

P2.G4



**The flexible
bending solution**

salvagnini

Flexible bending solution.

PRODUCTIVITY

How to combine productivity and flexibility?

Conventional bending is characterized by an average OEE of 30%, with flexibility dependent on the tool change system - which is often costly and more time-consuming than on a panel bender - or on the installation of more than one press brake. The P2.G4 panel bender, on the other hand, natively combines productivity, with its automatic bending and handling cycles, and flexibility, with its universal bending tools. And with its advanced cycles, the P2.G4 completes an average of 17 bends per minute.

How long does re-tooling take?

The P2.G4 doesn't require re-tooling: the upper and lower blades, the counterblade and the blankholder are universal tools that are able to process the whole range of thicknesses and machinable materials.

Do manual loading and unloading affect the total cycle time?

Loading and unloading are performed by the operator, who positions the sheet metal on the worktable and collects the product after bending. The P2.G4's cycle minimizes the impact of these activities on total cycle time, as it allows the product to be unloaded after positioning the sheet on the worktable, thus combining two operations in a single action.

Does the P2.G4's set-up affect productivity?

The set-up has minimal impact on the panel bender's productivity: when the program is loaded, the blankholder automatically adapts in masked time, and the manipulator gets into position for gripping and handling the sheet.

How to produce in kits or batch-one?

The P2.G4 is equipped with an automatic blankholder, which automatically adapts the length of the tool according to the size of the part to be produced, without the need for machine downtime or manual re-tooling even in-cycle: the ideal solution for batch-one and kit production.



The **P2.G4** natively combines **productivity**, with its automatic bending and handling cycles, and **flexibility**, with its universal bending tools.

Intelligent system, constant quality.

PRECISION

How to achieve maximum precision?

The sheet metal is centered, just once at the start of the process, against controlled reference stops: this minimizes the cycle time as well as any precision errors, which are all absorbed by the first bend. The bending formula automatically optimizes the bending parameters to reduce waste, while MAC3.0 detects and automatically compensates any variability in the material to guarantee precise, high-quality bends.

ADAPTIVITY

How to make production independent of changes in material?

MAC3.0 is the set of integrated technologies – sensors, formulas and algorithms – that make the panel bender intelligent: it eliminates waste and reduces corrections, measuring in-cycle and automatically compensating any variability in the material being machined.

How to make production independent of external variations?

The P2.G4 integrates advanced sensors that measure the actual thickness and effective size of the part to be machined, and detects any deformations caused by variations in temperature. The data are fed in real time into the bending formula, which defines the correct force to apply to the sheet metal, guaranteeing the precision, repeatability and quality of the finished product.

How to adapt the panel bender to different production needs?

In addition to the automatic blankholder, the P2.G4 offers a range of options to guarantee maximum versatility and adaptability, to suit any production strategy or mix.

How to make the process reactive to changes in the production lists?

The P2.G4 can be equipped with proprietary OPS software, which ensures communication between the panel bender and the factory ERP: depending on needs, OPS manages the production of sequences of different parts. Universal bending tools, automatic in-cycle set-up and automatic handling allow the system to respond to any requests immediately.

The compact panel bender for lean, flexible production.

Adaptive system

The integrated adaptive technologies (advanced sensors, bending formula, MAC3.0) make the system intelligent and able to **automatically adapt** to changes in the material and the external environment, **eliminating waste and corrections**, and extending the range of products that can be made.

Flexible automation

It uses **universal bending tools** which automatically adapt in-cycle to the panel geometry, without machine down times or manual re-tooling, allowing **batch-one or kit productions**.

Connectivity 4.0

The proprietary **LINKS** and **OPS** softwares establish communication between the system and the company departments involved in the production flow.

Production versatility

It offers **customized solutions**, including **auxiliary tools** and **additional devices** for special geometries or **different loading/unloading solutions** with additional door or robot.

Sustainable technology

The technical solutions adopted (Direct Drive and pneumatic and electric actuators) allow it to **respect both people and the environment** without reducing its productivity.

