



**P4**

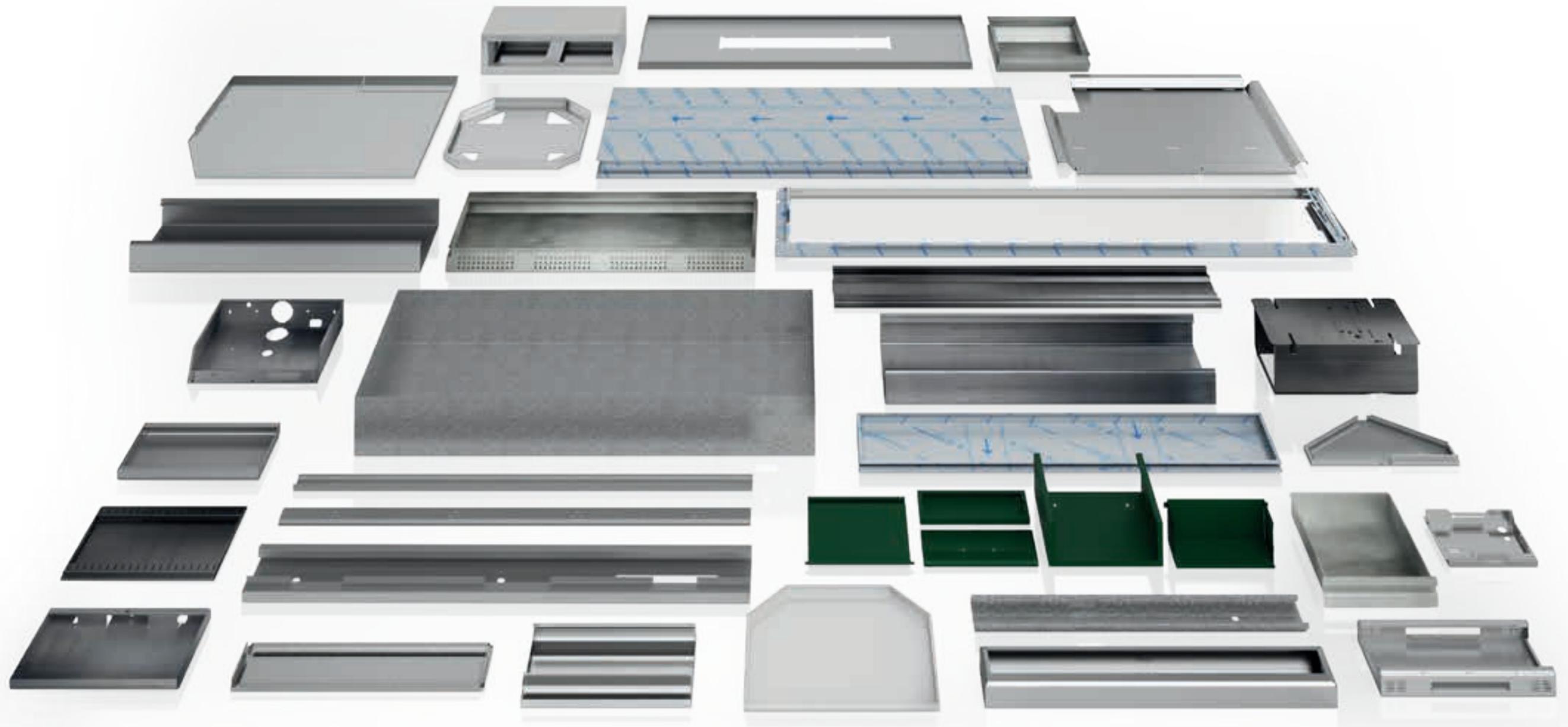


*Automatic panel bender:  
Today's solution. For your tomorrow.*

**salvagnini**

# A winning solution to shape the future.

The **P4 panel bender** is a smart manufacturing tool, invented by **Guido Salvagnini** in **1977**, designed for flexible and automatic production of sequences of panels starting from punched and cut parts **without retooling or operator intervention**.



