



Shaping your ideas

# BENDING TECHNOLOGIES

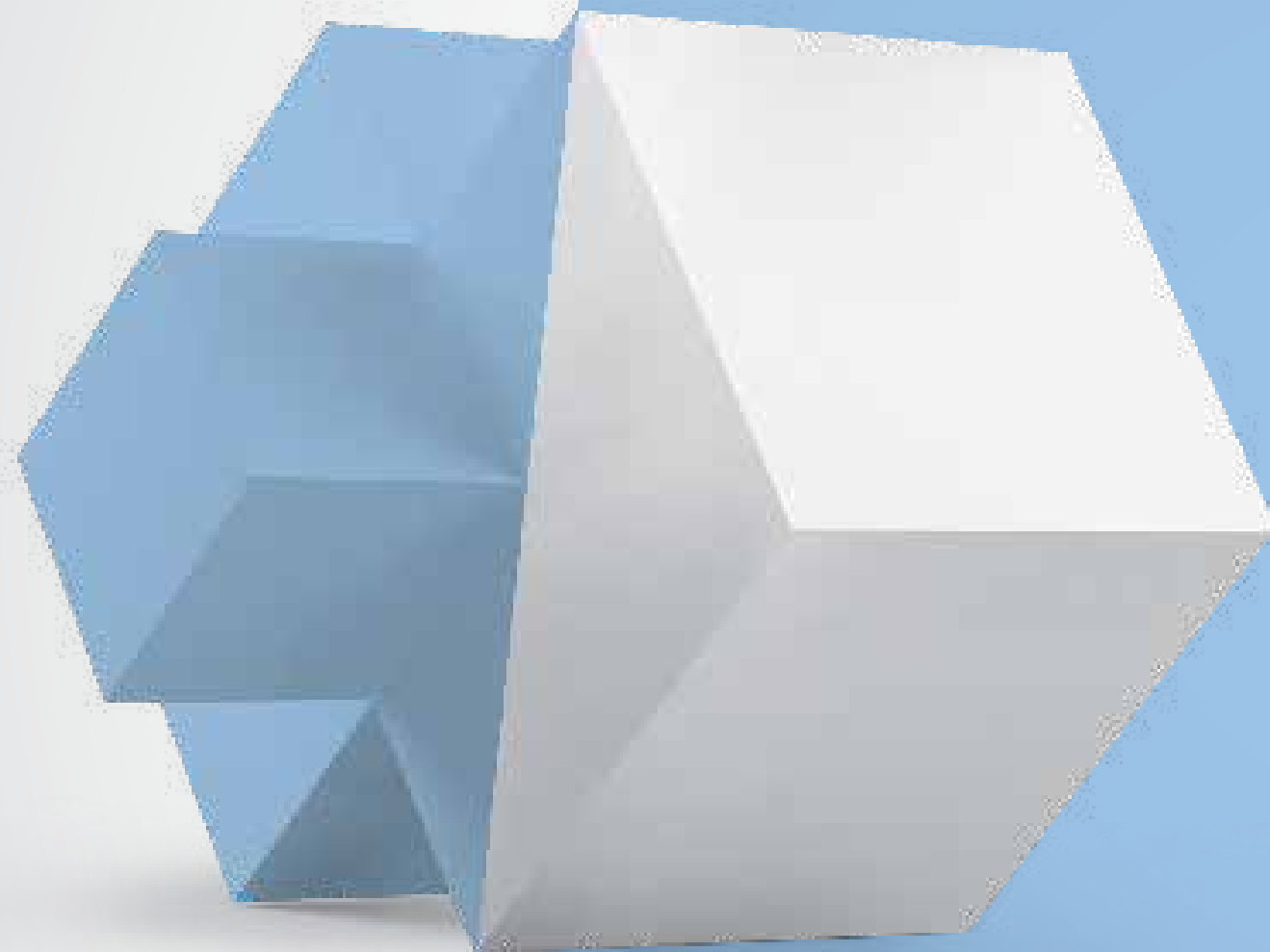
Catalogue 2016



**40 years of  
knowledge,**

**40 years of  
excellence.**





Shaping your ideas.



[www.gasparini.it](http://www.gasparini.it)



- 9. The company
- 17. X-Press press brake
- 103. Service & Retrofit
- 113. Sheet metal forming





# The company



## › GASPARINI INDUSTRIES

We work every day to give a new shape to the future.

Operators and skilled technicians allow for maximum customization and an effective assistance, guaranteeing **performance**, **quality** and **service**.

### 2 product platforms

press brakes and hydraulic shears

8.000 +

machines installed worldwide

10.000 m<sup>2</sup>

production site

2.400 m<sup>2</sup>

office

700 m<sup>2</sup>

showroom

*We don't offer plain machines.  
We study solutions to provide  
the best answer to everyone.*



## > ECOLOGY

Gasparini has always respected ecological principles and was among the first to employ special water-based paints and steam washing machines for cleaning and degreasing instead of common chemical products.

Gasparini has always been complying with the laws for environment protection, developing a production system with respect for ecology.

## > RESEARCH

Thanks to its constant engineering research, Gasparini is qualified as a Research Laboratory by the MIUR (Ministry of Education, University and Research).

## > PATENTS

- ACSG adaptive real-time crowning
- GPS4 spring-back correction and angle measurement system
- AIC pneumatic clamping intermediates
- Reflex frame deformation compensation

## > QUALITY

The quality of Gasparini products is granted by the permanent research and development activity for product's innovation and operator's safety.



# GASPARINI



## > VISION & MISSION



*Experience and passion.  
We turn your ideas into reality.*

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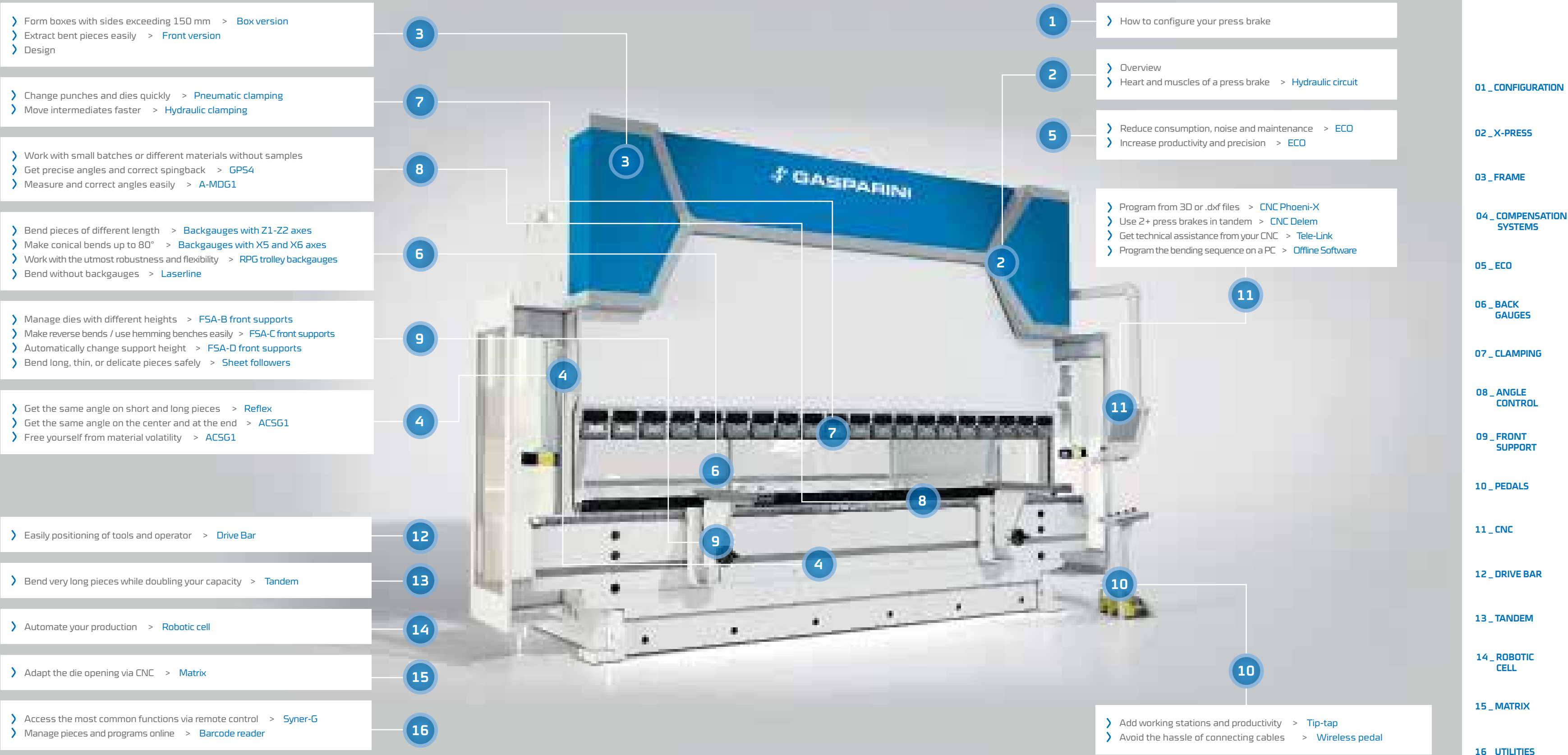
We aim at making bending and cutting sheet metal a quick, precise and reliable process. We try to make our Clients more productive and competitive.

We aim to become the constant point of reference in the theory and practice of press braking and shearing.



# **X-Press Press Brake**

**GASPARINI** | BENDING TECHNOLOGIES 2016



01\_CONFIGURATION

02\_X-PRESS

03\_FRAME

04\_COMPENSATION  
SYSTEMS

05\_ECO

06\_BACK  
GAUGES

07\_CLAMPING

08\_ANGLE  
CONTROL

09\_FRONT  
SUPPORT

10\_PEDALS

11\_CNC

12\_DRIVE BAR

13\_TANDEM

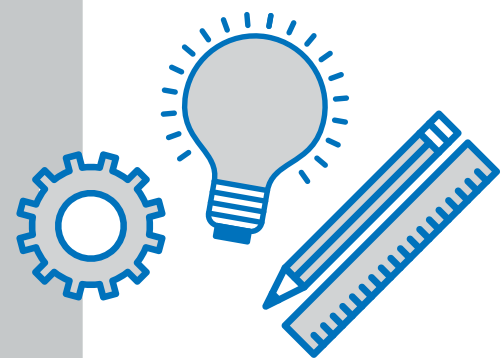
14\_ROBOTIC  
CELL

15\_MATRIX

16\_UTILITIES



## CHOOSE AND CONFIGURE YOUR PRESS BRAKE



Your business takes  
a new twist.

Finally a machine tool tailored to your needs.

### 1 LENGTH

It varies according to the maximum dimensions of the piece.

### 2 TONNAGE

It depends on the material and its thickness; hemming requires a higher tonnage.

### 3 DAYLIGHT

The daylight is the opening between bench and ram. The Box version allows to form boxes without the need for special punches.

### 4 STROKE

The Front version has an increased stroke for easier extraction of bent pieces.

### 5 THROAT

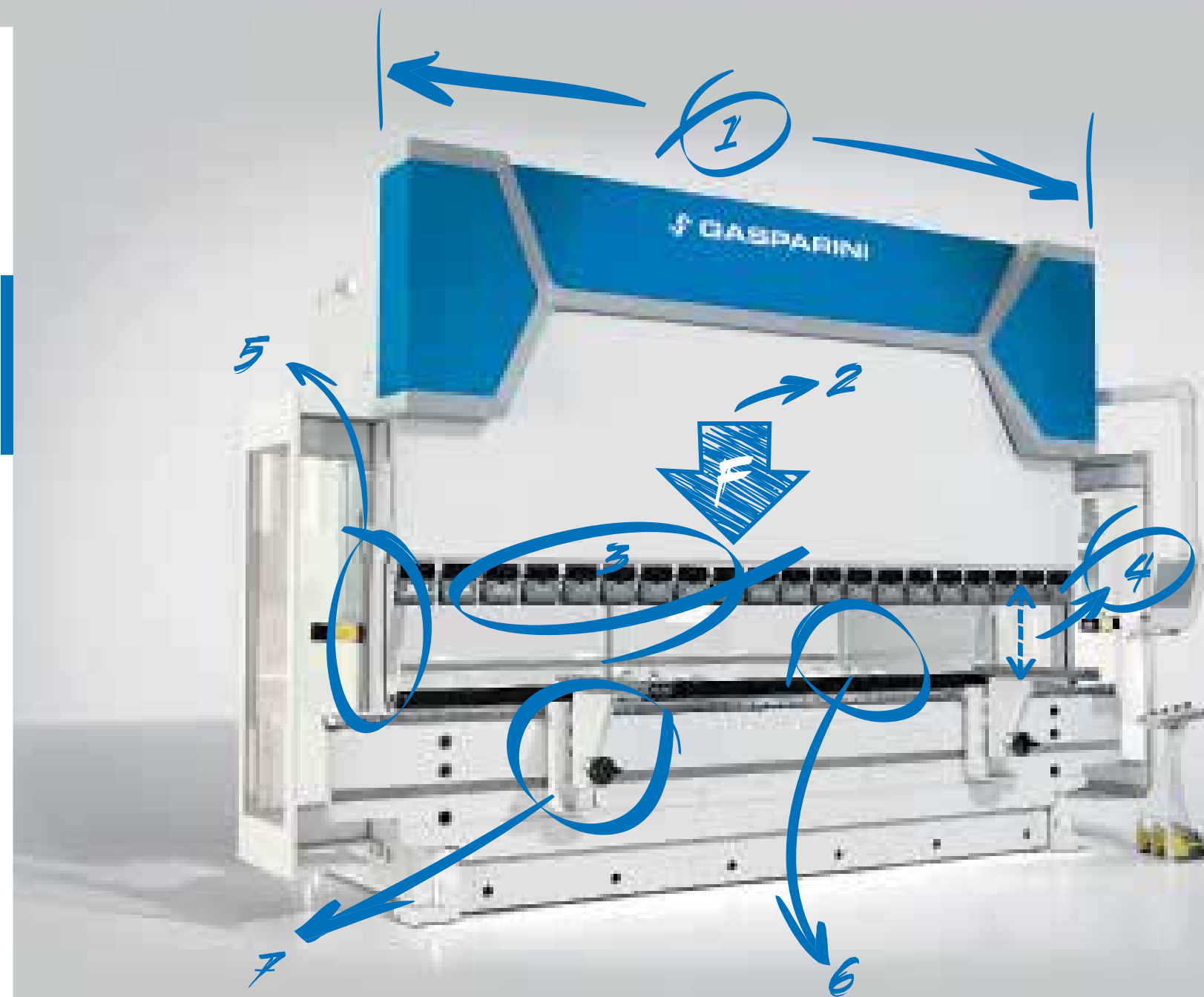
It varies according to total dimensions. Increased throat is useful for lateral extraction, as well as for tandem machines.

### 6 BACK GAUGES

As well as the basic axis X+R, we can add Z1+Z2 axis for very long pieces; X5 and X6 axis are used to make conical bends. An increased number of axis allows for more flexibility on conical or complex bends. The RPG version is the stronger and more powerful solution.

### 7 FRONT SUPPORTS AND SHEET FOLLOWERS

Useful to protect and support the sheet, with hemming bench, or with very large pieces.



#### 01 \_ CONFIGURATION

02 \_ X-PRESS

03 \_ FRAME

04 \_ COMPENSATION  
SYSTEMS

05 \_ ECO

06 \_ BACK GAUGES

07 \_ CLAMPING

08 \_ ANGLE  
CONTROL

09 \_ FRONT  
SUPPORTS

10 \_ PEDALS

11 \_ CNC

12 \_ DRIVE BAR

13 \_ TANDEM

14 \_ ROBOTIC  
CELL

15 \_ MATRIX

16 \_ UTILITIES



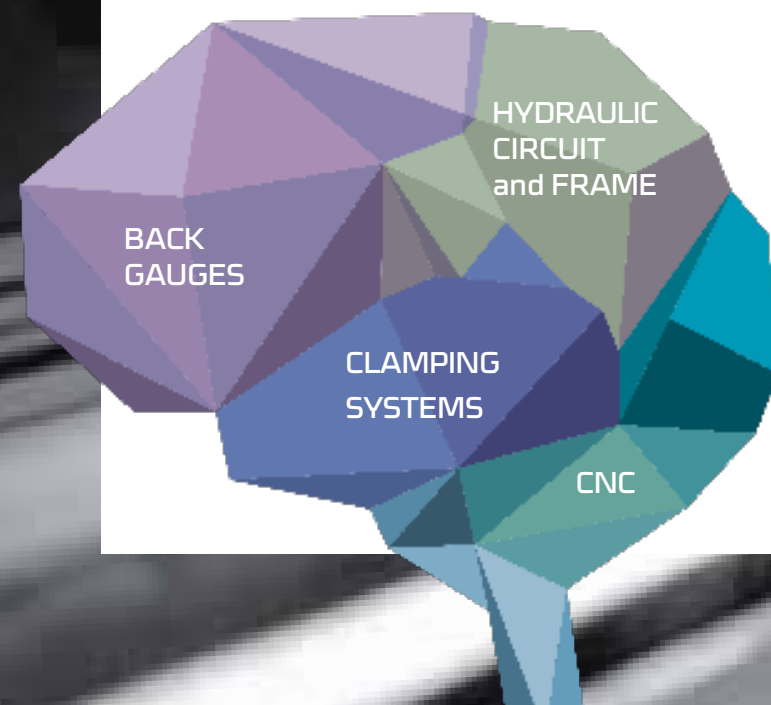


## > X-PRESS

An entire range of models and tonnage to satisfy the most advanced needs.

X-PRESS is the result of the innovation strategy of Gasparini combined with 40 years of experience in the design and production of press brakes.