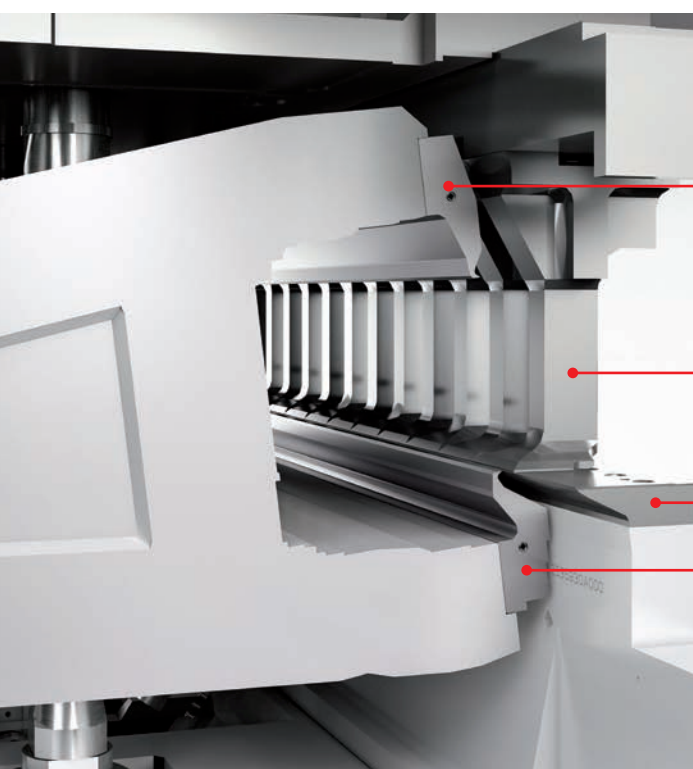
Salvagnini is panel bending, panel bending is Salvagnini.

4,000 installations in 85 countries, the world's largest panel bender manufacturing plant and over 40 years of experience and competence speak for themselves: Salvagnini is an authority on "panel forming 4.0", a flexible process the likes of which has never been seen before, whose application boundaries are extended to sectors and environments that have always been considered poorly suited to this technology.

5 P2.G4 models to choose from, for bends up to 2750 mm in length and 260 mm in height.

Flexible automation.

Upper and lower blade, counterblade and blankholder are the **four universal tools** used to process the whole range of thicknesses and machinable materials, from 0.4 to 3.2 mm, during the cycle and without machine down times or manual re-tooling.



A The upper and lower blades (A, D) are the two tools featuring interpolated controlled movement and responsible for bending.

B The automatic blankholder (B) works simultaneously with the blades and counterblade to bend and clamp the sheet accurately and effectively. It adapts the tool length according to the size of the part being produced during the cycle, without machine down times or manual re-tooling.

C The counterblade (C) helps clamp the sheet during the cycle.

Automatic manipulator: fast and accurate.

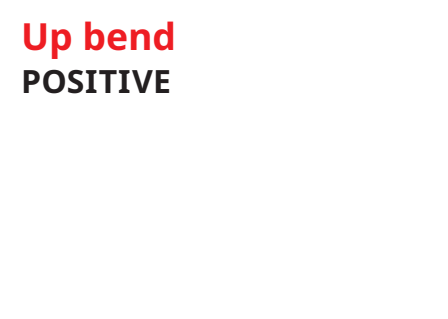
Quickly and fully automatically, this moves, handles, grips and rotates the sheet metal throughout the whole machining cycle. It requires no manual interventions during the cycle. **The operator positions the sheet metal on the worktable** and collects the product after bending, performing only the loading and unloading operations.

Operating mode: simple, quick and lean.

Bending on each side of the sheet is achieved thanks to the **controlled interpolated** movements of the blades.