With a wide range of models, the P4 panel bender is designed to cater to several manufacturing requirements and is a winning solution for different industrial sectors, such as **subcontractors, lifts, electrical enclosures, doors, metal furniture, lighting, catering, HVAC, automotive, refrigeration, transport, construction, etc.**

# Today's solution. For your tomorrow.

## Flexible and automatic system

Each P4 is used to produce a wide range of sheet metal parts, working with universal **bending tools** featuring **automatic set-up in masked time**.

## Adaptive technology

Featuring embedded MAC 2.0 technology, the P4 detects in-cycle any variations in the material being processed and automatically compensates for them.

## Precision and repeatability

The oscillating blade operating principle and the exclusive bending formula along with proprietary thickness control solutions and thermal compensation make the panel bender amazingly accurate and responsive.

## Versatility and modularity

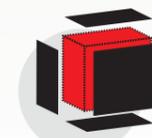
The loading/unloading devices available allow the P4 to be **configured** for working stand-alone or in-line or to be integrated into a flexible manufacturing cell or an automated factory.

## Efficiency and agility

The P4 panel bender ensures **productivity and efficiency**, while operating with different production strategies, such as JIT, kit or batch-one processing and medium or small runs.



Productivity



Flexibility



Adaptiveness



Versatility



Zero waste

# Flexible automation and lean manufacturing.

## Universal bending tools

The P4 uses universal bending tools that **do not require set-up times** and **adapt automatically** to panel geometry; this becomes a plus for operator safety and ensures productivity and flexibility.

Bending on each side of the sheet is achieved thanks to the controlled interpolated movements of the two oscillating blades that make the bends, while the sheet is handled automatically.

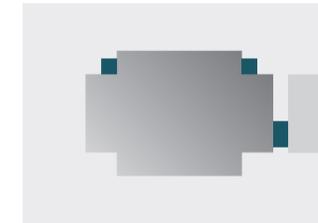


## Automatic controlled centering

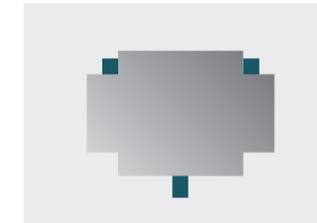
Finished panels are **always of the right size** thanks to the controlled reference stops. **The sheet is centered just once on the notches**: this reduces cycle time and possible errors in accuracy, which are all absorbed by the first bend.



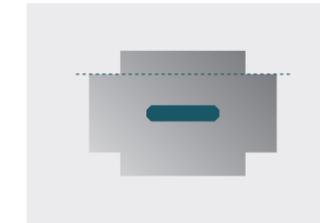
Pick-up



Positioning



Centering



Bending

## Accurate controlled handling

The sheet is gripped, rotated and handled so as to ensure **unbeatable accuracy, repeatability and finished product quality**, thanks to the electric manipulator with controlled clamp descent which allows the exact measurement of the thickness of the sheet being processed.

### Down bend - NEGATIVE



### Up bend - POSITIVE



### Flattened bend - WITH BLADE



### PRESS

The press is the working heart of the panel bender. Its sturdy frame holds:

- the **bladeholder**, which has upper and lower blades, the two universal tools featuring interpolated controlled movement and responsible for bending;
- the **counterblade**, which helps clamp the sheet during the cycle;
- the **blankholder**, one of the distinguishing features of the Salvagnini panel benders, which works simultaneously with the blades and counterblade to bend and hold the sheet accurately and effectively.



### ABA AUTOMATIC BLANKHOLDER

The blankholder (ABA) automatically adjusts itself to the dimensions of the panel to be bent, in masked time, eliminating the need for tool change.

### AUTOMATIC MANIPULATOR

The sheet is handled, gripped and rotated by the manipulator, which handles all sheet movements throughout the processing cycle quickly and entirely automatically. The operator's only task is to position the sheet on the feeding device, where applicable, and remove the manufactured item once bending is complete.

