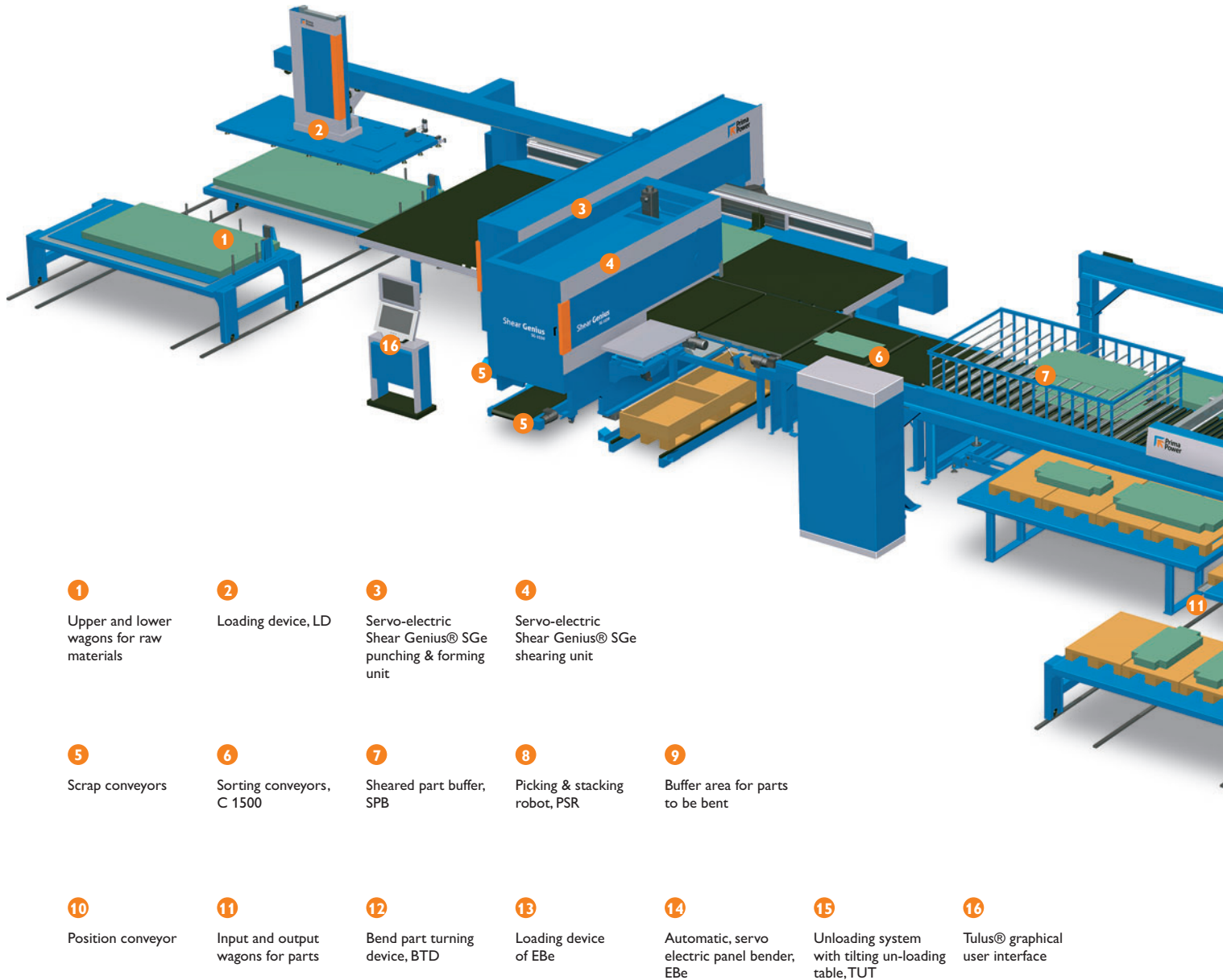


The Bend  
The Combi  
The Laser  
The Press  
The Punch  
The Shear  
The System  
The Software

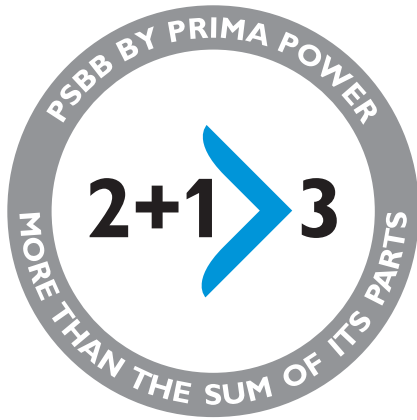
## **Prima Power PSBB – a Compact Flexible Manufacturing System**

# Prima Power PSBB – a Compact Flexible Manufacturing System



## Flexible production

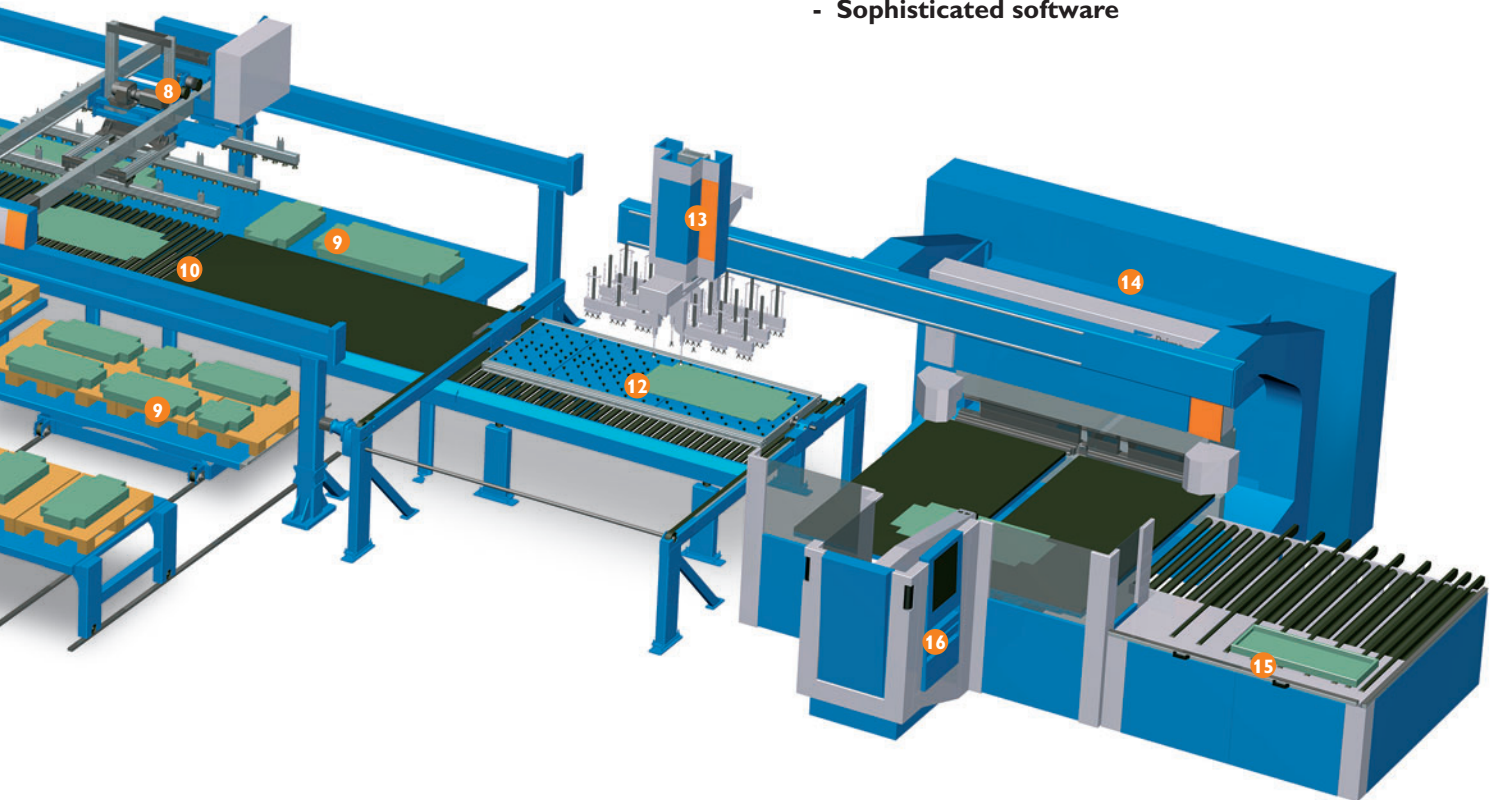
Material flow can be arranged in flexible ways to transfer parts directly to automatic bending, balance the different time requirements of bending and punching/shearing, to exit material from the system and to bring new material into it. The flexible and versatile buffering function ensures that optimum operation in terms of manufacturing cost and throughput time can always be chosen, whatever the manufacturing task at hand.



