L5



High dynamics fiber laser

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High dynamics fiber laser.



What factors affect the productivity of a laser?

The productivity of a laser is affected by **market factors**, i.e. everything the system cannot control, such as batch size, frequency of production changes and mix of materials/thicknesses; and by **technological factors**, which are linked to the features of the cutting system, such as source power, level of automation and digitalization.

The **field of application**, with its specific mix of materials, thicknesses and production strategies, is the key factor in the choice of technology: versatile and transversal, as in the case of the L3, or with high dynamics, like the L5.

Increasingly small batch sizes need **rapid automation** for rapid or masked-time production changes. Salvagnini offers a wide range of solutions: high-performance systems that are modular and compact for managing increased output, as well as systems that are open to downstream processes and designed to be effectively integrated into the factory's production flow.

The range of workable thicknesses and the cutting performance depend on the **power of the source.** To meet different production needs, Salvagnini has introduced a 6kW high power density source and a 10kW source.

The **compass**, an original mechanical system, moves the laser head with accelerations of up to 5g without using linear motors, helping to further increase system **productivity**, while maintaining reduced consumption.

Efficiency and productivity are achieved by eliminating downtime, optimizing the process and simplifying the control system: these objectives can be reached with **digital solutions** that support the operator's work and the **OPS process software** that manages the exchange of information with the ERP in real time and balances the production flow.

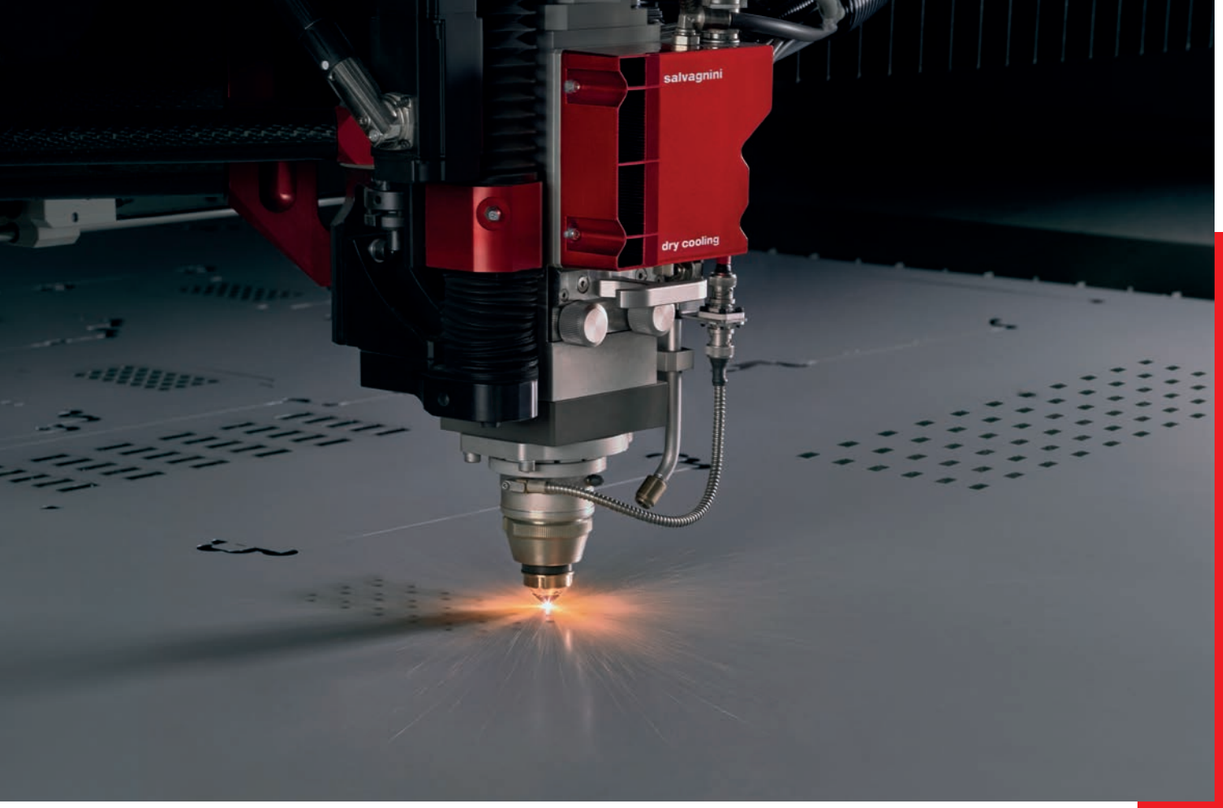
What is the Salvagnini formula for maximum productivity?