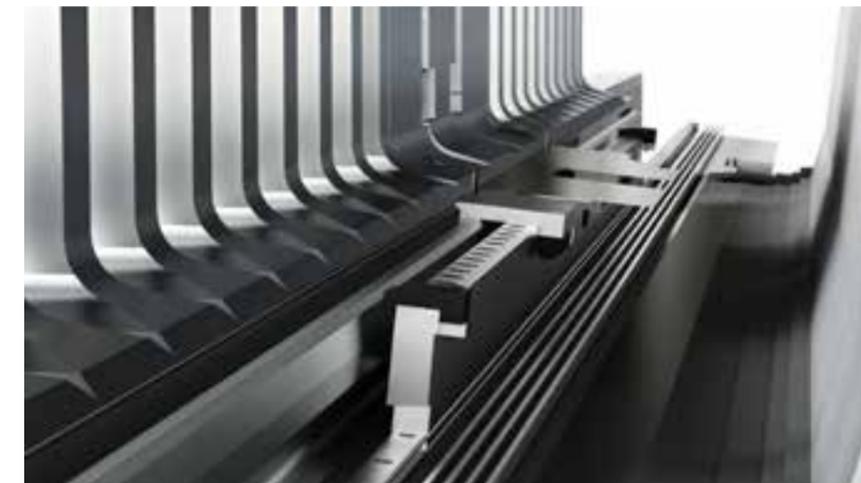
## T/P, CUT and CLA tools

*Custom solutions, designed to widen versatility.*

**T/P tools:** T/P auxiliary tools can be inserted and removed **under the blankholder quickly and automatically**. They allow narrow panels to be handled and tubular, hidden or radius bends, or bends with intrusive embossings, to be made.

**CUT option:** enables profiles of different lengths, materials, thicknesses and shapes to be cut automatically from a single blank, making separation cuts after each sequence of bends. Cuts are done using a T/P plate-shaped tool and a cutting blade placed over the lower bending blade.

**CLA tools:** CLA auxiliary blades are modular in length, come in both positive and negative versions (for making upward or downward tabs) and engage and disengage quickly and automatically between the blank and the bending blades. They are used to make bends that are shorter than the side to be bent. Auxiliary blades can be set up manually or, in some models, can even be set up **automatically** with the **CLA/SIM** option, which **composes sequences** of different lengths in masked time.



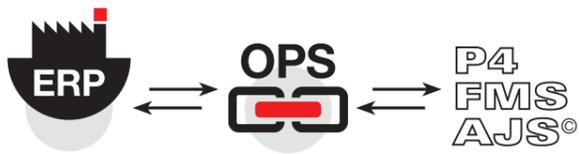
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Operating mode: **simple, quick and lean.**

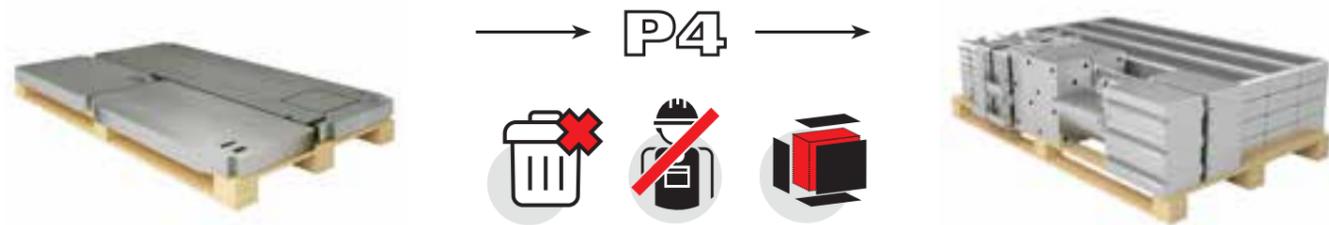
# Welcome to panel bending 4.0

The P4 panel bender is designed for the future, to evolve and meet the demands of ever-changing manufacturing trends. It has been designed for easy integration with automatic handling devices and to be ready for Industry 4.0.