The X-PRESS is available in a wide range of models and powers. A skilled technical office and a flexible manufacturing plant enable production of even very high tonnage machines, with any bending length. With standalone, tandem and tridem configurations, with a wide range of accessories (back gauges, front supports, clamping systems, sheet followers, controls, etc.), with tailor-made approach, we always guarantee the best solution for every production need and every set of technical and economic constraints.



Four elements,  
new forms of intelligence.

Design and production  
made in Gasparini.

**FLEXIBILITY  
TOP PERFORMANCES  
HIGH STANDARDS**

01\_CONFIGURATION

02\_X-PRESS

03\_FRAME

04\_COMPENSATION  
SYSTEMS

05\_ECO

06\_BACK GAUGES

07\_CLAMPING

08\_ANGLE  
CONTROL

09\_FRONT  
SUPPORTS

10\_PEDALS

11\_CNC

12\_DRIVE BAR

13\_TANDEM

14\_ROBOTIC  
CELL

15\_MATRIX

16\_UTILITIES





# Hydraulic circuit

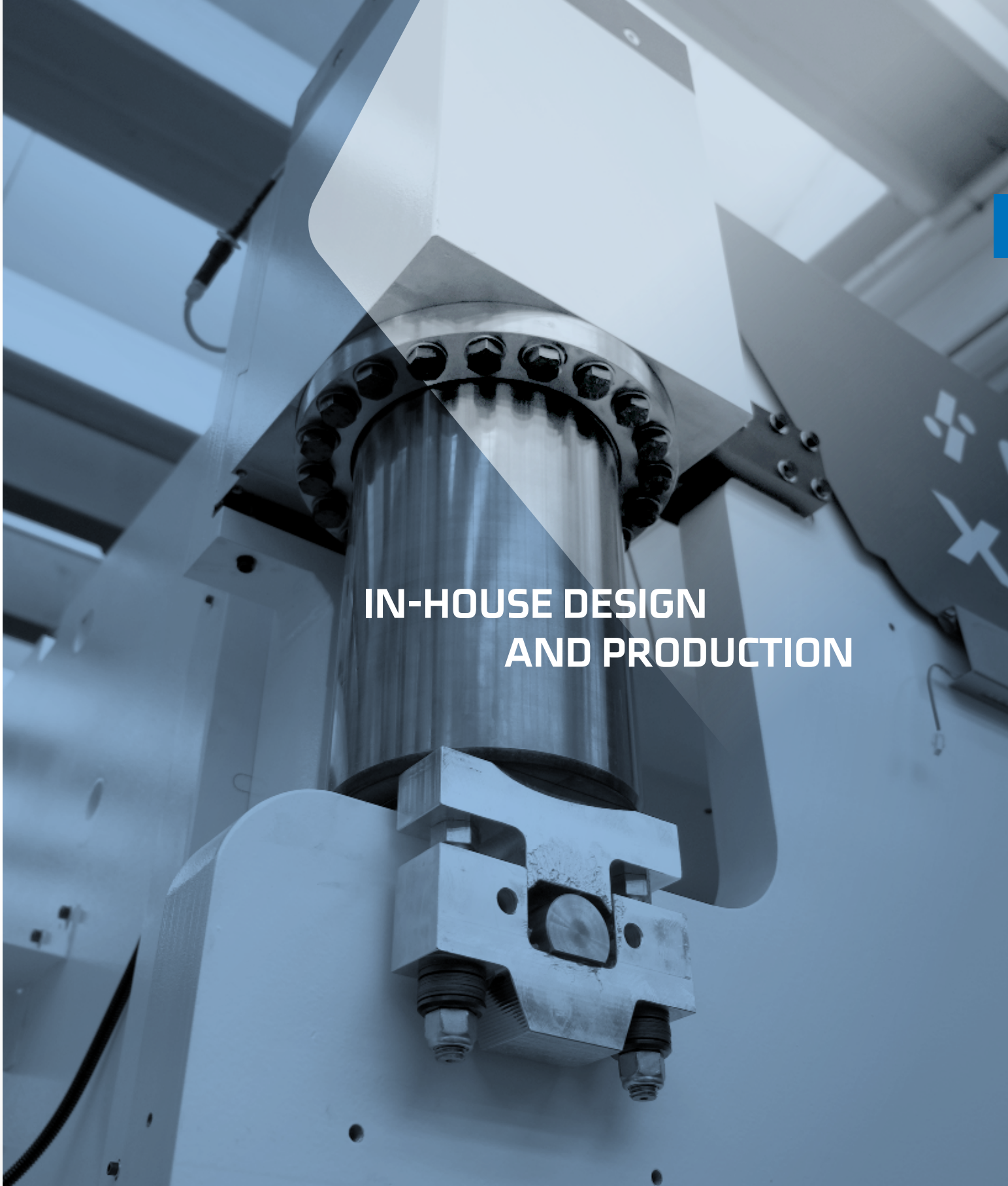
The hydraulic circuit represents the heart, veins and muscles of a press brake.

- + Hydraulic operation with two cylinders
- + High performance hydraulic gear pump
- + High pressure filter (with clogging detector and bypass) placed before all components
- + Air removal filter in the reservoir
- + Fast descent by gravity, bending phase and return of the ram are controlled electronically via a proportional flow valve
- + Bending force controlled by proportional pressure valves.
- + Quality oil with high viscosity index
- + Hydraulic components from leading companies worldwide
- + Connectors and system tube sizing according to din regulations
- + Flanged connectors and hoses according to sae regulations
- + Dimensioning of the reservoir to allow for better heat dissipation and optional heat exchanger in countries with tropical climates or intensive working cycles
- + Oil heaters to quickly bring the oil to optimal working temperature in cold climates
- + Components layout so as to favor the maximum serviceability, as well as to allow to install additional hydraulic units of any accessories
- + Construction of cylinders with high quality materials, hardening heat treatment and very accurate finishing for the sliding surfaces.
- + Choice of seals and sizing of the housings is a result of many years of experience
- + Preventive system flushing and thorough testing

The ram is another important element. Its main features are:

- + Sliding on materials that do not require lubrication
- + Fixing to each cylinder thanks to a hinge mounted on a ball joint and with the possibility of lateral sliding to compensate for any phase shift applied to the cylinders for conical folds

Hydraulic and mechanical safety devices prevent any excessive strain to the machine, deriving from an error by the operator or the electronic control. The hydraulic circuit of Gasparini press brakes can be oversized and equipped with heat exchangers to withstand even the most demanding working conditions.



01 \_ CONFIGURATION

02 \_ X-PRESS

03 \_ FRAME

04 \_ COMPENSATION  
SYSTEMS

05 \_ ECO

06 \_ BACK GAUGES

07 \_ CLAMPING

08 \_ ANGLE  
CONTROL

09 \_ FRONT  
SUPPORTS

10 \_ PEDALS

11 \_ CNC

12 \_ DRIVE BAR

13 \_ TANDEM

14 \_ ROBOTIC  
CELL

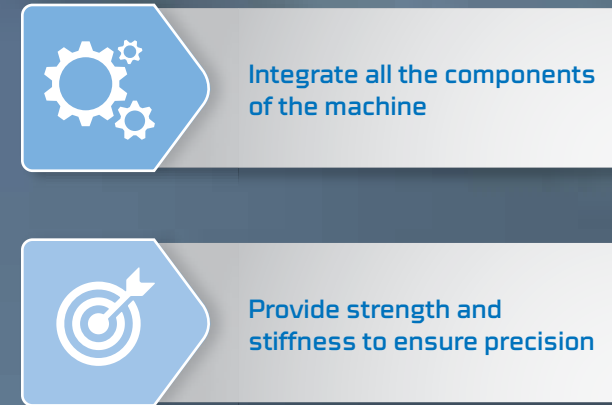
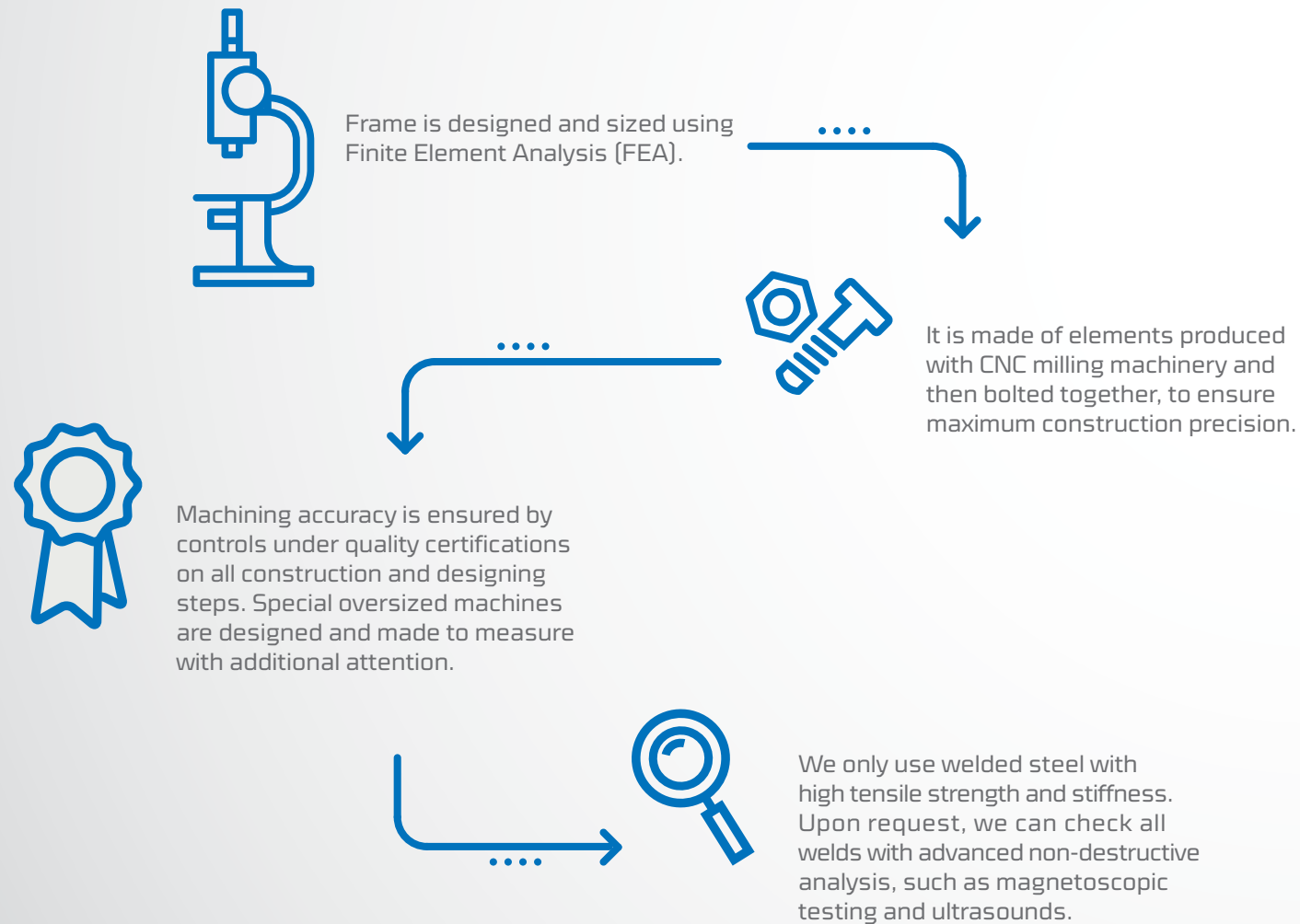
15 \_ MATRIX

16 \_ UTILITIES



## > FRAME

A milled and bolted frame, made of high-resistance steel, ensures the highest precision.



## THE SUPPORTING FRAME

01 \_ CONFIGURATION

02 \_ X-PRESS

03 \_ FRAME

04 \_ COMPENSATION  
SYSTEMS

05 \_ ECO

06 \_ BACK GAUGES

07 \_ CLAMPING

08 \_ ANGLE  
CONTROL

09 \_ FRONT  
SUPPORTS

10 \_ PEDALS

11 \_ CNC

12 \_ DRIVE BAR

13 \_ TANDEM

14 \_ ROBOTIC  
CELL

15 \_ MATRIX

16 \_ UTILITIES



## > COMPENSATION SYSTEMS

They compensate the press brake frame deformation. Do you want to get the same angle on short and long pieces? Here's how you can.

All systems based on statistical deformations are inaccurate by nature. Each type of material, due to its own characteristics and conditions, behaves differently during the bending process. That is why it is almost impossible to foresee all the possible reactions involved while maintaining maximum precision.



It is far better to intervene in the process during the actual bending sequence, in real time.

### REFLEX

the proportional compensation system

### ACSG1

the active real-time crowning system



Measure the frame deformation



Guarantee uniform angles over the entire length

01\_CONFIGURATION

02\_X-PRESS

03\_FRAME

04\_COMPENSATION SYSTEMS

05\_ECO

06\_BACK GAUGES

07\_CLAMPING

08\_ANGLE CONTROL

09\_FRONT SUPPORTS

10\_PEDALS

11\_CNC

12\_DRIVE BAR

13\_TANDEM

14\_ROBOTIC CELL

15\_MATRIX

16\_UTILITIES





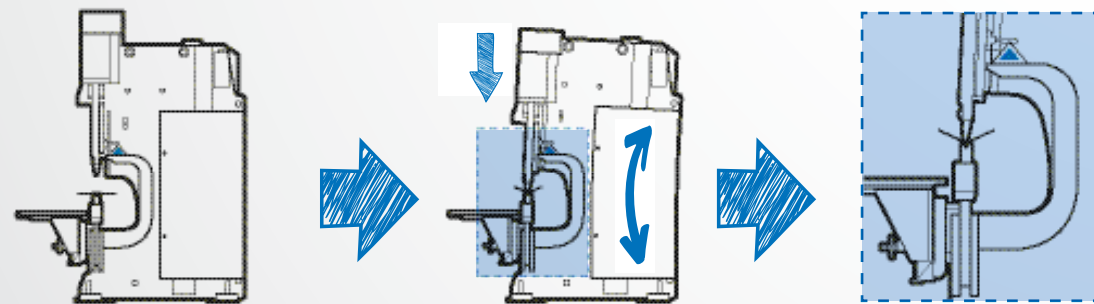
## Reflex

### Patented proportional frame deformation correction system.

During the bending process, the side frames are subject to deflection. This effect results in the top beam moving away from the lower beam, compromising the accuracy of the control systems. Frame deformation is a physical phenomenon that cannot be avoided.

Reflex is a system designed by Gasparini to monitor the press brake structural deflections. The system, which is installed on all Gasparini press brakes, is composed of a sliding device, connected to the linear encoder, which is placed on the C-shaped side frames anchored to the lower beam.

These side frames are not affected by the structural deflections as they are not connected to the machine's frame, and allow a correct positioning of the ram, thus achieving the same bending angle along the whole work piece. Regardless of the length, thickness and position of the work piece, as well as from the side frame deflections that may arise due to the loading force, the position of the top beam is constantly checked during the bending process so to assure a constant angle.



EFFECTIVE ON EACH  
AND EVERY PIECE

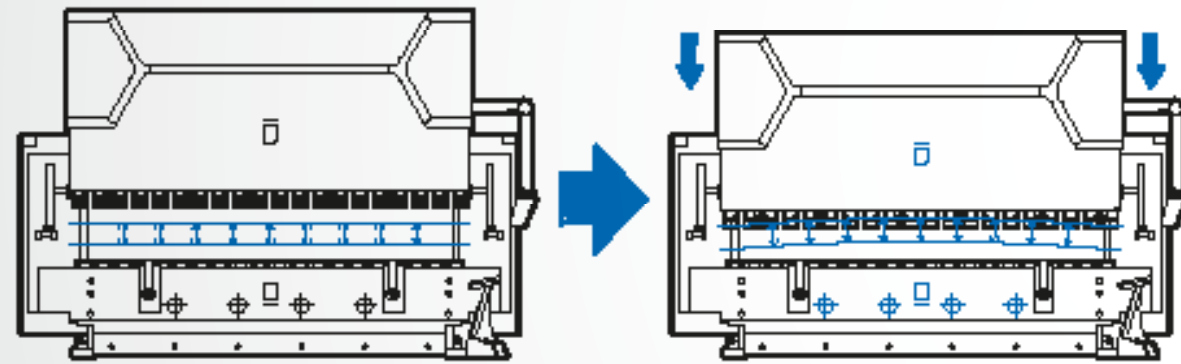
[01 \\_ CONFIGURATION](#)[02 \\_ X-PRESS](#)[03 \\_ FRAME](#)[04 \\_ COMPENSATION  
SYSTEMS](#)[05 \\_ ECO](#)[06 \\_ BACK GAUGES](#)[07 \\_ CLAMPING](#)[08 \\_ ANGLE  
CONTROL](#)[09 \\_ FRONT  
SUPPORTS](#)[10 \\_ PEDALS](#)[11 \\_ CNC](#)[12 \\_ DRIVE BAR](#)[13 \\_ TANDEM](#)[14 \\_ ROBOTIC  
CELL](#)[15 \\_ MATRIX](#)[16 \\_ UTILITIES](#)






## ACSG1

The only patented active crowning system for a constant angle.

The heart of our ACSG1 system lies in the two sensors placed on the ram and on the lower beam of the machine. The former detects deformation of the ram since the beginning of the bending process. The CNC drives the cylinders in the lower beam until the reading of the latter sensor equals the former. This way, the two beams are completely parallel. The result is complete control at maximum precision and absolute repeatability, with any material.



-  SENSOR IN THE RAM
-  SENSOR IN THE LOWER BEAM
-  CROWNING CYLINDERS

You don't have to set any value: the machine reads it from its sensors. The material may change completely from one piece to another, and the press brake will always react in the best way.

**ACSG2** is the most advanced version of Gasparini active crowning, part of the **ECO+** package. In this configuration, we have a pressurized oil reservoir, charged when the press brake is not active. When bending, the system therefore already has a spare volume of oil, ready to be used. Crowning starts instantly, reducing idle times and lowering motor and pump stress. Also power consumption is reduced, because the oil reservoir enables a smaller pump that can run at reduced power.

