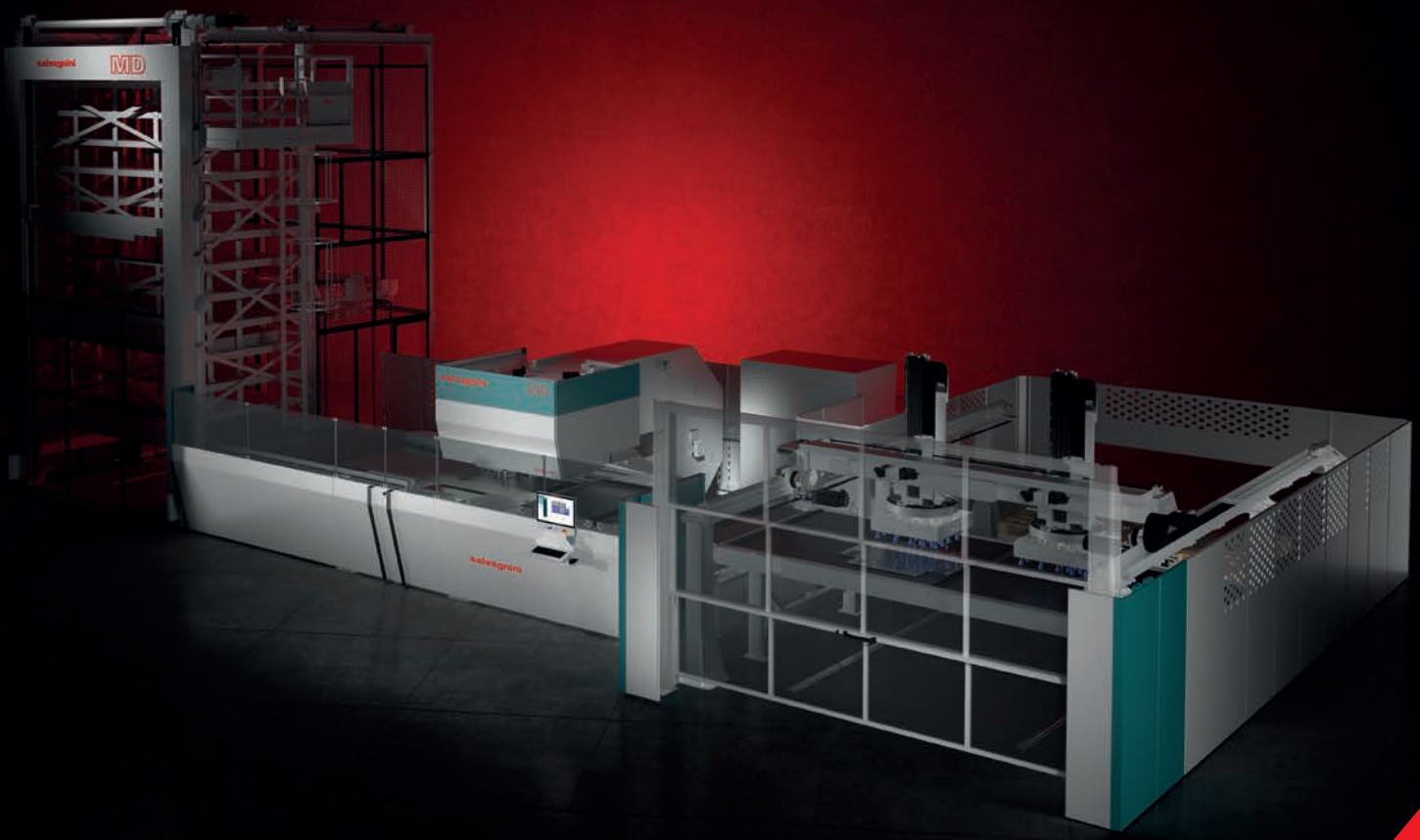
S4



Punching-shearing system

salvagnini

What is Salvagnini's perspective on punching?

For Salvagnini, punching is always a **combined process of forming and separating parts**, with the separation done either by shear or by laser. Part separation integrates the punching machine in a **modern and efficient production flow**, able to feed the workstations downstream, such as the panel bender.

What is the role of the punching machine today?

In today's production context, the role of the punching machine depends on the product: the **parts to be produced**, their **geometries**, the **jobs** planned, and the **productivity** required, are what determine the most suitable technological solution. In recent years, the laser has eroded part of the traditional punching market, but has not affected that of the Salvagnini **S4 punching-shearing center**, which, today as in the past, remains a competitive solution for companies looking for **productivity**, **flexibility**, **reactivity** and **efficiency**. The S4 performs all the part punching, forming and separation operations, destroying the skeleton to ensure that the parts flow progressively downstream: this eliminates the need for regripping and rapidly feeds the next production step.

How can we justify the investment?

Part geometries, increasingly small batch sizes, cutting quality and expected productivity are all factors that make the investment in an S4 more attractive than that in a traditional punching machine. High productivity is guaranteed because the S4 is a single work center, able to automatically produce finished parts without the need for regripping and/or re-tooling. It is the winning solution in production contexts in which lead times have to be minimized, because the integration of forming and separation processes drastically reduces throughput times. The S4 is the ideal solution in sectors requiring parametric jobs: more flexible than a laser, it drastically simplifies programming and reduces overall process times, from product design to production.

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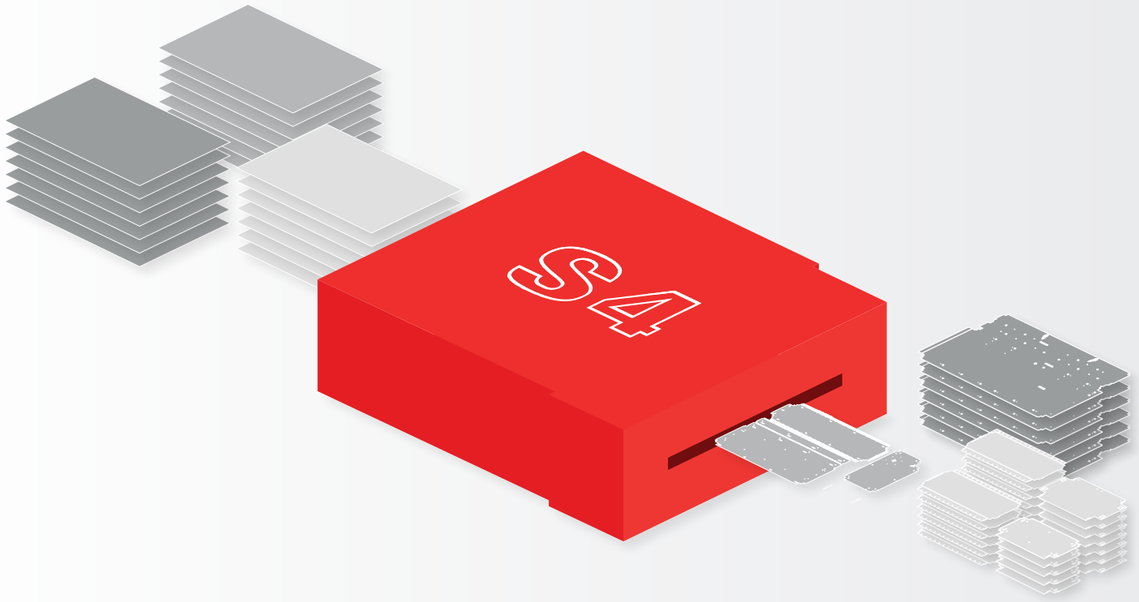

What is the Salvagnini formula for maximum productivity?

