

Cup Wheels



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Introduction

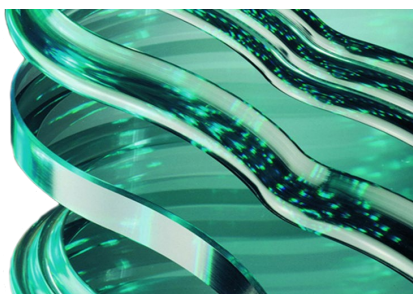
The concept of flat glass includes a wide spectrum of product groups such as window glass, automotive glass, furniture, construction, bullet-proof glass, refractory glass, ...

All these products are manufactured from large glass sheets and require processes such as sawing, cutting, grinding, drilling and polishing.

Edge working, by pencil edging is most important in construction and furniture industries.

The quality of the end product needs to be optimum, not only for security purposes (not to hurt the user) but also from an aesthetic point of view.

This criteria will be of utmost importance for mirrors, as their function is to reflect an image.



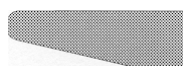
Different profiles (see drawings below)

Several profiles can be manufactured nowadays:

- straight edge
- bevelled edge
- flat edge and arris
- pencil edge (C-profile)
- mitre



Straight edge



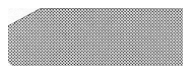
Bevelled edge



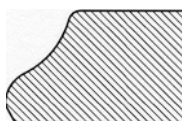
Flat edge and arris



Pencil edge



Mitre



OG



Double Edge



Triple Edge



Waterfall



Bullnose

For design reasons, we are now using more special profiles like OG (or others).

Machines

In order to produce such profiles, the market offers a large variety of automatic, semi-automatic or manual machines which all use diamond tools.

Besides their level of automatisisation, these machines can be distinguished by their design.

The position of the glass on the machine is therefore of prime importance.

Manual machines

These machines, which are still in use, can produce different profiles either manually or with the use of a template.

Vertical machines

As shown in figure 1, on vertical grinding machines the glass is loaded on to a conveyor and transported vertically. The process consists of grinding the lower glass edge only.

Advantage:

flexibility for small serials

Disadvantage:

grinding of one edge at a time.

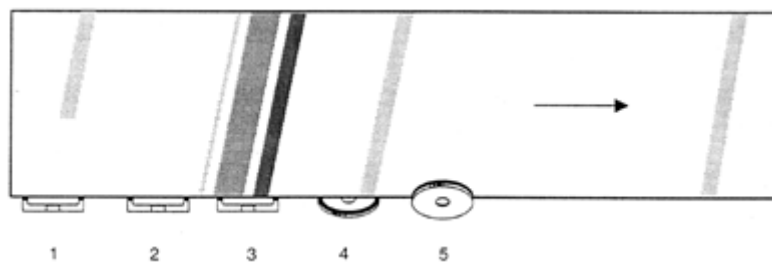


Figure 1

Horizontal double edge machines

On horizontal double edge machines both parallel sides of the glass sheet are ground simultaneously.

The glass is supported by compression between 2 holders conveying it between the grinding wheels.

These machines are used for the grinding of large series of rectangular work pieces.

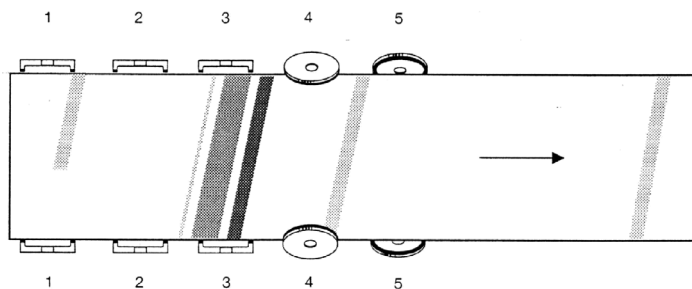


Figure 2

The productivity can be increased when you link two machines together with a transfer table.