**ACSG2** is a **patented system**, a result of Gasparini's research and development.

## CONTROL OF THE MACHINE DEFORMATION IN REAL TIME

01\_CONFIGURATION

02\_X-PRESS

03\_FRAME

04\_COMPENSATION  
SYSTEMS

05\_ECO

06\_BACK GAUGES

07\_CLAMPING

08\_ANGLE  
CONTROL09\_FRONT  
SUPPORTS

10\_PEDALS

11\_CNC

12\_DRIVE BAR

13\_TANDEM

14\_ROBOTIC  
CELL

15\_MATRIX

16\_UTILITIES



## ECO CONCEPT

A package of innovative and customer-oriented solutions aimed at reducing machine consumptions.

The ECO approach has a dual value: *eco-nomy* to optimize company resources utilization; *eco-logy* to take care of the environment for a better future.

The first application of the ECO Concept is the brand new X-Press ECO series.

The ECO+ version includes the ACSG2 crowning system



**Respect for the environment**  
**Energy saving**  
**Speed**  
**Reduced noise**  
**Less maintenance**  
**Less waste**  
**Extreme precision**  
**Repeatability**



Drive the motor and  
ACSG2 crowning



Reduce consumption and  
increase speed

01\_CONFIGURATION

02\_X-PRESS

03\_FRAME

04\_COMPENSATION  
SYSTEMS

05\_ECO

06\_BACK GAUGES

07\_CLAMPING

08\_ANGLE  
CONTROL

09\_FRONT  
SUPPORTS

10\_PEDALS

11\_CNC

12\_DRIVE BAR

13\_TANDEM

14\_ROBOTIC  
CELL

15\_MATRIX

16\_UTILITIES



## › POWER ONLY WHEN YOU NEED IT

The motor is controlled by an inverter, which is only activated when the machine is operating, always and only delivering the power requested by the bending process. When the machine is idle, the pump is stopped so that energy consumption and oil stress are greatly reduced.



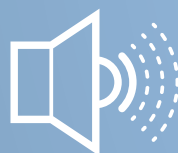
## › SAME JOB, 50% LESS ENERGY

The ECO system permits a more rational and efficient use of energy, with a saving of up to 50% compared to the standard version. ACSG2 active crowning, fast and precise, is only available in the ECO+ package.



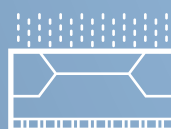
## › LESS WASTE, LESS MAINTENANCE

Reduced maximum oil temperature means less energy usage, increased oil and pump life, and less maintenance costs



## › LESS NOISE

Noise level on the operator side never exceeds 63 dBa: as much as a normal conversation, less than a vacuum cleaner.



## › MORE SPEED: 230 MM/S

The new X-Press ECO sets a new industry record with approaching and return speeds of up to 230 mm/s.

**LESS CONSUMPTION,  
MORE EFFICIENCY**

01 \_ CONFIGURATION

02 \_ X-PRESS

03 \_ FRAME

04 \_ COMPENSATION  
SYSTEMS

05 \_ ECO

06 \_ BACK GAUGES

07 \_ CLAMPING

08 \_ ANGLE  
CONTROL09 \_ FRONT  
SUPPORTS

10 \_ PEDALS

11 \_ CNC

12 \_ DRIVE BAR

13 \_ TANDEM

14 \_ ROBOTIC  
CELL

15 \_ MATRIX

16 \_ UTILITIES





## BACK GAUGES

X-Press press brakes can be equipped with a wide range of back gauges to meet the most varied production needs. The RPS and RPG series are characterized by robustness, accuracy and repeatability.

**Brushless** motors permit fast displacement of back gauges, thus reducing idle times. Linear guides with rack and pinion drive guarantee high and constant precision thanks to the compensation of mechanical clearance.

The type of back gauges and the number of axis can be adapted to specific manufacturing, piece size and number of working station. Special options like retractable sheet supports and back sheet followers can be installed. In this way the most varied production needs can be satisfied.

All back gauges, also in the basic 2 axes configuration, can be moved and repositioned without having to access the rear of the machine, with considerable time-saving safety advantages. By selecting the F function (available on press brakes between 50 and 330 tons), the operator pneumatically unlocks and moves the turrets toward himself without the use of keys or tools: the operator can now reposition the back gauges according to the new needs from his working station.

Thanks to the **Anti-collision System**, the back gauge punch is disengaged in the event of shocks that could damage it or even make it lose its position. In this case, the operator can easily put the gauge back in its seat.

With the **Thin-support** system (optional retractable back supports) even thinner sheets are always correctly positioned and guided. Back supports have ball sliders and brushes to protect even the most delicate surfaces.

The RPS and RPG series with the different versions cover all combinations from 2 to 6 or more axes. The RPG system is based on completely independent turrets and integrates the maximum number of axes.



Position the piece to bend in the desired place



Bend profiles, boxes, pipes and any other product

01 \_ CONFIGURATION

02 \_ X-PRESS

03 \_ FRAME

04 \_ COMPENSATION  
SYSTEMS

05 \_ ECO

06 \_ BACK GAUGES

07 \_ CLAMPING

08 \_ ANGLE  
CONTROL

09 \_ FRONT  
SUPPORTS

10 \_ PEDALS

11 \_ CNC

12 \_ DRIVE BAR

13 \_ TANDEM

14 \_ ROBOTIC  
CELL

15 \_ MATRIX

16 \_ UTILITIES





The range

1500 t

420 t

330 t

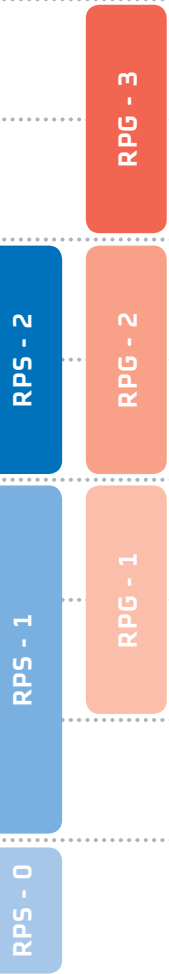
200 t

150 t

100 t

50 t

25 t



|                                                |  | RPS<br>series | RPG<br>series |
|------------------------------------------------|--|---------------|---------------|
| 4 axes:<br>Y1 - Y2 - X - R                     |  | ✓             |               |
| 6 axes:<br>Y1 - Y2 - X - R - Z1 - Z2           |  | ✓             |               |
| 7 axes:<br>Y1 - Y2 - X - R - Z1 - Z2 - X5      |  | ✓             |               |
| 8 axes:<br>Y1 - Y2 - X - R - Z1 - Z2 - X5 - X6 |  | ✓             |               |
| 8 axes:<br>completely independent              |  |               | ✓             |

A wide range of back gauges  
and sheet followers to meet  
all needs.

01 \_ CONFIGURATION

02 \_ X-PRESS

03 \_ FRAME

04 \_ COMPENSATION  
SYSTEMS

05 \_ ECO

06 \_ BACK GAUGES

07 \_ CLAMPING

08 \_ ANGLE  
CONTROL

09 \_ FRONT  
SUPPORTS

10 \_ PEDALS

11 \_ CNC

12 \_ DRIVE BAR

13 \_ TANDEM

14 \_ ROBOTIC  
CELL

15 \_ MATRIX

16 \_ UTILITIES





# The RPS series

The RPS back gauge consists of a one-piece structure, driven by rack and pinion travelling on recirculating ball linear guides.

It includes an X and R axes (depth and height) in the standard configuration and is fitted with two or more reference back fingers (according to machine length), assembled on linear guides. The guide profile is made of an aluminium extruded part whose design grants high rigidity and thus precision. All axes of the back gauge are programmed for maximum speed for all movements and for deceleration when nearing requested distances.

The back gauge has an integrated safety device so that it cannot hit the tools and which varies according to the size of the lower tool. The RPS system can be expanded upon request even on installed machines.

- + High speed
- + High accuracy and reliability
- + AC brushless motors
- + The movements of the X and R axes are made with hardened and ground rack-and-pinion with modular pitch
- + Z-axis movement with straight-toothed precision modular rack-and-pinion transmission
- + Up to 80 degrees of conical bend
- + Less noise, greater durability and greater precision

| MODEL / CHARACTERISTIC        | RPS - 0 | RPS - 1 | RPS - 2 |
|-------------------------------|---------|---------|---------|
| X axis standard stroke (mm)   | 300     | 600     | 800     |
| X axis speed (mm/s)           | 500     | 500     | 250     |
| X axis precision (mm)         | ±0,05   | ±0,05   | ±0,10   |
| X axis repeatability (mm)     | ±0,02   | ±0,02   | ±0,05   |
| R axis standard stroke (mm)   | 150     | 200     | 250     |
| R axis speed (mm/s)           | 125     | 250     | 160     |
| R axis precision (mm)         | ±0,1    | ±0,1    | ±0,1    |
| R axis repeatability (mm)     | ±0,05   | ±0,05   | ±0,05   |
| Z axis speed (mm/s)           | -       | 1600    | 1600    |
| Z axis precision (mm)         | -       | ±0,02   | ±0,02   |
| Z axis repeatability (mm)     | -       | ±0,05   | ±0,05   |
| X5-X6 axes stroke (mm)        | -       | ±150    | ±150    |
| X5-X6 axes speed (mm/s)       | -       | 125     | 125     |
| X5-X6 axes precision (mm)     | -       | ±0,10   | ±0,10   |
| X5-X6 axes repeatability (mm) | -       | ±0,05   | ±0,05   |
| X6 axis maximum* angle (°)    | -       | 65      | 65      |
| X5-X6 axes maximum* angle (°) | -       | 80      | 80      |

[\*] these values may be lower with retractable rear supports



VERSATILE,  
FAST, PRECISE

01 \_ CONFIGURATION

02 \_ X-PRESS

03 \_ FRAME

04 \_ COMPENSATION  
SYSTEMS

05 \_ ECO

06 \_ BACK GAUGES

07 \_ CLAMPING

08 \_ ANGLE  
CONTROL

09 \_ FRONT  
SUPPORTS

10 \_ PEDALS

11 \_ CNC

12 \_ DRIVE BAR

13 \_ TANDEM

14 \_ ROBOTIC  
CELL

15 \_ MATRIX

16 \_ UTILITIES





# The RPG series

The RPG back gauge system is extremely sturdy and precise, suitable for heavy processing as well as any type of bending on machines from 100 tons to 1500 tons.

In order to assure this level of performance, the back gauges are designed and manufactured with high technology, sophisticated and reliable components, providing a wide handling range, an easy oblique positioning, a very high precision and the possibility to integrate back sheet followers.

The RPG back gauge series consists of two or more trolleys, each equipped with 3 axes (X-R-Z), which are moved by linear guides, ball screws and AC brushless motors. This configuration with independent trolleys and axes enable any kind of positioning, does not limit any kind of inclination or conical bending, and furthermore allows the operator to make a large variety of movements within the machine itself.

On the rear side of the machine, it is possible to install sheet followers, to support the metal sheet in a similar way as with front sheet followers. They are especially useful in case of very thin, wide and heavy metal sheets.

- + High flexibility
- + X1-X2-R1-R2-Z1-Z2
- + Optional sheet followers
- + X axis stroke increased

| MODEL / CHARACTERISTIC      | RPG - 0 | RPG - 1 | RPG - 2 |
|-----------------------------|---------|---------|---------|
| X axis standard stroke (mm) | 800     | 1000    | 1000    |
| X axis speed (mm/s)         | 400     | 400     | 400     |
| X axis precision (mm)       | ±0,1    | ±0,1    | ±0,1    |
| X axis repeatability (mm)   | ±0,05   | ±0,05   | ±0,05   |
| R axis standard stroke (mm) | 250     | 250     | 300     |
| R axis speed (mm/s)         | 250     | 250     | 250     |
| R axis precision (mm)       | ±0,1    | ±0,1    | ±0,2    |
| R axis repeatability (mm)   | ±0,05   | ±0,05   | ±0,01   |
| Z axis speed (mm/s)         | 500     | 500     | 500     |
| Z axis precision (mm)       | ±0,02   | ±0,02   | ±0,02   |
| Z axis repeatability (mm)   | ±0,01   | ±0,01   | ±0,01   |

SUITABLE FOR  
HEAVY PROCESSING

01 \_ CONFIGURATION

02 \_ X-PRESS

03 \_ FRAME

04 \_ COMPENSATION  
SYSTEMS

05 \_ ECO

06 \_ BACK GAUGES

07 \_ CLAMPING

08 \_ ANGLE  
CONTROL

09 \_ FRONT  
SUPPORTS

10 \_ PEDALS

11 \_ CNC

12 \_ DRIVE BAR

13 \_ TANDEM

14 \_ ROBOTIC  
CELL

15 \_ MATRIX

16 \_ UTILITIES



## LaserLine

Bend without backgauges for multi-step bending and bumping.

It stems from the need of some customers to perform the so-called "**bending by marking**", a bend without the aid of back gauges; the typical case of the **multi-step bending (bumping)**.

The Laserline allows you to check that the metal sheet is in the correct position for the bend. It can also be applied in machines already sold, depending on the CNC version installed.

CONICAL BENDS  
MADE EASIER

[01 \\_ CONFIGURATION](#)[02 \\_ X-PRESS](#)[03 \\_ FRAME](#)[04 \\_ COMPENSATION  
SYSTEMS](#)[05 \\_ ECO](#)[06 \\_ BACK GAUGES](#)[07 \\_ CLAMPING](#)[08 \\_ ANGLE  
CONTROL](#)[09 \\_ FRONT  
SUPPORTS](#)[10 \\_ PEDALS](#)[11 \\_ CNC](#)[12 \\_ DRIVE BAR](#)[13 \\_ TANDEM](#)[14 \\_ ROBOTIC  
CELL](#)[15 \\_ MATRIX](#)[16 \\_ UTILITIES](#)

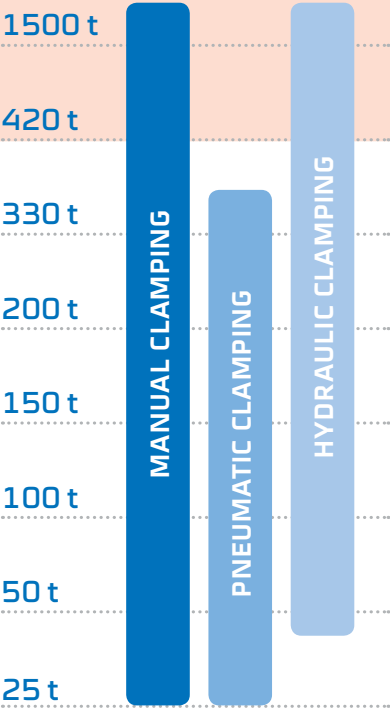


# TOOL CLAMPING

Supports for punches, dies, and intermediates.

To meet the widest range of production needs, Gasparini offers a complete range of clamping systems and intermediate adapters to fit almost all tools available. Combining Pneumatic, Hydraulic and Manual clamping technologies with a wide range of intermediates, Gasparini press brakes reach the best production needs coverage.

\* Tonnage not recommended on European-style tooling (Promecam)



Gasparini press brakes can equally use **long type tools** (i.e. Wila, Beyeler, LVD, Gasparini, etc.) fitted straight on the ram and **short type tools** (i.e. Promecam, etc.) fitted on the intermediate adapter.

|                    | EUROPEAN (PROMECAM)           | WILA        | GASPARINI                     | COLGAR-LVD BEYELER            |
|--------------------|-------------------------------|-------------|-------------------------------|-------------------------------|
|                    |                               |             |                               |                               |
| PNEUMATIC CLAMPING | only with adapters            | stand-alone | stand-alone                   | not available                 |
| HYDRAULIC CLAMPING | not available                 | stand-alone | stand-alone                   | only with adapters            |
| MANUAL CLAMPING    | stand-alone and with adapters | stand-alone | stand-alone and with adapters | stand-alone and with adapters |

Clamp punches and dies

Quickly change tools and hold them firmly

01 \_ CONFIGURATION

02 \_ X-PRESS

03 \_ FRAME

04 \_ COMPENSATION SYSTEMS

05 \_ ECO

06 \_ BACK GAUGES

07 \_ CLAMPING

08 \_ ANGLE CONTROL

09 \_ FRONT SUPPORTS

10 \_ PEDALS

11 \_ CNC

12 \_ DRIVE BAR

13 \_ TANDEM

14 \_ ROBOTIC CELL

15 \_ MATRIX

16 \_ UTILITIES



## Pneumatic clamping

### AIC system

The AIC upper self-aligning pneumatic tools clamping with intermediate, is suitable for European type tools. AIC clamp allows the tools to be inserted and removed safely from the front of the machine in a vertical manner. Tools are automatically aligned, seated and clamped, reducing changing time and significantly increasing productivity.

The AIC clamping system also allows the usage of punches in a reversed position, using a rear plate that can be activated from the front of the machine. Pneumatic clamping cannot be used above a certain tool weight or a maximum tonnage per meter.

### AIC AirSlide pneumatic sliding intermediates

The new pneumatic sliding intermediate adapters AIC AirSlide (patent pending) are a revolution in the world of press brake tool clamping. An innovative compressed air distribution system allows you to move them along the entire length of the ram in any position.

There is no air piping or other connections to be set. You can position them in the desired point, with just the push of a finger: you don't need any tools and there are no idle times. Intermediate adapters can be removed or added in any combination, with no air leaks. Moreover, they're self-aligning: when hydraulic clamping is activated, intermediates are immediately rested on the ram. No test bends are needed to align the elements.