The S4 natively integrates the punching and separation operations and automatically manages the feeding, sorting and unloading cycles which, when possible, are performed in masked time. With the patented multi-press head, the tools are always available for nesting and multiple jobs, with no re-tooling in-cycle or manual intervention. The proprietary Punch&Cut algorithm optimizes the integrated shearing cuts for separating the single parts in the sheet in a fast, flexible and automatic sequence with no waiting times for unloading the part.

How to combine productivity and flexibility?

With conventional punching, productivity and flexibility depend on the number of tool changes in-cycle and the times for moving the sheet underneath the turret or single punch, and are influenced by the time required for the separation operations downstream. The S4, on the other hand, natively combines **productivity and flexibility**. Helping to maximize **productivity** are the multi-press head, which ensures that the tools are always available, the advanced manipulator cycles that modulate the dynamics and the integrated shear, which works in Punch&Cut mode. These unique solutions also improve the **flexibility** of the S4 as – whatever the geometries and materials being machined – they do not require re-tooling and can produce large batches, kits or batch one with equal ease. STREAMPUNCH, the programming software for generating the punching program, includes proprietary algorithms for optimizing nests and parts, while reducing scrap. STREAMPUNCH makes it easy to choose the best production strategy, and simplifies the programmer's job with a user-friendly interface and interactive editing and simulation functions.

How long does re-tooling take?

The multi-press head **requires no re-tooling or tool changes** in-cycle, reducing overall processing times. The multi-press head is a distinctive feature of the S4, comes in 5 models and **can house up to 96 tools at the same time**. It ensures high punch-die alignment precision, for high-quality machining. The head configuration proposed for each customer is designed to meet their specific production needs, and to minimize tool changes which, when required, are simple and very quick.



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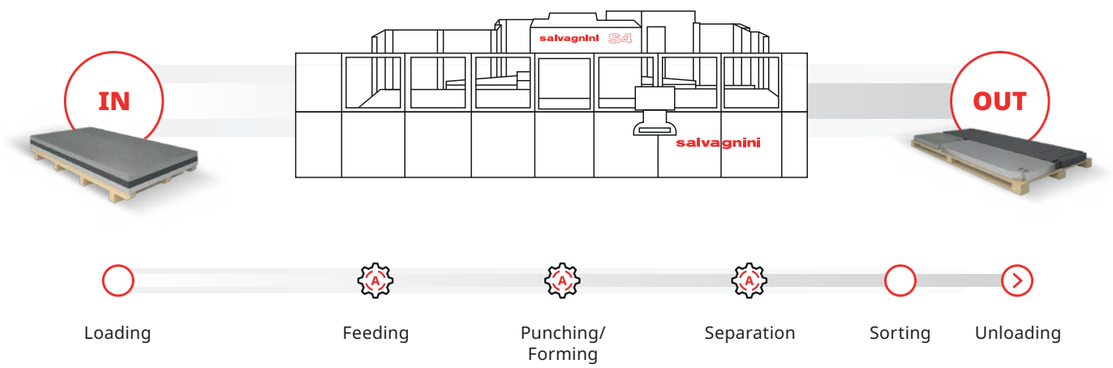
Multi-function system for lights-out manufacturing.



What is the minimum level of automation for an S4?

The S4 is a flow solution. In its basic configuration, it **integrates feeding and unloading solutions** that automate the production process and optimize each operation: at the infeed, a conveyor-centering device anticipates the loading of the sheet metal in masked time, positioning it correctly; at the outfeed, each part is automatically transferred to the next devices or the collection bins.

How can we recover efficiency?

In addition to solutions that optimize the efficiency of each operation, Salvagnini supplies **automation and process software** which, by suitably organizing the whole production flow, help to **achieve greater autonomy** for unmanned and lights-out jobs, reducing the impact of labor costs and the return-on-investment time.

Integrated modularity

The S4 is easy to configure and can work **stand-alone**, **in-line**, integrated into a **flexible cell** or for **lights-out manufacturing**. The loading/unloading solutions allow unmanned operations, enhancing the productivity of the punching-shearing center. The modularity of Salvagnini's automation devices allows the production flow to be extended and/or modified, even after first installation. In addition to integrated automation, Salvagnini supplies a wide range of **automatic loading/unloading and sorting devices** which, coupled with a store, increase system autonomy and efficiency. These devices mean that different materials and thicknesses are always available for just-in-time jobs, minimizing waiting times for sheet metal feeding and reducing the risk of error or damage to the material resulting from human intervention.

FMS and unmanned line manufacturing.



The S4 punching-shearing center is ideal for line production with P4 panel benders, ROBOformER robotized bending cells or FB framebenders.
Mechanical connection is guaranteed by various handling and transfer devices, while the software ensures two-way communication between systems, for unmanned and/or balanced production. The S4+P4 line, introduced by Salvagnini in 1979, ensures continuous production of kits and batch one, minimizing cycle times, semi-finished parts and intermediate handling. The S4+P4 line is the ideal solution for just-in-time production with full flexibility. It can be configured according to the space available, the degree of automation and autonomy needed, the context and production strategies, or the productivity required.

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Experience and innovation.

Process efficiency
The S4 punching-shearing center **maximizes process efficiency**: all the loading, punching, forming, separation and unloading operations are automatic, done by a single system that eliminates semi-finished parts, does not require manual intervention and assures extreme repeatability.



Adaptive system
The integrated adaptive technologies **make the system intelligent** and able to automatically adapt to variations, eliminating waste and corrections, while guaranteeing high machining quality:
- the centering control system measures the incoming sheet and adapts the program to the actual dimensions measured, if necessary;
- the manipulator changes its dynamics according to the size and weight of the sheet, opening the pincers according to the percentage of sheet machined;
- an automatic system checks the thermal expansion of the manipulator's axes and compensates any variations, guaranteeing extreme positioning precision;
- the shear automatically records the clearance and, depending on the thickness and the material, modulates the required force in-cycle.