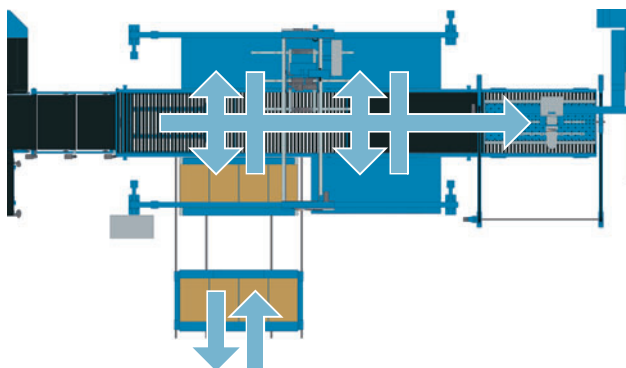
Basing on decades of experience in modular Flexible Manufacturing Systems Prima Power created the compact PSBB line, which processes blank sheets into ready-bent, high-quality components automatically. PSBB stands for punching – shearing – buffering – bending.

The productivity offered by this concept derives from integration of

- **Versatile servo-electric punching**
- **Integrated servo-electric shearing**
- **Servo-electric bending**
- **Automatic, flexible material flow and**
- **Sophisticated software**



Some of the illustrations show equipment without safety devices and some with optional equipment



### Flexible ways to produce

- Direct material flow from punching/shearing cell to bending cell
- Use of whole stacking area for buffering in direct connection
- Simultaneous stacking on tables/wagons and retrieval of components from tables/wagons to bending cell
- Use of whole stacking area in unattended operation



# PUNCHING AND SHEARING

## Shear Genius® cell

The vast majority of all fabricated sheet metal components are rectangular, so a highly economical method to produce them is to perform first punching and then shear the components loose in the same automatic process with an integrated right angle shear. Also, parts with two or three straight edges are perfect for fabrication with a right angle shear.

Shear Genius® provides more capacity, quality and cost efficiency for flexible sheet metal working than any comparable

system. Thirty years of experience in right angle shear technology combined with proven field performance in nearly 3,000 applications throughout the world has allowed providing Shear Genius® with major benefits:

- automated flexible fabrication
- no skeletons, less punching scrap – savings in raw material
- no nibble marks
- higher productivity
- low manufacturing costs
- fast return on investment

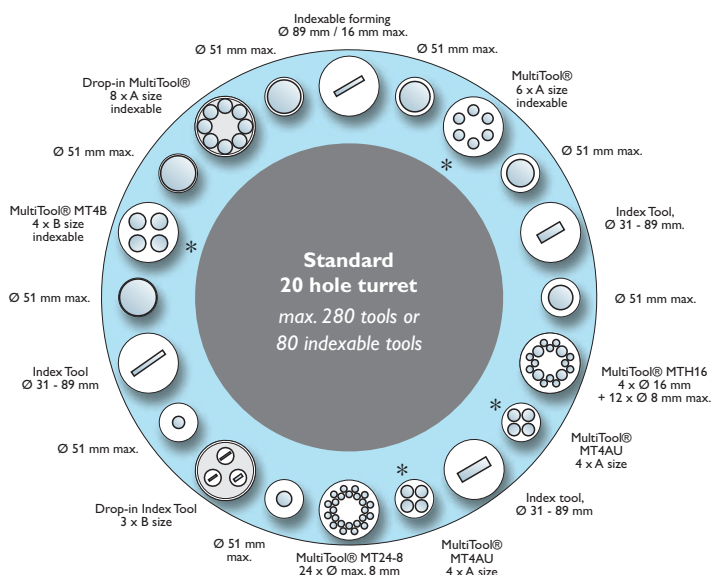


### SERVO-ELECTRIC PUNCHING

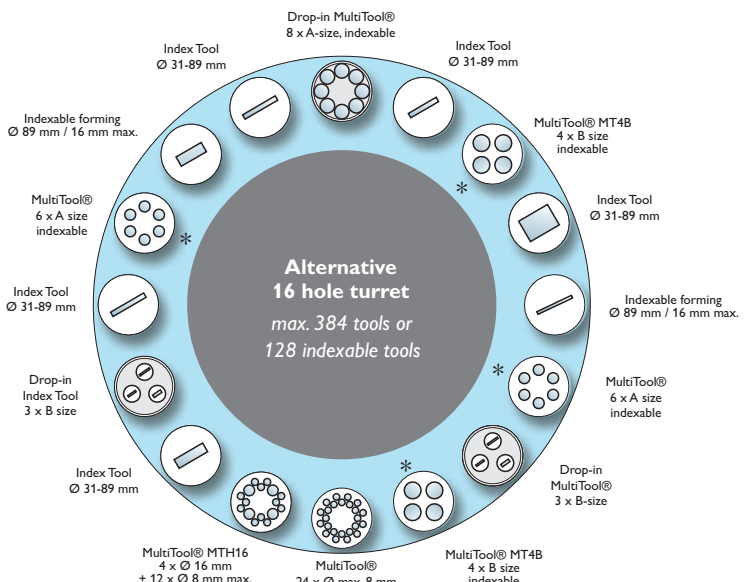
The inherent benefits of servo-electric technology include energy efficiency, versatility and accuracy and low maintenance cost. This amounts to superior fabrication capabilities and operation economy, i.e. remarkable savings. As the punching stroke is NC-controlled, in addition to high performance punching outstandingly accurate forming capacity is available. High repeatability facilitates forming, roll forming, marking etc. and shortens set-up times. Performance values of servo-electric punching are truly impressive.

### Customized turret design

Either a fully customized 16-station all-index turret or a 20-station turret can be chosen. A totally re-designed turret can be chosen; it can be customized and optimized for any requirement. Simultaneously, 384 tools can be available in the turret; thus unnecessary set-ups can be easily avoided. The maximum number of index tools is 128.



Customer specific layout with 81 tools, of which 25 index tools.



Customer specific layout with 79 tools, of which 39 index tools.

## A wide range of options

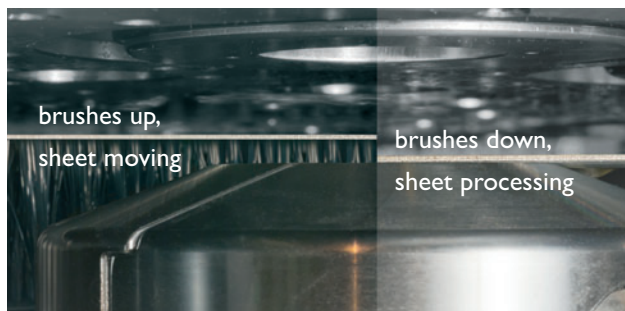
There is a wide selection of optional equipment and features with which the standard machine can be customized to meet specific requirements. Most of these can also be installed later as machine upgrades:

- Extra clamp and individual movement
- Multi-Tool® stations
- Upforming
- Part identification with different types of marking tools



## Scratch free production

A new option is having moving brushes also in front and inside of the turret and in front of the shear, which prevents effectively the scratching of sensitive materials. The movement is activated by the program when needed.



## SERVO-ELECTRIC INTELLIGENT RIGHT ANGLE SHEAR

Automatic clearance setting (ACS) of the intelligent servo-electric right angle makes changing from one material thickness to another automatic and fast, saving time and adding productivity. A wide range of thicknesses can be sheared, up to 5 mm aluminium.

### Intelligent part sorting

New shear has a unique system to sort parts and scrap. If there are any trims or leftover on the sheet, it is sorted out through the shear frame and conveyor.