## Integrated communication and JIT-production.



With its proprietary software, the panel bender can exchange information with the company's ERP or communicate with other systems: for instance, in S4+P4 FMS lines, dedicated software allows the two systems to communicate with each other and balance production so as to increase productivity and reduce waste and waiting times.



## MAC 2.0: guaranteed quality, each and every time.

Bending technology, machine type and material are the three factors that determine the result of the bending process.

The proprietary bending formula that controls movements, FEM deflection analysis and the numerous innovative solutions built into the machine - such as accurate thickness measurement and thermal bending unit compensation - eliminate any effects linked to the machine factor.

Then there is the MAC 2.0 adaptive technology which enables the machine to compensate in-cycle for any variations in material quality.

An innovative control procedure means that even the slightest variations in the material's mechanical properties are detected and, where necessary, compensated for in-cycle by the movements of the bending unit.

As a result, part quality remains consistent, even with variations in material, resulting in zero waste and optimized production times, for maximum productivity.

MAC 2.0 also reduces costs per part as the Salvagnini panel bender delivers an accurate bending result regardless of material quality.

### SMART ENERGY USE

In each P4, the cycles which run in masked time and the architecture of the cabling of the axis drives allow all the energy absorbed to be used efficiently, meaning that there is no need to send it back to the net or to dissipate it into heat.

### DIRECT DRIVE

The P4lean only adopts electric actuators, thus removing the hydraulics. Bending cylinders are driven by brushless motors, which has great advantages in terms of the reduced wear and deterioration of components that, unlike in other similar technologies, are no longer subjected to continuous extreme stress over and over on the same point.



## Lean generation

### Targets

- Designing a winning solution for both today's and tomorrow's production requirements.
- Offering a reliable and easy production system.
- Creating a machine which can easily be integrated in flexible manufacturing cells and communicate with other systems/devices in the factory 4.0.

### Features

- **Responsiveness:** just-in-time, batch-one production always when required.
- **Flexible automation:** automatic operation, lights-out operations or unmanned manufacturing.
- **Lean manufacturing:** no handling of work-in-process, waste reduced to zero, no set-up times.
- **Lean design:** intelligent use of energy, reduced consumption, tools with optimized profiles.

### Results

- Universal tool for bending from 0.4 mm to 3.2 mm (mild steel).
- Consumption reduced by more than 30% compared with previous models.
- Optimized compact layout and lean architecture.

**Maximum thickness up to 3.2 mm (mild steel)**

**9 kW (2.5 mt machine)**

**Performances > 15% (same layout)**

## Panel bending: a Salvagnini trademark.

Over 3.200 installations in 75 countries, the largest manufacturing plant dedicated entirely to panel benders and 40 years of experience and expertise. The meaning is clear: Salvagnini is an authoritative standard-bearer for panel bending 4.0: a process of unprecedented flexibility whose range of application has been extended to sectors and fields that have always been regarded as not being particularly compatible with this technology.

The widest range of models at your service.



# TECHNICAL DATA

Technical specifications	P4lean-2116	P4lean-2120
Maximum length of incoming sheet (mm)	2495	2495
Maximum width of incoming sheet (mm)	1524	1524
Maximum diagonal that can be rotated (mm)	2500	2500
Maximum bending force (kN)	330	330
Maximum clamping force (kN)	530	530
Maximum bending length (mm)	2180	2180
Maximum bending height (mm)	165	203
Minimum thickness (mm)	0.4	0.4
Maximum thickness and bending angle steel, UTS 410 N/mm <sup>2</sup> (mm)	3.2 (±90°) / 2.5 (±120°) / 2.1 (±135°)	3.2 (±90°) / 2.5 (±120°) / 2.1 (±135°)
Maximum thickness and bending angle stainless steel, UTS 660 N/mm <sup>2</sup> (mm)	2.5 (±90°) / 2.1 (±120°) / 1.6 (±130°)	2.5 (±90°) / 2.1 (±120°) / 1.6 (±130°)
Maximum thickness and bending angle aluminium, UTS 265 N/mm <sup>2</sup> (mm)	4.0 (±120°) / 3.5 (±130°)	4.0 (±120°) / 3.5 (±130°)

