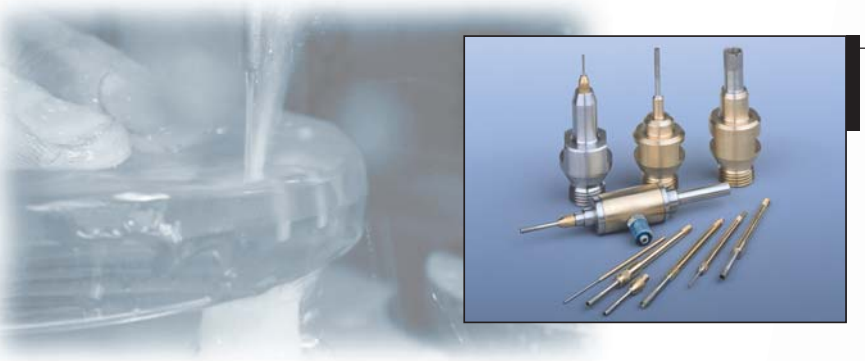
Segmented and continuous-rim circular cutting blades in single-layer and multi-layer design for all glasses and glass bonding materials.

You will find detailed information on our product range in our special subject catalogue

Drilling glass

WENDT has been supplying the glass industry for decades with innovative and reliable drilling and counter-sinking tools to the highest standards.





WENDT

Tubular drills for drilling float glass, optical glass, automobile glass and hollow glassware

FC159 ➔ Annular bits with high accuracy for a clean-edge quality.
FC158 ➔ Annular bits for economical manual operation.
FC161 ➔ Annular bits for semi- and fully automatic units with a high endurance for a large throughput.

Tools for drilling and counter-sinking panes of glass such as plate-glass for façades, glass doors or car windows in a single working process

Combi ➔ Protective drilling and counter-sinking for building glass.
Combi S ➔ Deep counter-sinking for shapes and fittings for building glass.
Monoblock ➔ Protective counter-sinking for mass-production in the same glass thickness, e.g. for automobile glass.

Tapered counter-sinking tools

Counter-sinking tools of type TR120D, due to the large range of diameters, can be universally used for large and small counter-sinking jobs on manual and automatic machines.

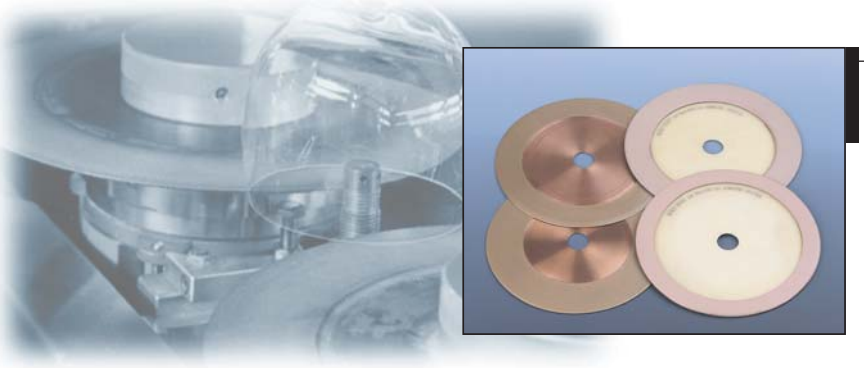
Galvanic drills

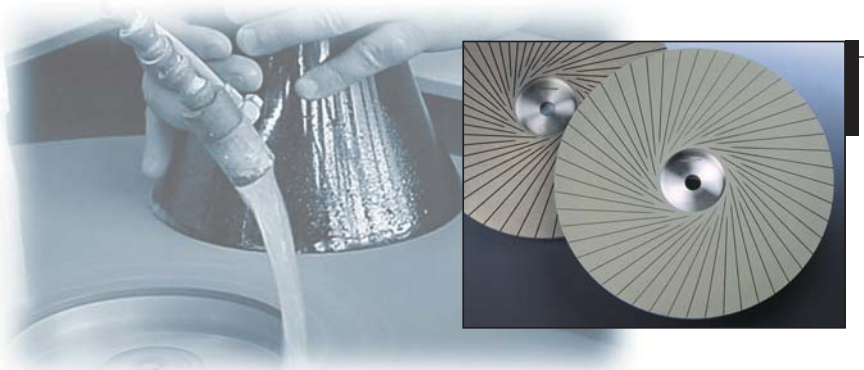
Particularly suitable for very small drilling diameters and for special kinds of glass.

You will find detailed information on our product range in our special subject catalogue

Working decorative glass

WENDT is a leading participant in the technical development of hollow glassware processing. Through numerous patents and the introduction of new kinds of products, the diamond tool has become the high-tech tool for working decorative glass. Today WENDT offers a tool specially designed for each processing task.