### Outstanding accuracy

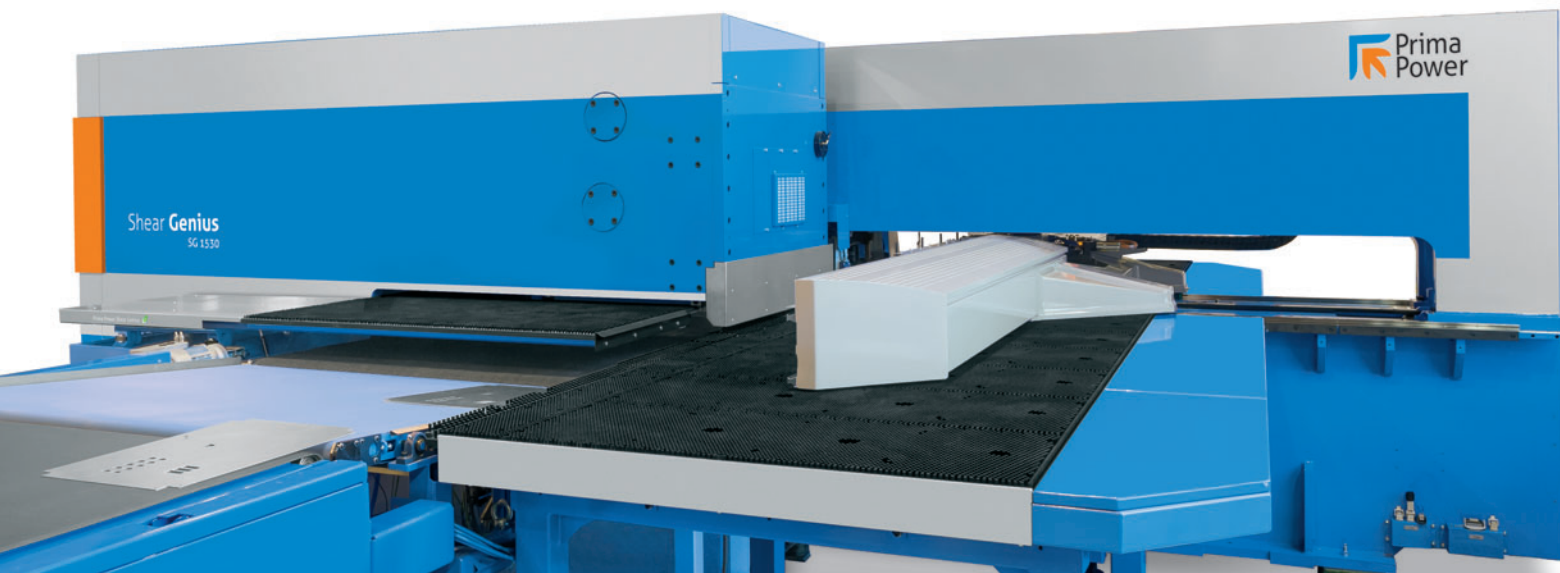
As the right angle shear is an integral part of the cell and not a separate machine, and since the sheet is firmly held throughout the fabrication process, high component accuracy is achieved.

### Support of large work pieces

When shearing large pieces an automatic lifting mechanism integrated in the conveyor holds the parts for high accuracy.

### Programmable sheet holder

The lateral forces caused by the shearing action are compensated using pneumatic sheet holders for excellent shearing quality and high tolerances. In the right angle shear, sheet holders are programmable, allowing shearing close to forms.



## Servo-electric Shear Genius®

- Servo-electric punching, forming and bending
- Servo-electric shearing with automatic clearance settings
- Loading, punching, forming, tapping, shearing and part sorting in a single unit
- Max. sheet size of raw material:  
SG 1530: 3,074 mm x 1,565 mm  
SG 1540: 4,300 mm x 1,565 mm
- X-traverse 3,144 mm; Y-traverse 1,605 mm

## Pure Dynamic

Two performance levels:	Pure	Dynamic
- Punching force	230 kN	300 kN
- Positioning speed	127 m/min	150 m/min
- Max. hit speed	1,800 1/min	2,500 1/min
- Up to 384 tools with Multi-Tools®		
- Low running costs – no expensive consumables		
- <b>Power consumption 5 kWh</b>		



# Shear Brilliance – a new generation of advanced fabrication technology

The new, fully servo-electric Shear Brilliance features linear drive technology in sheet positioning and raises manufacturing speed and productivity up to a new level. With long travel of the coordinate table full working area can be used without repositioning, accurately and at great speed. The sheets are pre-positioned during machine operation which reduces loading time dramatically.

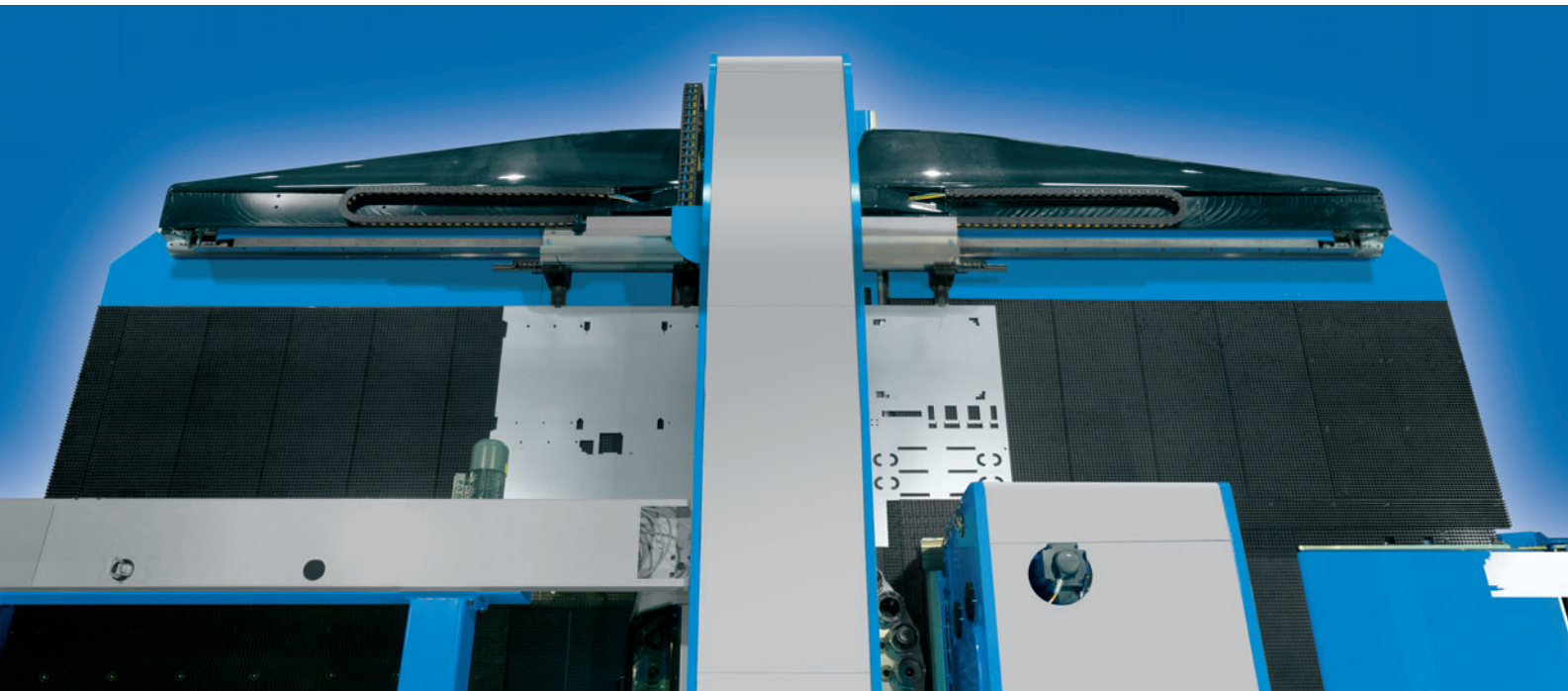
New generation punching technology, very high tooling capacity, the large common working area for punching and shearing as well as high-speed co-ordinate table movements combine to provide truly outstanding productivity.

