ELECTRON BEAM TECHNOLOGY

PTR
PRÄZISIONSTECHNIK GMBH

ELECTRON BEAM-
HIGH-PERFORMANCE MACHINES

Picture:
EBOMAT PK 01 with panelling for manual component change

EBOMAT PK/PS

Series PK 01 to PK 03/PS 02

MODULAR and INNOVATIVE

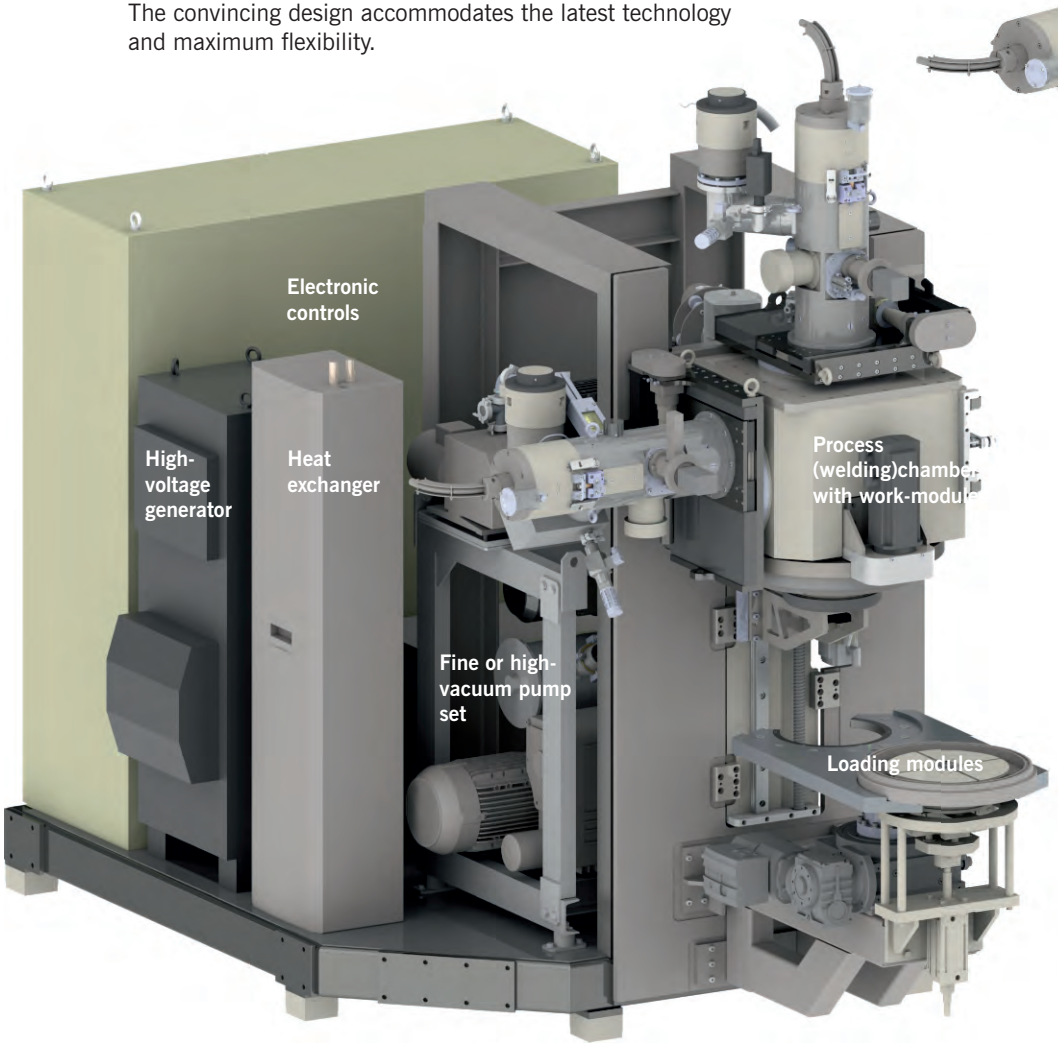
Developed for mass production of automotive motor and gearbox components, but an optimum solution for many other applications.

A member of

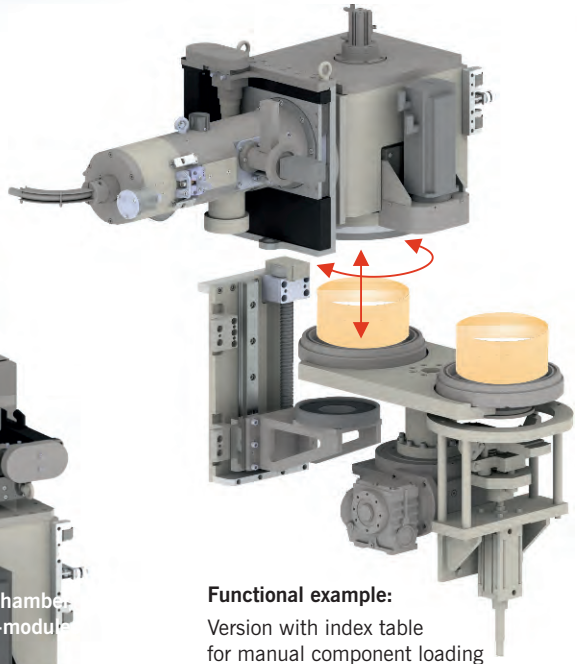
GLOBAL
Welding Technologies AG

MACHINE DESIGN

The convincing design accommodates the latest technology and maximum flexibility.



The frame provides space for modular processing and loading devices



Functional example:

Version with index table for manual component loading or automatic loading by gantry transfer systems

THE REVOLVING-BASE PRINCIPLE

All component fixtures are located onto the chamber bases.

A servo motor-driven ring is mounted on the working chamber, onto which the bases with appropriate fixtures are elevated by a lifting table, accurately positioned, welded and finally lowered again. The bases act as “transport palettes”, which cyclically transports to and from the chamber by means of a 180° index table or directly from a conveyor system.

This system design, when compared to conventional production machines, benefits from not having to change the workpiece tooling when welding different components – no downtime in production.

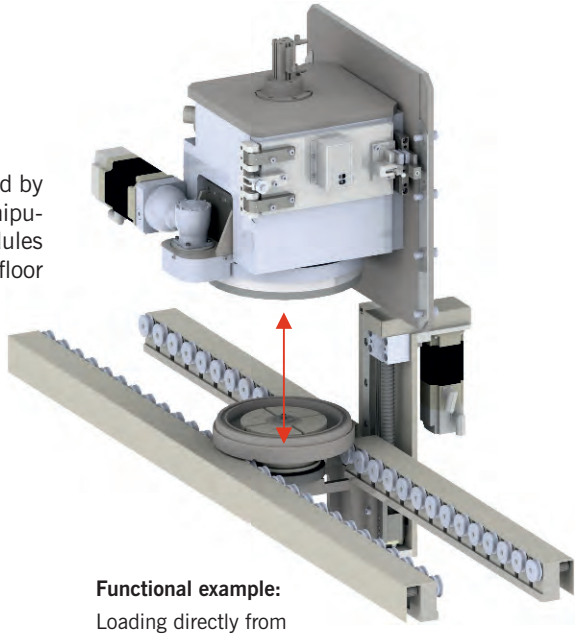
In production lines bases holding different fixtures can be supplied from several charging stations, with processing programme confirmation from bar-coded bases.