WENDT

Decor grinding disks for manual and automatic grinding

Segmented grinding disks for profile and surface grinding like the patented BG-disk for maximum abrasive efficiency in rough grinding.

Profiled disks with continuous edges in pointed, round and flat designs with good profile-holding ability, a high gripping capacity and good surface quality.

Flatting disks with metal or resin bonding

Complete solutions for machine components for grinding the mouth edges of soda, crystal or lead-crystal glasses also with patented tools for particularly high tolerances. For optimising the grinding results, various basic body materials and shapes are available in steel or composite materials.

Flat grinding disks with metal or resin bonding

Flat disks up to 600 mm diameter for preliminary and fine grinding of smooth flat surfaces capable of being polished, e.g. on glass figures and vases made of soda glass, crystal or lead-crystal.

- Metal-bonded flat disks in slotted design for rough grinding.
- Resin-bonded flat disks in slotted or continuous design for medium, fine and finest grinding.

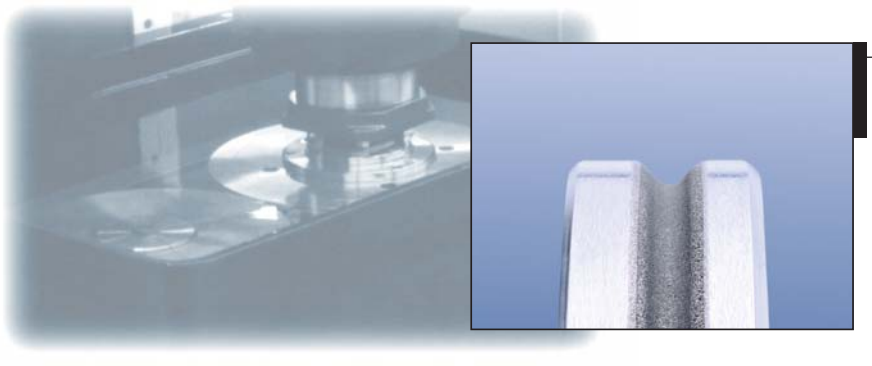
Reamers

Galvanic tools with close tolerances for producing perfect fitting glass stoppers and bottlenecks.

You will find detailed information on our product range in our special subject catalogue

Working automobile glass

In no branch of glass-working does the forward feed, bedding-in behaviour and practical life of the diamond tool and the quality of the ground glass edge play such an important role as in automobile glass. Because of the large number of pieces, the working process is subject to continuous improvement and optimisation at all production levels. Here, due to adaptation, optimisation and development of the tools, new flange systems and excellent service, WENDT has set new standards.



WENDT

Metal-bonded edge-working tools

For all kinds of glass such as windscreens, side windows, sunroofs or rear windows, WENDT offers an innovative range:

- Special bonds guarantee maximum forward-feed on the new generation of CNC machines.
- Long-life disks with high endurance when 'missing' and grinding a C-profile.
- Special flange system for minimising the bedding-in time and for reducing set-up times.
- Development of HIGH-SPEED disks for peripheral speeds of up to 145 m/s in order to reach even higher forward feeds.

Drilling/counter-sinking tools

The new monoblock tools improve the quality of the transition between counter-sinking and drilling and increase the output at the kiln. Above all, the consistent performance of these tools provides security for the customer.

Cup and circumferential disks for working rear-view and wing mirrors

For edge finishing and bevel grinding of car mirrors, the most varied production processes are used. WENDT is in the position of being able to supply all the necessary tools, offering good endurance and surface quality.

Re-profiling

6 profiling centres around the world offer our customers optimum service. The spark-erosion technology used is suitable for the tools' special bonds. Our know-how offers the following advantages compared to conventional methods:

- special start-up behaviour
- constant profiling quality guarantees the same functioning always
- optimum use obtained from the disk
- maximum tool efficiency is achieved
- coating geometry is adaptable to the processing task

You will find detailed information on our product range in our special subject catalogue

Working optical glass

In optics, high-precision components must be worked with specially developed tools. Through collaboration with machine manufacturers, WENDT is continuously developing these tools for greater economy or new quality requirements. Due to its many years' experience, WENDT is able to offer the complete product range of tools for the optical field.

WENDT

Profile and circumference disks with metal and galvanic bonds

Finding tools for facetting spectacle glasses and optical glasses. These high-precision tools are also suitable for CNC grinding.

Milling tools with metal, plastic and galvanic bonds

Milling tools for surface working of spectacle glass made of mineral glass or CR39. Such tools are also used for rough and fine grinding of lenses and prisms made of optical glasses such as BK270, flint glass, ZERODUR, etc.

Pellets in metal and plastic bonding

Fully coated tools for coating form tools for final finishing of accurate fine optical surfaces.