## Fast material loading

With a new type of loading solution, raw material loading is mainly done in hidden time, therefore material loading time from last shearing hit to first punch of new material is minimal.

## New generation Servo-electric punching

Up to 35 tons of servo-electric ram force allows very long contours, using one hit instead of two. As fewer hits are needed production is faster. Despite the ram force speed has not been compromised. 1,300 hpm is the fastest full format hit rate in the market. This adds again productivity.



## New coordinate table with linear drives

A light weight and rigid composite construction allows coordinate table length of 4,070 mm length and this, in turn, 3,100 mm punching – shearing without repositioning. The lightness of the coordinate table increases speed.

Fast and extremely accurate positioning with linear drives. Positioning is very fast, which again saves production time.

In the same process using linear drives you gain more precision, which is always a valuable quality factor.

## Bigger working area

Working area is maximized with longer X- (4,070 mm) and Y-traverses (1,640 mm). When working with 3,100 mm x 1,565 mm sheets you can punch in all edges of the sheet and fully utilize the whole area.

## Servo-electric Shear Brilliance®

- Max. sheet size of raw material 3,100 mm x 1,565 mm
- X-traverse 4,070 mm, Y-traverse 1,640 mm
- Common working area 3,100 mm
- Loading, punching, forming, tapping, shearing and part sorting in a single unit
- Servo-electric punching, forming and bending
- Positioning speed up to 210 m/min
- 35 ton ram force
- Hit speed up to 1,300 1/min
- Up to 576 tools with Multi-Tools®
- Servo-electric shearing with automatic clearance settings
- Low running costs – no expensive consumables
- **Power consumption 8 kWh**

The Sheet Brilliance turret offers a huge tooling capacity (up to 576) in a 24 or 30 station turret which ensures minimum set-up times and maximum tool quantity in single set-up. Tool sizes can be chosen by the customer which adds flexibility required in modern production.

There is a wide selection of optional equipment and features with which the standard machine can be customized to meet specific requirements. Most of these can also be installed later as machine upgrades:

- 



The diagram illustrates a 30-hole turret with a central grey circle labeled "30 hole turret". The turret is divided into 30 individual tool positions, each represented by a small circle. The positions are arranged in a ring around the center. The tools and their dimensions are as follows:

- Position 1 (Top):** MultiTool® 4 x 16 mm + 12 x 8 mm, Ø 51 mm max.
- Position 2:** Indexable high forming, Ø 51 mm max.
- Position 3:** MultiTool® 6 x A size, Ø 51 mm max.
- Position 4:** Index Tool Ø 31 - 89 mm, Ø 51 mm max.
- Position 5:** MultiTool® 10 x Ø 16 mm max., Ø 51 mm max.
- Position 6:** Index Tool Ø 31 - 89 mm, Ø 51 mm max.
- Position 7:** MultiTool® 24 x Ø max. 8 mm, Ø 51 mm max.
- Position 8:** Index Tool 3 x B size, Ø 51 mm max.
- Position 9:** Index Tool Ø 31 - 89 mm, Ø 51 mm max.
- Position 10:** MultiTool® 6 x A size, Ø 51 mm max.
- Position 11:** MultiTool® 8 x Ø 24 mm max., Ø 51 mm max.
- Position 12:** Index Tool 8 x A size, Ø 51 mm max.
- Position 13:** Indexable high forming, Ø 51 mm max.
- Position 14:** Indexable high forming, Ø 51 mm max.
- Position 15:** MultiTool® 4 x 16 mm + 12 x 8 mm, Ø 51 mm max.





# AUTOMATIC BENDING

## Express Bender EBe

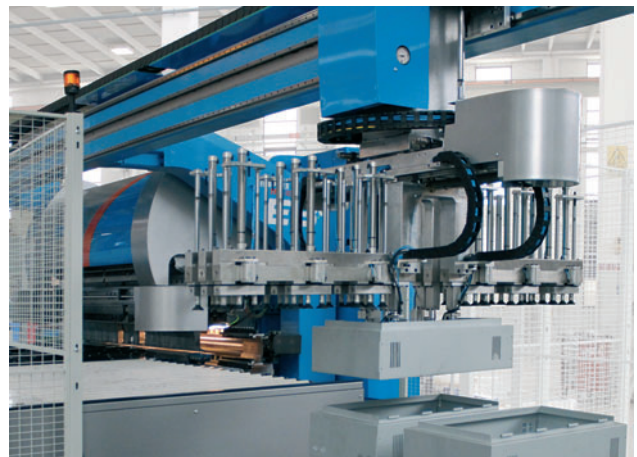
The automatic Express Bender solution, featuring Prima Power's servo-electric technology, offers outstanding benefits through very fast operation, flexibility for small series production, and low energy and low maintenance cost.

Bending quality is excellent as required by e.g. design products. This is achieved through precise control of bending axes, fast and smooth bending, open programmability, and the fact that the construction is immune to variation in thermal conditions.

Express Bender can be customized using a wide range of options.



*Automatic unloading and stacking add unmanned production capacity*



### Servo-electric Express Bender

- Max. bending lengths
  - EBe 4 2,250 mm
  - EBe 5 2,650 mm
  - EBe 6 3,350 mm
  - EBe 3820 3,800 mm
- Capable of even most intricate bending tasks – with off-line programming
- Excellent bending accuracy and surface quality
- High repeatability
- High productivity and flexibility thanks to automatic tool change ATC and loading in hidden time
- Two operating modes for optimum surface quality
- **Power consumption 9.5 – 13.5 kWh**



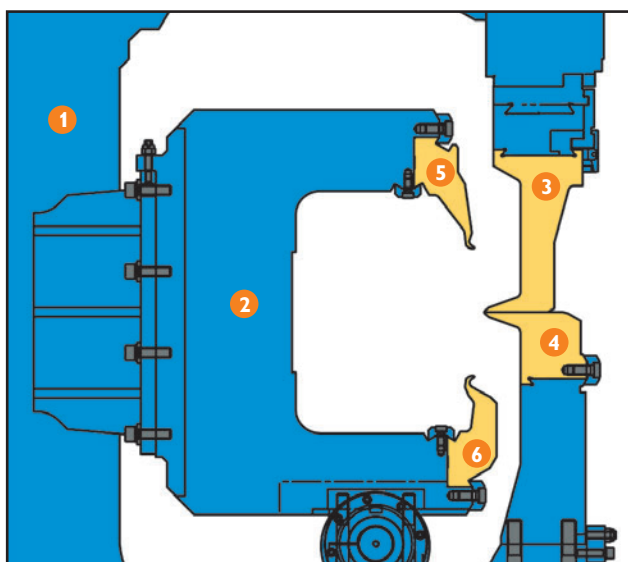
## Bend press

EBe has two frames: the stationary main frame (1) and the C frame (2). The C-frame mounts within the main frame and supports the upper and lower bending blades.

The upper tool (3) consists of a tool holder bar with tool segments that can be composed to match the size required by the work piece and to contract for part exit. The tools composition of the upper tool is made at 4 mm steps. The upper tool holder can allow contraction of tool segments for disengagement, several spaces between tool segments and their compaction.

The fixed lower tool (4) holds the work piece in position during the bending procedure. It consists of a single element that is fitted to base beam.

There are two bending blades, the upper one (5) to make negative (downward) bends and the lower one (6) to make positive (upward) bends.



## Two operating modes

The Prima Power solution offers a choice of two interpolation modes of operating blades for optimum surface quality, also ensured by brush tables. With the “rolling mode” there is no relative friction between blade and material, which saves the material surface from damages and reduces wear of the blade. With the standard “circular mode”, the contact point remains constant whereas the contacting point of the blade changes during the bending movement.

## Programmable upper tool crowning device

The device is used for correcting the straightness when thick material is bent or long bends are made.

## Work piece centering system

The centering system offers a major advantage as the part is centered accurately in a single operation.

The two positioning pin units support two pins each. These are individually controlled by 3 CNC axes for parts with even asymmetric notches.

## Manipulator

During the bending sequence, the manipulator performs all sheet movements by NC control axes once the sheet has been loaded onto the machine table.