Technical specifications	P4-2225
Maximum length of incoming sheet (mm)	2815
Maximum width of incoming sheet (mm)	1524
Maximum diagonal that can be rotated (mm)	2820
Maximum bending force (kN)	440
Maximum clamping force (kN)	660
Maximum bending length (mm)	2200
Maximum bending height (mm)	254
Minimum thickness (mm)	0.5
Maximum thickness and bending angle steel, UTS 410 N/mm <sup>2</sup> (mm)	3.2 (± 90°) / 2.3 (± 135°)
Maximum thickness and bending angle stainless steel, UTS 660 N/mm <sup>2</sup> (mm)	2.0 (± 90°) / 1.6 (± 130°)
Maximum thickness and bending angle aluminium, UTS 265 N/mm <sup>2</sup> (mm)	4.0 (± 90°) / 2.3 (± 130°)

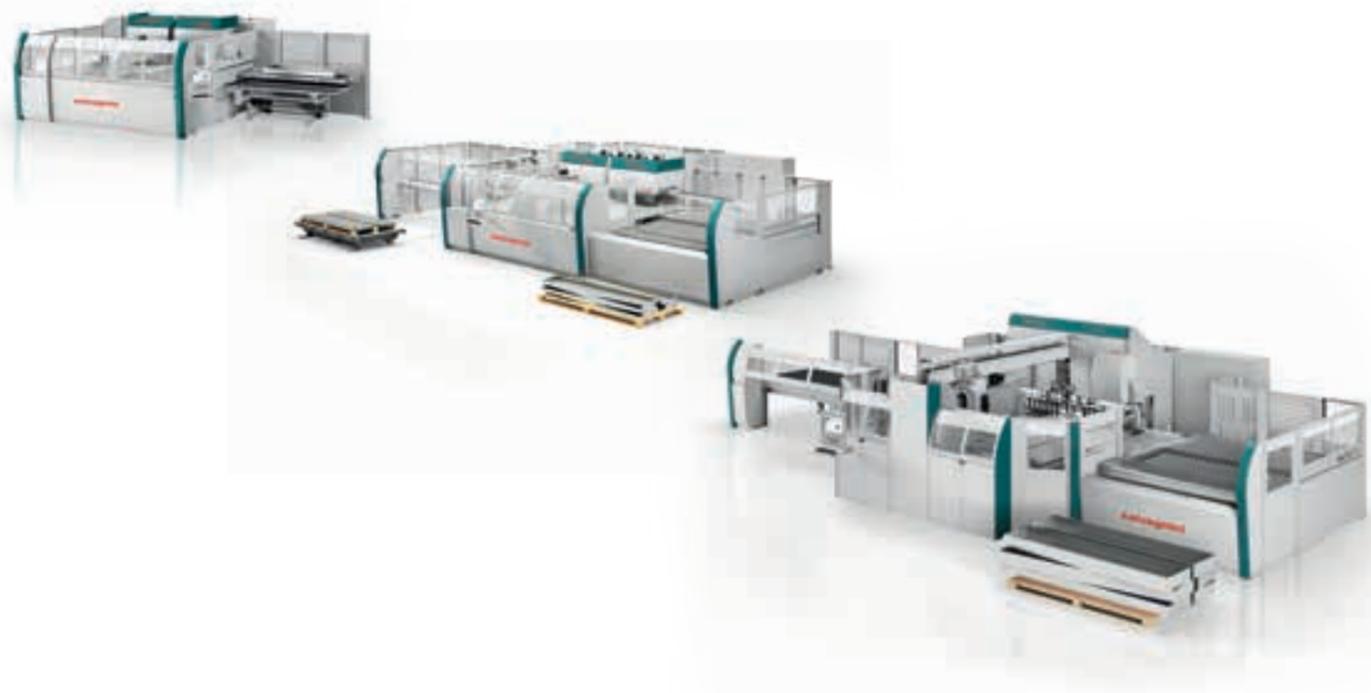
Technical specifications	P4lean-2516	P4lean-2520
Maximum length of incoming sheet (mm)	2795	3050
Maximum width of incoming sheet (mm)	1524	1524
Maximum diagonal that can be rotated (mm)	2800	3200
Maximum bending force (kN)	660	660
Maximum clamping force (kN)	1060	1060
Maximum bending length (mm)	2500	2500
Maximum bending height (mm)	165	203
Minimum thickness (mm)	0.5	0.5
Maximum thickness and bending angle steel, UTS 410 N/mm <sup>2</sup> (mm)	3.2 (±90°) / 2.5 (±130°) / 2.1 (±135°)	3.2 (±90°) / 2.5 (±130°) / 2.1 (±135°)
Maximum thickness and bending angle stainless steel, UTS 660 N/mm <sup>2</sup> (mm)	2.5 (±90°) / 2.1 (±125°) / 1.6 (±135°)	2.5 (±90°) / 2.1 (±125°) / 1.6 (±135°)
Maximum thickness and bending angle aluminium, UTS 265 N/mm <sup>2</sup> (mm)	4.0 (±120°) / 3.5 (±130°) / 3.0 (±135°)	4.0 (±120°) / 3.5 (±130°) / 3.0 (±135°)