- + no connection pipes, not even on the clamps
- + can be moved anywhere on the ram
- + no special tools needed, just a finger
- + no idle setup times
- + can be added or removed in any combination
- + with hydraulic clamping, no preparatory bends are needed to align the punches

[01 \\_ CONFIGURATION](#)[02 \\_ X-PRESS](#)[03 \\_ FRAME](#)[04 \\_ COMPENSATION  
SYSTEMS](#)[05 \\_ ECO](#)[06 \\_ BACK GAUGES](#)[07 \\_ CLAMPING](#)[08 \\_ ANGLE  
CONTROL](#)[09 \\_ FRONT  
SUPPORTS](#)[10 \\_ PEDALS](#)[11 \\_ CNC](#)[12 \\_ DRIVE BAR](#)[13 \\_ TANDEM](#)[14 \\_ ROBOTIC  
CELL](#)[15 \\_ MATRIX](#)[16 \\_ UTILITIES](#)





# Hydraulic clamping

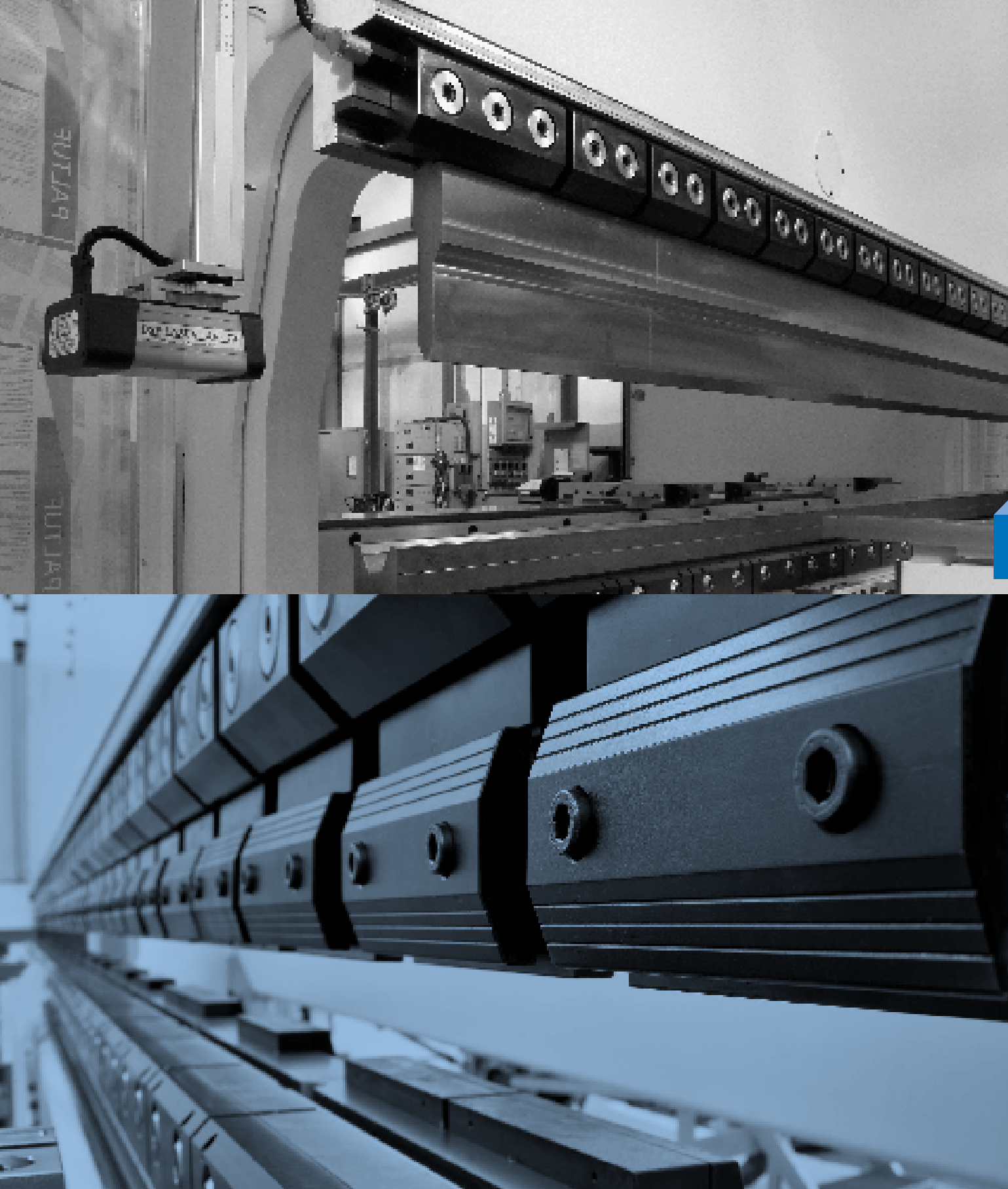
The hydraulic clamping system is used in **large size** machines and high bending forces, or with long tools that do not need intermediate tool holders.

The system achieves **high locking strengths** and, acting over large surfaces, needs low pressure and thereby guarantees a longer life for the system.  
The clamps allow the rapid and precise locking of the tool guaranteeing perfect alignment even in the case of fractional tools.

# Manual clamping

When production conditions do not require frequent tool changeover, the manual clamping system is a good choice.  
The manual clamping system is **very robust**: it does not have tonnage limit and can thus be used even for the highest tonnage.

Tools are extracted from the side in total safety since tools stay in place even when the clamping is open.



01 \_ CONFIGURATION

02 \_ X-PRESS

03 \_ FRAME

04 \_ COMPENSATION  
SYSTEMS

05 \_ ECO

06 \_ BACK GAUGES

07 \_ CLAMPING

08 \_ ANGLE  
CONTROL

09 \_ FRONT  
SUPPORTS

10 \_ PEDALS

11 \_ CNC

12 \_ DRIVE BAR

13 \_ TANDEM

14 \_ ROBOTIC  
CELL

15 \_ MATRIX

16 \_ UTILITIES



















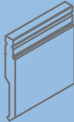



# Clamping systems for intermediate adapters

Intermediate elements can be mounted on the ram with Hydraulic or Manual clamping systems. The range includes four single-tool intermediates (one tool position) and six double-tool intermediates (front and reverse tool positions) with various combinations of clamping systems. Tools can be mounted on the intermediate adapters both manually or pneumatically.

The range of intermediate elements includes versions suitable to be mounted on almost all rams: this allows the press brake to equally use long type tools (i.e. Wila, Beyeler, LVD, Gasparini, etc.) fitted straight on the ram and short type tools (i.e. Promecam, etc.) fitted on the intermediate.



Various intermediate adapters are available, for all ram types

|                                                                                       |                                                                                       |  |                                                                                      |                                                                                       |                                                                                       |  |                                                                                      |  |                                                                                     |  |                                                                                     |  |
|---------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------|--|--------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------|--|--------------------------------------------------------------------------------------|--|-------------------------------------------------------------------------------------|--|-------------------------------------------------------------------------------------|--|
| SIMPLE<br>{top, bottom}                                                               | Manual<br>Manual                                                                      |  | Manual<br>Pneumatic                                                                  |                                                                                       | Hydraulic<br>Manual                                                                   |  | Hydraulic<br>Pneumatic                                                               |  |                                                                                     |  |                                                                                     |  |
|                                                                                       |    |  |   |                                                                                       |    |  |   |  |                                                                                     |  |                                                                                     |  |
| DOUBLE<br>{top, bottom, front, reverse}                                               | Manual<br>Manual - Manual                                                             |  | Manual<br>Pneumatic - Manual                                                         |                                                                                       | Manual<br>Pneumatic - Pneumatic                                                       |  | Hydraulic<br>Manual - Manual                                                         |  | Hydraulic<br>Pneumatic - Manual                                                     |  | Hydraulic<br>Pneumatic - Pneumatic                                                  |  |
|                                                                                       |    |  |   |                                                                                       |    |  |   |  |  |  |  |  |
| SUITABLE TOOL PROFILES                                                                | EUROPEAN<br>(Promecam)                                                                |  | EUROPEAN<br>(Promecam)                                                               |                                                                                       | EUROPEAN<br>(Promecam)                                                                |  | EUROPEAN<br>(Promecam)                                                               |  |                                                                                     |  |                                                                                     |  |
|                                                                                       |   |  |  |                                                                                       |   |  |  |  |                                                                                     |  |                                                                                     |  |
|                                                                                       | WILA                                                                                  |  |                                                                                      |                                                                                       | WILA                                                                                  |  |                                                                                      |  |                                                                                     |  |                                                                                     |  |
|                                                                                       |  |  |                                                                                      |                                                                                       |  |  |                                                                                      |  |                                                                                     |  |                                                                                     |  |
| GASPARINI                                                                             |                                                                                       |  |                                                                                      | GASPARINI                                                                             |                                                                                       |  |                                                                                      |  |                                                                                     |  |                                                                                     |  |
|  |                                                                                       |  |                                                                                      |  |                                                                                       |  |                                                                                      |  |                                                                                     |  |                                                                                     |  |
| COLGAR<br>LVD<br>BEYELER                                                              |                                                                                       |  |                                                                                      | COLGAR<br>LVD<br>BEYELER                                                              |                                                                                       |  |                                                                                      |  |                                                                                     |  |                                                                                     |  |
|  |                                                                                       |  |                                                                                      |  |                                                                                       |  |                                                                                      |  |                                                                                     |  |                                                                                     |  |

01 \_ CONFIGURATION

02 \_ X-PRESS

03 \_ FRAME

04 \_ COMPENSATION  
SYSTEMS

05 \_ ECO

06 \_ BACK GAUGES

07 \_ CLAMPING

08 \_ ANGLE  
CONTROL

09 \_ FRONT  
SUPPORTS

10 \_ PEDALS

11 \_ CNC

12 \_ DRIVE BAR

13 \_ TANDEM

14 \_ ROBOTIC  
CELL

15 \_ MATRIX

16 \_ UTILITIES





# Lower tool clamping systems

Thanks to the wide range of clamping systems, almost all lower tools (i.e. European-Promecam, Wila, Beyeler, LVD, Gasparini, etc.) can be fitted on the X-Press series with Pneumatic, Hydraulic or Manual clamping technologies.

|                       | EUROPEAN<br>(PROMECAM) | WILA-LVD-BEYELER<br>WITH INTERMEDIATES | WILA FIXED |
|-----------------------|------------------------|----------------------------------------|------------|
| MANUAL<br>CLAMPING    |                        |                                        |            |
|                       |                        |                                        |            |
|                       |                        |                                        |            |
| PNEUMATIC<br>CLAMPING |                        |                                        |            |
|                       |                        |                                        |            |
|                       |                        |                                        |            |
| HYDRAULIC<br>CLAMPING |                        |                                        |            |
|                       |                        |                                        |            |
|                       |                        |                                        |            |



01 \_ CONFIGURATION

02 \_ X-PRESS

03 \_ FRAME

04 \_ COMPENSATION  
SYSTEMS

05 \_ ECO

06 \_ BACK GAUGES

07 \_ CLAMPING

08 \_ ANGLE  
CONTROL

09 \_ FRONT  
SUPPORTS

10 \_ PEDALS

11 \_ CNC

12 \_ DRIVE BAR

13 \_ TANDEM

14 \_ ROBOTIC  
CELL

15 \_ MATRIX

16 \_ UTILITIES



# GPS4

The innovative and exact system for springback compensation.

Spring back is a phenomenon that appears when bending any type of material under any type of condition. The GPS4 angle measurement system ensures precise bends without the need to perform tests or corrections.

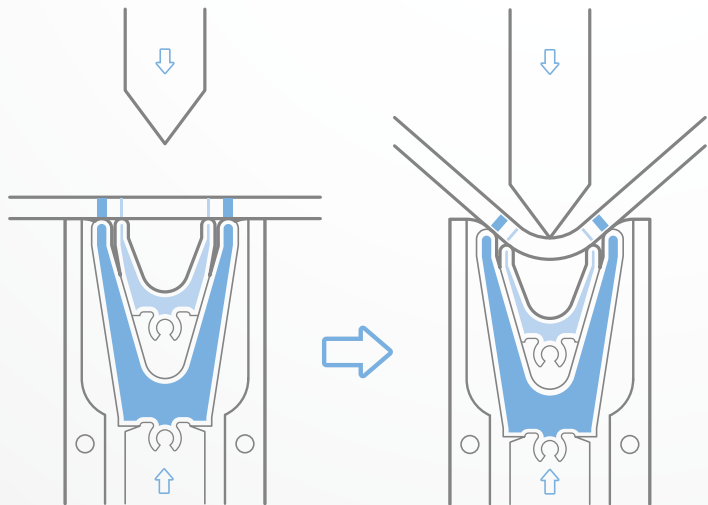
The GPS4 controls and adjust the angle during the bending process. A sensor, phisically contacting the material, measures the current angle in real time. It then sends the data to the CNC, allowing the press brake to reach the desired angle.



The heart of the system is the double-fork-**sensor** establishing **4 contact points** on the material: this detects the bending angle on two points on both sides of the bend. It then sends the data to the control system, thus enabling a perfect bend angle from the first piece to the last.

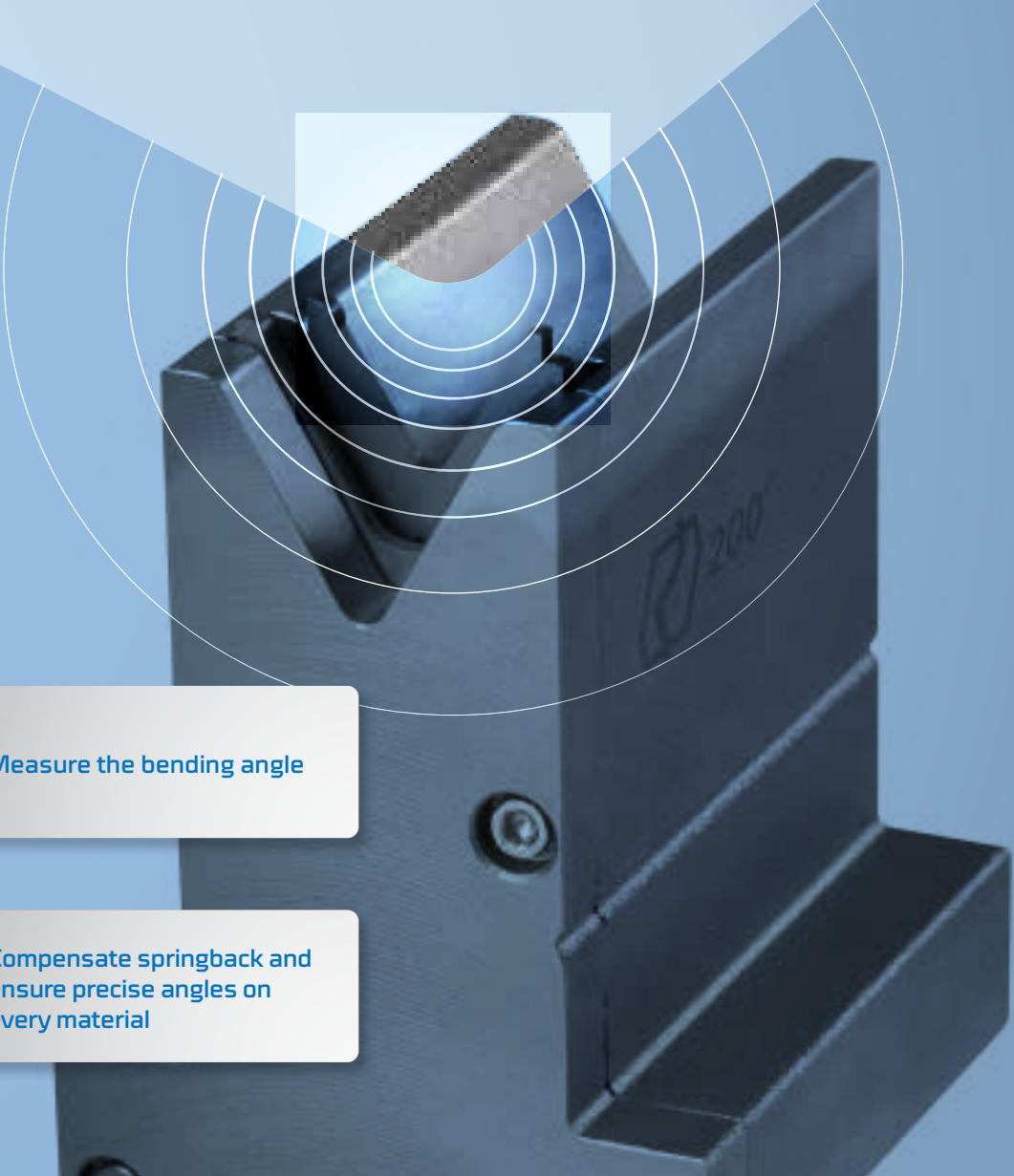



CONTACT POINTS




|                                                     |      |
|-----------------------------------------------------|------|
| Minimum die opening (mm)                            | 8    |
| Maximum die opening (mm)                            | 160  |
| Minimum die height (mm)                             | 18   |
| Minimum die length (mm)                             | 80   |
| Max. measurable angle (on 8 to 10-mm die opening)   | 135° |
| Max. measurable angle (on 12 to 160-mm die opening) | 150° |
| Minimum measurable angle                            | 70°  |

## NO MORE WRONG PRODUCTS





Measure the bending angle



Compensate springback and ensure precise angles on every material

01 \_ CONFIGURATION

02 \_ X-PRESS

03 \_ FRAME

04 \_ COMPENSATION SYSTEMS

05 \_ ECO

06 \_ BACK GAUGES

07 \_ CLAMPING

08 \_ ANGLE CONTROL

09 \_ FRONT SUPPORTS

10 \_ PEDALS

11 \_ CNC

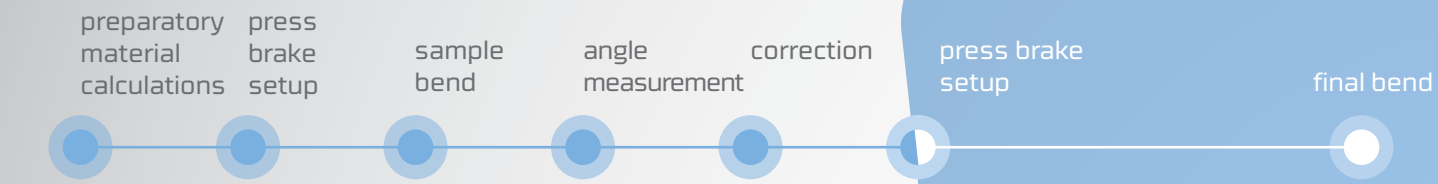
12 \_ DRIVE BAR

13 \_ TANDEM

14 \_ ROBOTIC CELL

15 \_ MATRIX

16 \_ UTILITIES



*Much more precise.  
In much less time.*

VS

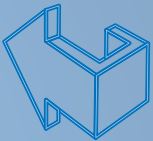
empirical method

GPS4 system

It allows to bend pieces with flanges that do not extend beyond the width of the V-die



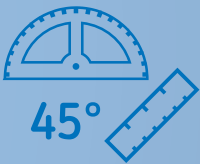
It allows to bend pieces with counterbends, without problems derived by error accumulation



Maximum precision and repeatability without manual correction



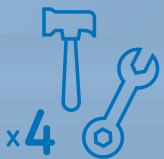
The angle measurement is real, not theoretic



The system leaves free space around the work area



It is possible to use up to four working stations



Available for most commercial dies



01\_CONFIGURATION

02\_X-PRESS

03\_FRAME

04\_COMPENSATION  
SYSTEMS

05\_ECO

06\_BACK GAUGES

07\_CLAMPING

08\_ANGLE  
CONTROL

09\_FRONT  
SUPPORTS

10\_PEDALS

11\_CNC

12\_DRIVE BAR

13\_TANDEM

14\_ROBOTIC  
CELL

15\_MATRIX

16\_UTILITIES



## › FRONT SUPPORTS

They support and guide sheet metal to maximize productivity and facilitate your work.