## Modern software

The latest generation of Prima Power bending software (Tulus® Bend and Master BendCam) includes numerous new features that facilitate the process from programming to operation monitoring and has been designed especially for ease of use.



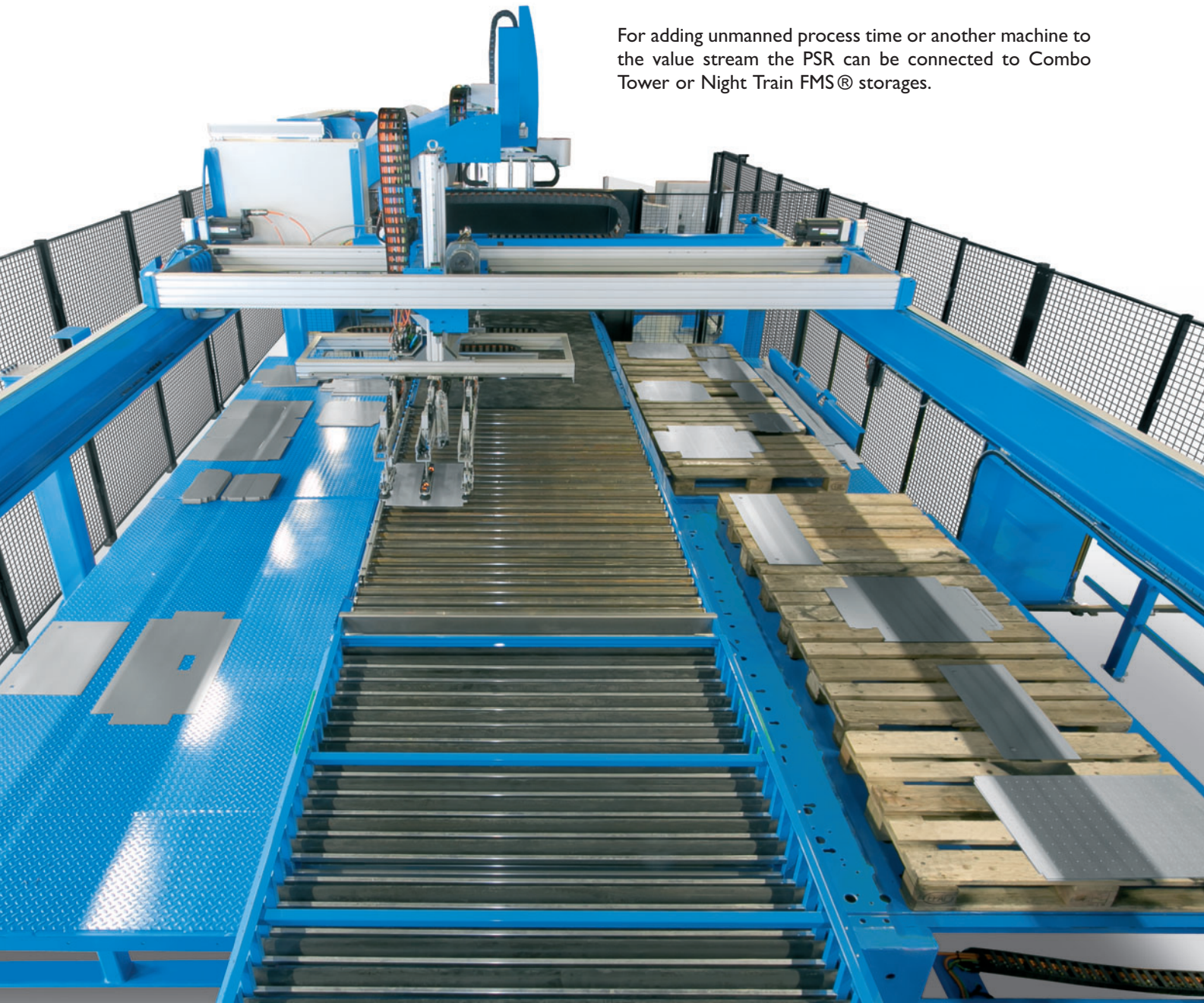
# BUFFERING

## Picking and stacking robot PSR

Picking and stacking robot PSR provides high flexibility for picking and stacking. Parts are always placed directly to stack and never dropped. Thus high component and stack quality is ensured.

PSR with buffering functions allows re-organization and optimization of production flow from Shear Genius® / Shear Brilliance to EBe.

For adding unmanned process time or another machine to the value stream the PSR can be connected to Combo Tower or Night Train FMS® storages.



### The PSR benefits:

#### Productive process

- Maximum production capacity of
  - Shear Genius® (SG) / Shear Brilliance (SBe) and
  - Express Bender (EBe)
- Balancing of cycle times between individual processes
- Intermediate buffer with direct connection to EBe
- Improving utilization level of EBe
- Stacking wagons, parts from external sources to panel bender
- Unmanned production
- Large stacking area utilized for unmanned shifts

#### Added flexibility

- Flexible production
  - Possibility to re-organize part flow order before bending
  - Large stacking area allows kit production
- Possibility to add parts from external sources to value stream
- Stacking wagons, continuous process during part removal

# Loading options

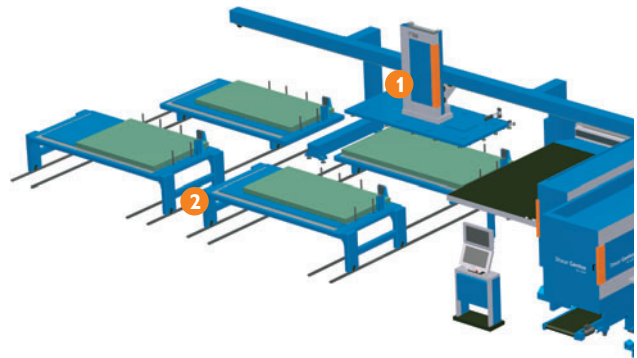
The modular Prima Power process automation allows optimum factory logistics and using the most economical type of raw material.



## Loading from wagons

Up to four wagons can be installed in the system.

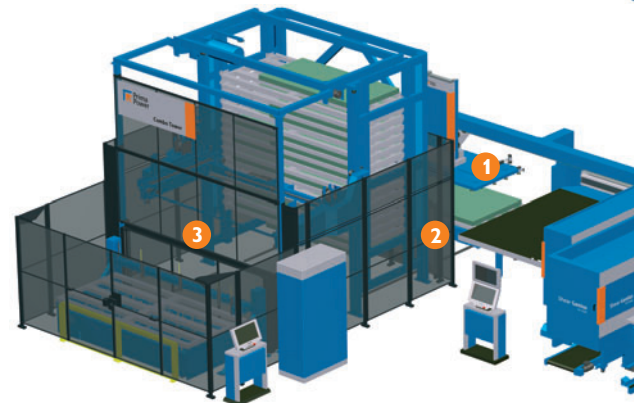
- 1 Loading device LD long
- 2 Upper and lower wagons for raw materials



## Loading from Combo Tower

Equipped with a Combo Tower storage the PSBB line is the perfect solution for lights-out production of even the most intricate components from a variety of materials, which can be changed, as programmed, automatically. Adding a second shelving unit to the Combo Tower provides truly extensive capacity.