THE LOADING VARIANTS

At the moment, loading is usually carried by automatic overhead gantry transfer manipulators and the index table. Flexible modules are also available for the integration of floor conveyor systems.

Functional example:

Version with component exchanger loading from an external conveyor

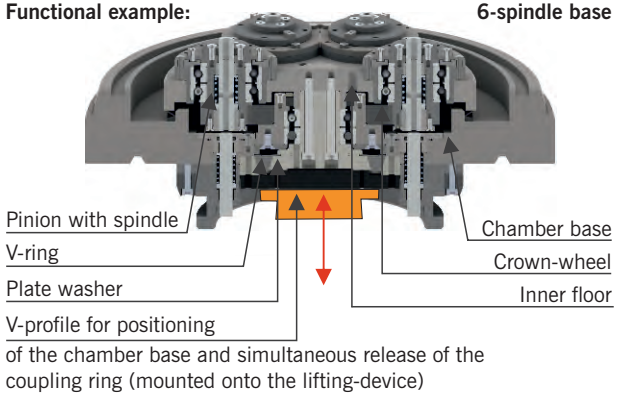


Functional example:

Loading directly from a conveyor

THE DOUBLE-BASE PRINCIPLE

Functional example: **6-spindle base**



of the chamber base and simultaneous release of the coupling ring (mounted onto the lifting-device)

In the **basic version of the base** the component fixture is mounted on it and rotates with the base.

However, if only the workpiece is required to rotate or if several fixtures are to be activated simultaneously; a **double-base** is used. This version contains an internal base, which is connected to the external base by a coupling ring which can be released by the clamping device, and which on release of the coupling is locked in various working positions.

In this operating condition, the rotation of the chamber base is transmitted to the working spindles of the internal base by an integrated gear. In this way for example, the spindles can be indexed during the work programmes with the clamping device lowered, and turned by raising the clamping device.

THE GENERATOR MOVEMENT WITH „DISC SEAL"

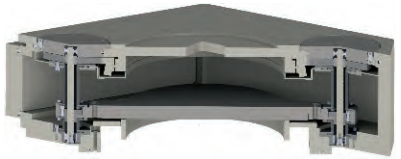
The systems are supplied with 60 kV generators, which can be mounted vertically or horizontally, or in the PK 03 series at 45°, either fixed or on a sliding-carriage.

With these manual or motor-driven sliding-carriages, a new seal system is used, which avoids using extended gap sealing-plates and permits large movement travel thanks to the small, round sealing disk.

THE ACTIVE COUNTER THRUST-BEARING

with component positioning

For component clamping and positioning for axial welding (i.e. circumferential relative to the generator axis); the mounting plate holds the workpiece tooling and is driven by a motorised ball-screw.



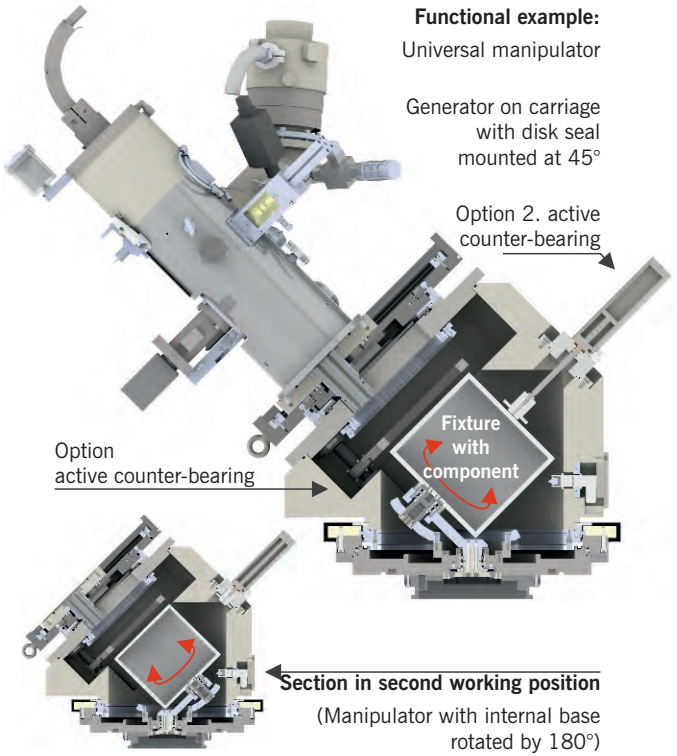
THE UNIVERSAL PROCESSING CHAMBER

of the PK 03 series

The principle of the double-base also allows the alternating movement of application-specific manipulator axes in the workpiece fixtures by means of a single servo-motor mounted outside on the chamber.

For example in this new chamber version, in which the working spindle is arranged in the double-base at 45°, so that by programme-controlled cycling of the internal base by 180° all processing operations on the face and obverse surfaces of the workpiece can be carried out in one cycle.

Functional example:
Universal manipulator



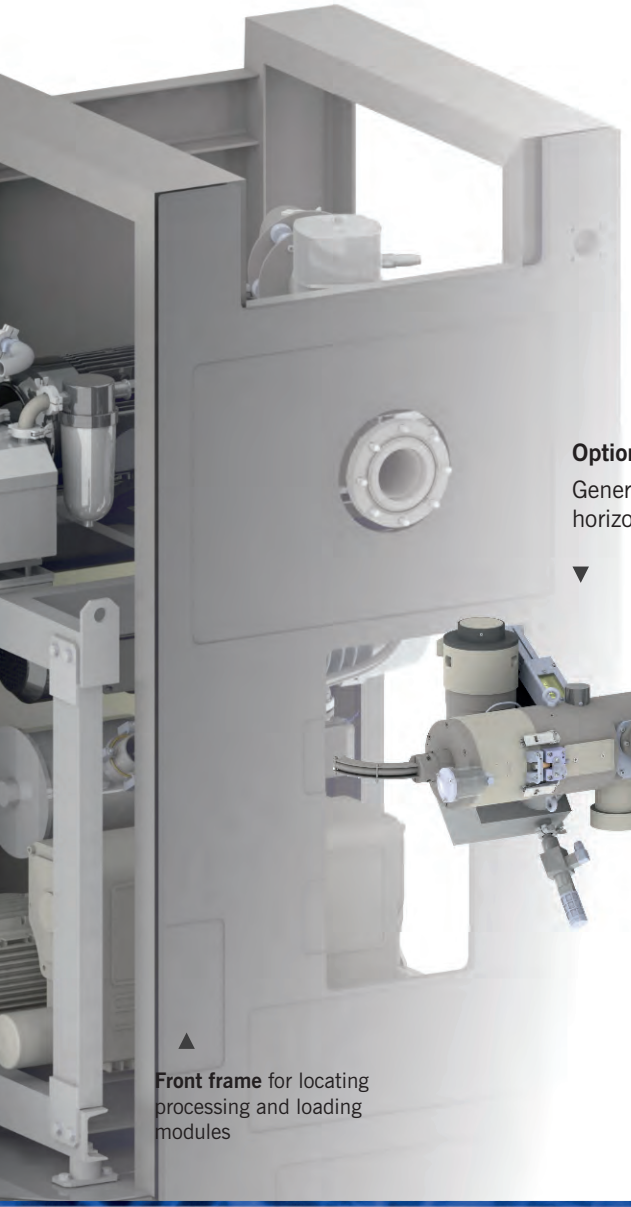
(Manipulator with internal base rotated by 180°)