Technical specifications	P4-3125
Maximum length of incoming sheet (mm)	3495
Maximum width of incoming sheet (mm)	1524
Maximum diagonal that can be rotated (mm)	3500
Maximum bending force (kN)	510
Maximum clamping force (kN)	780
Maximum bending length (mm)	3100
Maximum bending height (mm)	254
Minimum thickness (mm)	0.5
Maximum thickness and bending angle steel, UTS 410 N/mm <sup>2</sup> (mm)	3.2 (± 90°) / 2.3 (± 135°)
Maximum thickness and bending angle stainless steel, UTS 660 N/mm <sup>2</sup> (mm)	2.0 (± 90°) / 1.6 (± 130°)
Maximum thickness and bending angle aluminium, UTS 265 N/mm <sup>2</sup> (mm)	4.0 (± 90°) / 2.3 (± 130°)

Technical specifications	P4lean-3216	P4lean-3220
Maximum length of incoming sheet (mm)	3495	3850
Maximum width of incoming sheet (mm)	1524	1524
Maximum diagonal that can be rotated (mm)	3500	4000
Maximum bending force (kN)	660	660
Maximum clamping force (kN)	1060	1060
Maximum bending length (mm)	3200	3200
Maximum bending height (mm)	165	203
Minimum thickness (mm)	0.5	0.5
Maximum thickness and bending angle steel, UTS 410 N/mm <sup>2</sup> (mm)	3.2 (±90°) / 2.5 (±130°) / 2.1 (±135°)	3.2 (±90°) / 2.5 (±130°) / 2.1 (±135°)
Maximum thickness and bending angle stainless steel, UTS 660 N/mm <sup>2</sup> (mm)	2.5 (±90°) / 2.1 (±125°) / 1.6 (±135°)	2.5 (±90°) / 2.1 (±125°) / 1.6 (±135°)
Maximum thickness and bending angle aluminium, UTS 265 N/mm <sup>2</sup> (mm)	4.0 (±120°) / 3.5 (±130°) / 3.0 (±135°)	4.0 (±120°) / 3.5 (±130°) / 3.0 (±135°)