Wide range of supporting arms:

### CE STANDARD

FSA-A

FSA-B

FSA-C

FSA-D

### FRONT SHEET FOLLOWERS



Support and follow sheet metal



Bend even the biggest panels, use hemming benches

01 \_ CONFIGURATION

02 \_ X-PRESS

03 \_ FRAME

04 \_ COMPENSATION  
SYSTEMS

05 \_ ECO

06 \_ BACK GAUGES

07 \_ CLAMPING

08 \_ ANGLE  
CONTROL

09 \_ FRONT  
SUPPORTS

10 \_ PEDALS

11 \_ CNC

12 \_ DRIVE BAR

13 \_ TANDEM

14 \_ ROBOTIC  
CELL

15 \_ MATRIX

16 \_ UTILITIES





## CE standard

Standard CE sheet front support with adjustable height.  
Provided as standard if no other supports are chosen.

## FSA - A

Front support arms made of aluminium profiles.  
The coupling system allows quick positioning along its entire length.

They are also vertically adjustable to suit the height of the bottom tool.  
The support has a particular aluminium profile allowing:

- › DISAPPEARING STOPS
- › GRADED RULER
- › STEEL BALL TRANSFERS

A series of accessories can be installed on request, including brushes to support materials having delicate surfaces, micrometric gauges and protractor.



ADJUSTABLE  
HEIGHT



POSITIONING ALONG  
THE ENTIRE LENGTH

[01 \\_ CONFIGURATION](#)[02 \\_ X-PRESS](#)[03 \\_ FRAME](#)[04 \\_ COMPENSATION  
SYSTEMS](#)[05 \\_ ECO](#)[06 \\_ BACK GAUGES](#)[07 \\_ CLAMPING](#)[08 \\_ ANGLE  
CONTROL](#)[09 \\_ FRONT  
SUPPORTS](#)[10 \\_ PEDALS](#)[11 \\_ CNC](#)[12 \\_ DRIVE BAR](#)[13 \\_ TANDEM](#)[14 \\_ ROBOTIC  
CELL](#)[15 \\_ MATRIX](#)[16 \\_ UTILITIES](#)



## FSA - B

This type of sliding front support has been designed to facilitate the job of the operator.

They are attached to the press brake by means of a linear guide, which allows positioning along the entire length of the machine; they are also vertically adjustable on an axis with precision ball screws to suit the height of the bottom tool.

The linear guides extend beyond the table where the supports can be stored when not in use. The support has a particular aluminium profile allowing:

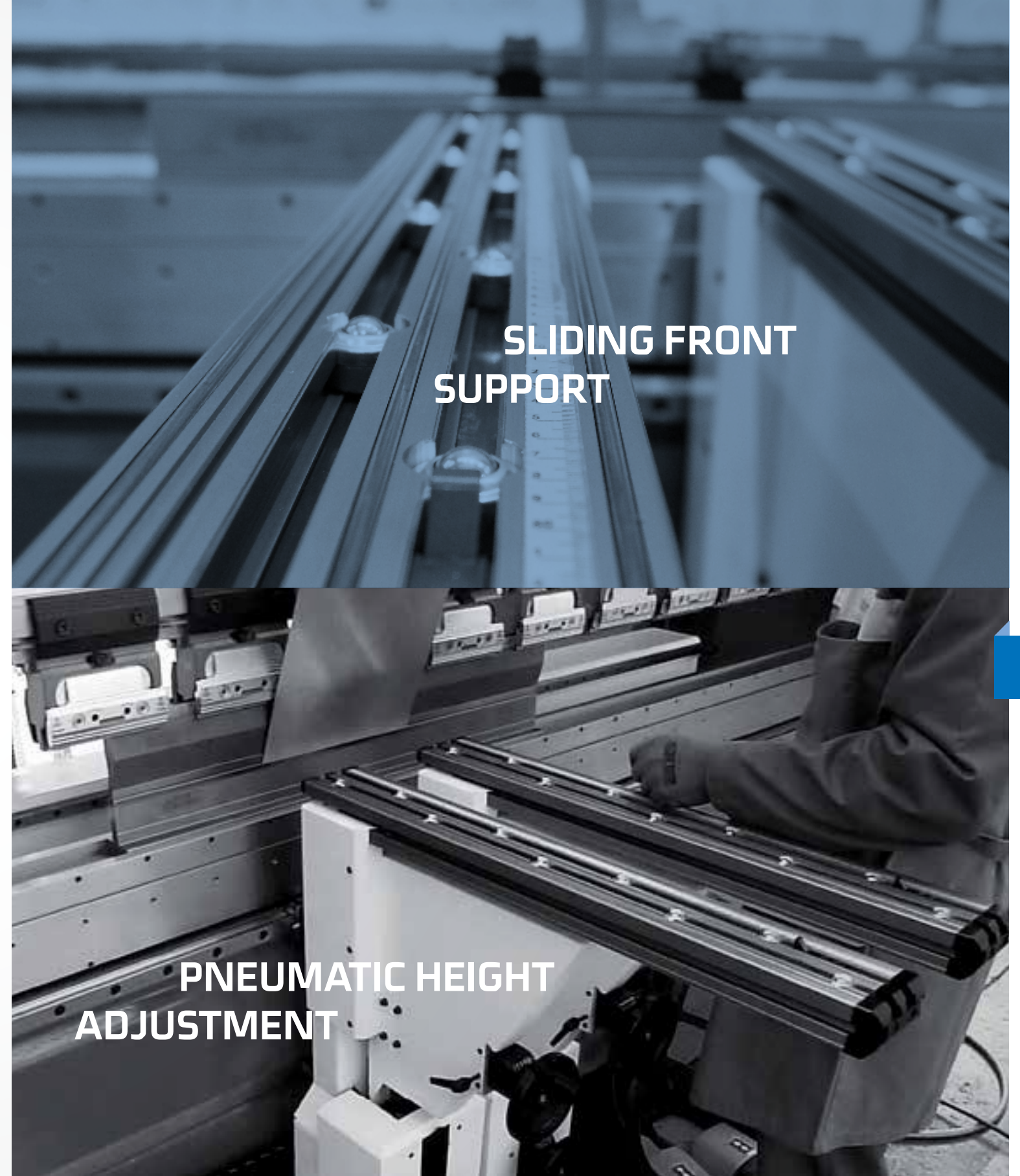
- › DISAPPEARING STOPS
- › GRADED RULER
- › STEEL BALL TRANSFERS

A series of accessories can be installed on request, including brushes to support materials having delicate surfaces, micrometric gauges and protractor.

## FSA - C

This type of front support is similar to FSA-B, but, in addition, it has a pneumatic height adjustment (dual positioning), controlled by the CNC.

This function is useful when working with hemming bottom tools, which require positioning the plate at a different height as needed.

[01 \\_ CONFIGURATION](#)[02 \\_ X-PRESS](#)[03 \\_ FRAME](#)[04 \\_ COMPENSATION  
SYSTEMS](#)[05 \\_ ECO](#)[06 \\_ BACK GAUGES](#)[07 \\_ CLAMPING](#)[08 \\_ ANGLE  
CONTROL](#)[09 \\_ FRONT  
SUPPORTS](#)[10 \\_ PEDALS](#)[11 \\_ CNC](#)[12 \\_ DRIVE BAR](#)[13 \\_ TANDEM](#)[14 \\_ ROBOTIC  
CELL](#)[15 \\_ MATRIX](#)[16 \\_ UTILITIES](#)





## FSA - D

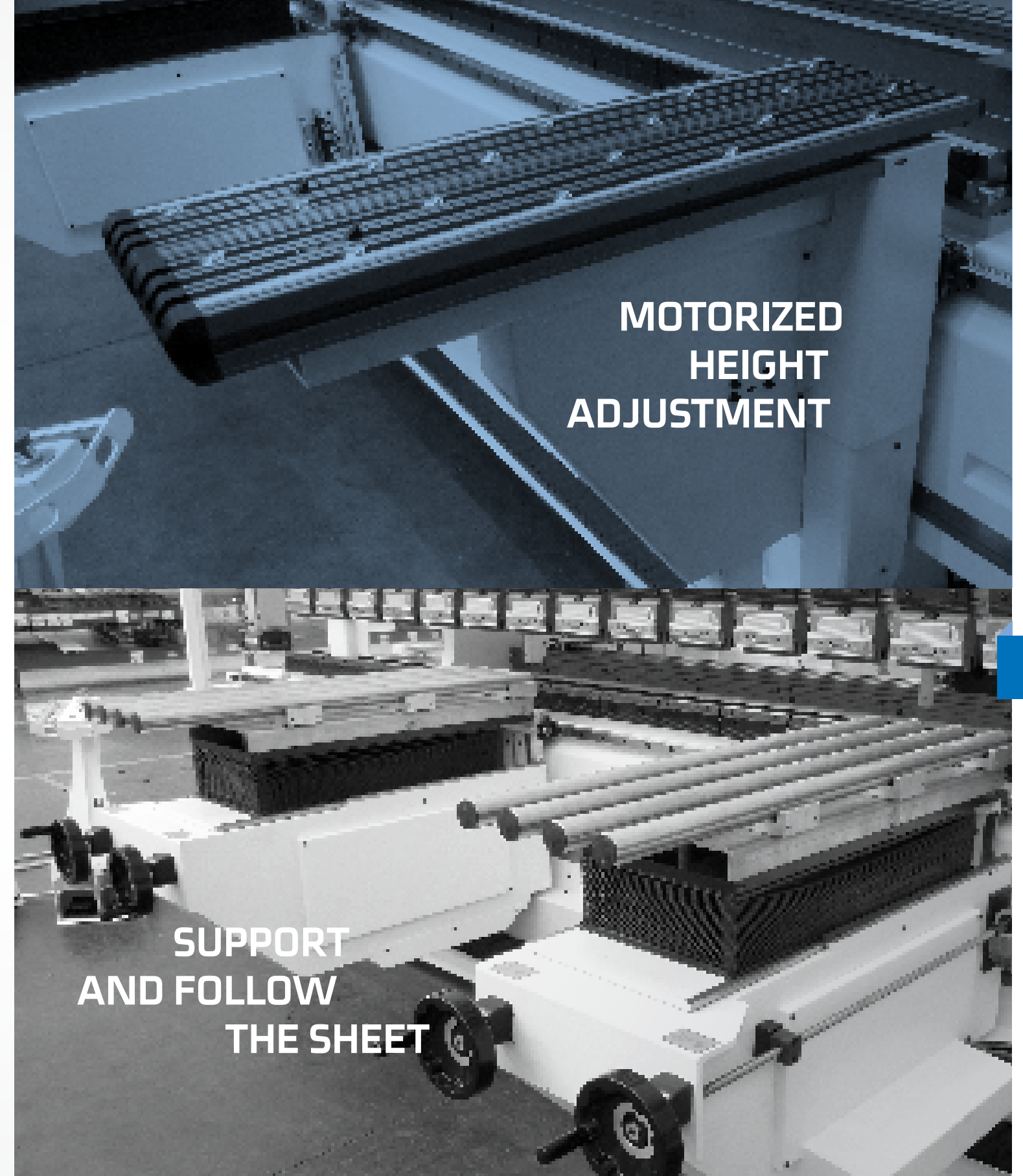
This type of front support has a motorized height adjustment completely controlled by CNC

The sheet support can be placed at any intermediate position. This function is useful both when working with hemming bottom tools and for particular profiles with counter-bends facing down, which require positioning the plate on surfaces at different heights..

## FRONT SHEET FOLLOWERS

The sheet follower is an effective accessory for press brakes.

It basically consists of a pair of sheet supports placed on the front of the machine at the height of the bending line (bottom tool). Supports are controlled by the CNC, following and supporting the sheet during the bending process. Sheet followers can be installed also in the inner part of the machine.



**MOTORIZED  
HEIGHT  
ADJUSTMENT**

**SUPPORT  
AND FOLLOW  
THE SHEET**

[01 \\_ CONFIGURATION](#)[02 \\_ X-PRESS](#)[03 \\_ FRAME](#)[04 \\_ COMPENSATION  
SYSTEMS](#)[05 \\_ ECO](#)[06 \\_ BACK GAUGES](#)[07 \\_ CLAMPING](#)[08 \\_ ANGLE  
CONTROL](#)[09 \\_ FRONT  
SUPPORTS](#)[10 \\_ PEDALS](#)[11 \\_ CNC](#)[12 \\_ DRIVE BAR](#)[13 \\_ TANDEM](#)[14 \\_ ROBOTIC  
CELL](#)[15 \\_ MATRIX](#)[16 \\_ UTILITIES](#)



# WIRELESS PEDAL

Discover the freedom of movement.

This is the evolution of the standard Gasparini foot controls. It has been designed for those customers who do not want the hassle of connecting cables on the floor in front of the machine.

The wireless foot control is equipped with a radio transmitter in constant communication with the receiver in the control cabinet. The radio system is certified for use on industrial machines.

The only wireless pedal for press brakes on the market.

NO CONNECTION  
CABLES

Avoid bothering cables

Work easily and safely

01 \_ CONFIGURATION

02 \_ X-PRESS

03 \_ FRAME

04 \_ COMPENSATION  
SYSTEMS

05 \_ ECO

06 \_ BACK GAUGES

07 \_ CLAMPING

08 \_ ANGLE  
CONTROL

09 \_ FRONT  
SUPPORTS

10 \_ PEDALS

11 \_ CNC

12 \_ DRIVE BAR

13 \_ TANDEM

14 \_ ROBOTIC  
CELL

15 \_ MATRIX

16 \_ UTILITIES





## > TIP-TAP

### Additional foot switches to add working stations to the machine

Multi-station bending processes are not normally easy for the operator to manage, and productivity is typically low, since as well as moving to the next work position with the bent part, the operator must also manage to move the foot pedal box.

Tip-Tap definitely facilitates this kind of production, since each work position is equipped with a pedal.

- + Programmable pedal activation sequence according to bending sequence
- + Pedals can be positioned all along the bending line or in parking position
- + One-movement placement & quick fastening
- + Transparent safety guard on the sliding rail of pedals
- + Active pedal marked by blinking led
- + Productivity improvement



Repositionable pedals



Work easily on multiple stations

ONE STEP  
BEYOND

01 \_ CONFIGURATION

02 \_ X-PRESS

03 \_ FRAME

04 \_ COMPENSATION  
SYSTEMS

05 \_ ECO

06 \_ BACK GAUGES

07 \_ CLAMPING

08 \_ ANGLE  
CONTROL

09 \_ FRONT  
SUPPORTS

10 \_ PEDALS

11 \_ CNC

12 \_ DRIVE BAR

13 \_ TANDEM

14 \_ ROBOTIC  
CELL

15 \_ MATRIX

16 \_ UTILITIES



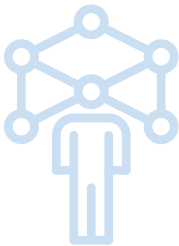
# > CNC


## Advanced control and remote assistance

Our press brakes can be equipped with two different types of CNC, according to requirements, preferences and products:




Each platform has its own characteristics that fit specific customer needs.





Manage all sensors, valves and servodrives of the pressbrake



Generate bending sequences, import drawings, connect to servers

01 \_ CONFIGURATION

02 \_ X-PRESS

03 \_ FRAME

04 \_ COMPENSATION SYSTEMS

05 \_ ECO

06 \_ BACK GAUGES

07 \_ CLAMPING

08 \_ ANGLE CONTROL

09 \_ FRONT SUPPORTS

10 \_ PEDALS

11 \_ CNC

12 \_ DRIVE BAR

13 \_ TANDEM

14 \_ ROBOTIC CELL

15 \_ MATRIX

16 \_ UTILITIES



# Phoeni-x

## Straightforward and hassle-free programming of all production phases

Phoeni-x is a CNC developed by Gasparini Industries srl on a [Cybelelec](#) platform. Thanks to its high performance and expandability features, [VisiTouch](#) has been chosen for this control.