Modular automation
Storage and automatic loading/unloading devices **increase the autonomy of the system**, regaining efficiency both in individual processing steps and throughout the production process. The wide range meets practically any layout or configuration requirements, adapting to the most diverse production strategies.

The S4 punching-shearing center has been a winning choice for companies in **66 countries worldwide** and in **over 110 sectors**: from elevators to switchboards, from HVAC to metal furniture, from doors to lighting, from Ho.Re.Ca to logistics systems, from refrigeration to machinery, from building technologies to the automotive industry and many more besides.

Designed by Guido Salvagnini in 1978, the S4 punching-shearing center is natively developed for integration into automatic manufacturing systems or lines.

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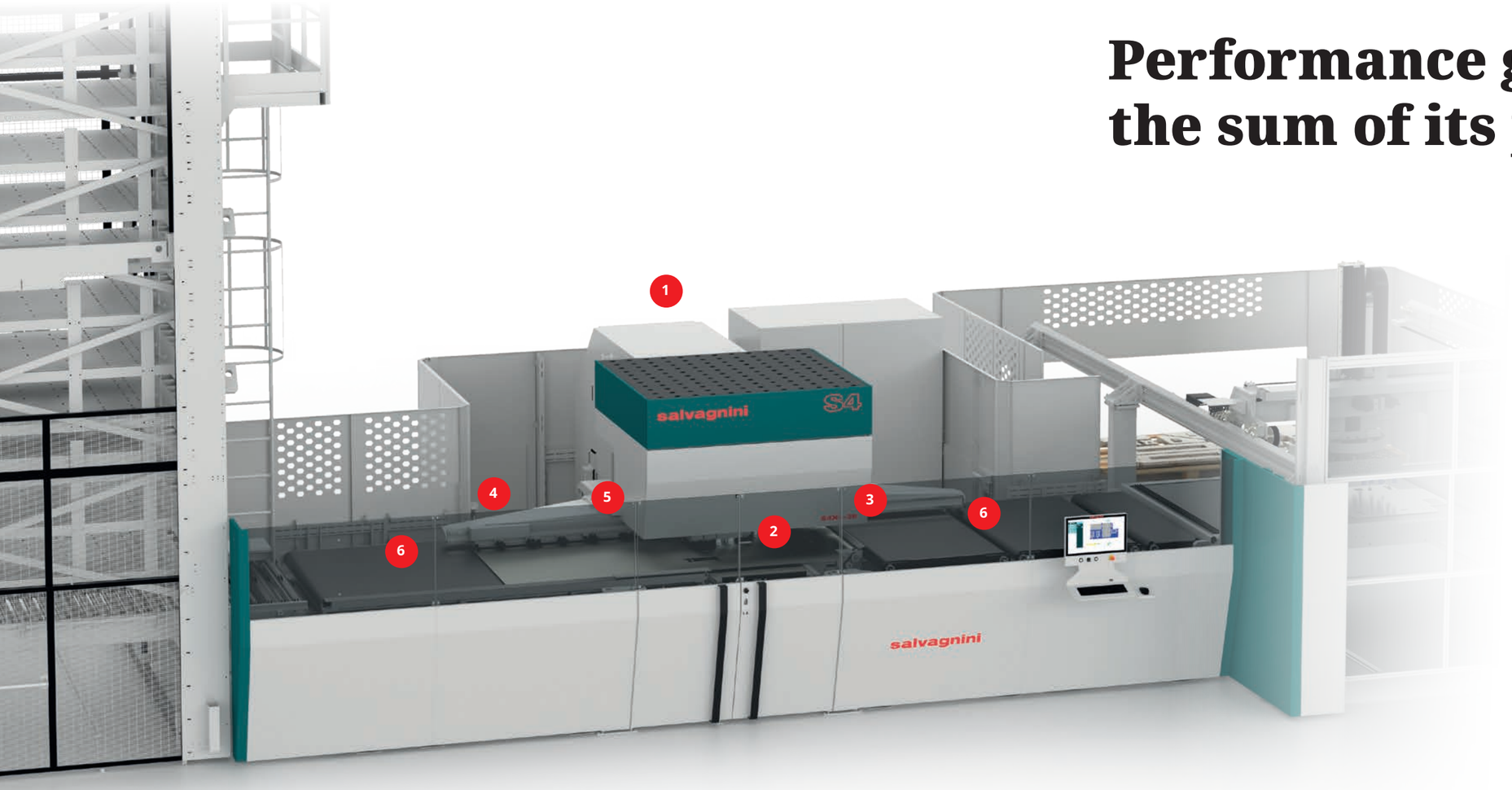
Performance greater than the sum of its parts.



1. Structure
2. Multi-press head
3. Shear
4. Manipulator
5. Rotator
6. Working table

TECHNICAL DATA		
Models	**S4Xe.30**	**S4Xe.40**
Maximum sheet dimensions (mm)	3048 x 1650	4064 x 1650
Maximum sheet diagonal (mm)	3466	4386
Minimum sheet dimensions (mm)	370 x 300	370 x 300
Maximum speed (m/min):		
X axis	132	132
Y axis	96	96
Speed with both axes moving simultaneously (m/min)	163	163
Maximum acceleration (m/s^2):		
X axis	30	30
Y axis	15	15

TECHNICAL DATA		
	Punching	**Shearing**
Technology	Operating head	Simultaneous or independent X- and Y-axis cutting
Maximum material thickness (mm)		
Aluminum, UTS 265 N/mm^2	5.0	5.0
Steel, UTS 410 N/mm^2	3.5	3.5
Stainless steel, UTS 610 N/mm^2	2.0	2.0
Minimum material thickness (mm)	0.5	0.5

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Multi-press head: tools always available.

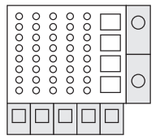


The multi-press head has a **die-structure** that houses **up to 96 tools** needed for production. **Each tool is actuated individually and is always available**. The multi-press head guarantees high punch-die alignment precision, and thus machining quality, with reduced cycle times, eliminating in-cycle set-ups and the related waiting times.

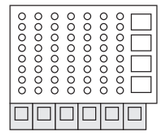
The multi-press head offers several advantages:

- **performs both single and multiple punchings;**
- **minimizes the repositioning needed to move the sheet to the tool;**
- **reduces cycle time and tool wear;**
- **improves punching flexibility;**
- **maximizes productivity in nests that require punchings of different shapes and sizes.**

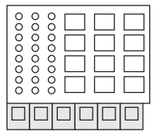
The multi-press head is available in 5 models that can house a varying number of stations to meet different production needs. The head configuration proposed for each customer is designed to meet their specific production needs, and is designed to optimize cycle times.