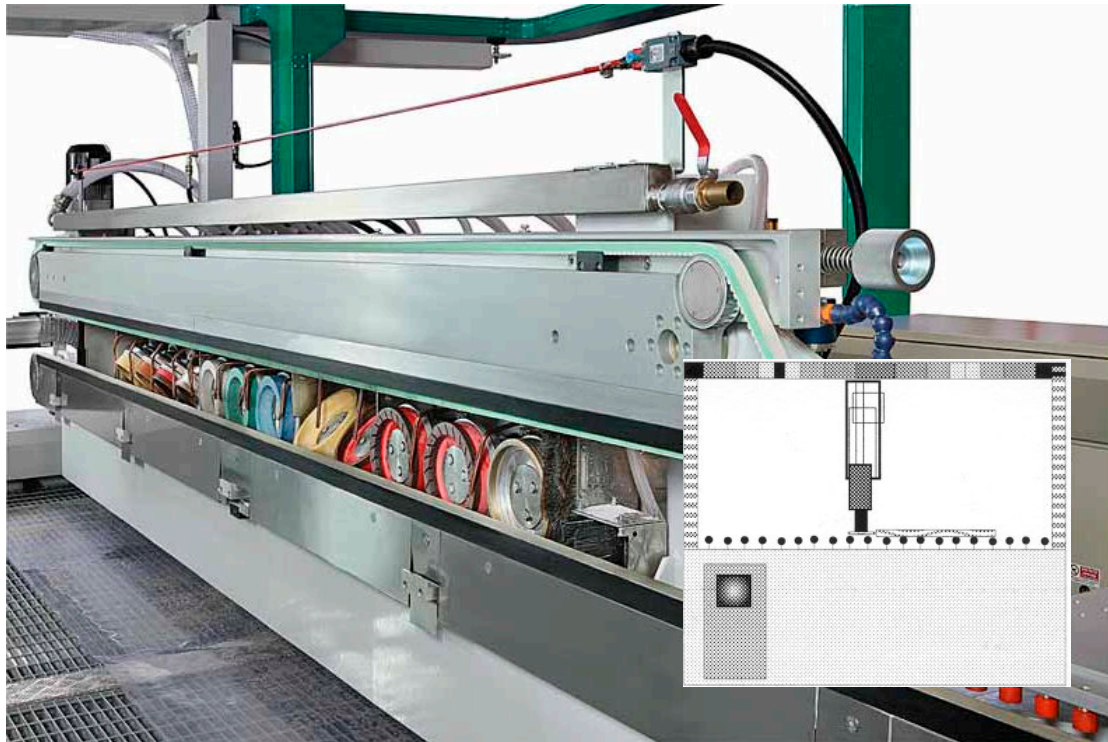


Figure 3

Horizontal CNC machines

Nowadays, CNC machines are becoming more popular. As shown in figure 3, the glass plate is placed horizontally on the machine plane and held by vacuum suction. The grinding wheel grinds the required profile by means of CNC control.

These machines have increased the work speed and productivity for the companies.

The cup wheels

The cup wheels are used on straight line and bevelling machines for the manufacturing of straight, flat edge and arris and bevelled edges.

The peripheral wheels

The Diamond Tool

Working steps

Edge working is generally done in several steps to obtain an optimum edge quality and a high feed speed.

- For machines with three diamond grinding wheel positions, we use a roughing wheel, a semi-roughing wheel and a finishing wheel.
- For machines with two diamond grinding wheel positions, we use one roughing wheel and one finishing wheel.

The edge working operation combines both material removal and surface finish. Thus the roughing wheel removes a large volume of material and the finishing wheel removes all scratches generated by the roughing wheel (until it reaches the result required).

Number of working positions

	1	2	3
<i>Roughing</i>		D181	D252 D151
<i>Semi-roughing</i>	D107	D107	D126 D 91
<i>Finishing</i>	D 64	D 76 D 54	D 76 D 54

Figure 4

Working conditions

The peripheral speeds usually recommended are:
 - 30 to 40 m/s for peripheral wheels (small contact area)
 - 20 to 25 m/s for cup wheels (large contact area)

Types of work

Flat edge grinding

Flat edge grinding can be done on horizontal (two sides) and vertical (one size) machines. On these machine types cup wheels will be the tools mostly used to perform straight edging and seaming. The horizontal CNC machines, on the other hand, use peripheral and cup wheels (segmented or continuous) to suit the high speeds and high stock removal.