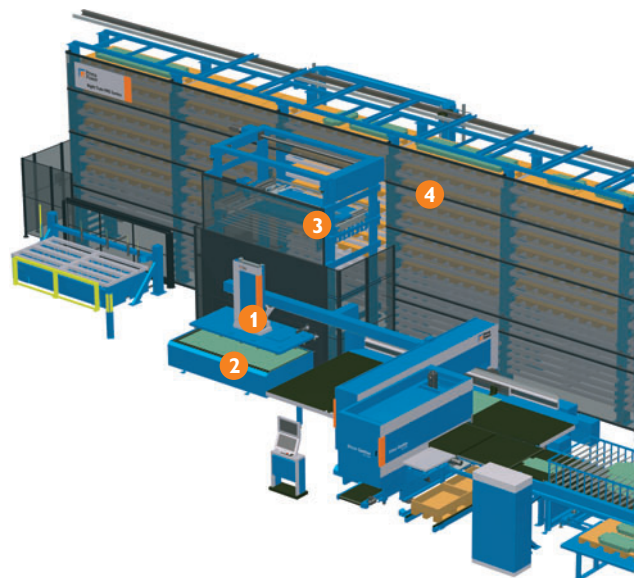
- 1 Loading device LD
- 2 Raw material connection for LD
- 3 Automatic Combo Tower storage for raw materials



## Loading from NightTrain FMS®

PSBB can be integrated as a key element in Night Train FMS®

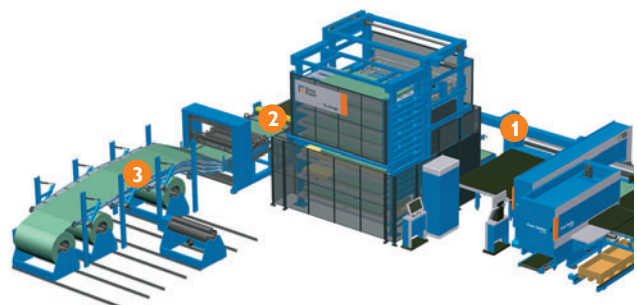
- 1 Loading device LD
- 2 Raw material connection for LD
- 3 Fast Loading Device FLD, for fast material changes
- 4 Automatic Night Train FMS® storage for raw materials and stacked parts



## Loading from cut-to-length line

Cut-to-length line can be integrated as part of PSBB with loading device LD. Integration is possible with wagons, ComboTower and Night Train storages.

- 1 Loading device LD long with rotating gripper option
- 2 Connection to cut-to-length line
- 3 Cut-to-length line with automatic material change



# PSBB standard configurations

Prima Power flexible manufacturing solutions offering outstanding productivity for different applications and production needs. Most of the time solution can be found from stan-

dard manufacturing line configurations that are tailored according customer needs with additional machine options that fulfills production requirements.

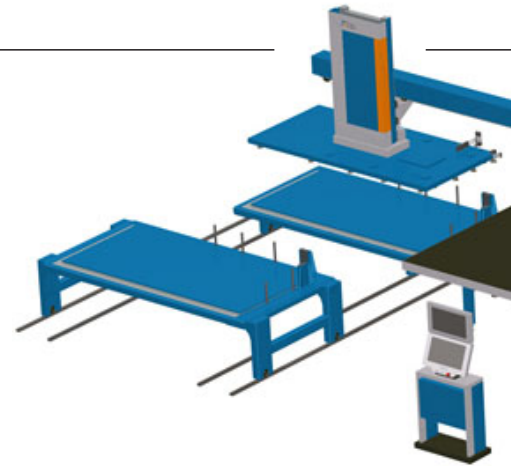
## PSBB with PCD

### Standard solutions for example for...

- ... steel doors
- ... steel furniture
- ... elevators
- ... home appliances
- ... steel facades
- ... lighting equipment
- ... etc.

### When...

- ... there are only a few components per nest
- ... the need of intermediate buffering is minimal
- ... external feed in to bending process is needed
- ... component stacking for external process is minimal



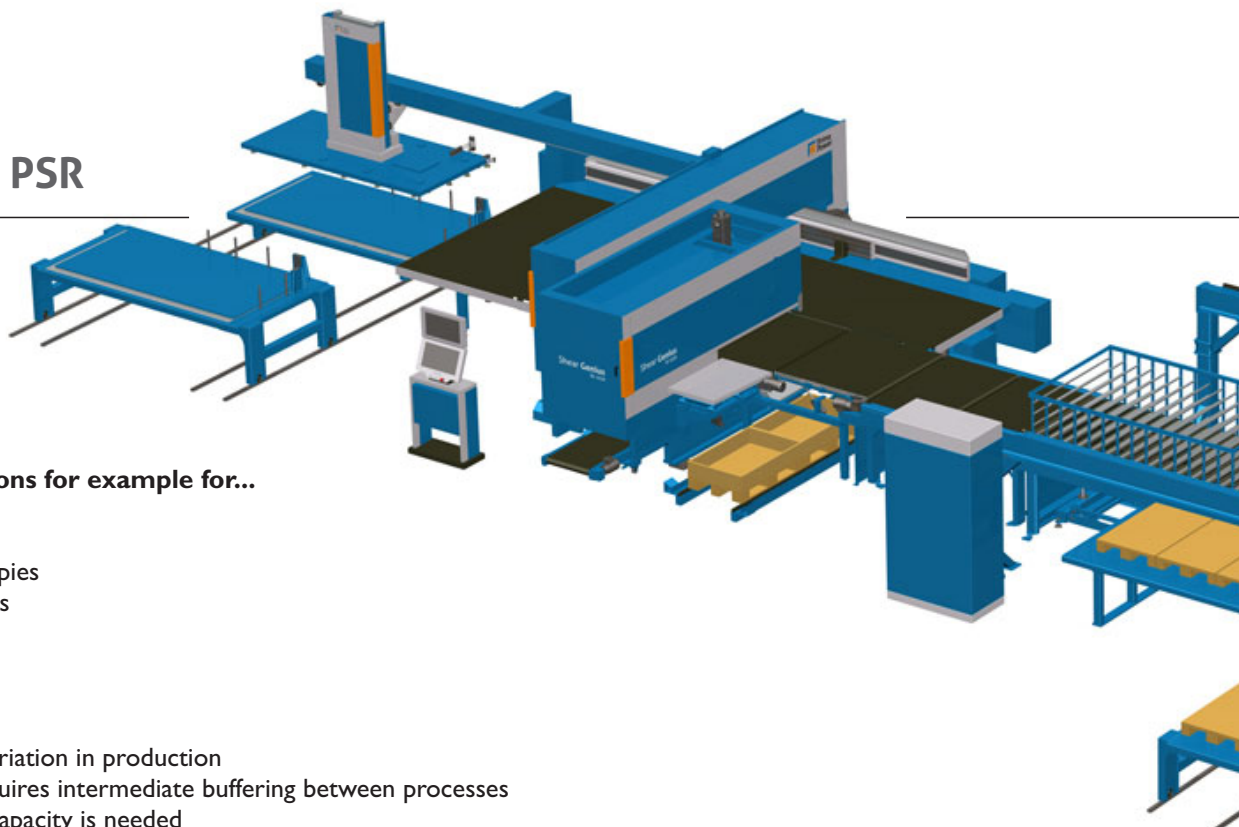
## PSBB with PSR

### Standard solutions for example for...

- ... HVAC
- ... gensets & canopies
- ... electric cabinets
- ... subcontractors

### When...

- ... there is high variation in production
- ... production requires intermediate buffering between processes
- ... large stacking capacity is needed
- ... high flexibility is needed
- ... external feed in to bending process is needed