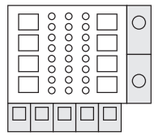
H2, the most versatile option.



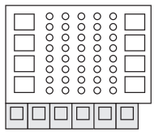
H3, ideal for nesting.



H4, specially designed for thick material.



H5, designed for symmetrical processing.



H6, suitable for nesting on thick material.

TOOL STATIONS					
Press specifications	**Number of tools per head model**				
	H2	**H3**	**H4**	**H5**	**H6**
70 kN / 7.7 ton presses with max. Ø 33 mm tools	40	56	24	24	40
260 kN / 28.6 ton presses with max. 90 x 90 mm tools	4	4	12	8	8
Basic configuration	**44**	**60**	**36**	**32**	**48**
Optional 120 kN / 13.2 ton presses with max. Ø 60 mm tools	5	6	6	5	6
Optional 80 kN / 8.8 ton embossing presses with max. Ø 60 mm tools	5	6	6	5	6
Optional 120 kN / 13.2 ton double indexing presses with max. Ø 60 mm tools	6	6	6	6	6
Optional 30 kN multiple presses with 6 max. Ø 33 mm tools each.	30	36	36	30	36
Optional 55 kN / 6.1 ton lower-effect embossing presses	5	5	2	3	3
Maximum number of punches	**76**	**96**	**72**	**64**	**84**

OPTIHEAD is a feature of STREAMPUNCH, the programming software for punching, used to **optimize tool positioning** according to actual production needs, reducing cycle time. **OPTIHEAD** automatically suggests the best set-up of the multi-press head to the programmer, simplifying management of the S4.

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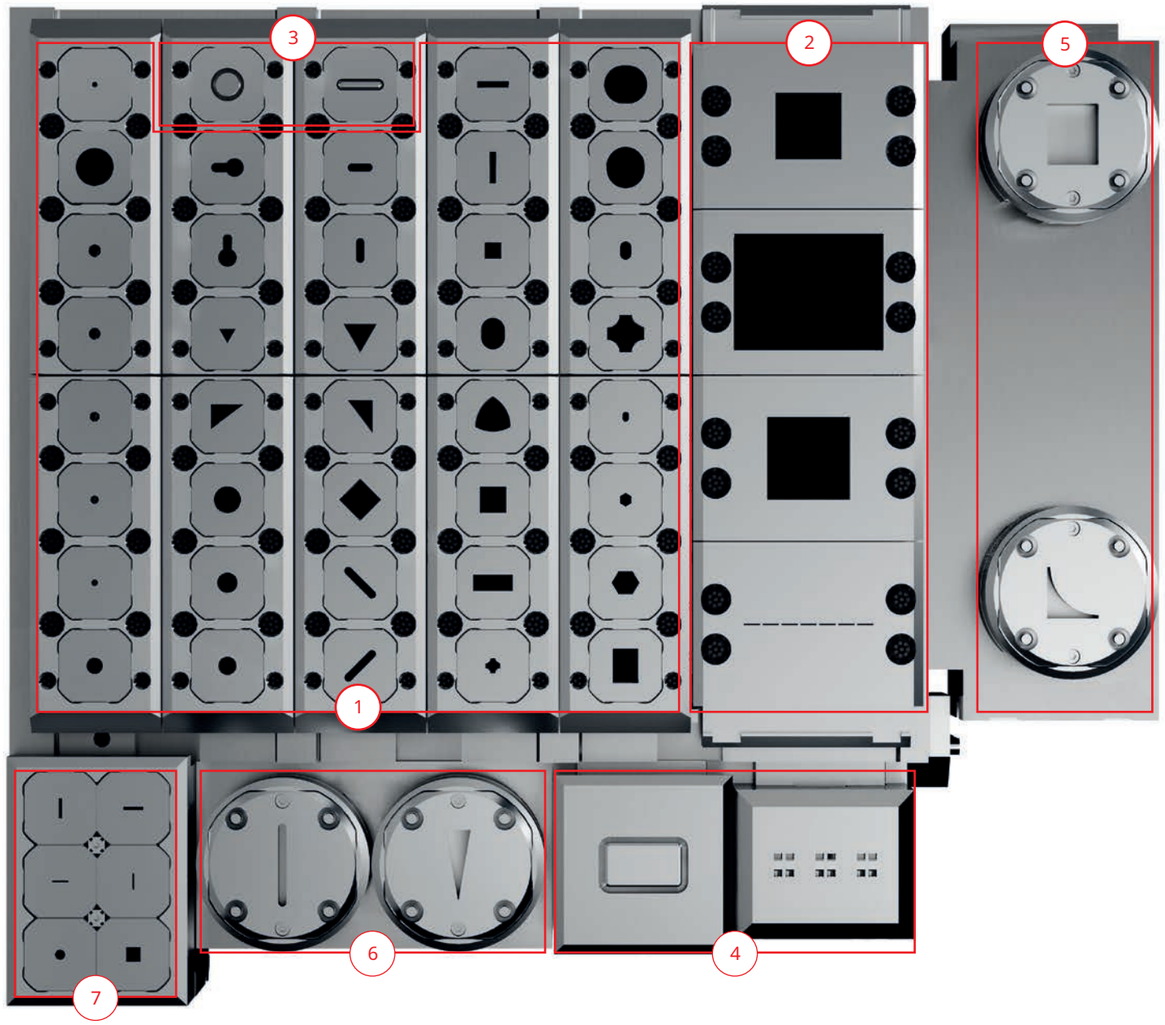
Salvagnini tools.



All-round quality and service.

With thirty years' experience in tool design and production, **Salvagnini oversees the whole manufacturing chain**, from the control of the steels used to mechanical machining and assembly, with its own team of professionals.

Each tool is characterized by:

- infeed and guide systems to protect the panel from damage;
- pre-tensioning systems inside the insert, for optimal production of grilles;
- solutions to prevent the machining burrs from being crushed.

The Salvagnini range includes standard tools for punching, forming and separating, as well as parametric and special tools, designed and made for specific jobs or materials.