Gasparini's CNC is a very intuitive control that allows for easy and quick programming of all bending processes. Gasparini CNC provides for the integrated management of all the parameters and the machine's functionality. It allows to import 3D models and to simulate the entire bending process in a 3D environment..

- + Automatic backup&restore utility
- + Import of 3D files (IGES, STEP and SolidWorks) and 2D (.dxf)
- + Perfect integration with cutting machines thanks to the exportation of .dxf files
- + Best choice for those working with graphic programming environments: duplicate operations are avoided due to its versatile automation
- + it automatically suggest the bending sequence
- + 3D visualization
- + 2D programming
- + Feedback on feasibility and collision detection
- + remote assistance (tele-link and tele-service)
- + Complete tool catalogs (punches and dies) from the most important manufacturers
- + Easy creation of new custom tools
- + Multilingual interface (HMI) also available in Russian and Chinese
- + K Elongation factor table for the main material types: you can precisely foresee the sheet metal behavior and cut the work pieces so as that after the bending, measures are absolutely correct
- + Possibility to add custom K factors specific to the material you are working, with an easy and efficient tool for optimized K factor calculation
- + All of your data (Bending programs, material databases, machine parameters, etc.) are protected thanks to the Uninterruptible Power Supply and the backup software
- + Electric axis control (i.e. back gauges) in EtherCAT buses and digital drives, for better precision and faster target approach

EASY AND QUICK  
PROGRAMMING

01 \_ CONFIGURATION

02 \_ X-PRESS

03 \_ FRAME

04 \_ COMPENSATION  
SYSTEMS

05 \_ ECO

06 \_ BACK GAUGES

07 \_ CLAMPING

08 \_ ANGLE  
CONTROL

09 \_ FRONT  
SUPPORTS

10 \_ PEDALS

11 \_ CNC

12 \_ DRIVE BAR

13 \_ TANDEM

14 \_ ROBOTIC  
CELL

15 \_ MATRIX

16 \_ UTILITIES





## Delem

### Direct link between programming and production.

Delem CNC allows a direct connection between programming and production through the user interface. The easy-to-use features are well combined to a consolidate technology thus improving the press brake's utilization.

The CNC is available in two versions: [DA-66T](#) and [DA-69T](#). The difference being the capability of import of .dxf files and 3D programming.

- + 2D import
- + 3D visualization and programming (DA-69T)
- + 2D visualization and programming
- + 3D offline visualization
- + possibility to simultaneously manage several press brakes in a line (Tandem, Tridem, Quadrem) or to use them independently from each other
- + compatibility with legacy Delem CNCs, without losing bending programs
- + Remote assistance and troubleshooting

## DIRECT CONNECTION BETWEEN PROGRAMMING AND PRODUCTION

[01 \\_ CONFIGURATION](#)[02 \\_ X-PRESS](#)[03 \\_ FRAME](#)[04 \\_ COMPENSATION  
SYSTEMS](#)[05 \\_ ECO](#)[06 \\_ BACK GAUGES](#)[07 \\_ CLAMPING](#)[08 \\_ ANGLE  
CONTROL](#)[09 \\_ FRONT  
SUPPORTS](#)[10 \\_ PEDALS](#)[11 \\_ CNC](#)[12 \\_ DRIVE BAR](#)[13 \\_ TANDEM](#)[14 \\_ ROBOTIC  
CELL](#)[15 \\_ MATRIX](#)[16 \\_ UTILITIES](#)

# DRIVE BAR


Coloured lights for tool positioning and highlighting the active working station.

Drive bar is an array of RGB LEDs, controlled directly by the CNC. They are useful in the case of press brakes with multiple workstations.


In this way, the operator is positioned directly at the point indicated for the next bend, without any hesitations, allowing a considerable saving of time.

BLUE LIGHT  
tells the operator where upper tools must be installed

GREEN LIGHT  
indicates which will be the next active station



Marks working stations with LED lights



Highlights tool positioning and bending phases

- 01\_CONFIGURATION
- 02\_X-PRESS
- 03\_FRAME
- 04\_COMPENSATION SYSTEMS
- 05\_ECO
- 06\_BACK GAUGES
- 07\_CLAMPING
- 08\_ANGLE CONTROL
- 09\_FRONT SUPPORTS
- 10\_PEDALS
- 11\_CNC
- 12\_DRIVE BAR
- 13\_TANDEM
- 14\_ROBOTIC CELL
- 15\_MATRIX
- 16\_UTILITIES





# TANDEM

Tandem, tridem and quadrem configuration:  
real teamwork.

Gasparini press brakes can be connected in a tandem, tridem or quadrem configuration. Safety devices are designed to adapt to new multiple setup.

The CNC "Tandem Link" option allows to transfer bending programs among different machines. Press brakes can be turned back to stand-alone usage in any moment.



Connect and synchronize  
from 2 to 4 press brakes

Use press brakes  
independently or together  
for long pieces



- 01 \_ CONFIGURATION
- 02 \_ X-PRESS
- 03 \_ FRAME
- 04 \_ COMPENSATION SYSTEMS
- 05 \_ ECO
- 06 \_ BACK GAUGES
- 07 \_ CLAMPING
- 08 \_ ANGLE CONTROL
- 09 \_ FRONT SUPPORTS
- 10 \_ PEDALS
- 11 \_ CNC
- 12 \_ DRIVE BAR
- 13 \_ TANDEM
- 14 \_ ROBOTIC CELL
- 15 \_ MATRIX
- 16 \_ UTILITIES



**GASPARINI**  
**X-PRESS 330**

**GASPARINI**  
**X-PRESS 330**

**MAXIMUM FLEXIBILITY  
ON BIG AND  
HEAVY MACHINES**

01\_CONFIGURATION

02\_X-PRESS

03\_FRAME

04\_COMPENSATION  
SYSTEMS

05\_ECO

06\_BACK GAUGES

07\_CLAMPING

08\_ANGLE  
CONTROL

09\_FRONT  
SUPPORTS

10\_PEDALS

11\_CNC

12\_DRIVE BAR

13\_TANDEM

14\_ROBOTIC  
CELL

15\_MATRIX

16\_UTILITIES



## > ROBOTIC CELL

The future of automated bending: integration of a press brake and a robot and ensure maximum production throughput.

Gasparini press brakes can be used in a robotic cell, either completely robotic, or when either a robot and an operator can alternatively use the machine.

With the exclusive use of the robot, production cycles can be much accelerated. In this case, the press is equipped with some accessories that can increase the speed. On the other hand, safety devices can be removed. It is also important to automatically control the operating conditions, to avoid mechanical stress and damage.

Press brakes that will be used by either robots and human operators will be equipped with side guards and laser safety device to guarantee maximum security.

Gasparini can provide all the accessories and services necessary to allow the robot to bend and manipulate the sheet metal.

**PUSH PRODUCTIVITY  
TO THE LIMIT**



Interface between robot and  
press brake



Quickly bend pieces in big  
batches

01 \_ CONFIGURATION

02 \_ X-PRESS

03 \_ FRAME

04 \_ COMPENSATION  
SYSTEMS

05 \_ ECO

06 \_ BACK GAUGES

07 \_ CLAMPING

08 \_ ANGLE  
CONTROL

09 \_ FRONT  
SUPPORTS

10 \_ PEDALS

11 \_ CNC

12 \_ DRIVE BAR

13 \_ TANDEM

14 \_ ROBOTIC  
CELL

15 \_ MATRIX

16 \_ UTILITIES





# MATRIX

## CNC-controlled variable-opening die to dynamically fit working conditions.

The Matrix variable opening die is a lower tool whose opening can be increased or decreased so as to adapt to the manufacturing needs. Movement is controlled by the CNC according to material and bending type.

- + Optimal control of the force and the radius of curvature: varying the die opening allows you for better control over the bending parameters
- + Comfort and safety of the operator: you no longer have to manipulate many different dies
- + Save time: tool change is drastically reduced
- + Great versatility: Matrix dies can achieves a bending angle of 75° on the whole extension

| RANGE      | DIMENSION   | STEP  | TONNAGE   |
|------------|-------------|-------|-----------|
| MATRIX I   | V 10÷160 mm | 10 mm | 3000 kN/m |
| MATRIX II  | V 40÷300 mm | 20 mm | 4000 kN/m |
| MATRIX III | V 40÷400 mm | 20 mm | 4000 kN/m |

The Matrix variable die can be equipped with inserts such as rollers (10 mm or 30 mm), rounded edges, or standard fixed dies.



A single die for all thicknesses

Eliminate tooling changing times

A THOUSAND TOOLS IN ONE

01 \_ CONFIGURATION

02 \_ X-PRESS

03 \_ FRAME

04 \_ COMPENSATION SYSTEMS

05 \_ ECO

06 \_ BACK GAUGES

07 \_ CLAMPING

08 \_ ANGLE CONTROL

09 \_ FRONT SUPPORTS

10 \_ PEDALS

11 \_ CNC

12 \_ DRIVE BAR

13 \_ TANDEM

14 \_ ROBOTIC CELL

15 \_ MATRIX

16 \_ UTILITIES

## › UTILITIES

The path we follow in the development of our products is traced by a constant focus on our customers and their way of working.

Making our machines more and more flexible, smart and easy to use is a constantly evolving process. We have therefore created a series of accessories to facilitate the most common operations:

**BARCODE READER**  
**SYNER-G REMOTE CONTROL**  
**LED LIGHTING**  
**DESIGN**  
**TELELINK**  
**HEMMING BENCH**  
**LASERCHECK**  
**DSP-AP SAFETY SYSTEM**

[01 \\_ CONFIGURATION](#)[02 \\_ X-PRESS](#)[03 \\_ FRAME](#)[04 \\_ COMPENSATION  
SYSTEMS](#)[05 \\_ ECO](#)[06 \\_ BACK GAUGES](#)[07 \\_ CLAMPING](#)[08 \\_ ANGLE  
CONTROL](#)[09 \\_ FRONT  
SUPPORTS](#)[10 \\_ PEDALS](#)[11 \\_ CNC](#)[12 \\_ DRIVE BAR](#)[13 \\_ TANDEM](#)[14 \\_ ROBOTIC  
CELL](#)[15 \\_ MATRIX](#)[16 \\_ UTILITIES](#)





## Barcode Reader

Gasparini united the power and versatility of Phoeni-X with a powerful hand-held laser scanner.

Managing many small and different production batches can be complicated. Simplifying the operator's job means reducing production times and mistakes, increasing overall efficiency.

This wireless code reader communicates with the CNC through its recharge base. It's able to read traditional 1D bar codes (EAN, Code128, Code39 Extended, etc) as well as the newer and more efficient 2D codes (DataMatrix, QRCode, ecc).

In order to load a bending program, one just has to scan the code. This code can be printed on a production note, on a label, or engraved directly on the sheet metal blank. The program can be stored locally or on a server.

The scanner helps the reading by projecting crosshairs and delimiting the scanned area with four red dots. Should the reading be correct, the scanner gives a feedback to the user with a green dot on the code and a light on its back. A beep is also emitted, which can be disabled by the user. The first configuration and all following setups are carried out by simply scanning specific 2D codes.

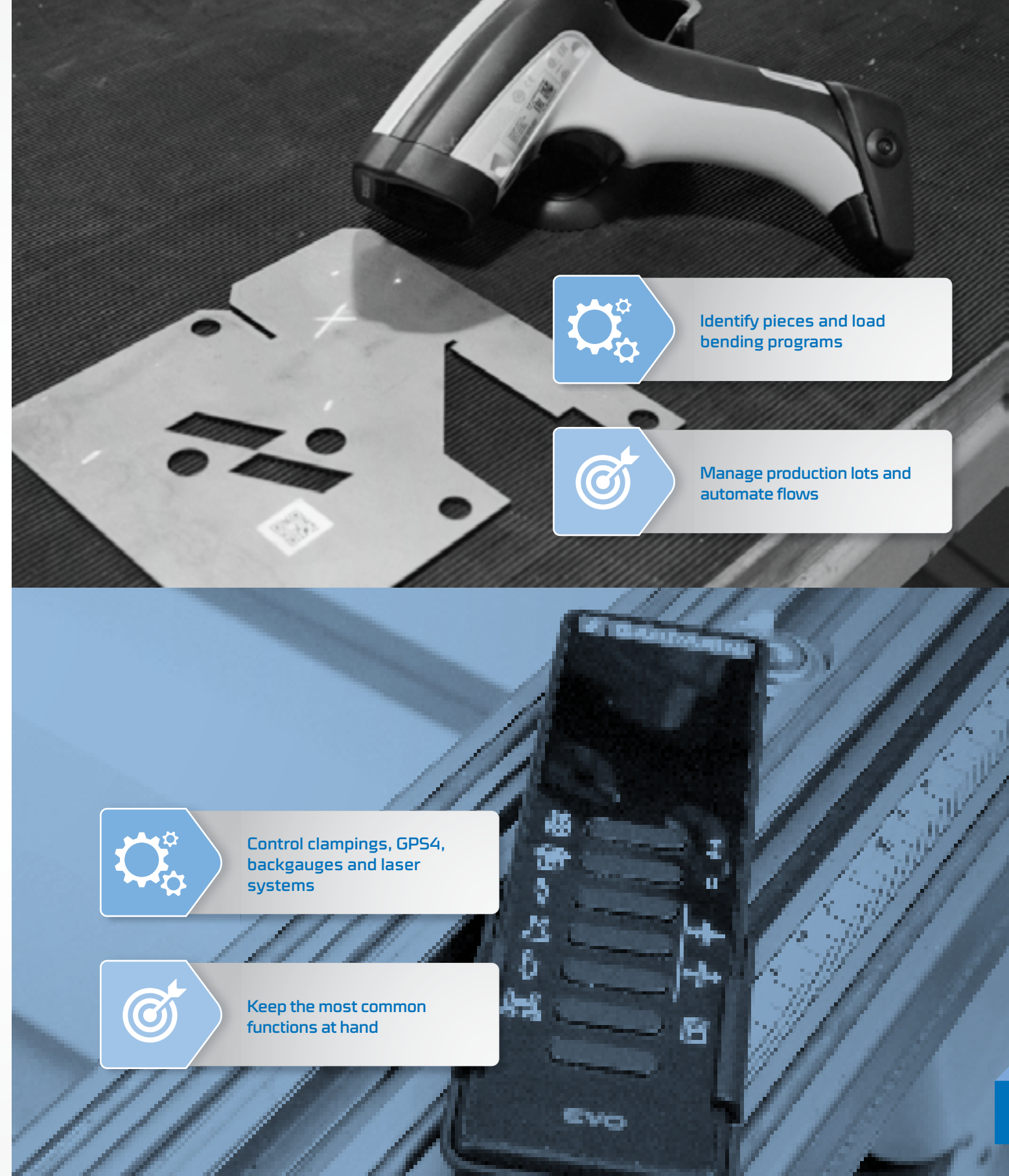
The Phoeni-x Bar Code Reader can be installed also on existing Gasparini machines, updating the software and adding the necessary components.

## Syner-G Remote Control

This device allows to easily access some functions:

- › Opening and closing of pneumatic clamping for punches and dies
- › Opening and closing of hydraulic clamping for intermediates
- › Sensor calibration for the GPS4 angle control system
- › Parking of motorized laser safety system and back gauges

There is one spare button that can be associated to one out of some other functions at your choice. This optional is included as standard if the press brake is equipped with pneumatic or hydraulic clamping, with GPS4, or with motorized laser safety system.



Identify pieces and load bending programs



Manage production lots and automate flows



Control clampings, GPS4, backgauges and laser systems



Keep the most common functions at hand

01 \_ CONFIGURATION

02 \_ X-PRESS

03 \_ FRAME

04 \_ COMPENSATION  
SYSTEMS

05 \_ ECO

06 \_ BACK GAUGES

07 \_ CLAMPING

08 \_ ANGLE  
CONTROL09 \_ FRONT  
SUPPORTS

10 \_ PEDALS

11 \_ CNC

12 \_ DRIVE BAR

13 \_ TANDEM

14 \_ ROBOTIC  
CELL

15 \_ MATRIX

16 \_ UTILITIES



## LED lighting

Perfect illumination of the working area of the machine is guaranteed by an efficient LED lighting. Light output is three times greater than conventional systems, meanwhile ensuring lower energy consumption.

The LED lighting system does not require maintenance, it is insensitive to vibrations and generates no annoying heat radiation. The work area is perfectly illuminated to reduce fatigue. The color temperature of the light at 6000 °K was chosen to highlight sheet metal edges. Shadows are reduced but the light source does not create glare. As an option, light intensity can be dimmed to provide the maximum user comfort.

- + Maximum visibility
- + Energy saving
- + No eye fatigue

## Design

New style: unique, modern, Italian.  
The same look and feel for all product families.

The renewed style of Gasparini press brakes is the result of collaboration with an important and well-known design and engineering firm, Studio Volpi. It is the perfect combination of aesthetics and ergonomics. One look and feel for all product families.

We use epoxy-acrylic paint, that produces an acrylic surface film which protects the paint itself. This shiny film also makes cleaning easier.



01 \_ CONFIGURATION

02 \_ X-PRESS

03 \_ FRAME

04 \_ COMPENSATION  
SYSTEMS

05 \_ ECO

06 \_ BACK GAUGES

07 \_ CLAMPING

08 \_ ANGLE  
CONTROL09 \_ FRONT  
SUPPORTS

10 \_ PEDALS

11 \_ CNC

12 \_ DRIVE BAR

13 \_ TANDEM

14 \_ ROBOTIC  
CELL

15 \_ MATRIX

16 \_ UTILITIES



## Telelink

Gasparini Industries offers a specialized, immediate, and secure service with its new Teleassistance & Telediagnosis kit.

Using a simple internet connection, our technicians are able to remotely diagnose any anomalies of machinery or software, or errors of use of the machine or CNC by the operator.

The new Tele-Link, available as standard on all X-Press machines, is a software package that allows service technicians to connect to Gasparini CNC client. Remote assistance allows to analyse the problem as if the technician were in front of the machine.

