PROCESSING MODE

Flame-Processing

füller
GLASTECHNOLOGIE

Fire-Polishing
Rim-Glazing
Burning-off
Welding
Stretching and Twisting
Punching/Fire-cutting

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APPLICATION

The flame-processing system allows processing of all shapes of glass items: oval, round, angular, flat, as well as for all sizes of glass items. Modular functional stations allow individual adaptation to special applications, production targets and quality requirements. These highly flexible components perform different flame-processing functions and may be integrated into one processing system in order to extend the range of functions available for different production targets. One example to combine different functions for varying design requirements is to include welding, stretching and fire-polishing functions into one processing system for highly flexible stemware lines. Another option is to combine punching and fire-polishing functions into one combi-system.
The functional station equipment is based on modular components, which allow to precisely control all necessary movement, temperature and time parameters and to achieve highest quality standards as well as highly reproducible results.

Functional Stations are:

- fire-polishing of surfaces and handles
- rim-glazing
- burning-off function for removing the top or cap of blown articles
- welding of stemware and architectural glass bricks
- stretching of stems
- twisting of stems in order to achieve complex stem shapes
- punching/fire-cutting of holes

TYPES OF GLASS COMPOSITION	lead glass, soda-lime glass, recycling glass, borosilicate glass
PRODUCTION RATE	up to 60 pieces./min. (depending on the dimensions of the glass item)

MODE OF OPERATION

Depending on the task, the roundtable system is either equipped with rotating plates or article holders, onto which the glass items are placed, i.e. for fire-polishing or for pre-heating and forming (punching). It may also be equipped with two article-holders for each station for holding the top and the bottom part of glass items for either separating (burning-off) or joining (welding) the two parts (i.e. blown bowl and pressed stem or foot) or for forming the softened glass (stretching and twisting of stems).

Highly flexible components perform all special functions. The processing cycle - which is based on the temperature of the glass item necessary for processing - can be optimised according to the individual requirements, since the MMC-software allows to achieve an optimal interaction of the servo-motor based table rotation and the performance of each station. The burners as well as the articles can be precisely positioned or moved in each processing step. All movement parameters as well as the tools for forming the softened glass (punching, calibrating etc.) are controlled by the MMC-software. The processing cycle typically includes functions like loading, pre-heating, flame-processing, forming of the softed glass, cooling and/or unloading.

FEATURES

very flexible processing	• because the number of stations fully equipped can be varied according to the capacity target and article dimensions – increasing the flexibility of the system depending on article sizes • because modular components allow the integration of additional functions – making the system very flexible and extending the range of processing steps available • due to easy job-changes since the MMC-software provides an efficient product management tool which stores the adjustments of all production parameters under the specific name of the glass item and provides optimal processing parameters for later resumption of production
optimal processing conditions	• because the relevant parameters may be altered while the machine is in operation and optimal results may thus be achieved immediately • because the MMC-software facilitates noting, connecting and keeping record of all adjustments and events and helps to efficiently control and monitor the processing process
extremely user-friendly	• due to the uncomplicated user menu of the MMC-software • due to the MMC-software's graphic programming tool which includes all parameters of the processing cycles
reduced operational costs	• because the media-supply for the burner systems may be automatically switched on and off according to need






APPLICATION

Fire-polishing of surfaces and handles mainly aims at eliminating press seams and at increasing the surface quality. Rim-glazing on the other hand allows to process the top or cap of blown glass items after the cold-cutting process if the glass items are not acid-polished.

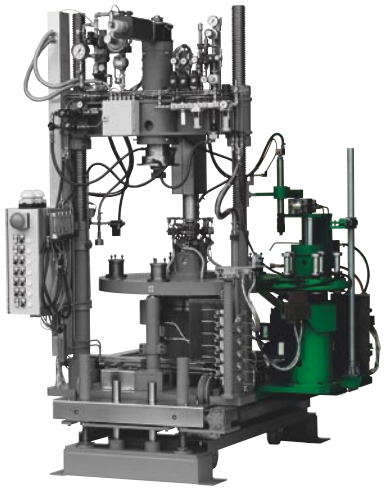
TYPES OF GLASS COMPOSITION	lead glass, soda-lime glass, recycling glass, borosilicate glass
PRODUCTION RATE	up to 60 pieces./min. (depending on the dimensions of the glass item)