THE AUTOMATION

With the capability of being able to process very different components one immediately after the other with EBOMAT PK machines, it has become a simple matter to design completely flexible production systems. The different baseplates are stored in magazines along the transport systems and then provided to the different mounting and processing stations in accordance with the production plan, e.g. for demagnetisation, pre-heating, EB processing, measurement etc. A master system control directs and monitors all steps in accordance with the production plan.

PROCESSING MODULES

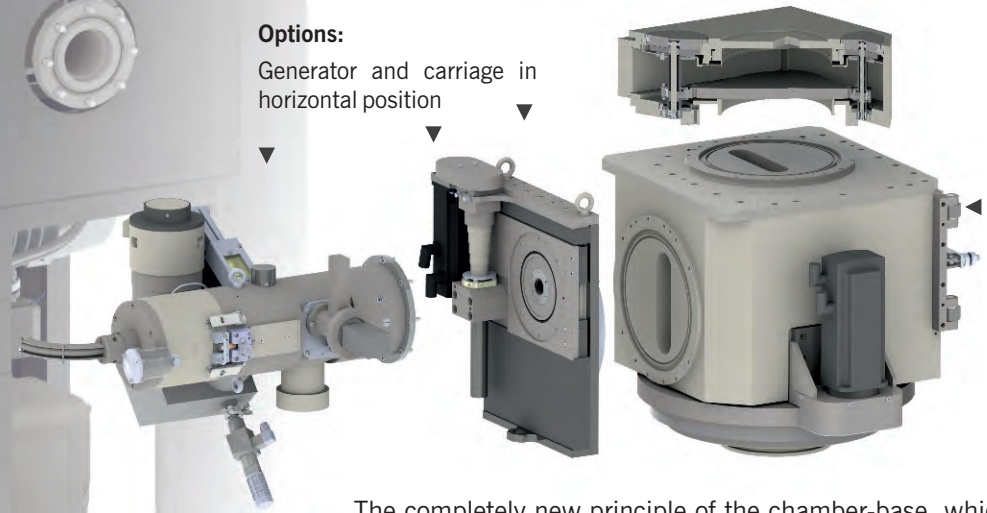
of the series PK 01 and PK 02



▲ **Front frame** for locating processing and loading modules

Option:
Counter bearing with horizontal generator ▶

Options:
Generator and carriage in horizontal position ▼



Generator EBOGEN 60 B
Powers 6 kW to 25 kW
Options:
Video monitoring and all functions of the fast beam deflection technology "EBO Jump" ◀

Movement or sliding-carriage
in 3 travel lengths with disk seal and manual adjustment or with servo-drive ◀

Counter-bearing options:
Various active and passive counter-bearings both with and without positioning for machines with horizontally and vertically arranged generators ◀

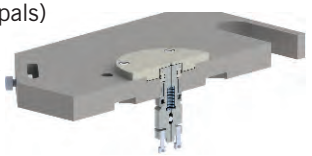
Working chamber PK 01
Internal diameter 245 mm
Chamber height 370 mm
with base-holder and servo-drive ◀

Working chamber PK 02
Internal diameter 390 mm
Chamber height 470 mm
Design and all processing modules as with PK 01 ▶

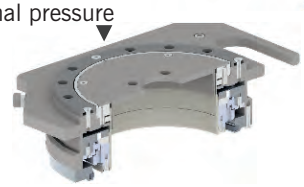
Examples of many counter thrust-bearing modules:

(Functionality principals)

Passive operation ▶
internal pressure



external pressure ▼



Pneumatically-**active operated** movement for horizontally mounted EB generator

◀ both with and

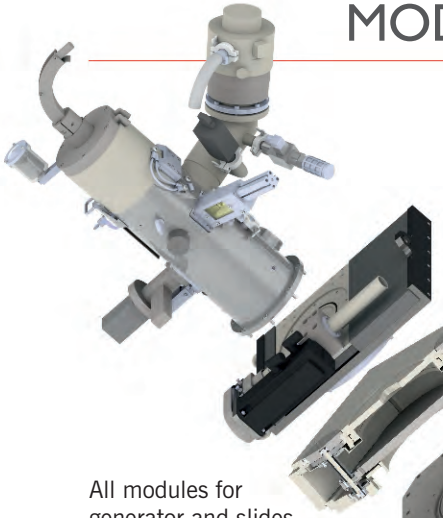
without positioning ▶

motorised movement for a vertically mounted EB generator ▶

The completely new principle of the chamber-base, which serves as the manipulator and fixture for the component, defines the design concept of these machines; offering decisive advantages for the production of components in either small or large series, and above all the flexibility of production of different workpieces.

The modular technology also enables simple future upgrading of the systems in the event of production conversion.

MODULES OF THE SERIES EBOMAT PK 01, PK 02 AND PK 03



MODULES FOR THE SERIES PK 03

For processing both face and obverse side of components within one cycle.

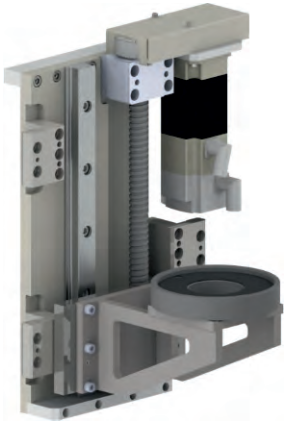
All modules for generator and slides and options of active counter-bearing with and without positioning are identical to PK 02.