Grit sizes

- Roughing: D181 à D151
- Semi-roughing: D126 à D91
- Finishing: D76 à D54

The concentration should be between 40 and 50; the bond should be a soft bronze bond. The seaming wheel should be a bit harder and the grit size slightly finer.

For grinding thick glass and bullet-proof glass, we nearly always use segmented cup wheels because of the extremely high material removal capability.

On the one-side horizontal machines the right angle of the glass is handled with peripheral wheels.

Seaming can be done either by combining a peripheral wheel type 1A1 in the centre of a V-profile wheel type 1EK6Y, or by using a double faceting (VEE) wheel type 1DD6Y comprising the two profiles mentioned above.

Bevelling

Bevelling is mainly used when grinding mirrors for which the surface quality is of prime importance.

Two types of machines achieve this kind of operation:

- horizontal machines
- vertical machines.

These machines exclusively use cup wheels for the bevelling process. The most important operations are achieved with roughing and semi-finishing tools.

The grinding wheel abrasiveness has a direct influence on the bevel quality; this is the reason why we use metallic wheels featuring a very abrasive bond and grit sizes from D252 to D91, knowing that the quantity of material to be removed will depend on the angle and the bevel width.

Scratch-free polished surfaces are only obtainable with super finishing resin bond grinding wheels in micron grit size.

- Vertical machines:

Material removal is achieved in several steps (with the help of several wheels). Roughing and semi-finishing are performed with metallic bond wheels whereas finishing is reached with resin bond wheels.

Polishing is mostly done by means of felt polishing wheels together with cerium oxide which is in suspension in the coolant.

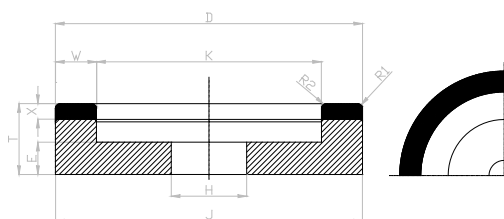
- Horizontal machines:

This kind of machine is used when a mirror is manufactured in specific shapes (oval, round, ...). The working process is carried out manually, semi-automatically or by means of a CNC machine.

Types of cup wheels

ALTIFORT-BOART Description

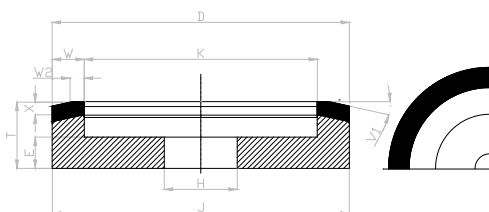
L30L-D-W-X-Specification-H/T-(E)-R1-R2



Ø	100 → 200
T	20 → 100
X	4 → 20

ALTIFORT-BOART Description

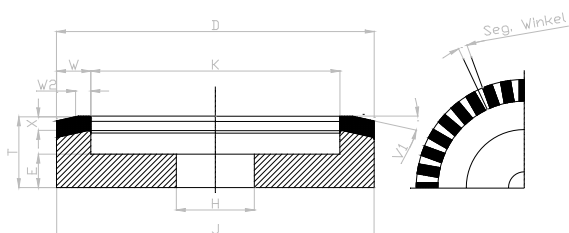
L30J-D-W/V-X- Specification -H/T-(E)



Ø	100 → 200
T	20 → 100
X	4 → 20
V	0 → 4

ALTIFORT-BOART Description

L30X-D-W/V-X- Specification -H/T-(E)



Ø	100 → 200
T	20 → 100
X	4 → 20
V	0 → 45°

ALTIFORT-BOART offers a programme covering the requirements of the most used machines on the market:

ADA – BANDO – BAUDIN – BAVELLONI – BENTELER – BESANA - BIELEFELDER UNION –
 BODO GERHARD – BOTTERO – BOVONE – BUSETTI – COVESA – FMF – FREDIANI –
 GLASS PROGETTI – GME – INTERMAC – IRM – KLÖPPER – LATTUADA – LOVATI –
 MACLAV – SCHIATTI – VITRODODI – ZAFFERANI – ZANETTI.