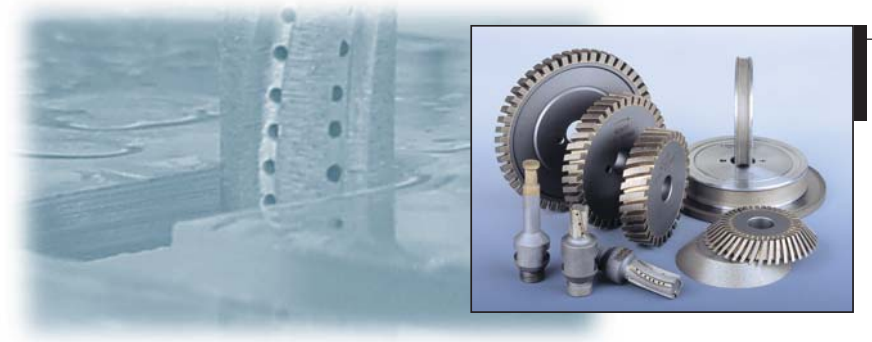
Pads

Extremely thin, flexible, metal-bonded grinding tools. These pads are used in prescription finishing of spectacle lenses. As the radii necessary are constantly changing, these tools, due to their greater flexibility, have successfully won through against the pellets used in the past.

You will find detailed information on our product range in our special subject catalogue

Working glass for furniture and building purposes

Present-day machine technology demands economic and, above all, reliable tools of outstanding quality. The WENDT tool range facilitates economic working with modern CNC machines. Long years of experience have made possible perfectly designed machine tools for every production task.



WENDT

Metal-bonded cup wheels

There are tool sets available for all types of edge-processing machines: from segmented cup wheels for laminated glass, thick glass and mitre cutting to cup wheels with a continuous edge for normal float and mirror glass.

Tools for CNC machines

The total range of tools for machine flexibility are available.
For example segmented circumferential disks, circumferential disks with a continuous edge, profile disks for every glass thickness, millers and profile millers in the optimum specification for using up machine capacities.

The 6 profiling centres throughout the world provide a special service for rapid re-profiling of all tools.

Metal-bonded profile and circumferential disks

New production technology makes it possible to produce tools which are particularly economic in their use. A suitable specification for all types of profile produces perfect harmony between grinding speed, edge quality and endurance.

The tools are available with the main body made of aluminium or stainless steel.

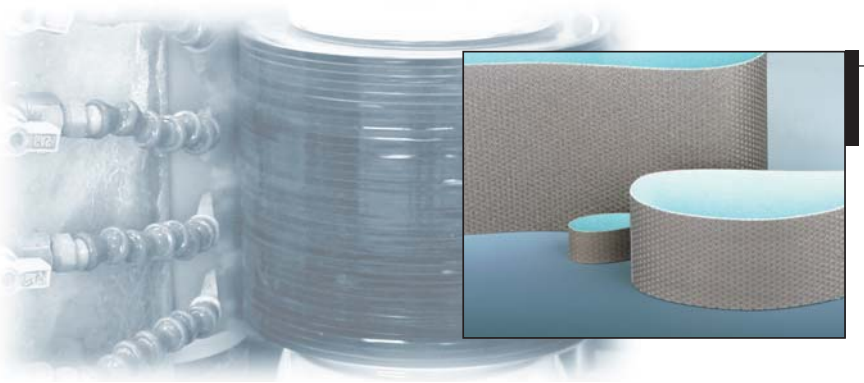
Metal and resin bonded cup wheels for facetting machines

An excellent facet quality and good economy can be achieved with the constant tool quality of our cup wheels.
Metal-bonded cup wheels are used for rough grinding operations, and resin-bonded for fine and finest grinding.

You will find detailed information on our product range in our special subject catalogue

Flexible diamond tools

Flexible diamond tools are now well established in the glass-working industry. WENDT began with their introduction to the market many years ago and have developed the most varied applications. In many applications only flexible diamond tools can be used.



WENDT

Diamond grinding belts with galvanic and plastic bonding

Diamond grinding belts can be supplied in all sizes for the various types of belt grinding machines.
In contrast to the conventional SiC belts, scratching of the glass surface and damage to the table rollers by SiC attrition are avoided. Long life and improved grinding qualities increase economy, e.g. for edging toughened safety glass. Process safety in tempering is clearly enhanced.

Dish-wheels for manual grinding machines with galvanic and plastic bonding

For rapid flexible use on manual machines.
Rough, medium and fine grinding for every processing job arising, where retooling the machine is uneconomical.