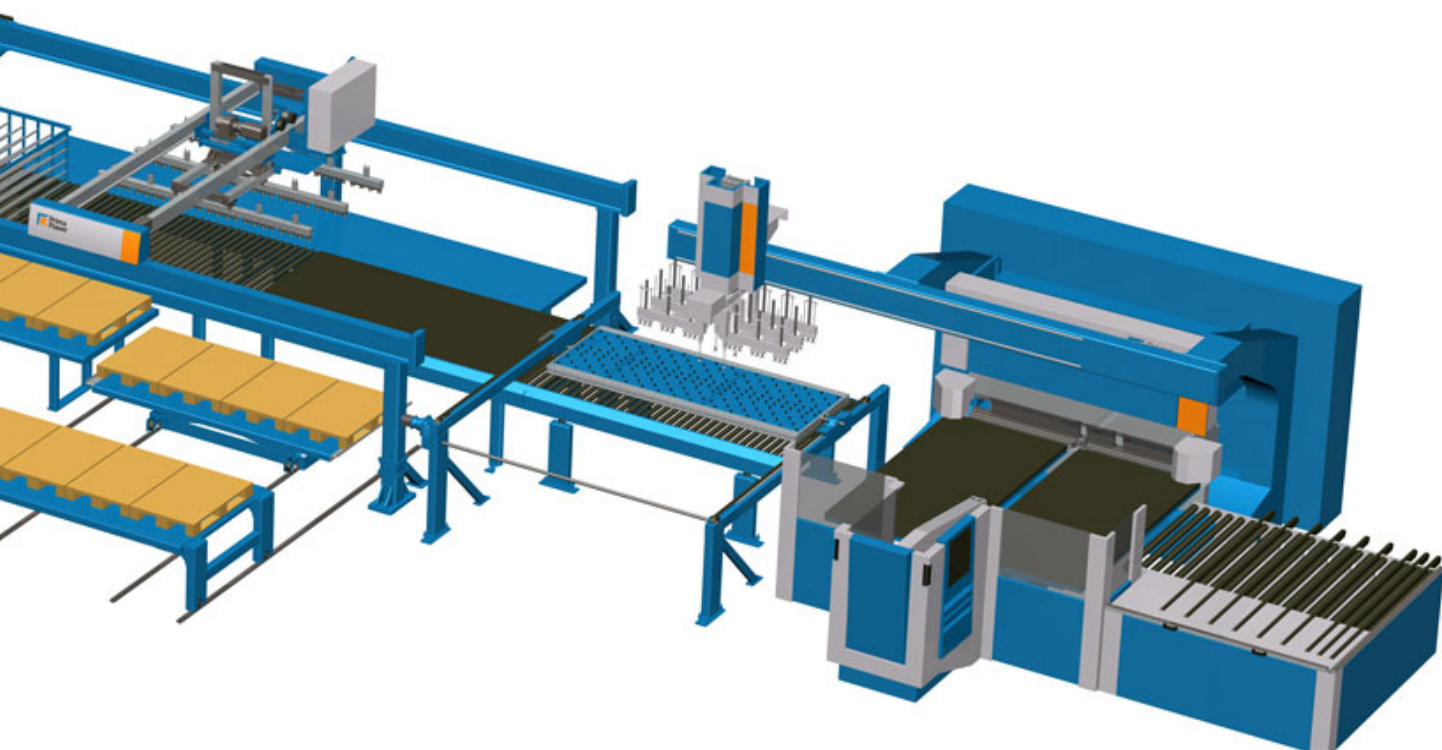
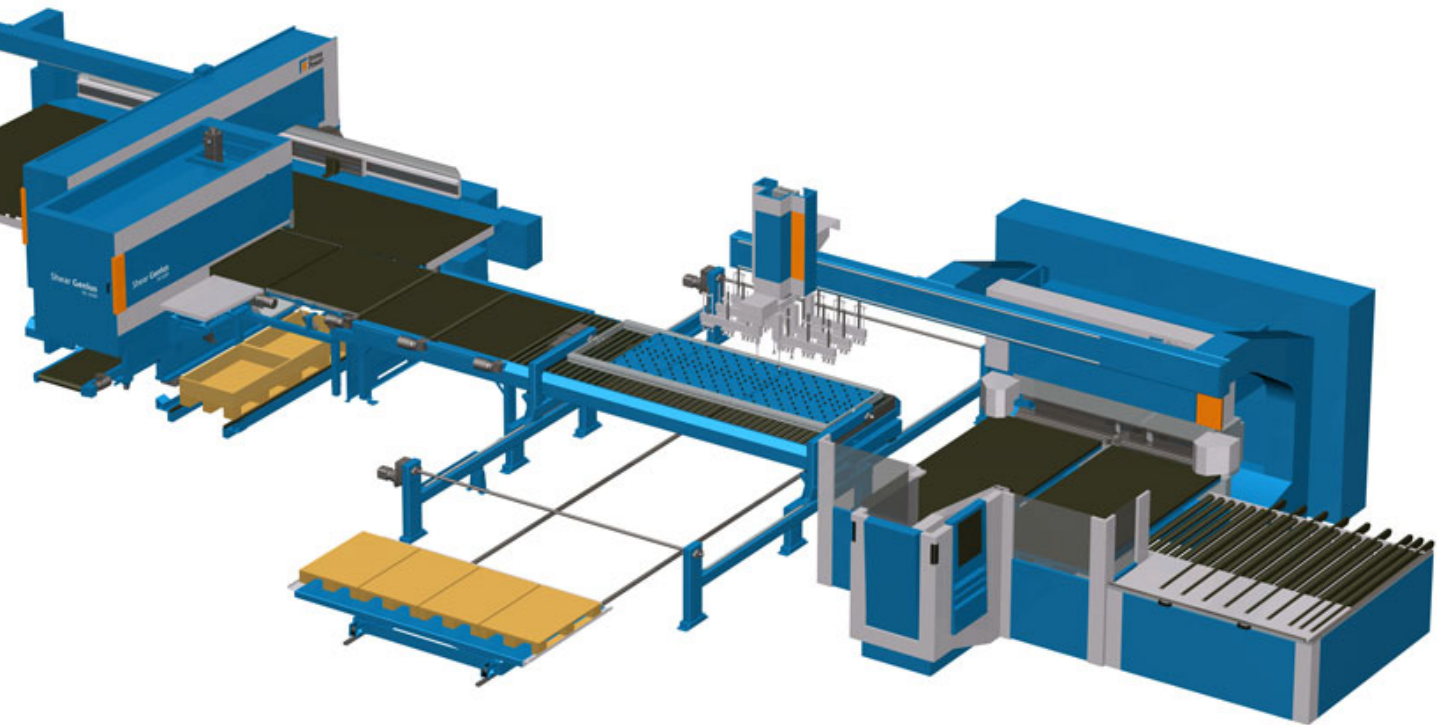


### PCD – Picking and centring device

With PCD parts can flow directly from the machine cell to the bending process and/or can be picked from a wagon where they can be placed to multiple stacks. The wagon underneath the PCD can also be connected to a Combo Tower or Night Train FMS® storage.

Parts coming from the direct connection are positioned by PCD to be ready to be picked up by the loading gripper of EBe. Parts can then be either delivered to the bending process or stacked on the wagon underneath the PCD.

Parts on the wagon can be picked up to the bending process by EBe loading gripper. Parts are always positioned before bending. With an optional bend part turning device (BTD), parts can also be turned before the bending process.