Technical specifications	P4lean-3816	
Maximum length of incoming sheet (mm)	3990	
Maximum width of incoming sheet (mm)	1524	
Maximum diagonal that can be rotated (mm)	4000	
Maximum bending force (kN)	660	
Maximum clamping force (kN)	1060	
Maximum bending length (mm)	400-3200	3200-3850
Maximum bending height (mm)	165	
Minimum thickness (mm)	0.5	
Maximum thickness and bending angle steel, UTS 410 N/mm <sup>2</sup> (mm)	3.2 (±90°) / 2.5 (±130°) / 2.1 (±135°)	2.5 (±125°) / 2.1 (±130°) / 1.6 (±135°)
Maximum thickness and bending angle stainless steel, UTS 660 N/mm <sup>2</sup> (mm)	2.5 (±90°) / 2.1 (±125°) / 1.6 (±135°)	2.5 (±90°) / 2.1 (±120°) / 1.6 (±135°)
Maximum thickness and bending angle aluminium, UTS 265 N/mm <sup>2</sup> (mm)	4.0 (±120°) / 3.5 (±130°) / 3.0 (±135°)	4.0 (±120°) / 3.5 (±130°) / 3.0 (±135°)

Values refer to standard machines. Salvagnini reserves the right to modify this data without prior notice.



# Modular automation for all manufacturing requirements.

The P4 panel bender can be set up in various ways to match different production needs. Configurations are defined according to a variety of requirements in terms of loading and unloading solutions and machine models.

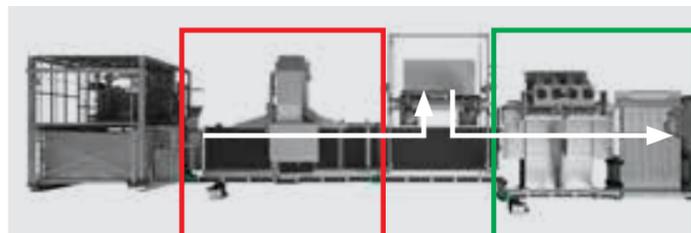


A P4 can be fed manually or automatically. By choosing the latter option, sheets are taken from one or more packs to feed the machine in masked time. When in-line, feeding operations are evenly balanced and optimized for all intermediate stations. For unloading panels, panel benders can be equipped with different devices: **manual, automatic or robotic**.

- **Manual unloading:** the bent part is handled and removed by an operator.
- **Automatic unloading:** the part is transferred automatically to the next station (welding, assembly, painting).
- **Robotic unloading with palletizing:** the parts produced are handled by a robot.



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The **PACK-MODE** and **STACK-MODE** software optimizes flow along the line between the S4 and P4. It balances production, switching to table- or buffer-fed processing during run-time, or ordering parts - again during run-time - to be stacked on pallets, in accordance with the actual progress of parts along the line.

## The Salvagnini Software Ecosystem.

*STREAM* defines the production process, starting from the finished product model, according to the **best processing sequence**, taking all variables into consideration, including production costs. It features three levels: **technical, productive and business**.



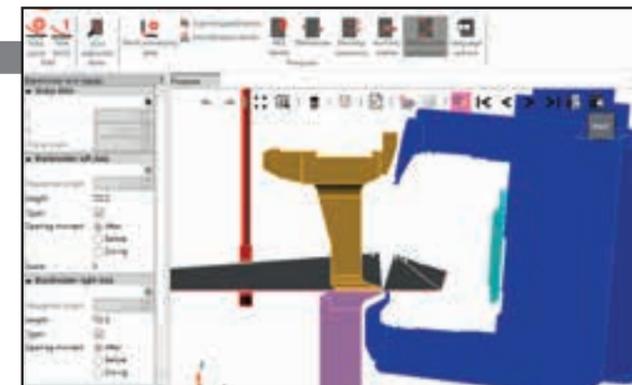
### TECHNICAL

2-levels programming software for the generation of panel bending programs:

- automatic programming starting from a 3D model;
- interactive programming that allows manual changes/finalization/generation.