MODE OF OPERATION

There are three principal options for the layout of the fire-polishing system:
First: the glass item is entirely fire-polished by large burners and is moved through one or more fire-polishing stations subsequently until the required result is reached.
Second: each section of the glass item is fire-polished subsequently while manually height-adjustable burner systems cover different zones of the rotating glass item in subsequent stations. A turning device allows to reach all zones equally and a double-headed burner, which moves in and out, allows to fire-polish handles.
Third: a computer-controlled vertical movement of the burner allows to individually adjust the fire-polishing time for each zone of the rotating glass item. If oval or rectangular glass items have to be fire-polished, the servo-motor based table movement, which allows to perform a nearly linear backward and forward movement, may be used to perform a horizontal movement in addition to the article rotation and the vertical movement of the burner system. These synchronized movement parameters allow to follow the contour of the glass item. One or more stations may be equipped with a computer-based height-adjustable burners.
For rim-glazing, the height of the burner is adapted to the height of the glass item and the glazing result is regulated by the fire-polishing time.

FEATURES

very high quality	• because varying sizes of burners as well as the surface tension of the glass guarantee a regularly polished surface • since synchronized movements allow to follow the contour of the glass item in a precisely defined time
large cost-savings	• because cost-intensive acid-polishing is unnecessary



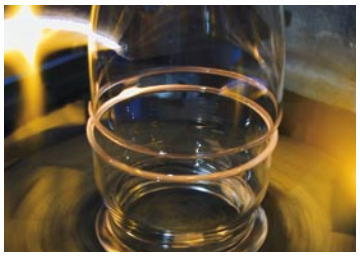
Burning-off

APPLICATION

The burning-off unit has been designed for removing the top or cap of blown articles. Burning-off the top leaves the rim slightly thicker than the wall, and - given this visual implication - it is generally used for glasses with a safety rim and for glass items which incorporate this rim into their design.

GLASS ITEMS	blown glass items which need processing since the top of cap has to be removed; laboratory glasses; recycling glasses
DIMENSIONS OF GLASS ITEMS	total height: up to 400 mm diameter or diagonal: up to 250 mm

MODE OF OPERATION



The blown glass item is transferred to the roundtable of the burning-off unit, where the base is held by the upper article holder. A ring-shaped cutting torch burner is closed around the glass item, while the top or cap is gripped by a lower gripping device. The burner heats the glass until the top can be pulled down and the rim can be fire-polished. After cooling, the glass item can be taken out and transferred into the annealing lehr.

FEATURES

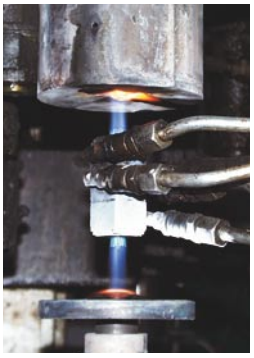
very high quality	• since precise positioning of the glass item in combination with a precise fire-cut provided by a ring-shaped cutting torch burner and a controlled vertical movement of the lower article holder (which actually pulls off the blowing cap) guarantees a good rim quality
large cost-savings	• because any processing after the annealing lehr is replaced (cracking-off, rim-glazing or acid-polishing), and glass items which are not processed are ready for sale directly after the annealing lehr

Welding

APPLICATION

The welding process allows two different applications: welding is necessary for joining the (pressed or injected) stem or foot with the blown goblet bowl of stemware. But the welding process also allows to weld more complex shapes such as round, oval or rectangular rims. This process is used for welding architectural glass bricks.

GLASS ITEMS	stemware, glass bricks for architectural use
DIMENSIONS OF GLASS ITEMS	total height: up to 400 mm diameter or diagonal: up to 250 mm rim thickness: 1-4 mm