- > Preventive maintenance
- > Quick fault analysis and reduced machine downtime
- > Ability to solve CNC and software problems remotely
- > Reduction of over-the-phone assistance
- > Ease of Use
- > Safety

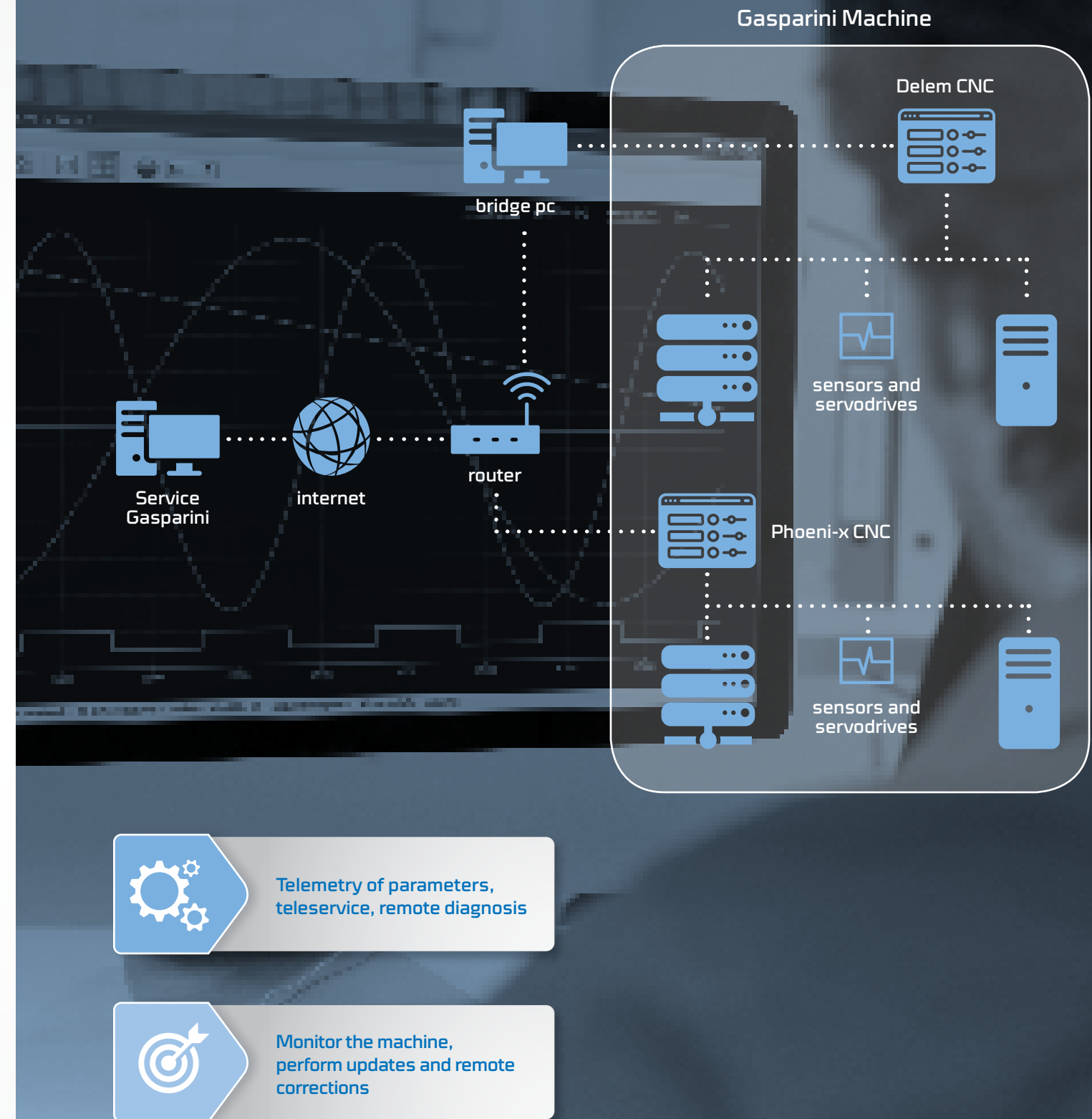
These features can be accessed through an Internet connection (ADSL or HDSL) for testing, piloting, analyzing and possibly update the smart devices that compose the machine.

Any failures or problems can therefore be diagnosed and understood in real time.

We can therefore react promptly to customer needs while reducing response time and maintenance costs.

### FEATURES AND BENEFITS

- |                                            |                                                          |
|--------------------------------------------|----------------------------------------------------------|
| + CNC control and telemetry                | + Control of digital and analog inputs and outputs       |
| + Software updates                         | + Control of pressures, positions, limit switches, fuses |
| + Data monitoring and editing              | + Status of motors, axes, electrovalves, accessories     |
| + Program execution and control            | + Monitoring and parametrization of crowning system      |
| + Creation and editing of models and tools | + Management of safety software                          |
| + Remote training                          |                                                          |



01 \_ CONFIGURATION

02 \_ X-PRESS

03 \_ FRAME

04 \_ COMPENSATION  
SYSTEMS

05 \_ ECO

06 \_ BACK GAUGES

07 \_ CLAMPING

08 \_ ANGLE  
CONTROL09 \_ FRONT  
SUPPORTS

10 \_ PEDALS

11 \_ CNC

12 \_ DRIVE BAR

13 \_ TANDEM

14 \_ ROBOTIC  
CELL

15 \_ MATRIX

16 \_ UTILITIES





# Hemming bench

The Gasparini hemming bench can fold the edges of the sheet metal quickly and accurately.

It consists of two parts: the upper part holds the die for the air bending. The upper part rests on the bottom part and is lifted with a pneumatic system controlled by the CNC. After making the first bend, the top is raised and the operator inserts the edge of the sheet in a lateral seat. The punch lowers and pushes on the die, folding the sheet in the side slot. The same bench also allows to make air bends without having to change punches and dies, even on thick and long sheets.

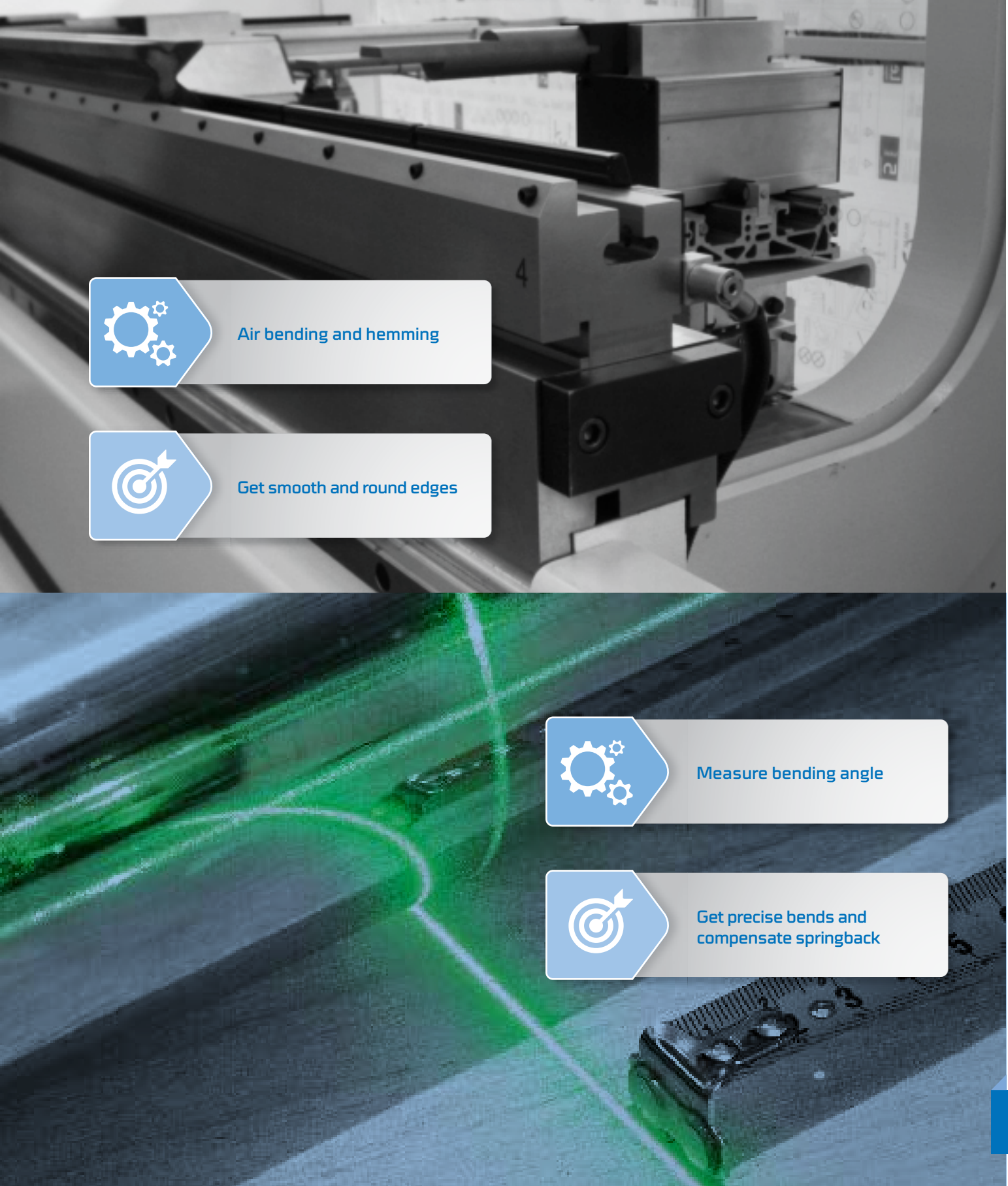
With Gasparini's hemming bench, reverse bands are easier with respect to traditional hemming benches. It is also cheaper on the long run because you will need fewer dedicated dies.

# LaserCheck

Is an automatic measuring system that allows you to immediately get the desired angle.

Laser Check is based on a pair of lasers and cameras able to measure the inclination of the sheet. It can be used on all press brakes with a minor change to the bench and is compatible with all the punches and dies. It requires a minimum edge of some centimeters, depending on the die.

There may be limitations with counterbends, surface finishes, and bending forces. There are no limits in the opening of the matrix. Optionally, the sensors can be motorized and controlled by CNC.



01 \_ CONFIGURATION

02 \_ X-PRESS

03 \_ FRAME

04 \_ COMPENSATION  
SYSTEMS

05 \_ ECO

06 \_ BACK GAUGES

07 \_ CLAMPING

08 \_ ANGLE  
CONTROL

09 \_ FRONT  
SUPPORTS

10 \_ PEDALS

11 \_ CNC

12 \_ DRIVE BAR

13 \_ TANDEM

14 \_ ROBOTIC  
CELL

15 \_ MATRIX

16 \_ UTILITIES





## DSP-AP safety system

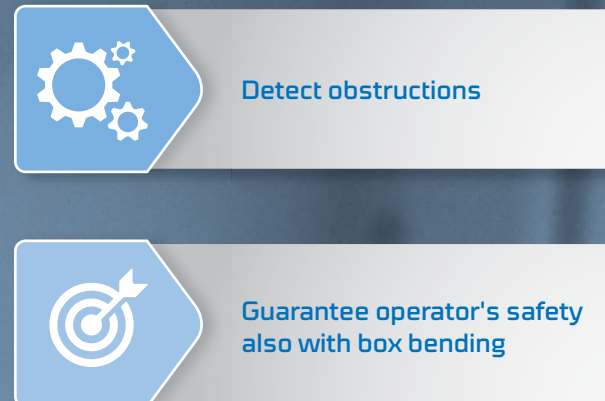
DSP-AP Laser safety system with lowering of the mute point and reduction of cycle time.

DSP-AP generates a visible laser protection compliant to EN12622 regulation. The beam protects the press brake operator from the danger of being crushed between upper and lower tool. This device allows to reduce the mute point (speed change point) to up to 4 mm from the sheet metal, thus permitting a remarkable saving in the duration of the bending cycle.

As a result, the ram moves at a higher speed for a longer time, keeping the part of the bending cycle when it moves at a lower speed to a minimum. The amount of time that can be saved by DSP-AP with respect to a conventional system is about 1.2 seconds per each bend.

- + Auto-blanking for automatic box and side wall detection
- + "Safe Release" supports are unhooked without damages in case of collision

Transmitter and receiver can be equipped with CNC motorized positioning.  
The two devices are placed to the exact height according to tools used and working conditions.



01 \_ CONFIGURATION

02 \_ X-PRESS

03 \_ FRAME

04 \_ COMPENSATION  
SYSTEMS

05 \_ ECO

06 \_ BACK GAUGES

07 \_ CLAMPING

08 \_ ANGLE  
CONTROL09 \_ FRONT  
SUPPORTS

10 \_ PEDALS

11 \_ CNC

12 \_ DRIVE BAR

13 \_ TANDEM

14 \_ ROBOTIC  
CELL

15 \_ MATRIX

16 \_ UTILITIES



# Service & Retrofit

GASPARINI | BENDING TECHNOLOGIES 2016



## › SERVICE GASPARINI

Gasparini Industries is structured to ensure customers of an efficient and professional assistance service thanks to the preparation and many years of experience of its technicians and of all the technical staff that represent it in the world.

Gasparini Service plans ensure high reliability through an annual inspection of the machines, "recalibration" to the original specifications and preventive maintenance: the smartest way to prevent unexpected downtime due to a fault!

### + SET UP AND INSTALLATION:

Upon request, we can provide shipping, unloading and installation as a complete service. Skilled personnel will take care of the final test, making sure that the machine is in perfect efficiency, ready to work.

### + ASSISTANCE SERVICE

Through its own local sales and service network, Gasparini ensures customers of efficient and professional support.

### + RAPID SUPPLY OF ORIGINAL SPARE PARTS

Our warehouse is able to provide most of the Gasparini replacement parts. We work closely with our partners to always have all the other components in a short time.

### + TELEASSISTANCE/TELESERVICE

Gasparini Industries offers a specialized, immediate, and secure service with its new Teleassistance & Telediagnosis kit. Using an Internet connection, our technicians are able to diagnose the problems of the machines or software in remote mode, reducing machine down times.

### + PLANNED MAINTENANCE CONTRACTS

Gasparini planned maintenance service is a complete check-up consisting of scheduled periodic visits with the aim of checking the efficiency of the machine.

### + TRAINING COURSES

Gasparini provides its customers with training and refresher courses. Gasparini also offers seminars and events in association with other companies and associations in the field.

### + RETROFIT

It's the best and most cost-effective way to give a new life to your machinery. Gasparini products can work to the best of their performances for a long time.



*We know our machines in every little detail, and we take care of them in the best possible way.*







## › PLANNED MAINTENANCE

If you own a Gasparini machine whose warranty is about to expire, you can take advantage of the scheduled assistance program “Gasparini Planned Maintenance”.

Our technicians will inspect your press brake and will allow you to work with peace of mind and safety.

It is an annual contract that includes two separate visits, during which we will perform:

- › An inspection of machine general conditions
- › Alignment of ram and bench according to Gasparini recommendations
- › Back gauge alignment
- › Oil leaks check
- › Fastening of pipes and fittings
- › Greasing of all moving parts
- › Safety systems check
- › Oil filter change
- › Hydraulic oil change (oil not included)

*Our Service team is at your complete disposal to explain all details of Gasparini Planned Maintenance.*





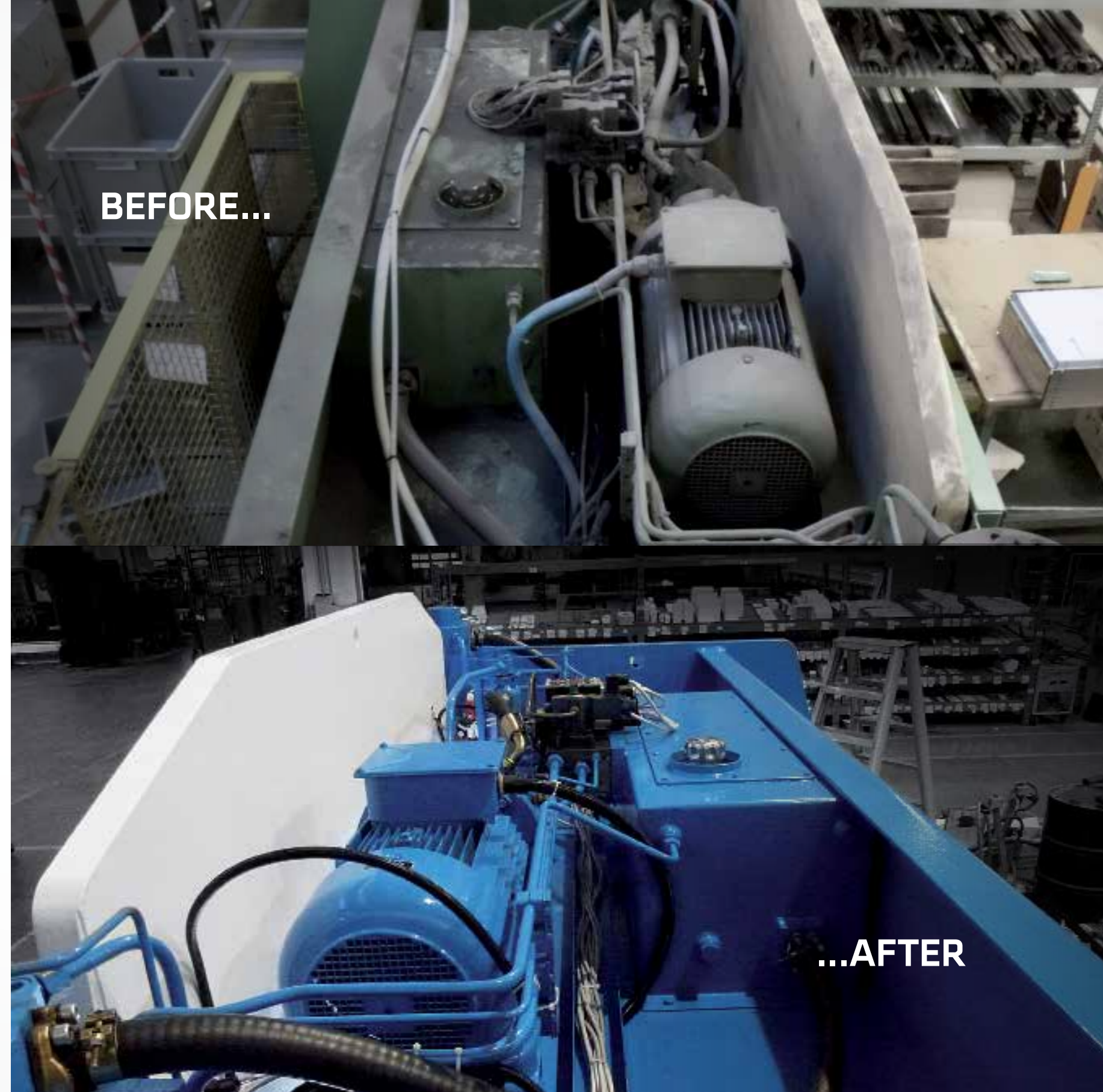
## › PRESS BRAKE RETROFIT

### Hydraulic circuit

- › All pipes and fittings are replaced
- › Analog proportional valves are replaced with new digital integrated valves in order to increase Speed and precision
- › The hydraulic system is cleaned and calibrated with standard pressure
- › Waste oil is replaced
- › Oil filters are replaced with newer models