Depending on the model and the configuration, the multi-press head works on various types of station:

- P from 7 t or 26 t (cutting)
- EI, BU, BH (forming)
- PP polypunch
- P2R (indexed/rotating tools)
- ME (tapping unit)

1 2 **PUNCHING**



3 4 **EMBOSSING, FORMING**



5 6 **AUTO-INDEX**



7 **POLY-PUNCH, TAPPING**



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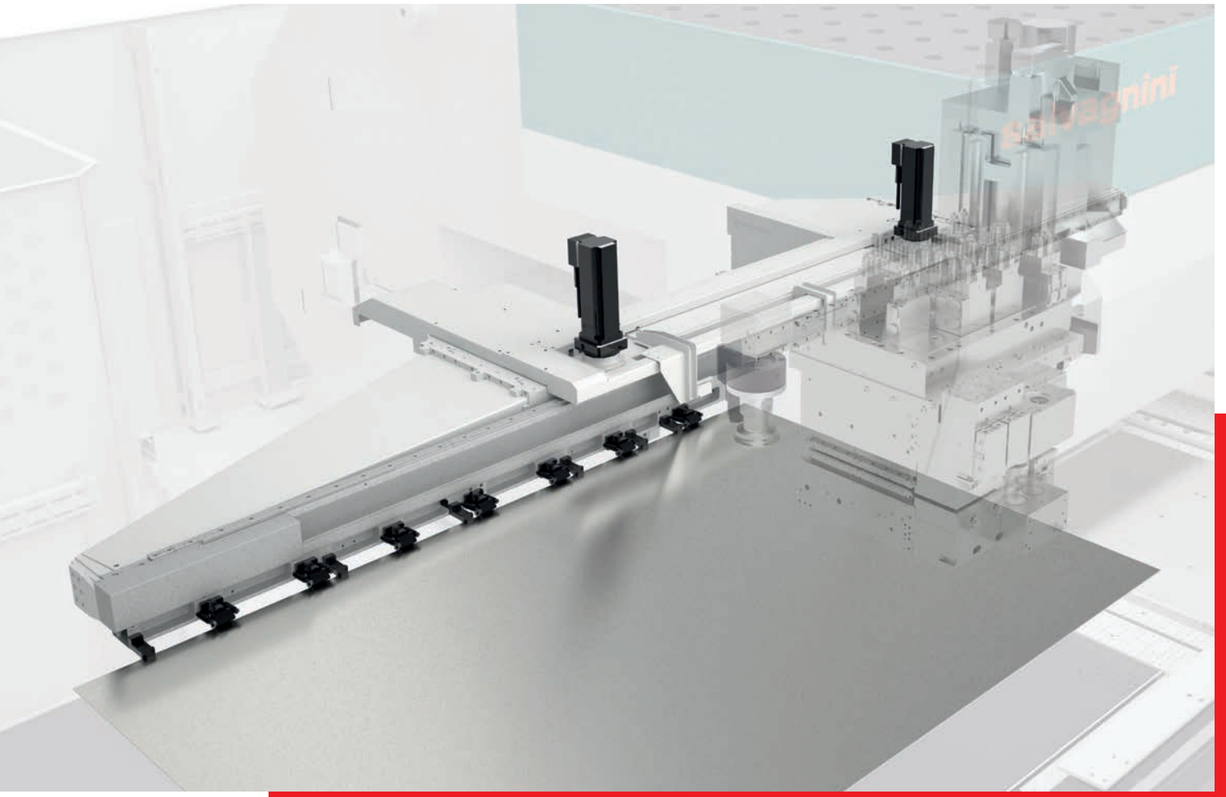
Manipulator: accurate referencing and fast scrap-free processing.

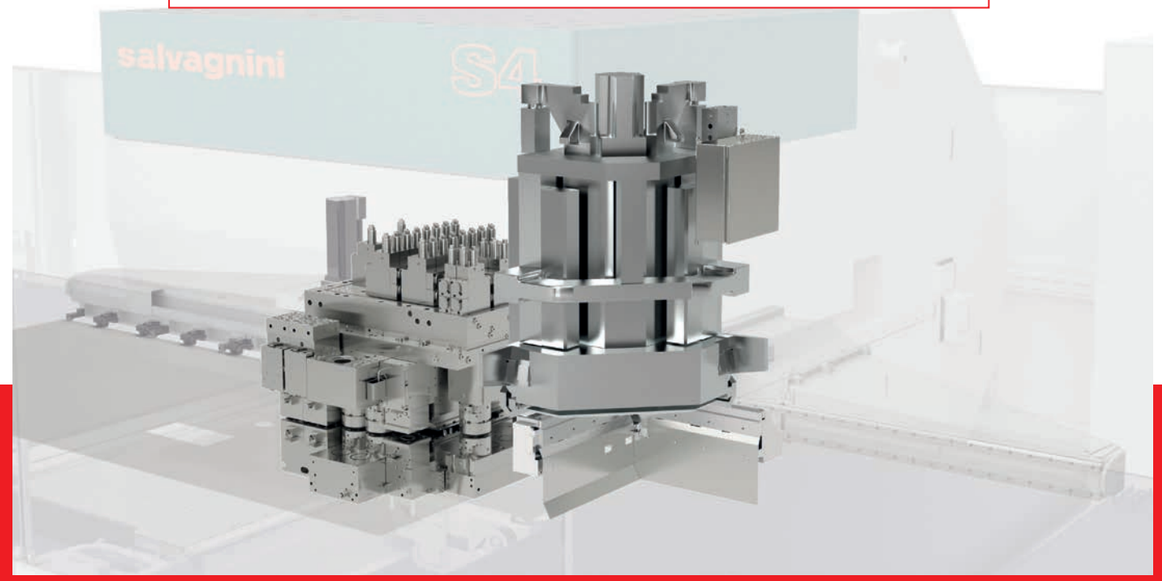


The manipulator centers the sheet when machining begins and keeps it clamped during the punching and separation operations. It has a maximum stroke of 3030 mm which allows sheets of up to 3048 mm to be machined without regripping, and has **9 pincers with independent opening**, extending the possibility of machining nests without any holding scrap and reducing scrap by optimizing sheet metal use. The path and punching optimization algorithm makes it extremely precise and reliable. It has a patented hand-over system that modulates the dynamics according to the weight of the sheet metal being processed.

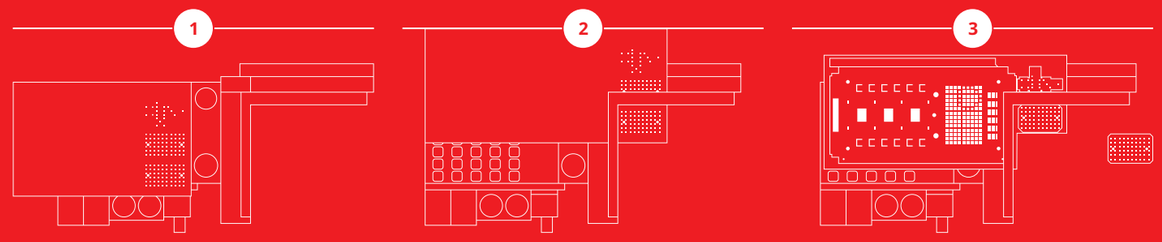
Integrated shear.