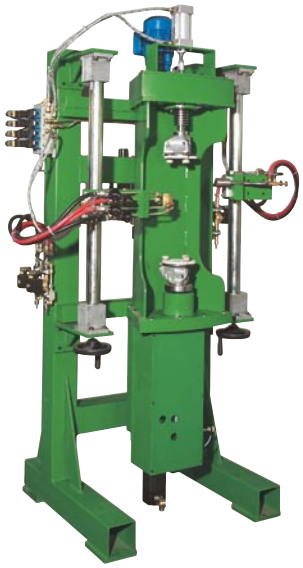


MODE OF OPERATION

In a completely automatic stemware production line, the bowl (or bowl complete with vacuum-drawn stem) is produced on the blowing machine, while the foot (or pressed foot complete with stem) is produced on a press machine. Both items need to be joined together and this is done by welding. The welding is either done on a separate roundtable system into which the bowl and stem or foot are loaded. Alternatively, the welding can also be done in the welding station which is integrated into the blowing machine. The stem or foot is transferred into the blowing machine from the press machine and is welded to the bowl (complete with stem). A double-headed burner heats both parts at the welding interface surface. When the surfaces reach the correct temperature, the bottom part moves vertically upwards until contact between both surfaces takes place. After cooling, the complete stemware is taken out for annealing. The same system may also be applied for welding glass bricks for architectural use. While the tools (article holders and burner system) vary from the stem-welding system, the processing procedure is basically the same. A special layout for the tools, especially the burner systems, is decisive for the quality of the welding joint.

FEATURES

very high quality	• because the individual components of the stemware are produced independently and under optimal conditions (seamless) – and are welded together without a visible seam • because the welding station may be integrated into the blowing machine, saving one processing step in a fully automatic stemware production line and drastically reducing handling times
large cost-savings	• because a welding roundtable system connects the intersections of the production process – thus providing the basis for a fully automatic stemware line – while flame-processing combi-systems allow to perform also other functions like stretching or twisting of the stem



Stretching and Twisting

APPLICATION

Depending on the manufacturing process, there are two fields of application for the stretching equipment: For stemware which is produced in one piece already in the blowing machine by squeezing a foot out of the vacuum-drawn stem, the stretching process is necessary to transform the thick and short stem provided by this process into a longer and slimmer stem. For pressed stems or vacuum-drawn stems (with a pressed foot welded onto the stem) special design requirements might make the stretching process necessary in order to achieve even slimmer and higher stems than is possible by pressing or vacuum-drawing.
The stretching equipment also allows to produce twisted stems by applying lacing and winding techniques. Thus the range of designs available in a fully automatc stemware line is essentially extended.

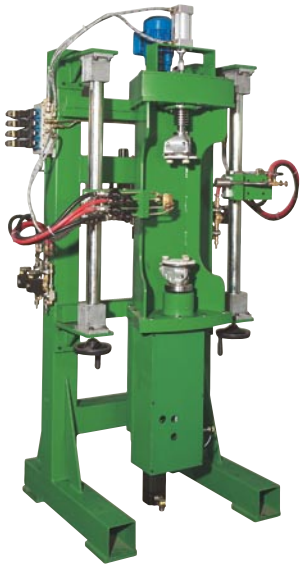
GLASS ITEMS	complementary equipment for stemware produced in one piece in the blowing machine special design requirements for stemware
DIMENSIONS OF GLASS ITEMS	total height: up to 400 mm diameter or diagonal: up to 250 mm

MODE OF OPERATION

The stem is pre-heated while the top and the base of the glass item are held. The two article holders rotate synchronously. The vertical movement of the lower article holder allows to stretch the stem as soon as the glass is sufficiently heated and soft enough for forming. The softened stem may also be twisted by changing the rotating speed of the lower station.

FEATURES

very high quality	• because heating and stretching improves the surface quality of the stem due to the surface tension of glass
extended range of designs	• because the stretching process allows to achieve design requirements featuring extremely slender stems, which – for technical reasons – have so far been impossible to make in an automatic production (restriction imposed by the minimum diameter of pressed and vacuum-drawn stems) • because the processing tools of the stem-stretching equipment also allows making complex stem shapes using lacing and winding techniques (twisting) which have traditionally been features of manual production



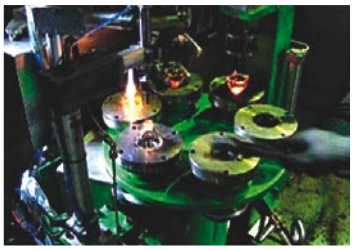
Punching / Fire-Cutting

APPLICATION

Flame-processing in combination with mechanical tools allows to punch holes into the hot glass, which is necessary for light-sources, mixing equipment etc.