Working chamber PK 03
Internal diameter 390 mm,
Chamber height 390 mm
with base-holder and servo drive
(components restricted for swivelling)

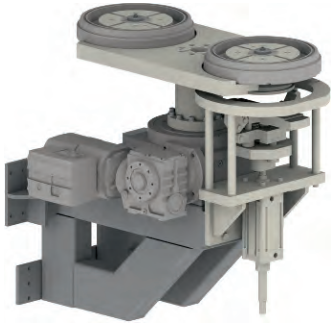
Double-base
with spindle
at 45°

LOADING MODULES FOR ALL SERIES

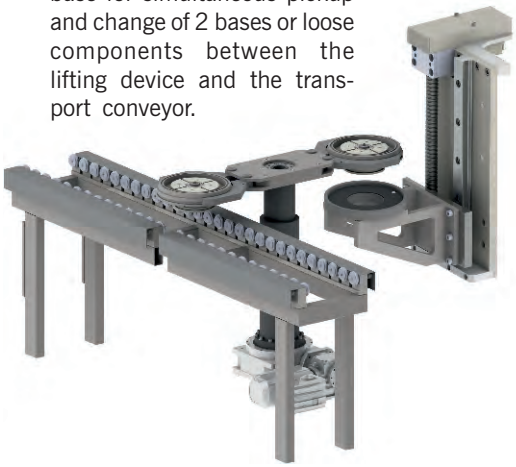
Lifting device
for loading the working chamber



Index-table 180°
for manual or automatic loading of the lifting device via overhead gantry. (Option: automatic release of the clamping device)

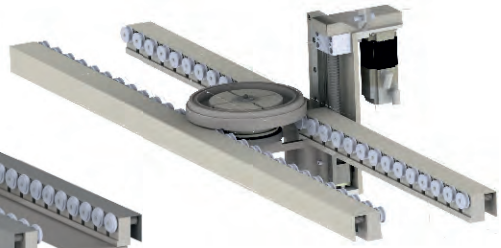


Component exchange 180°
with gripper tongs on rotating-base for simultaneous pickup and change of 2 bases or loose components between the lifting device and the transport conveyor.



Base stacking magazines

Lift- and Roll modules
for connecting PK machines with base-magazines and other processing stations

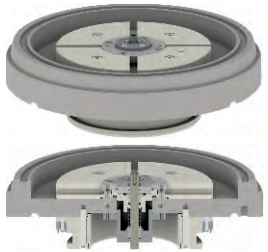


and all further conveyor systems and complete systems equipment for fully-automatic production control.

CHAMBER BASE-MODULES FOR THE SERIES PK 01 and PK 02

Single bases with optional clamping tennons

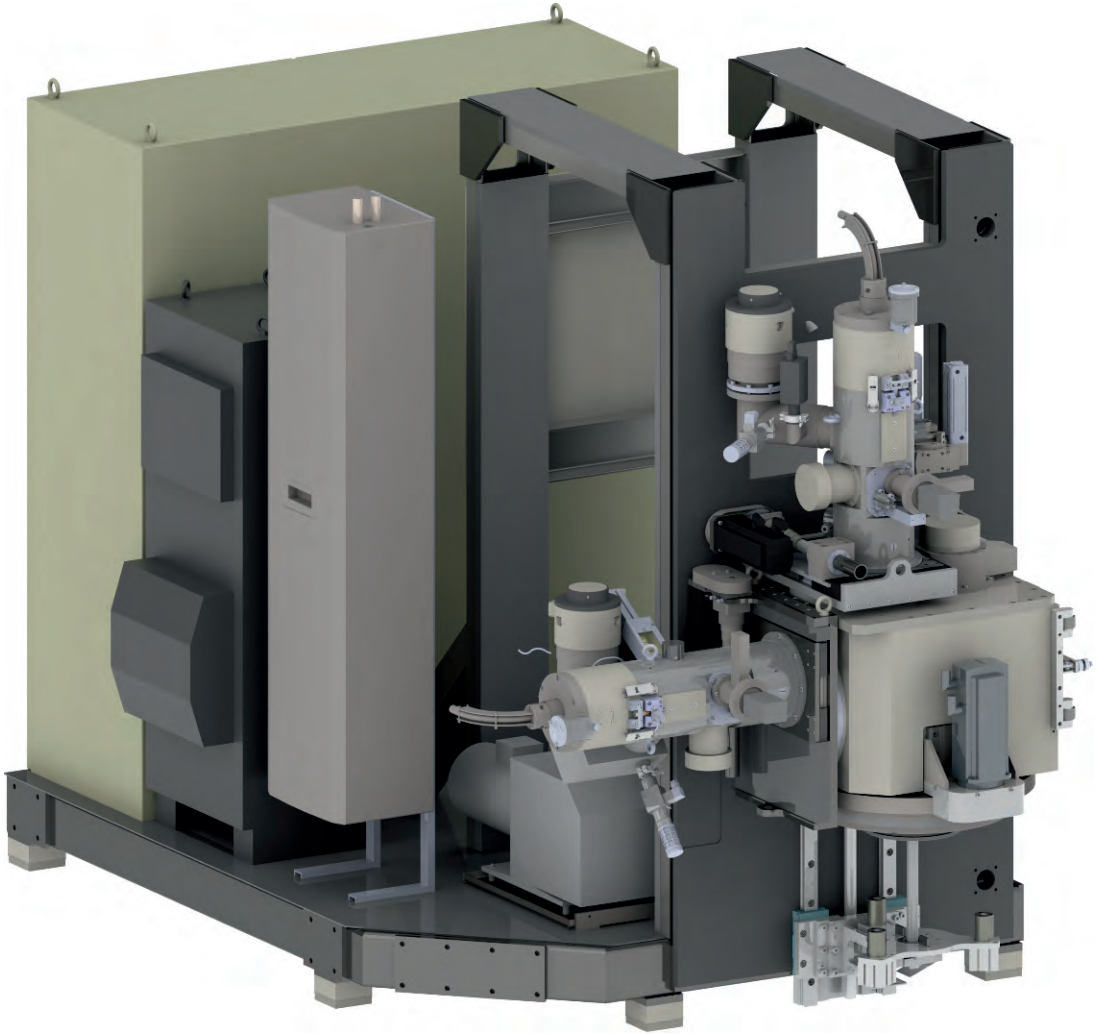
Double-bases with drive for 1, 3 or 6 spindles or integrated manipulators (customised version)



with and without clamping device guide release

Brush-base for automatic chamber cleaning

The **shuttle machine PS 02** is equipped with a special version of the PK 02 chamber, which is loaded from above by a shuttle-gate; 2-spindle double-base is only lowered for cleaning and tool changing.