The shear is composed of two 500 mm blades, which are independent and orthogonal to each other, equipped with blankholders, for cutting any length. Installed next to the multi-press head, the shear is part of the same structure: it is a distinctive solution and unique on the market, eliminating the geometric limits due to the head/shear distance and ensuring optimal, constant alignment and superior machining quality. The shear also ensures advantages in terms of process quality as, compared to separation by punch, it reduces the cycle time, does not erode the material, improves optimization and minimizes scrap, making the S4 a truly combined system.

Freedom of choice: the shear cuts the sheet metal into parts of any size, with or without holding scrap, choosing the best option for the specific manufacturing requirements.



Balanced production and optimized flow.



In traditional systems, the individual parts in a multiple sheet or nest are separated and unloaded sequentially once the whole sheet has been punched. Salvagnini's Punch&Cut mode groups together the machining operations for each part (1) and processes them separately (2), improving precision and repeatability by minimizing the stress on the sheet metal, and rapidly feeding the production flow downstream (3) by balancing kit or multiple production batches.

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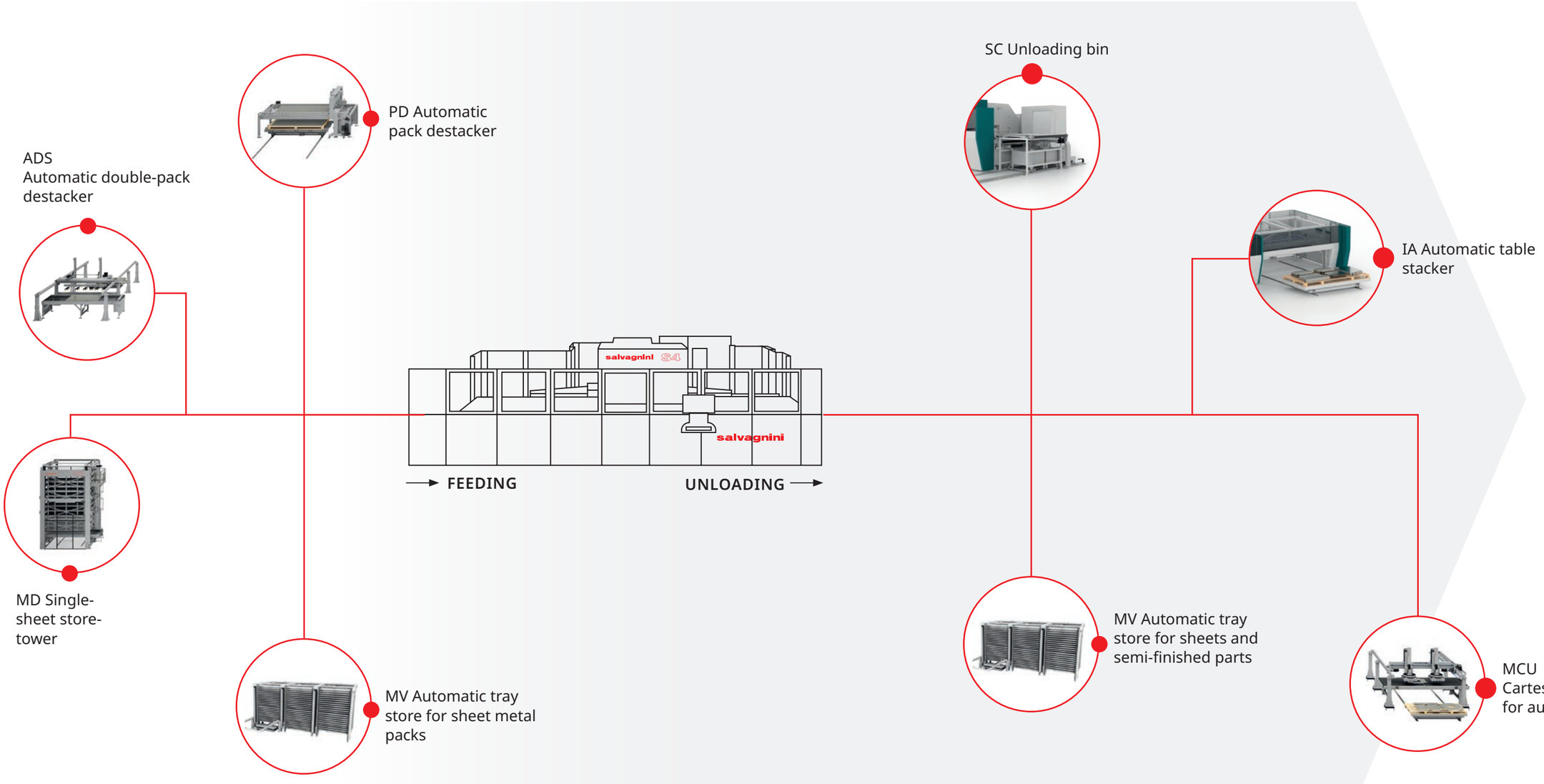
Modular, scalable automation for regaining efficiency.

Automation plays an increasingly important role: it reduces the risk of loading and unloading becoming bottlenecks, and can help to reduce the impact of labor costs.

The Salvagnini loading/unloading and sorting connections satisfy all automation requirements: from stand-alone operation, to integration in flexible cells or in automatic lights-out factories.

Feeding devices
The S4 punching-shearing center can have different types of feeding connections: from the in-line conveyor to the automatic destacker, from the automatic store-tower to the automatic tray store.

Unloading devices
The punched and/or sheared parts can be automatically directed to collection bins, buffers, one or more stackers, or intermediate stores, or straight to downstream operations.