# Modular automation

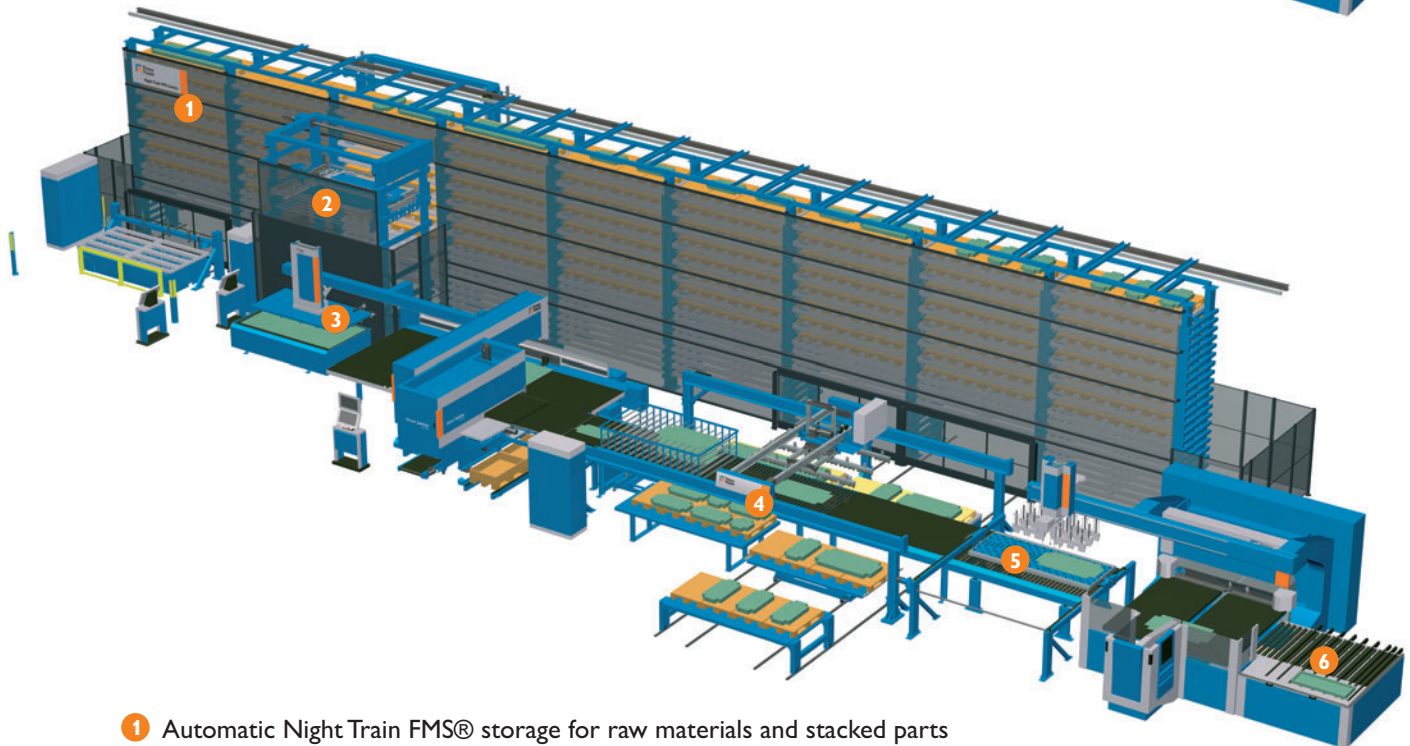
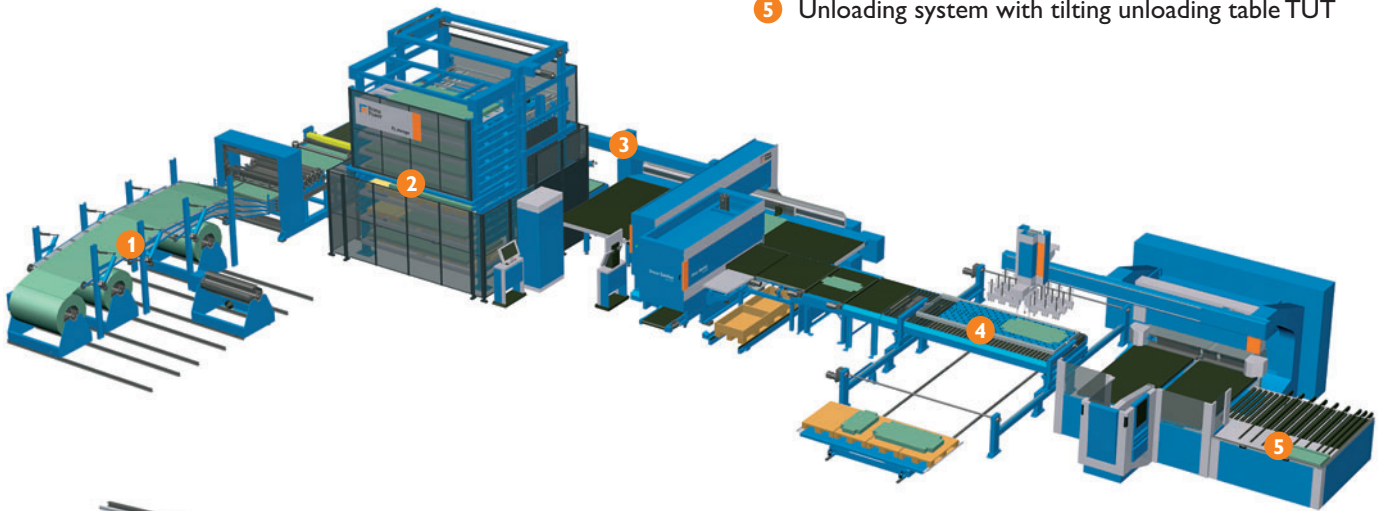
Systems are customized using the wide Prima Power range of high performance machine tools, integrated cells, automatic material handling solution and software. Due to the wide range and modularity, the optimum solution can be found for every application and all system sizes.

The flexibility of Prima Power FMS technology extends beyond our own range of machines and cells. The standard Prima Power interface allows also the integration of other suppliers' machines in the system.

## Storage connections for more capacity and higher utilization

Integration of automatic storage capacity helps utilize bending capacity to the full, allows connection with other machines providing vast buffering capacity for optimum production flow and increasing unmanned production time.

- 1 Cut-to-length line with automatic material change
- 2 FL storage for fast material changes
- 3 Loading device LD long with rotating gripper option
- 4 Picking and centering device PCD with bend part turning option BTB
- 5 Unloading system with tilting unloading table TUT



- 1 Automatic Night Train FMS® storage for raw materials and stacked parts
- 2 Fast loading device FLD for fast material changes
- 3 Loading device LD
- 4 Picking and stacking robot PSR
- 5 Connection to EBe with bent part turning device BTB
- 6 Unloading system with tilting unloading table TUT

# With Tulus® software the process is at your fingertips

The Tulus® software family developed by Prima Power is a powerful tool for managing the entire PSBB process. It consists of several modules.

## Tulus® Cell

Tulus® Cell is a machine user interface which controls machine operation, tools, machining order and sorting of the finished parts.



## Tulus® stacking & sorting management

Tulus® calculates automatically the part positions on the pallets and in the boxes and the times at which the parts must be removed from the stacking areas manually or, in the storage connection, automatically. Cassette changes become automatic.

## Tulus® Bend

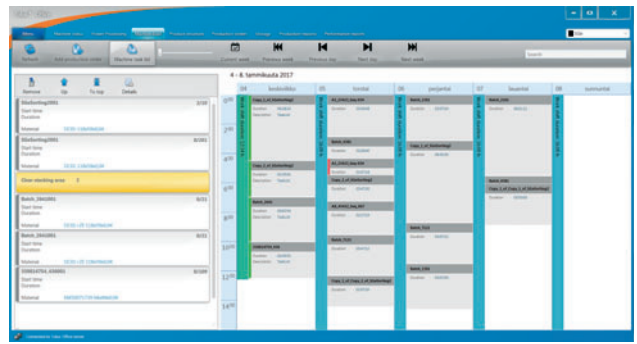


The parts that come to the bending center are managed in Tulus® Bending view. With Tulus® you can control the bending of the parts as well as part stacking with robot (and manage stacking area of PSR robot and external production).

There are three different modes for the Bending task list:

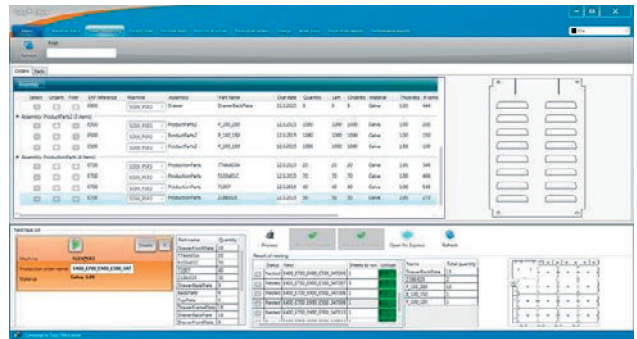
- Normal mode: parts are bent according to the sequence in the task list.
- Search mode: parts are bent according to availability. Parts coming from SGe/SBe are handled first and parts from the cassette are bent from topmost stacks.
- Direct mode: parts coming from SGe/SBe are sent directly to bending. If there is another work active in the bending cell, it is interrupted until the direct mode part has been bent.

## Tulus® Office



Tulus Office is a scalable software package that offers a variety of options connecting to machinery at the shop floor.

## Tulus® Power Processing



Tulus® Power Processing is a Manufacturing Execution Systems (MES) which is easy to connect with other information systems such as ERP. With Power Processing you can control the whole production process, from ordering, programming and machine loading to all the way to the finished product and reporting.

Tulus® Power Processing makes the production process transparent and easier to manage. There is always data of the production status and in which work stage each component is.

## Tulus® e-Kanban digitizes the ordering process



Tulus e-Kanban can be used for all part ordering processes, not only sheet metal parts. Part's metadata is used to determine where the order is placed, how large is the batch size, storage location, etc. Order can go either to ERP or directly to Tulus® Power Processing order management. Operators no longer need to look for paper orders because orders are entered digitally directly to where they are intended.