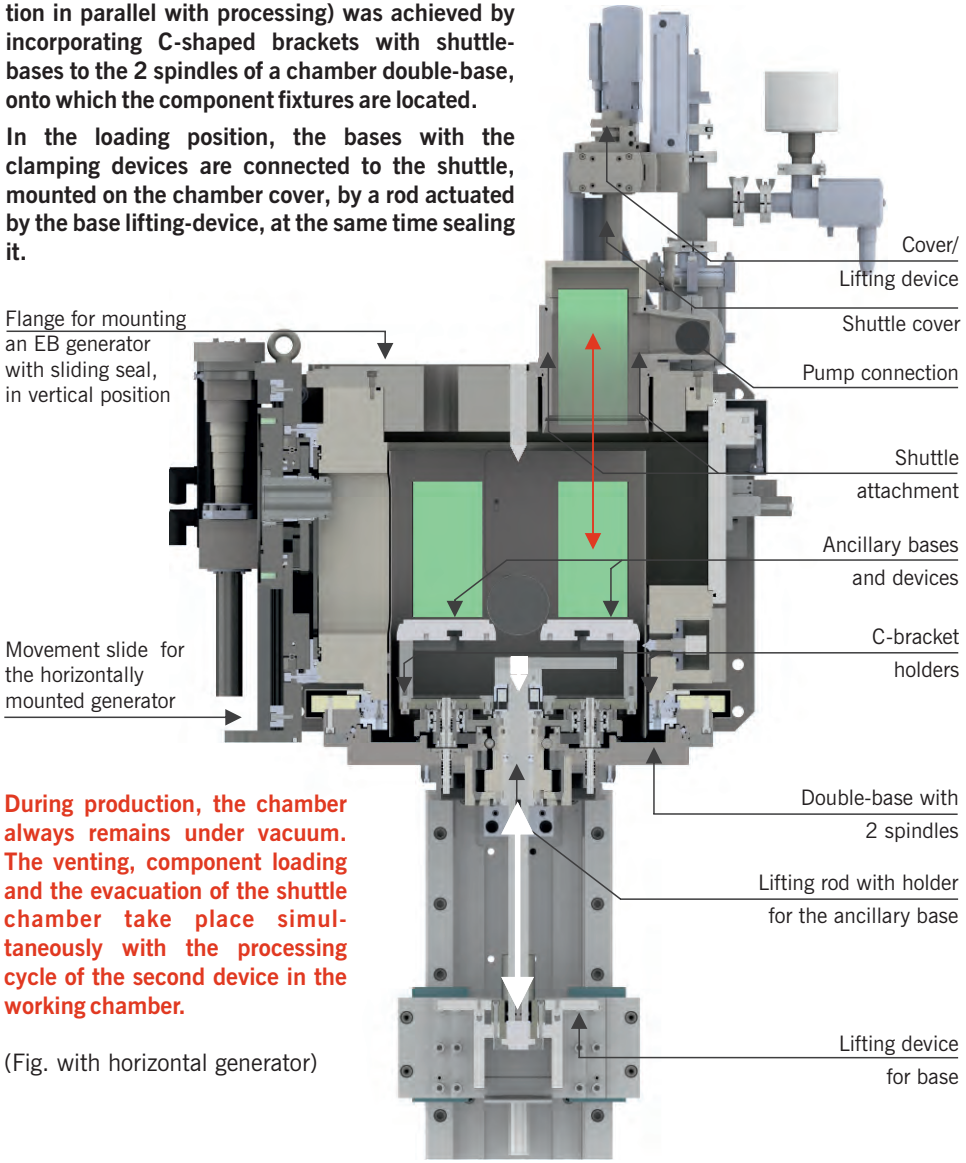


Basic machine type PK 02 with component load-lock transfer chamber (example with two generators)

THE FUNCTIONAL PRINCIPLE

The principle of the shuttle machine (i.e. evacuation in parallel with processing) was achieved by incorporating C-shaped brackets with shuttle-bases to the 2 spindles of a chamber double-base, onto which the component fixtures are located.

In the loading position, the bases with the clamping devices are connected to the shuttle, mounted on the chamber cover, by a rod actuated by the base lifting-device, at the same time sealing it.



During production, the chamber always remains under vacuum. The venting, component loading and the evacuation of the shuttle chamber take place simultaneously with the processing cycle of the second device in the working chamber.

(Fig. with horizontal generator)

THE MODULES OF THE CYCLED SHUTTLE MACHINES PS 02

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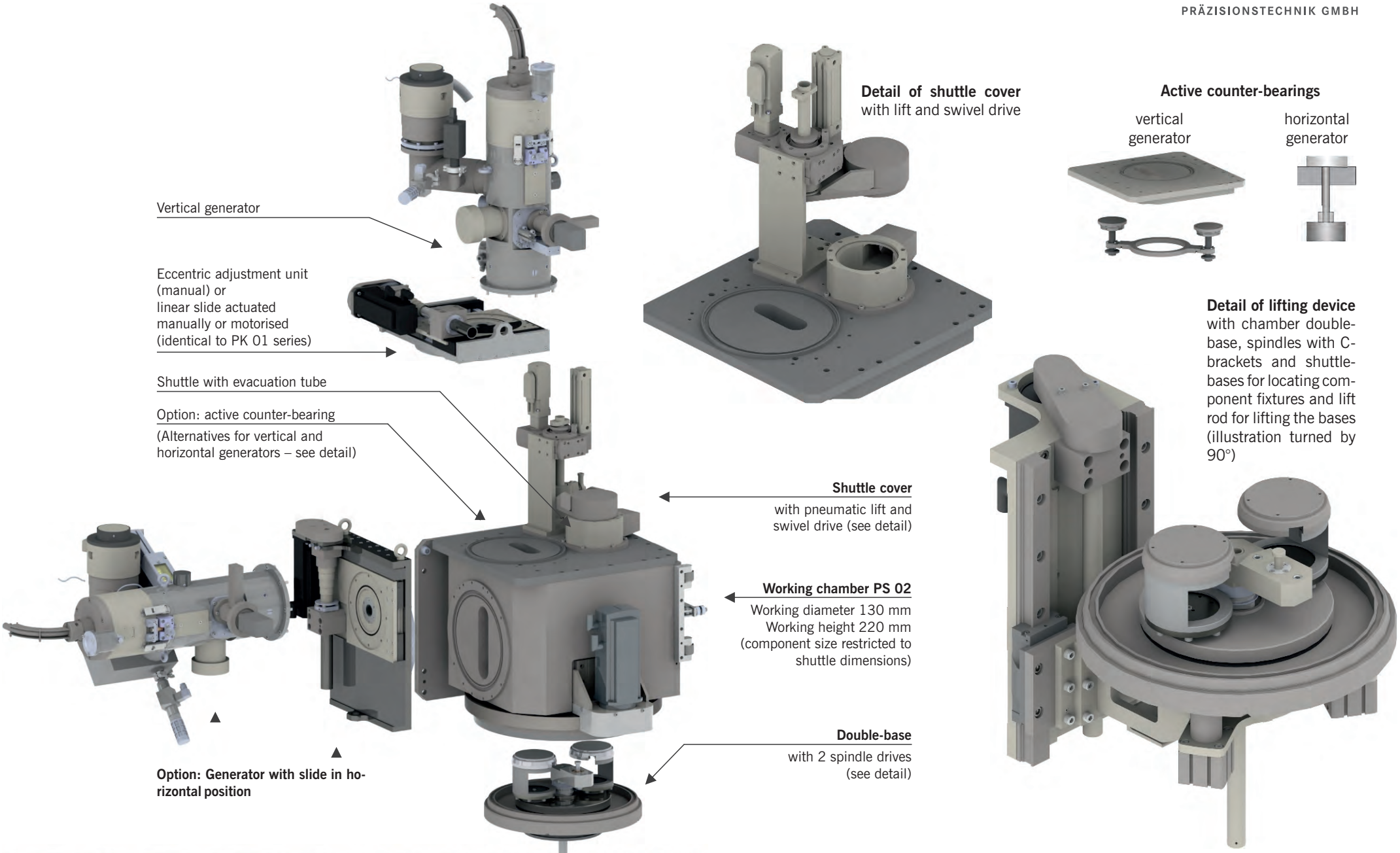