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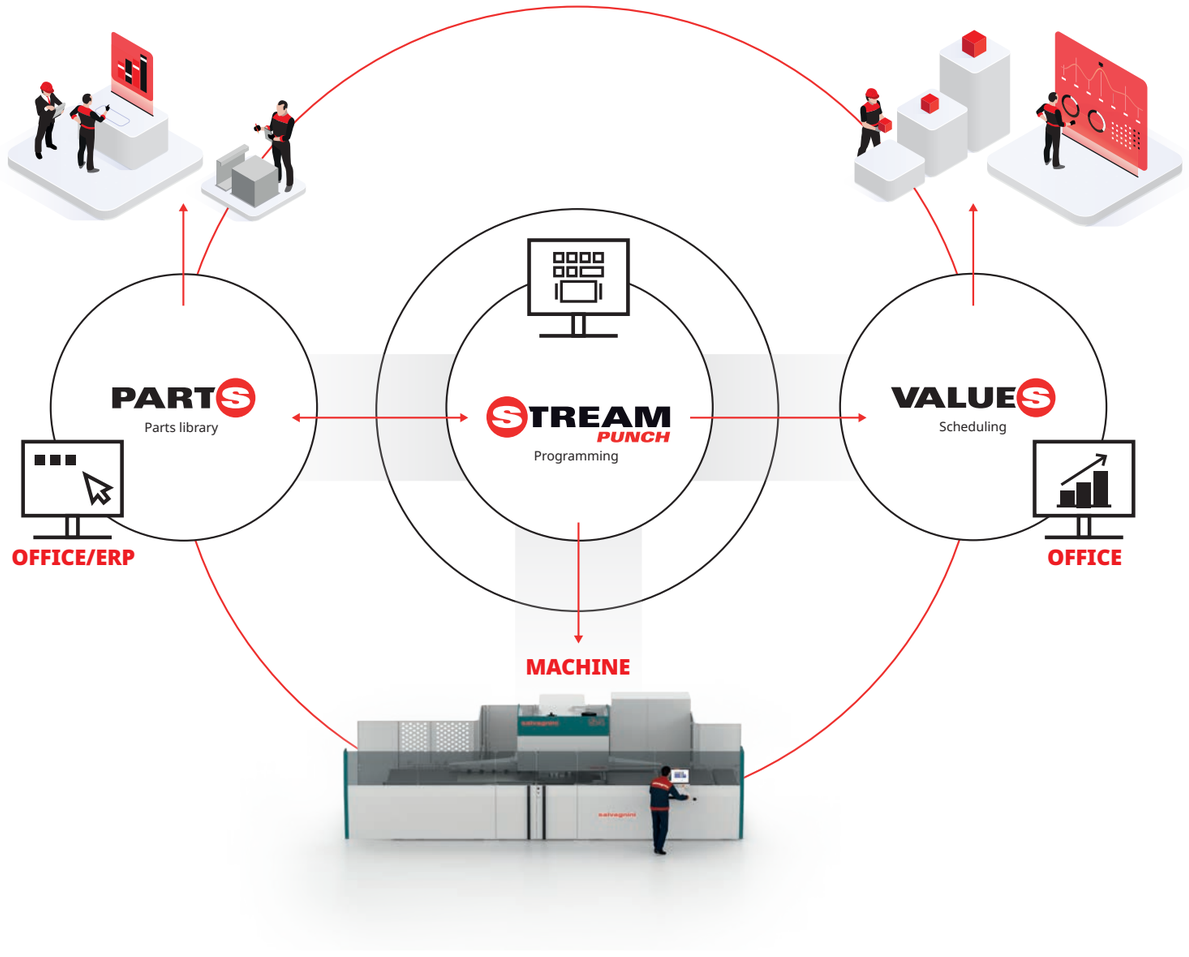
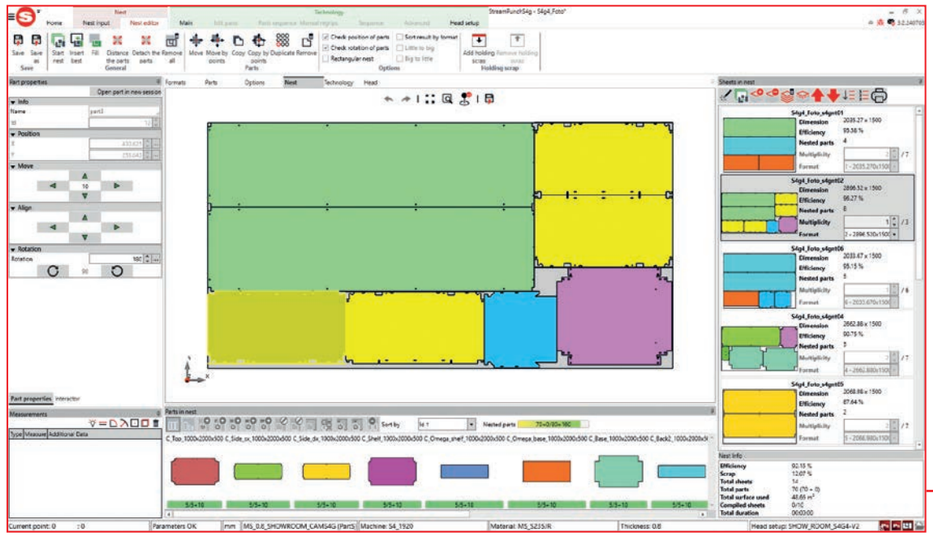
The software ecosystem.

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



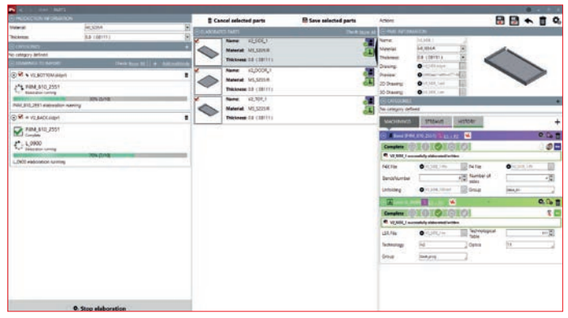
It is the integrated environment for **managing all activities in the office and on the shop floor;** it constitutes a single **point of access for all technologies**, from cutting to bending; it is capable of meeting all planning, programming, production, management, control and optimization needs throughout the production process. STREAM can also be used to **calculate costs**, including those for upstream and downstream processes where necessary.



STREAMPUNCH.G4

STREAMPUNCH is the programming software for generating punching programs. it includes the following functions:

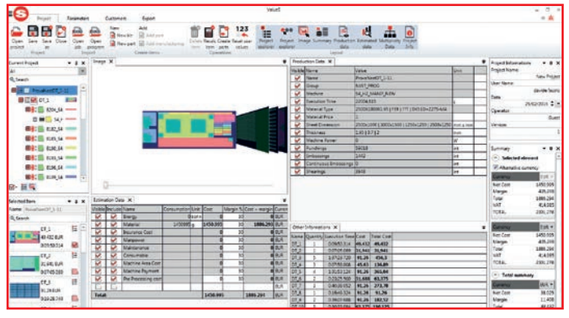
- **CAM**: creates or edits the 2D drawing of the part, and automatically defines the punches for creating the geometries, punching and shearing sequences and sheet metal handling operations.
- **Nesting**: automatically, semi-automatically or manually optimizes the sheets for production, starting from a production list.
- **Reverse engineering**: generates the part drawing from the machine program.
- **OPTI**: optimizes the use of the sheet, increasing process efficiency and minimizing waste.
- **Parametric shapes**: compiles nests from programs with parametric variables, without using a 2D drawing.