GLASS ITEMS	holes for lampshades, blender containers, reflectors for halogen projector light sources, picture frames etc.
DIMENSIONS OF GLASS ITEMS	height: up to 400 mm diameter or diagonal: up to 500 mm whole diameter: up to 60 mm

MODE OF OPERATION



A cylinder, which performs a vertical movement, punches a hole into the glass item after the glass item has been pre-heated. The part, which will have to be punched out, has been carefully conditioned so that a defined cut is guaranteed. The hole is fire-polished, calibrated and cooled in subsequent processing steps.

FEATURES

very high precision of the punched hole	• because the pre-heating and conditioning process prior to punching provides optimal conditions for the punching process • since fire-polishing the punched rim and calibrating further enhance the quality and precision of the hole
reduced cracks and higher total output due to higher quality	• since hot-end processing reduces the risk of uncontrolled micro-cracks in the vicinity of the punched hole • because the combination of fire-cut and mechanical punching reduces the risk of deteriorating the inside surface of the reflector which is to be coated in another processing step

THE PACKAGE INCLUDES

	LINEAR PROCESSING CYCLE	ROUNDTABLE SYSTEM	OVAL STATION ORDER
BASIC EQUIPMENT	single station; 2 or more stations	2 or more stations	2 or more stations (for rectangular shapes)
	servo-driven telescope unit (one station) or servo-driven chain drive (up to 36 stations)	servo-driven rotating table	servo-driven chain drive
HOLDER FOR GLASS ITEM	AC-driven rotating plate	AC-driven rotating plate	AC-driven rotating plate
BURNER SYSTEM(S)			
MEDIA SUPPLY			
CONTROL PANEL	PC-based real time system with MMC-software and Windows 2000 operating system, incl. cooling system		

OPTIONS

STATION ORDER (BASIC EQUIPMENT)
- single station system: linear processing cycle (servo-motor driven telescope unit)
- 2 or more stations: roundtable system (servo-motor driven)
- 2 or more stations, especially for rectangular glass items: oval station order (servo-motor based chain drive)

BASIC LAYOUT
- independent system
- integrated into production system (welding station integrated into blowing machine; fire-polishing unit integrated into roundtable press etc.)

NUMBER OF ARTICLE STATIONS (DEPENDING ON CAPACITY)
- 1 to 36 stations
- the stations may be equipped according to capacity targets and article dimensions (smaller articles allowing all stations to be fully equipped - providing highest capacity; and larger articles reduced number of stations fully equipped and thus providing reduced capacity)

ARTICLE STATION EQUIPMENT

HOLDER FOR GLASS ITEM
- AC-driven rotating plate (different sizes)
- holder and centering device (adjustable to the size of the glass item)
- 3-parted gripper
- vacuum holder

ROTATING MOVEMENT OF GLASS ITEM
- AC-drive in combination with friction wheel for rotating movement (allowing to be clutched in at individual stations if the rotational movement of the glass item is required)

VERTICAL MOVEMENT FOR LOWER STATION
- stepper motor for vertical movement

FUNCTIONAL STATION EQUIPMENT (DEPENDING ON PROCESSING TARGET)

BURNER SYSTEM
- air/gas burner (pre-mix burner)
- gas/oxygen burner (pre-mix or surface mix)
- hydrogen burner
- double-flame oxygen burner (for welding)
- opening and closing ring-shaped cutting torch burner (for burning-off/welding of glass bricks for architectural use)

HOLDER FOR BURNER SYSTEM (VERTICAL MOVEMENT OF BURNER SYSTEM)
- manually height-adjustable with hand-wheel
- motor-drive in order to individually position or move the burner – allowing precise adjustment of the fire-polishing time for each zone of the rotating glass item

HORIZONTAL MOVEMENT AXIS
- pneumatic cylinder for in- and out movement of functional station equipment
- stepper motor for the horizontal movement of the burner system (i.e. 250 mm stroke), allowing to follow the contour of the glass item; manually height-adjustable

ADDITIONAL FUNCTION
- turn-over device for fire-polishing all zones equally
- punching/calibrating tool (height-adjustable cylinder)

BASIC/ADDITIONAL MACHINE EQUIPMENT

COOLING SYSTEM
- delay time
- air-cooling/manifold
- airmover based on injector principle

MEDIA SUPPLY
- manifold (gas/oxygen/air)
- minimal flow gauge (gas-flow interruption when gas is not needed; gas-flow interruption in combination with emergency stop or for each cycle)

ELECTRONIC CONTROL
- external control panel, when there is insufficient space to install the control panel close to the blowing system