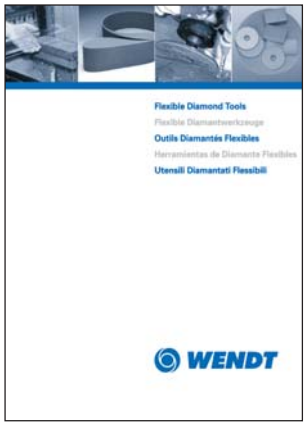
Grinding sheets with galvanic and plastic bonding

Available as self-adhesive sheeting, with a burred or linen backing.
For all special applications for making up profiling tools or surface grinding disks by affixing to a suitable carrier.

Manual rubbing blocks with galvanic and plastic bonding

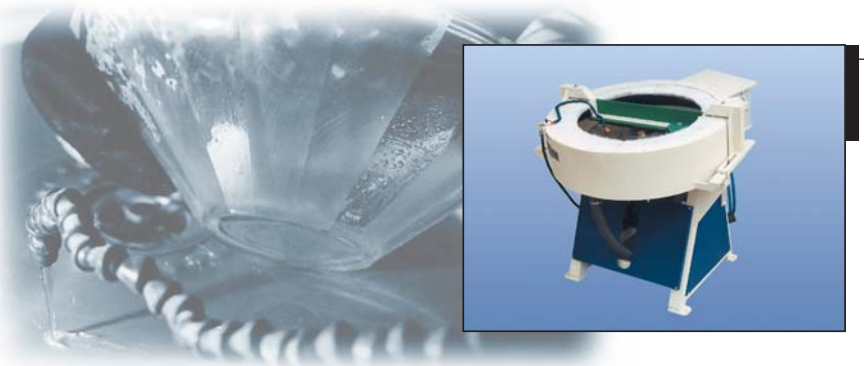
For all manual processing jobs on glass.
Rub down sharp cut edges for safer transport.
Suitable as a grinding tool or for repair work after final processing.

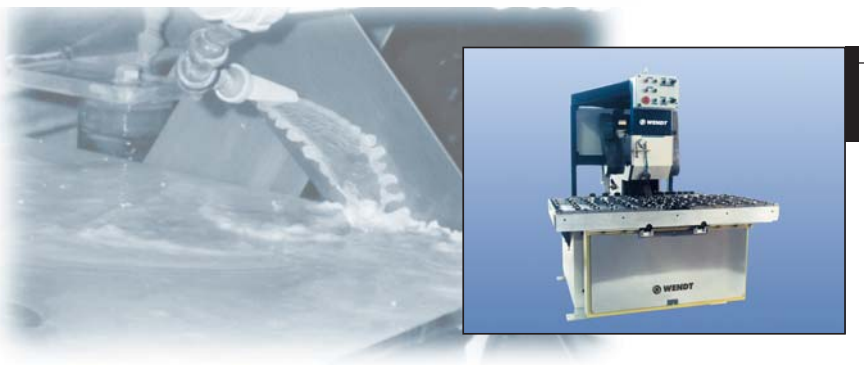
You will find detailed information on our product range in our special subject catalogue



Machines for working glass

The range of machines arose from experience gained by WENDT through the application of its diamond tools. The machines have therefore been developed according to the requirements of the diamond tool and the associated grinding operation and its parameters. The machines are therefore the product of the application and thus designed precisely for the task. Our varied range is constantly being extended by new customer requests.





WENDT

Cutting machines

Robust machines, specially designed for working on glass. Conceptually intended for the manual workshop for cutting lamps, vases, glass blocks, etc.
Automated and/or specially equipped units can be supplied at any time to suit customer's wishes.

Surface grinding machines

Machines for rough and fine grinding of level surfaces on gift articles, vases, lamps and other glass objects made of soda glass, crystal, lead-crystal and opal glass. Specially designed for diamond surface grinding disks of a diameter of 250 and 600 mm.

Belt grinding machines

Machines for diamond-impregnated belts.
The special adaptations to high belt speeds and high mechanical loads are characteristic of these machines. Included in the range are belt grinding machines for cross sanding and treating straight edges on flat glass, hollow glassware, as well as special machines for special applications.

Drilling machines

Single and multi-spindle unilateral manual drilling machines for all kinds of drilling in glass.

You will find detailed information on our product range in our special subject catalogue

Success by Partnership

The extraordinary quality of our machines and the great variety of our tool products combined with the experience and creativity of our specialists offer you the optimal solution for your application problems.

Come and visit one of our modern research and production sites. You are welcome to test the solutions necessary for your tasks directly on our high-performance grinding machines together with our specialists or to inform yourself on future-oriented trends and up-to-date grinding technologies.

Wendt – the Complete World of Grinding

Tools for Hard Material Grinding

Tools for Steel Grinding

Tools for Glass Grinding

Machines for Hard Material and Steel Grinding

Wendt-Partners Worldwide Nearest to You

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