Down bend
NEGATIVE



Up bend
POSITIVE

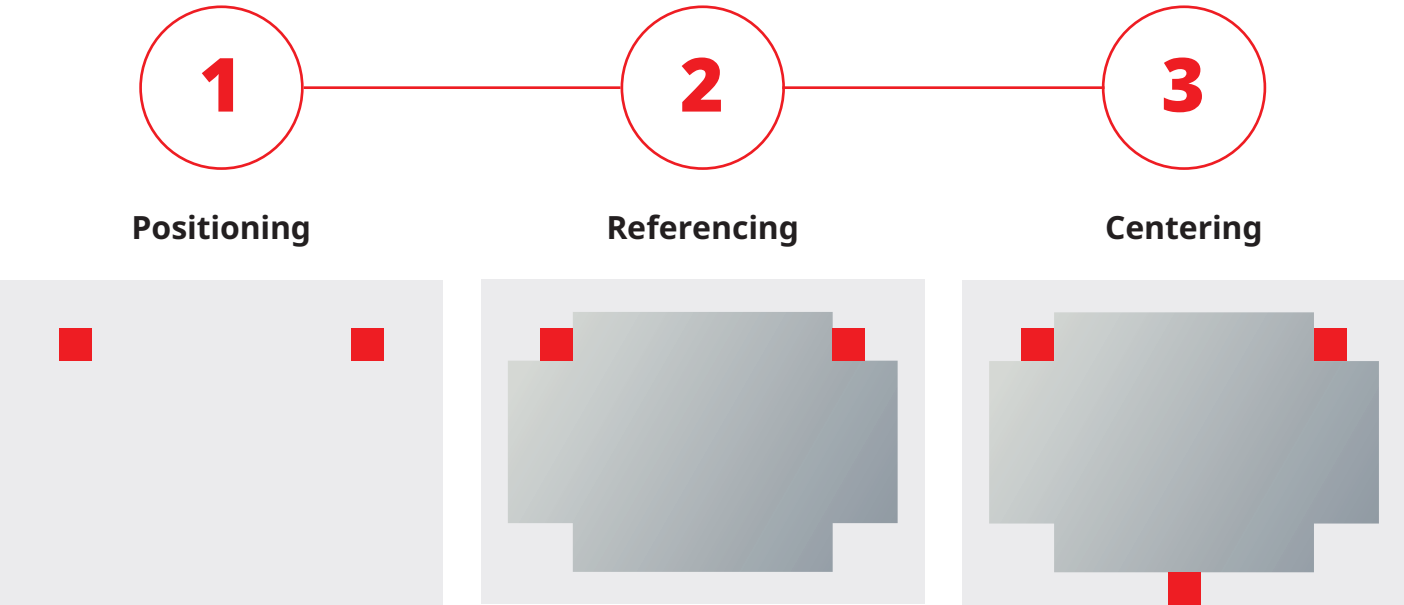


Flattened bend
WITH BLADE

Adaptive system.

One single and controlled centering process.
The sheet metal is centered, just once at the start of the process, against controlled mechanical stops: the cycle time is minimized and any precision errors are all absorbed by the first bend.

The mechanical stops are a further guarantee of finished panels of the correct size, every time.



Proprietary bending formula.

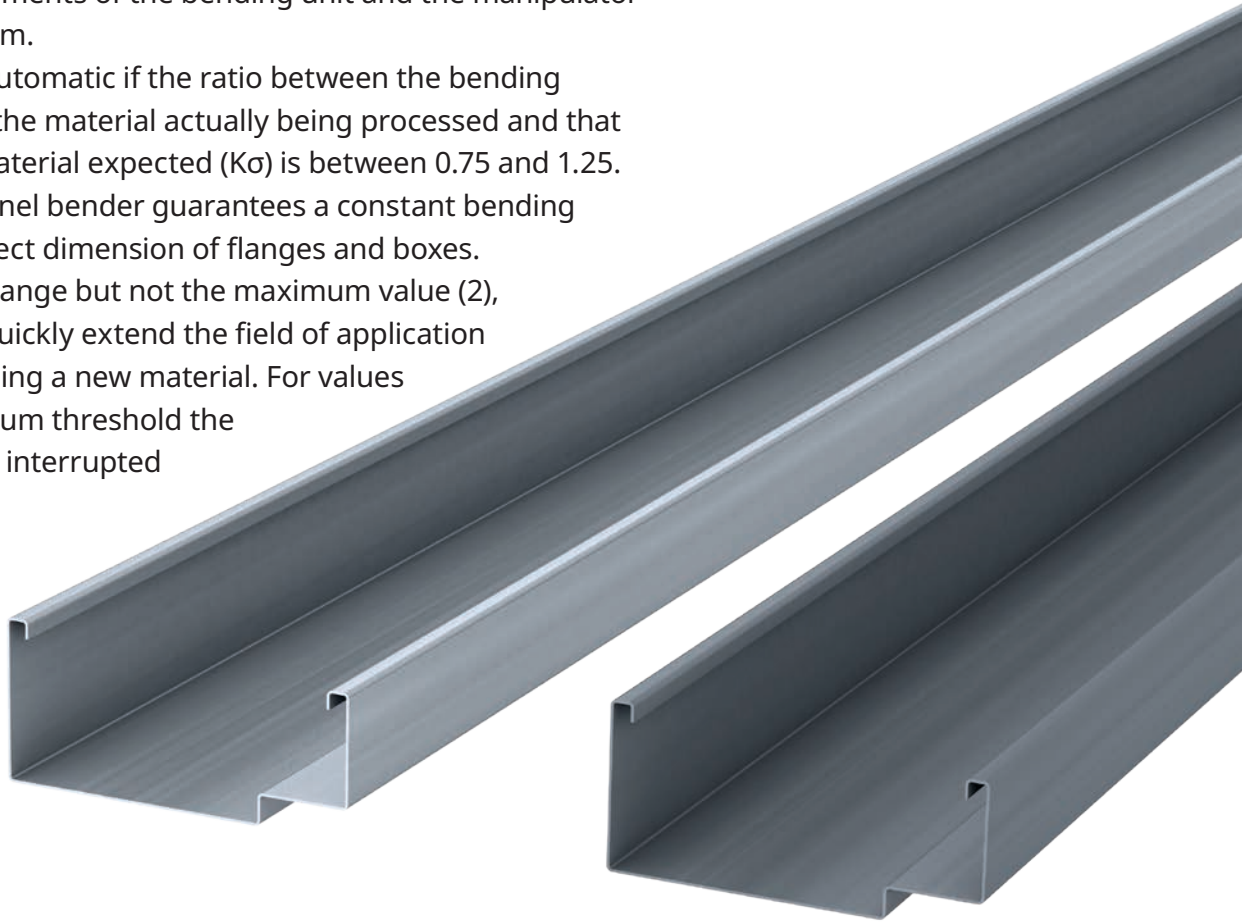
Developed over the years, the bending formula defines the force and manages the movements of the universal tools, analyzing different parameters in real time, including deflections, temperature and thickness, guaranteeing the precision, repeatability and quality of the finished product.