Detail of shuttle cover
with lift and swivel drive

Active counter-bearings

vertical generator

horizontal generator

Detail of lifting device
with chamber double-base, spindles with C-brackets and shuttle-bases for locating component fixtures and lift rod for lifting the bases (illustration turned by 90°)

BEAM GENERATOR EBOGEN 60 EG 60 B

CHARACTERISTICS

Electron beam generator, 60 kV with powers up to 25 kW.

High energy-density beam, with long cathode-life and automatic cathode heating optimisation, guaranteeing reproducible processing.

Fast and simple cathode exchange, alternating with two beam generator sources, with bayonet location.

The cathode-insulator is protected against vapour deposition.

Stable operation, even with continuous high power use.

Simple generator inspection and cleaning access through a hinged generator section.

Optional optical process viewing system; before, during and after welding (telescope viewing or CCD-TV video).

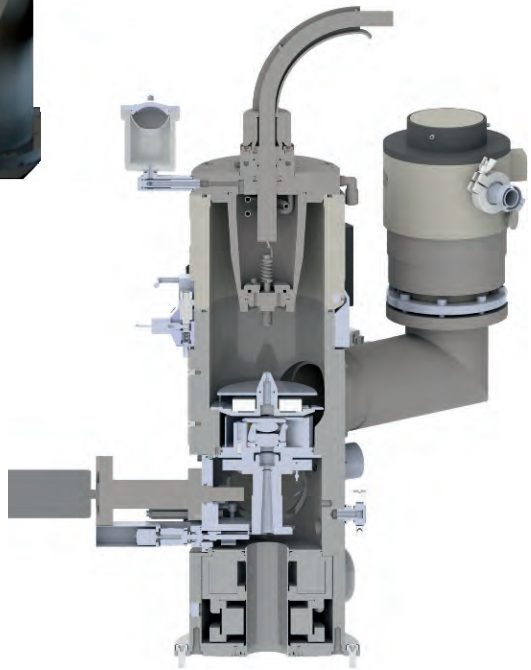
Protection glass mechanism with integrated vapour protection (closed if not required), to prevent metal vapour deposition.

Turbo-molecular pumping system, providing a stable hydrocarbon-free high vacuum environment for extended cathode life operation.

Vacuum isolation between beam generator and working chamber by means of a column valve.

Programmable NC axes provide precision control for beam current, beam focal position, static and dynamic beam deflection during processing.

The generator can operate either under CNC (Sinumeric 840D, 840DS or EBCON) or integrated into the PLC control, which also controls the machine's logic system.



Fast deflection system EBO Jump

The generator can be expanded by utilising the fast deflection system to provide such functions as

Multi-pool welding: *EBO Jump*

Electron optical viewing: *EBO View*

Joint tracking *EBO Scan and*

automatic beam alignment: *EBO Set*

Cathode loading fixture (KMV)

The cathode loading-tool provides a fast and reproducible cathode exchange. By using this tool it is normally not necessary to re-align the beam following a cathode exchange.

CROSS-SELECTION TABLE; ALL CYCLE MACHINES IN THE PK/PS RANGE

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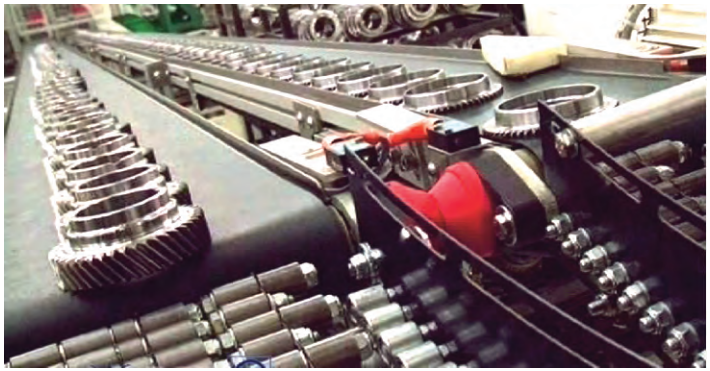
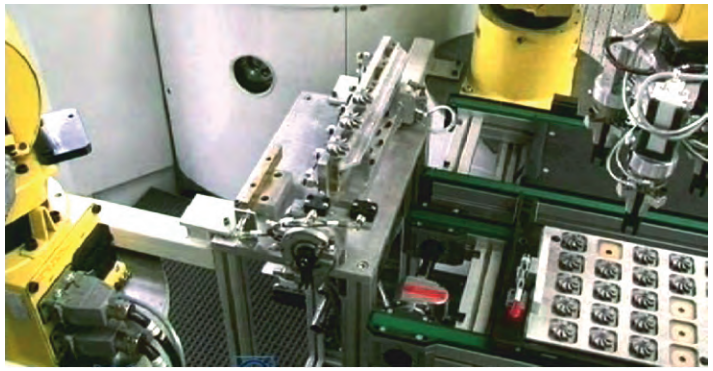
EBOMAT		PK 01	PK 02	PK 03	PS 02
Generator position		vertical horizontal 2 generators	vertical horizontal 2 generators	45°	vertical horizontal 2 generators
Working chamber dimensions					
Diameter/height	(mm)	245/370	390/470	390/390	130/220
Volume	(litres)	28	71	66	5 (shuttle gate)
Rotary speeds	(rpm)	225	355	260	120
Double-base					
Rotary spindles	(Number)	1/3/6	1/3/6	1	1
Spindle speed 1 spindle	(rpm)	250	130	250	130
3 spindles	(rpm)	750	640		
6 spindles	(rpm)	750	640		
Fixture/component size					
Diameter/height					
1 spindle	(mm)	225/267	375/387	260/240	120/215
3 spindles	(mm)	85/224	155/350		
6 spindles	(mm)	70/224	105/350		
Generator movement				45°	
horizontal	(mm)	100	170	170	170
vertical	(mm)	100	170		170
Ancillary times					
Lower/Index/Elevate	(approx. sec)	6	8	8	3
Evacuation ($5x10^{-2}$mbar)	(approx. sec)	7	11	11	3
Overall dimensions					
Depth	(mm)	3300	3600	3520	3600
Width	(mm)	1800	1800	1730	1730
Height	(mm)	2800	3000	2600	2300