Inclusive of a powerful machine simulator that can assess the results.

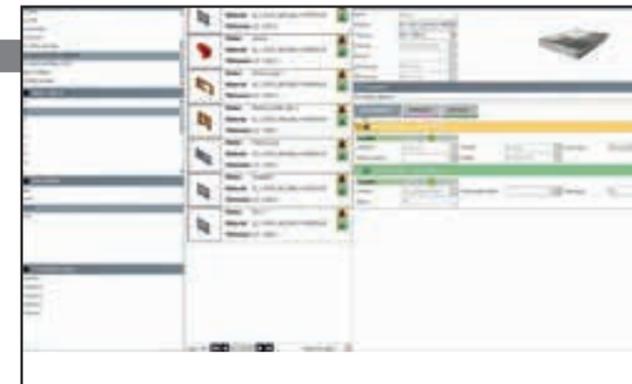
The software works also in case of multiple parts.



### PRODUCTION

Software that manages the database of entities that define the production flow of one part or a group of parts:

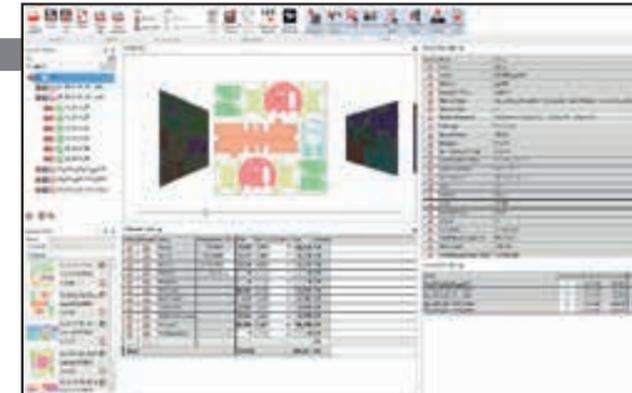
- it classifies parts according to common categories (size, material, thickness, ...) or categories personalized by the customer (commission, kit, ...);
- it defines one or more productions flows for each part to be made on Salvagnini systems;
- it generates programs for all Salvagnini technologies defined inside the production flow of the part.



### BUSINESS

Software for the estimation of production costs of a part realized inside a production flow:

- it provides the final cost of entire production batches, nesting, and single parts in a simple and efficient way;
- it manages costs relating to electrical energy, manpower, materials, depreciation and the automatic conversion of prices in the main currencies;
- it takes into consideration the work carried out on Salvagnini or third-party systems (painting, welding, etc.).



# CHECKLIST

**A unique investment on all fronts.**

**Flexibility** *Universal bending tool from 0.4 to 3.2 mm.*

*Universal bending tool with optimized profile and proprietary kinematic system for bending from 0.4 to 3.2 mm.*

**Productivity** *Automatic set-up in masked time.*

*Automatic blankholder tool set-up in masked time with no set-up times, for kit and batch-one productions.*

**Intelligence** *No waste.*

*Proprietary MAC 2.0 technology allows the machine to adapt to variations in sheet behaviour, ensuring consistent part quality.*

**Simplicity** *Intuitive programming.*

*3D programming on the machine or in the office to simulate bending; proprietary software suite for calculating the exact cost-per-part with different production methods - on both P4 and AJS.*

**Responsiveness** *Panel bending 4.0.*

*Option of using the machine in stand-alone, in-line or automated factory mode and of managing production automatically with proprietary OPS software.*

**Versatility** *Custom solutions.*

*Custom options available for producing profiles, boxed shapes and narrow panels and for cutting profiles of varying sizes and thicknesses in sequence.*

**Full range** *The widest range on the market.*

*The widest range available to meet a whole host of different production requirements.*

**Informed innovation to satisfy the manufacturing needs of today and tomorrow.**

**Lighting**



**Catering**



**Metal furniture**



**Building**



**Electrical enclosures**





# CHOOSE YOUR **S**IZE

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