MAC3.0

MAC3.0 detects any differences in the mechanical characteristics of the material compared to their nominal value during the cycle, adapting the movements of the bending unit and the manipulator to compensate them.

Compensation is automatic if the ratio between the bending force required for the material actually being processed and that required for the material expected ($K\sigma$) is between 0.75 and 1.25. In this case, the panel bender guarantees a constant bending angle and the correct dimension of flanges and boxes.

If $K\sigma$ exceeds this range but not the maximum value (2), the operator can quickly extend the field of application of MAC3.0 by defining a new material. For values beyond the maximum threshold the bending process is interrupted automatically.



A digital indicator integrated in FACE monitors the situation in real time, informing the operator of the actual characteristics of the material being machined.



Sustainable technology.

Direct drives.

The P2.G4 panel bender adopts only electric actuators, thus removing the hydraulics. Bending cylinders are driven by brushless motors, which offers 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 mechanical stress.

Intelligent energy use.

The masked-time cycles and smart drives help to use all the absorbed energy in the best way, without it being dissipated as heat.

Production versatility.

Custom solutions to widen versatility.

P tool: auxiliary tool that can be engaged and disengaged beneath the blankholder, rapidly and automatically, to make narrow panels, tubular, hidden or radius bends, or bends with intrusive embossings. Available only on P2.G4**20.

CLA tools: auxiliary blades, modular in length, available in both positive and negative versions, for making upward or downward tabs or bends that are shorter than the whole sheet length. Auxiliary blades can be set up automatically, with the CLA/SIM option, which composes sequences of different lengths in masked time.

CUT tool: combination of a specific P tool and an auxiliary blade for automatic and sequential cutting of profiles of different lengths, materials, shapes and thicknesses. An unloading belt device on the bladeholder is used for manual unloading.

DPM manipulator: suction-cup device used to handle narrow parts, or frames without material, minimum width 105 mm. Used together with the specific P tool, it can produce panels up to 45 mm wide.

The human-friendly software suite.



STREAM is Salvagnini's answer to the modern industrial context, a programming suite that improves reactivity and reduces costs, operating errors and process inefficiencies.

Industry has changed: flexibility and efficiency are fundamental requirements for managing increasingly smaller batches or rapid part code turnover. STREAM is Salvagnini's answer to the modern industrial context, a programming suite that improves reactivity and reduces costs, operating errors and process inefficiencies. STREAM is the integrated environment for managing all activities in the office and on the factory floor, the only point of access

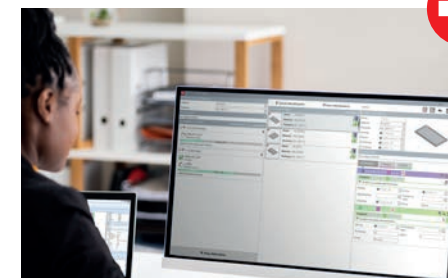
for all technologies, from cutting to bending, meeting all planning, programming, production, management, control and optimization needs throughout the production process. Moreover STREAM can be used to calculate costs, including upstream and downstream processes where necessary. It is structured on three levels: technical, productive and business.



STREAMBEND is the software for developing panel bending programs, including multiple parts:

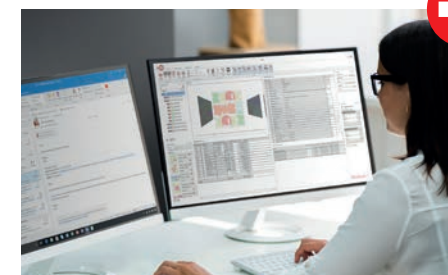
- in automatic mode, it develops programs independently, starting from a 3D model;
- in interactive mode, it is used for generation/editing/completion operations.