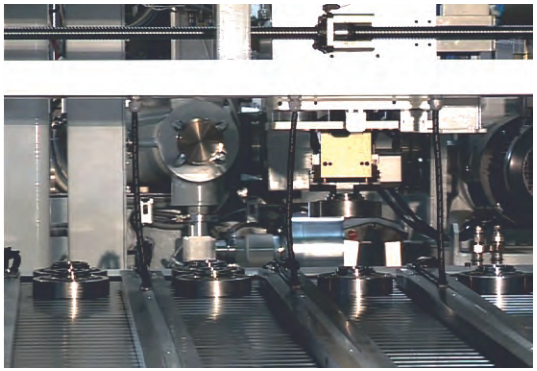
We would be delighted to plan and develop your next turnkey production line, together with your specialists.

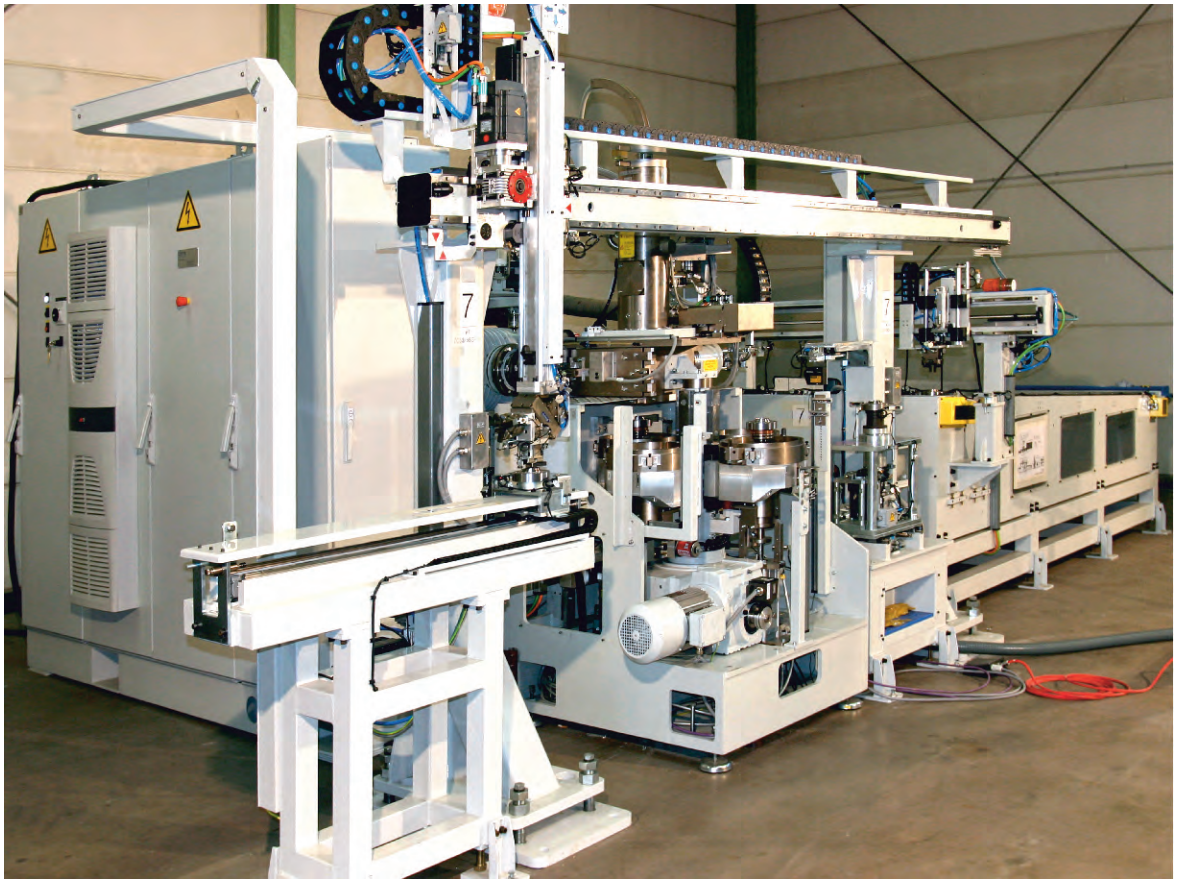
- **for your workpieces and welding tasks**
- **for your production numbers and special conditions**
- **for high utilisation and maximum availibility**
- **and for the optimisation of your production costs**