PARTS

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

- used to centrally create and modify the single part and nesting programs, for all Salvagnini technologies;
- simplifies nesting and part searches and traceability;
- is integrated with all the CAM/NEST software in the STREAM suite;
- it defines the production flows for each part to be machined;
- makes programming activities more efficient and dynamic in teams with more than one programmer;



VALUES

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 on that of the entire process, including upstream and downstream machining where necessary.

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Coordinate your factory with OPS in real time.



When adopted, advanced digital technologies can implement and manage complex, integrated, highly automated high-performance systems, and can help to develop simple solutions that require no structural changes to the production layout, making the world of smart manufacturing much more accessible.

In the production equation, OPS, the modular Salvagnini process software, acts as a central coordinator, managing and distributing information among all the environments to make the process truly efficient.

OPS receives the production list in real time from the factory ERP/MRP and supports programming activities, defines the rules and algorithms required to **automate the process, adding intelligence to the system.**

- **OPS can take independent decisions,** according to a production logic or a mix of multiple production logics;
- **Exchanges information between different technologies,** such as the components of an FSJ cell (Flexible Smart Job shop);
- **Organizes production,** defining priorities, managing any order changes or cancellations and checking the availability of the raw materials or semi-finished parts needed for production;
- **Automatically creates punching nests,** grouping parts by material, thickness, tool set-up required for any downstream operations, production and job orders;
- **Provides feedback to the factory ERP,** updating material availability and state of production in real time, part by part;
- **Reduces or eliminates any redundant activities** with low added value;
- **Integrates labeling, traceability** and stock management solutions up- and downstream of punching, minimizing error risk and waiting times.

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Transforming values into value.

A modular proposal developed across 3 service levels, designed respectively to:

Act

manage everyday needs

Plan

provide preventive maintenance and planning services

Grow

maximize the use and performance of the system

Proximity, reliability and **orientation to the future** are values that have always been found in the wide range of services available for responding to contemporary challenges.

LINKS

LINKS (ACT) is the IoT solution that improves the overall effectiveness of Salvagnini systems, using the latest business intelligence technologies. LINKS is used to monitor the machine performance and access the production data, logbooks, performance KPIs, telemetry and parameter monitoring, through the Condition Monitoring process.

SupportYou

SupportYou (ACT) is a subscription-based service that manages updates and provides support for using and programming STREAM and all the applications in the office station.

Close2You

Close2You Report (PLAN) uses LINKS data to offer an overview of the state of health of a system, suggesting the required maintenance interventions according to their criticality and proposing agreed interventions to minimize the risk of malfunctions.

Rethinks

Rethinks (GROW) is the ideal solution for anyone wishing to optimize their production process and improve quality and efficiency, reducing the number of work steps, material usage and costs.

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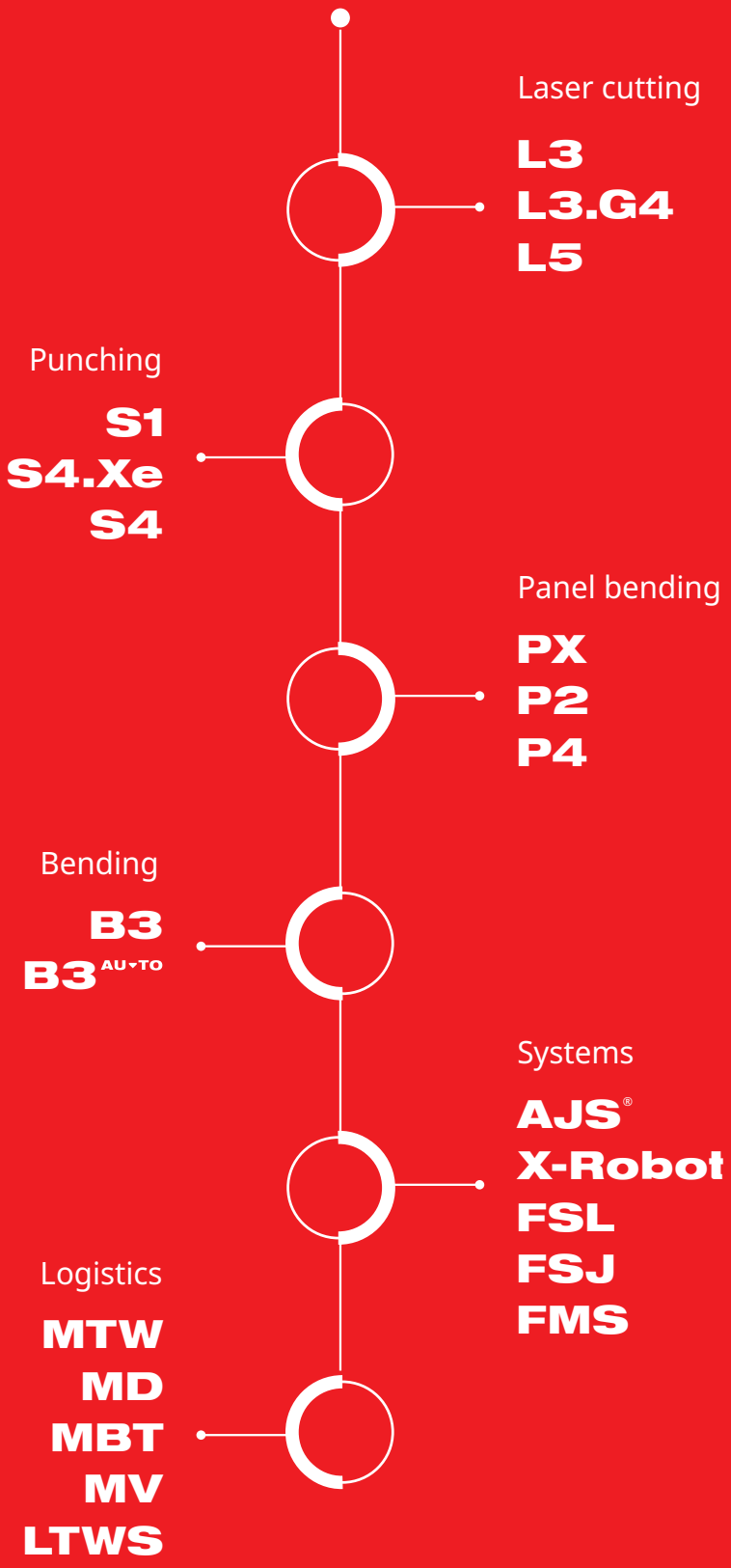

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