It includes a simulator that can assess the results obtained on the machine.



PARTS is the software used to manage the whole database of products and parts:

- it classifies the elements according to common or customized categories;
- it defines the production flows for each part to be machined;
- it generates the relative programs.



VALUES is the software which provides an accurate estimation of production costs. It allows calculation not only on the basis of the individual technology, but also over the entire process, including upstream and downstream machining where necessary.

Tools for digital factories.



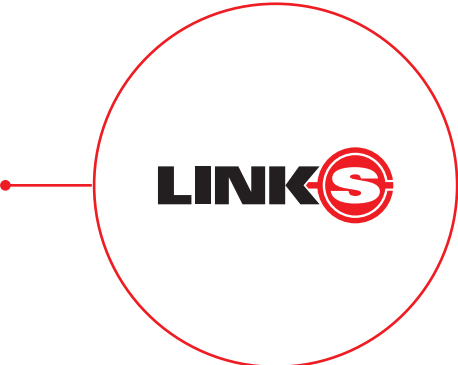
Coordinate your factory with OPS in real time.
OPS is the Salvagnini modular production management software, used to exchange information in real time between the panel bender and the factory ERP/MRP. Depending on the installed modules, OPS can:

- Organize and manage production**, defining the priorities, managing any order changes or cancellations, and checking the availability of the raw materials or semi-finished parts needed for production;
- Automatically create machine programs**;
- Provide feedback to the factory ERP**, updating material availability and state of production in real time, part by part;
- Reduce or eliminate any redundant activities with low added value.

OPS **can take independent decisions**, according to a production logic – or a mix of multiple production logics – designed to meet the customer’s production needs, transformed into an algorithm. It is also used to exchange information between different technologies, such as the components of an

FMC cell, so as to optimize production flows and increase productivity. The digital connection between different systems, and the easy-to-use software solutions, also help to maximize the production capacity available, increasing technology flexibility and overall factory efficiency.

LINKS: IoT to serve efficiency
LINKS is Salvagnini’s IoT solution that monitors the **performance of the panel bender**. It offers access to production data, logbooks, performance KPIs and telemetry, as well as parameter monitoring by the Condition Monitoring process, thus increasing the overall equipment efficiency.



Built around you.

Salvagnini offers 5 different models, which bend up to **2750 mm in length and 260 mm in height**, responding to all production needs and maximizing use of the panel bender.

| TECHNICAL SPECIFICATIONS | P2-1620.G4 | P2-2120.G4 | P2-2226.G4 | P2-2520.G4 | P2-2720.G4 |
|---|--|--|--|---|---|
| Maximum length of incoming sheet (mm) | 1995 | 2495 | 2815 | 2795 | 3050 |
| Maximum width of incoming sheet (mm) | 1414 | 1600 | 1600 | 1600 | 1600 |
| Maximum diagonal that can be rotated (mm) | 2000 | 2500 | 2820 | 3200 | 3200 |
| Maximum bending force (kN) | 240 | 330 | 590 | 660 | 660 |
| Maximum clamping force (kN) | 380 | 530 | 635 | 1060 | 1060 |
| Maximum bending length (mm) | 400-1000 | 1000-1600 | 2180 | 2200 | 2500 |
| Maximum bending height (mm) | 203 | 203 | 260 | 203 | 203 |
| Minimum thickness (mm) | 0.4 | 0.4 | 0.4 | 0.4 | 0.4 |
| Maximum thickness and bending angle steel, UTS 410 N/mm² (mm) | 3.2 (±90°) 2.5 (±120°) 2.1 (±130°) | 2.5 (±90°) 2.1 (±130°) 1.6 (±135°) | 3.2 (±90°) 2.5 (±120°) 2.1 (±135°) | 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/mm² (mm) | 2.5 (±90°) 2.1 (±120°) | 2.1 (±90°) 1.6 (±135°) | 2.5 (±90°) 2.1 (±120°) 1.6 (±130°) | 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/mm² (mm) | 3.5 (±120°) 3.2 (±125°) | 3.2 (±120°) 2.5 (±125°) | 4.0 (±120°) 3.5 (±130°) | 4.0 (±120°) 3.5 (±130°) 3.0 (±135°) | 4.0 (±120°) 3.5 (±130°) 3.0 (±135°) |
| Average absorbed power (kW) | 3.0 | 3.0 | 4.0 | 5.0 | 5.0 |
| Noise level (Machine Directive 2006/42/EC) (dB) | 68 | 68 | 68 | 69 | 69 |

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