### Electric circuit and CNC

- › Replacement of electrical panel and components
- › Complete rewiring of all power and signal connections
- › Replacement of pedals and pushbuttons
- › LED lighting on front and rear
- › Optional wireless pedal
- › Replacing the obsolete CNC with the new one featuring:
  - Import/export of files via network or USB stick
  - Simulation of the pieces with 2D or 3D design (depending on CNC)
  - Improved performance and accuracy of the machine, because all parameters can be set with more simplicity and efficacy
  - Possibility of interfacing the machine with automated systems
  - Remote connection for diagnosis and check-up (depending on CNC)







## Safety systems

Bring your press brake up to code and upgrade its protection devices:

- › Replacement of standard laser barrier with the new DSP laser system
- › Optional integration of the new DSP-AP laser curtain:
  - More protection thanks to the unique shape of laser beam
  - Sheet thickness recognition
  - Repositioning of speed change point > cycle time reduced by 1.2 seconds
  - Auto-blanking function for box bending
  - Quick unlock for punch change
  - Emergency unlock in case of collision
- › User manual integration
- › Declaration of "Safety device upgrade"
- › Blinking light installation
- › Supply and installation of stopping space verification system

## Hardware

- › Bench milling for correct die support
- › Ram milling
- › Intermediate milling for correct punch support
- › Milling and control of backgauges
- › Laser alignment of all machine geometries, starting from the ram, to intermediates, bench, and backgauges, to recover original precision levels.
- › Optional upgrade of pneumatic/hydraulic clamping
- › Optional upgrade of backgauges







# Bending

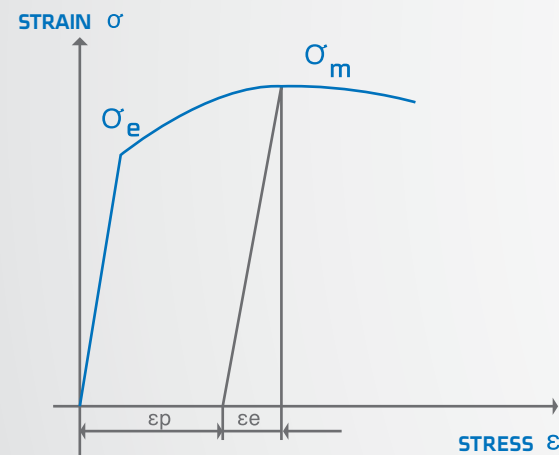
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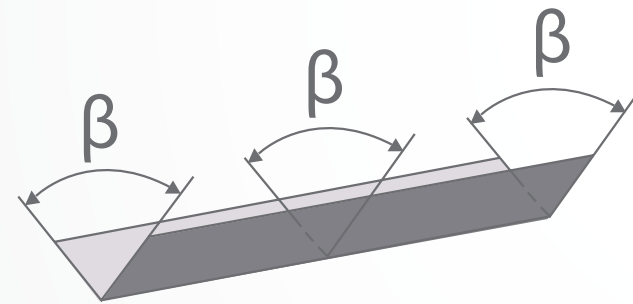
## THE BENDING PROCESS

A bend is the permanent deformation of sheet metal under the effect of an external force.

Most of the sheet metal forming processes involve an initial folding of the blank. Different bending processes are widely used in a wide range of products: automotive, furniture, doors, trains, construction, aerospace, electronics, telephony, ships, etc. The process of folding a metal sheet finds a place in the vast majority of the products. Despite its apparent simplicity, the bending process is a highly complex manufacturing technique that must be understood, led and dominated.



$\varepsilon_p$  = plastic deformation  
 $\varepsilon_e$  = springback



In the fabrication industry, one of the critical challenges is to maintain close geometric tolerances in finished products. The perfect bend is defined by three main factors:

- › Accurate bending angle (theoretical  $\beta$  vs. real  $\beta$ )
- › Correct parallelism of ram and bench
- › Alignment of backgauges





## Springback

The problem in respecting angle tolerances is related to the springback effect in the sheet metal: this effect is caused by the elastic recovery of stresses not uniformly distributed in a deformed part after forming load is removed. In other words, the bent piece tends to open a little, trying to get back to the original shape because it maintains a small elasticity.

## V-bending

V-bending is the most used forming technique. There are three V-bending techniques: [Air bending](#), [Hemming](#) (Flattening) and [Coining](#) (Bottoming).

All work on the principle of a punch that forces the sheet metal into the bottom die.

### Air bending

Among the V-bending processes, [air bending](#) is the simplest one and it is commonly used in a wide range of productions.

Air bending involves the punch pressing the sheet metal down into a V-shaped die. This way sheet metal flanges are folded up, creating the angle at the contact point between punch and sheet metal.

The sheet metal has 3 contact points with tool and die.

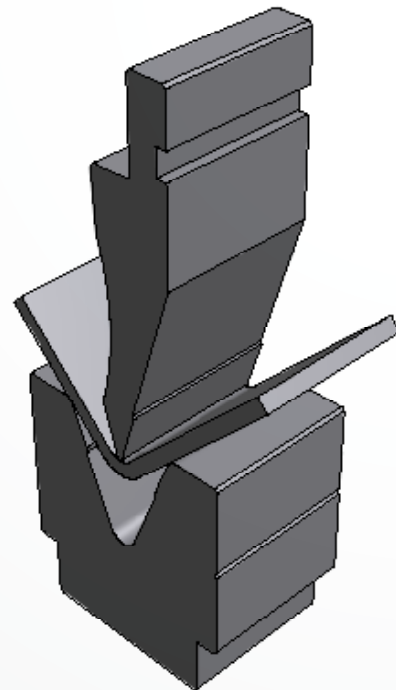
The bending angle is determined by how deep the tool pushes the sheet metal into the die.

The spring-back is compensated by a longer stroke, allowing the plate to return to the required bending angle (over-bending).

The advantages of air bending are: [low bending force](#), possibility to bend very [thick sheets](#) and possibility to obtain [different angles with the same tools](#).

These make it less expensive and more flexible.

Air bending is characterized by an initial difficulty in finding the correct bending angle due to sheet springback, and the need for a high-tech press brake to guarantee excellent bending precision.



## Coining (bottoming)

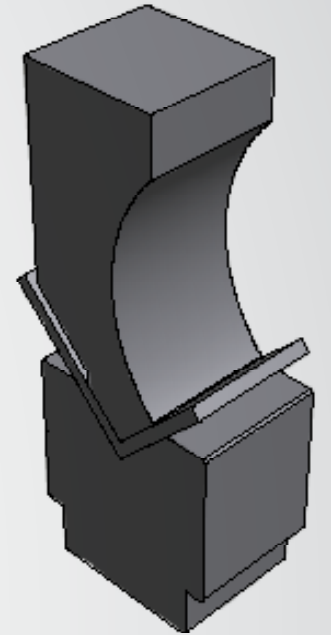
In coining, the punch presses the sheet metal completely into the die, so that the punch, the sheet metal, and the die are coupled together. For bottom bending, the punch and die have to fit together exactly.

Bottom bending is mainly used for producing 90-degree angles on thin sheet metal parts where a small bend radius is required. The bend is obtained by forcing the part completely into the die, so that the sheet metal follows exactly the die profile and angle.

The sheet metal is permanently deformed and spring-back is minimized.

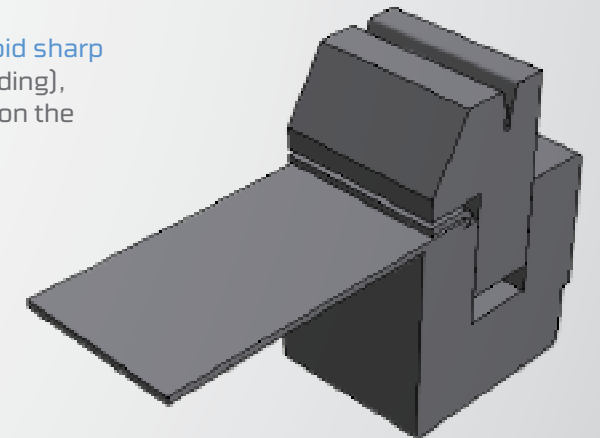
[Its advantages are a higher angle precision, no springback, and the possibility to obtain smaller bending radiuses](#)

Its main disadvantages are the need for a different tool set for each angle and shape, and the need for a higher tonnage (about 5 times with respect to air bending).



## Hemming (flattening)

It is normally applied to obtain [rigidity, edge protection, and to avoid sharp edges](#). It is a 2-step process: first a 26°-35° pre-bend (by air bending), then the bent part is completely or partially flattened, depending on the applied force.



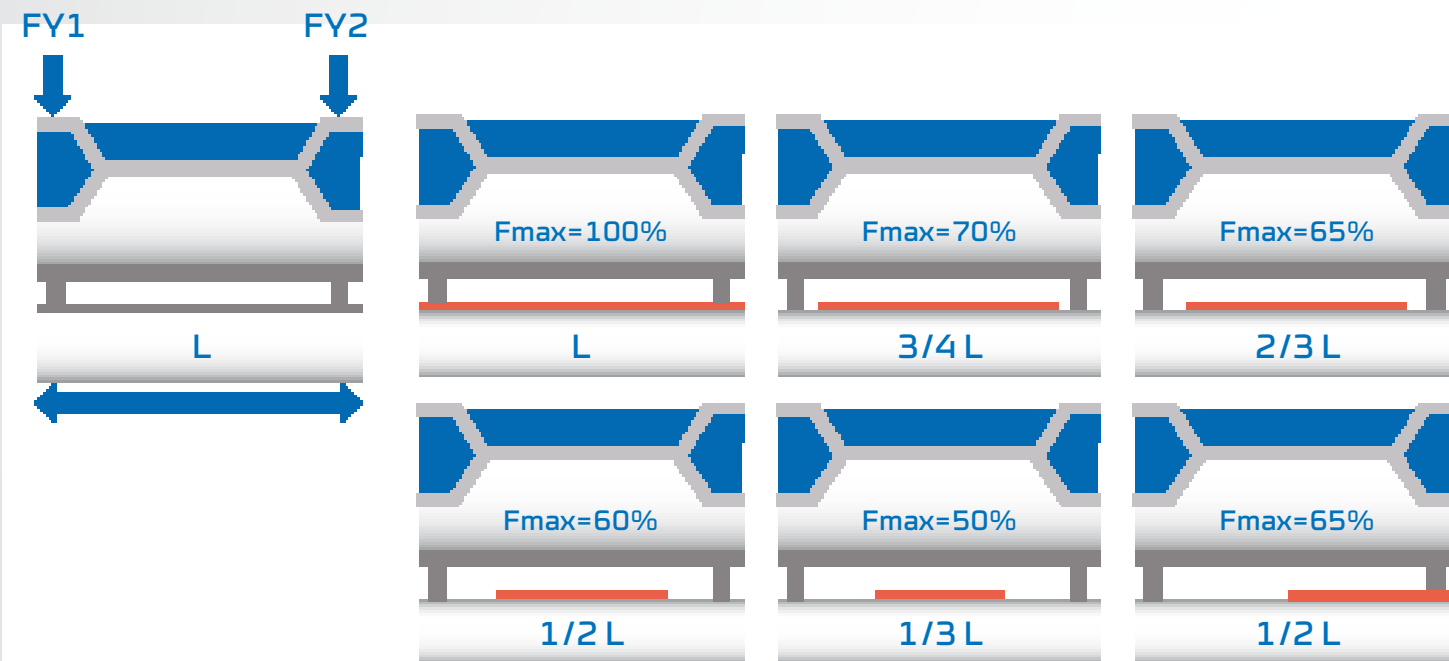




## › BENDING FORCE

A press brake is basically defined by its bending length (L) and its bending force (F = FY1 + FY2).

The maximum bending force (F max) applicable to the sheet metal, as a percentage of the total nominal machine force (F tot), depends on the length of the part (with respect to machine length) and the bending position (centered or not). Also the utilization rate (time) at full capacity is a factor to be considered when dimensioning correctly the press brake.



We recommend oversizing the machine by about 20-30%.



The following formula allows to calculate the required bending force and consequently to correctly size the press brake:

$$F = k (L * s^2 * \sigma_m) / V$$

L = bending length  
 $\sigma_m$  = tensile strength  
 k = correction factor

Recommended V/s:

MILD STEEL

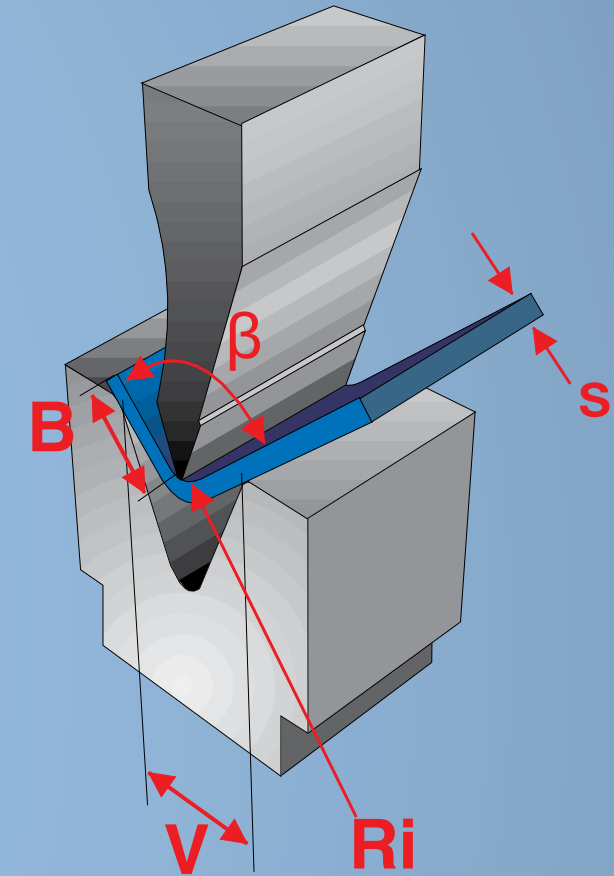
› with s < 8 mm: V/s ≥ 8

STAINLESS STEEL

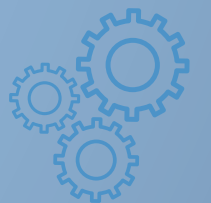
› with s ≥ 10 mm: V/s ≥ 10

HIGH-STRENGTH STEEL

› > V/s up to 20  
 [see Bending HSLA steel]



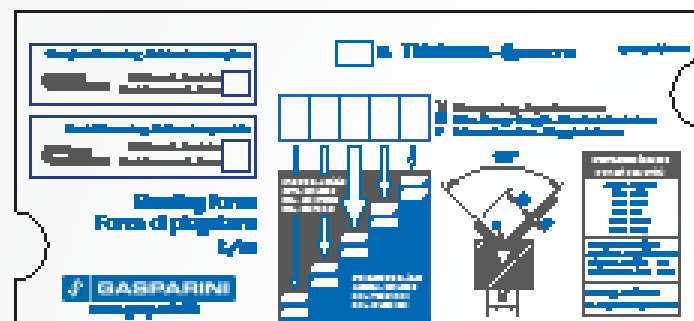
This formula allows to calculate the required bending force



## Bending force ruler

The bending force ruler is an easy tool to define the required bending force per meter (t/m), given the thickness (s), and the die opening (V).

The resulting value refers to air bending of mild steel at a 90° angle. However, the tool includes correction factors to be applied for different angles, materials and bending processes.



## Ruler usage example

To calculate the tonnage required for air bending, slide the rule until you have the correct sheet metal thickness in the window labelled Thickness (Spessore). In the window below you will see the recommended values for the die opening. Minimum is on the left, optimal is on the center and maximum is on the right. A different die opening implies different minimum flange lengths and internal radii. The windows at the bottom show the force (in tons per meter) required with the various die openings of the matrix, for construction steel and for stainless steel. The two boxes on the left indicate the force required for partial and complete hemming.

### EXAMPLE

|                        |                                                    |
|------------------------|----------------------------------------------------|
| Thickness :            | 1,2 mm                                             |
| Optimal die opening:   | 10 mm                                              |
| Minimum flange length: | 6,5 mm                                             |
| Internal radius:       | 1,3 mm                                             |
| Tonnage:               | 9 t/m with mild steel, 15 t/m with stainless steel |

[illegible]



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