EXAMPLES FOR INTER-CONNECTION OF PTR SMALL CHAMBER MACHINES

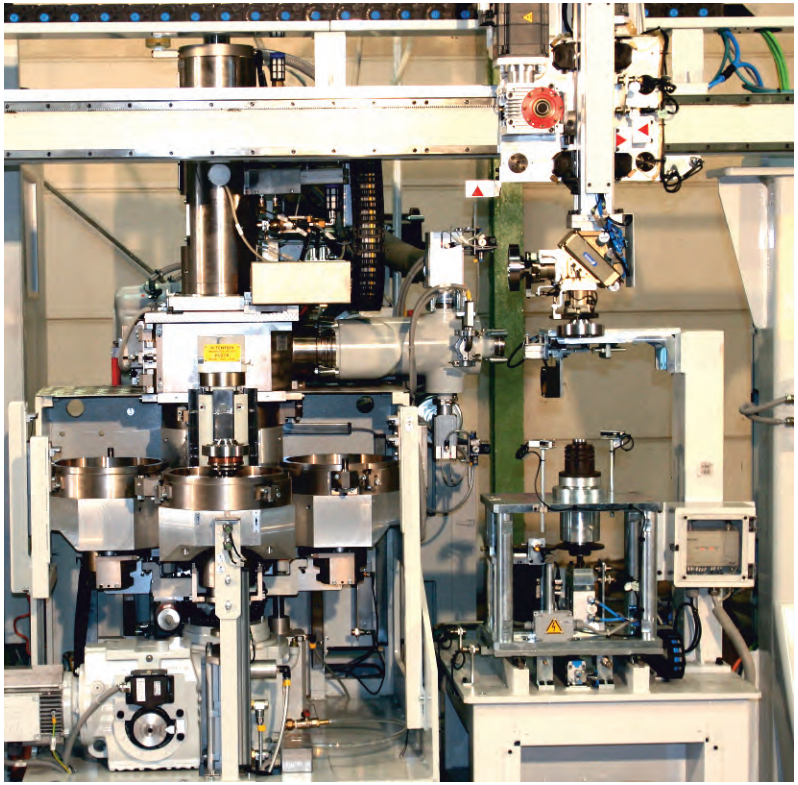








A few examples, of many applications



INTER-CONNECTION TO FLEXIBLE PRODUCTION MACHINES

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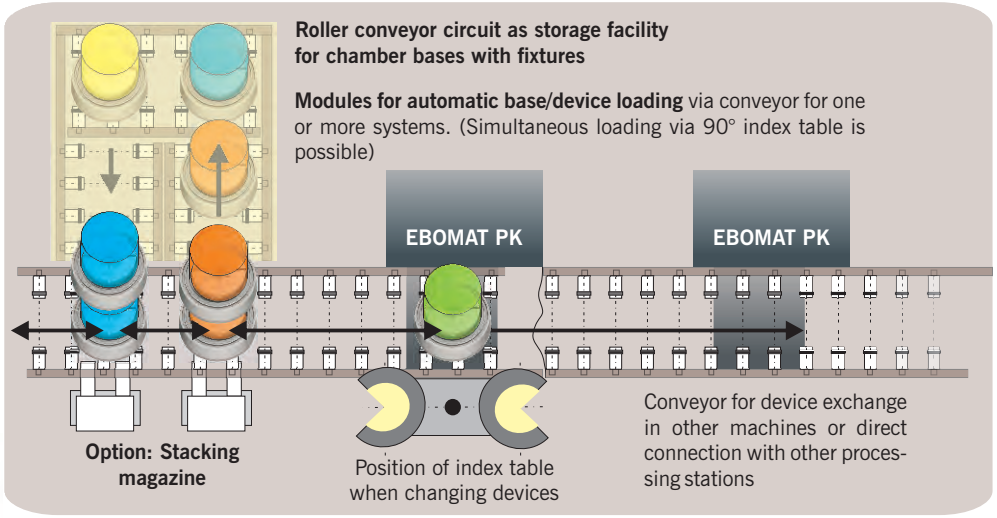
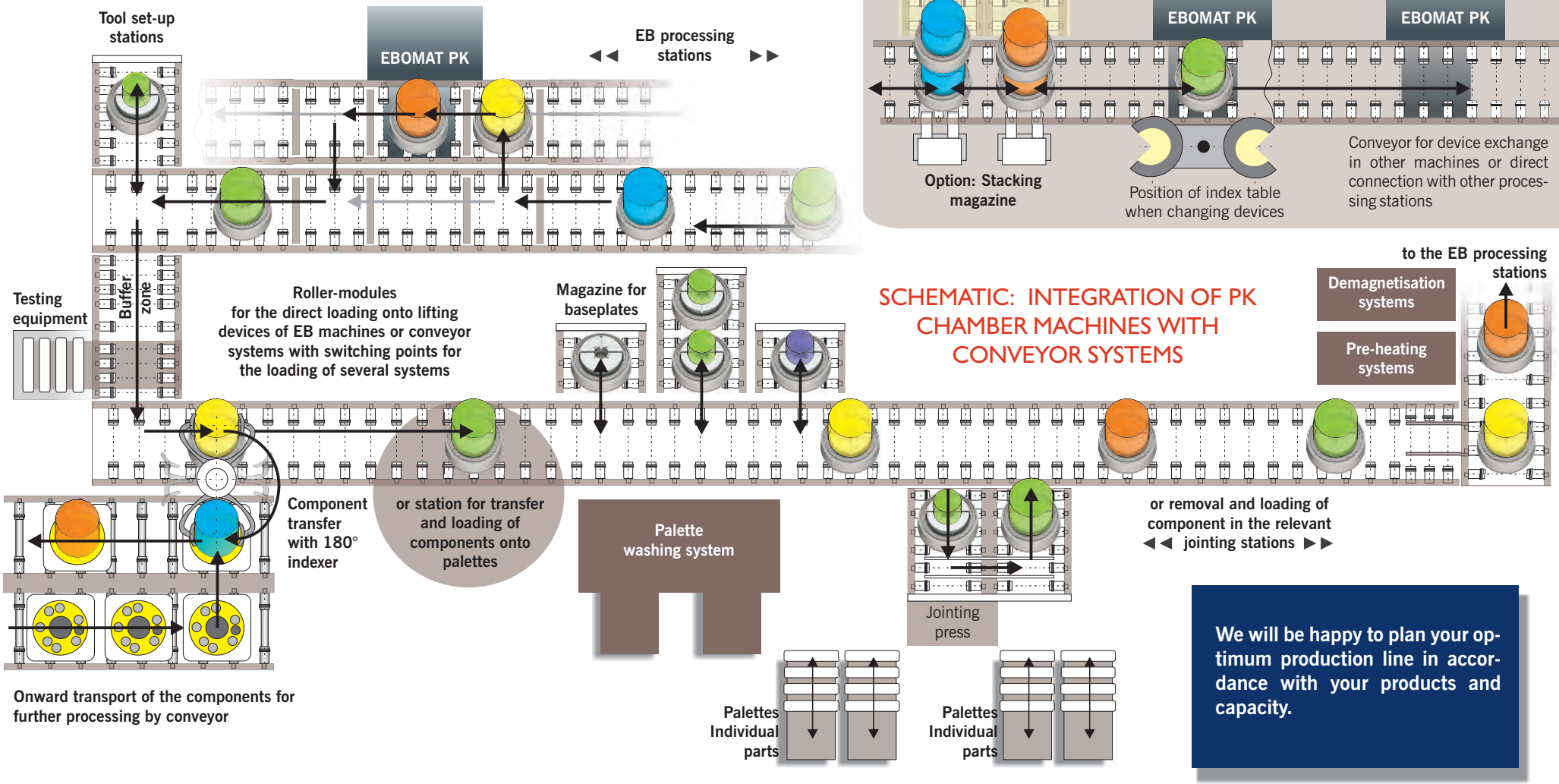
The loading of our EB small-chamber systems is carried out in most applications by integration with upstream and downstream processing machines via index tables and linear or flexible-arm robotic systems.

For flexible production the available modules offer many advantages for conveyor integration, some examples of which are given below.



Roller conveyor circuit as storage facility for chamber bases with fixtures

Modules for automatic base/device loading via conveyor for one or more systems. (Simultaneous loading via 90° index table is possible)



SCHEMATIC: INTEGRATION OF PK CHAMBER MACHINES WITH CONVEYOR SYSTEMS

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