Increasing the productivity of a laser means **guaranteeing efficiency throughout the whole process**. The Salvagnini formula blends the power of the source with intelligent sensors and solutions integrated into the L5 laser, automation upstream and downstream of the cutting process, and digitalization. The result? Higher performance, and an optimized production process.

What do we mean by original mechanical solutions?

The L5 is equipped with a **single laser head**, designed by Salvagnini, used to cut all the allowed materials and thicknesses. It is mounted on a carbon fiber compass system with advanced kinematics that moves the head on the XY plane with dynamics of up to 5g on short movements. It is equipped with the **patented DRY-COOLING system**, used to actively control the temperature of the optics. Its **process sensors** control and adapt the piercing in real time, monitoring any cutting losses, stopping the process, and restarting it with appropriately corrected parameters. The **TRADJUST function**, integrated into the proprietary control, ensures automatic parameter modulation according to the trajectories, making the system easier to use.

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Quick and easy high-quality cutting.

What are the main trends in the laser world today?

The market demands cutting-edge systems, with high performance, that are automated yet easy to use, manage and maintain. The **L5 is an agile laser**: the proprietary functions, the multi-task human-machine interface and the artificial vision systems help operators to effortlessly solve the problems in their day-to-day work. Salvagnini software solutions effectively connect the laser to the factory ERP and other technologies downstream, guaranteeing the traceability of the parts, supporting the operator in sorting the parts and providing progress feedback in real time to the production manager, whether this is human or virtual.

What are artificial vision systems?

The artificial vision systems implemented on the L5 simplify activities which require time or generate errors and waste. They are **simple solutions that increase the flexibility of the system** and broaden its field of application. **AVS** turns laser cutting into a work station downstream of punching, thus guaranteeing the maximum precision of the cut parts. **SVS** regains scrap and sheet metal leftovers, responding to urgent needs or replacing any waste in downstream machining activities. **NVS** checks that the laser beam is centered, and uses the machine learning algorithms to monitor the state of the nozzle and reduce waste.

How to combine digitalization with simplification?

It is the perfect combination: digitalization has led to the development of simple solutions, which have turned several traditional processes into smart production flows. **OPS**, the **modular software for production management**, receives the production list from the factory ERP/MRP in real time and supports the programming activities, defining priorities, rules and algorithms. OPS therefore helps to **automate the process, adding intelligence to the system**. The OPS applications for simplifying workshop management include **PDD**, which supports the operator via the monitor for manual part separation and sorting, and **LPG**, which laser-guides the operator in the pick-up sequence.



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EFFICIENCY

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What are the challenges faced by the companies of tomorrow?

These challenges relate in particular to the **recovery of autonomy and efficiency**. Automating loading/unloading/sorting operations ensures improved cutting system performance and brings benefits to the whole manufacturing chain. Implementing simple, quick office software reduces the risk of turning programming into the bottleneck of production. Integrating ERP/MRP and process software for managing production automates the distribution of information, helping to create a lean, error-proof production environment.

How to regain efficiency in cutting?

Automation plays an increasingly important role: the highest performing laser systems require **loading/unloading/sorting devices** that are equally **high-performing**. These solutions not only guarantee greater efficiency and autonomy for the systems they serve, they also **reduce the impact of labor costs** and **the return-on-investment time.**

Can configuration affect efficiency?

The data from LINKS, the Salvagnini IoT solution, shows that the efficiency of a stand-alone laser system generally **does not exceed 60%.** This parameter varies with configuration: **systems with automation have average efficiency values** that are much **higher**, reaching **80%** for horizontal loading/unloading solutions and even **90%** if we consider the LTWS store-tower.

What is the minimum level of automation for an L5 laser?

The minimum level of automation for the L5 laser is the CPE device, the ultra-rapid electrical pallet changer. The raw material always passes above the material that has already been cut, preventing any scrap from previous machining being deposited on the sheet metal. Integration with automation systems helps to fully exploit the high dynamics of the compass to achieve extremely high productivity and process efficiency as well as significant reliability in unmanned jobs.

How to increase the autonomy of a laser system and reduce bottlenecks?

The LTWS store-tower has automated loading/unloading, an enabling factor for increasing the autonomy of the cutting system. It ensures **different materials and thicknesses are available** for just-in-time production, **reducing waiting times** for sheet metal sourcing, and operator dependency. In contexts marked by low volumes and rapid production changes, LTWS is a winning choice.

Automation, autonomy and value for money: which to choose?

The LTWS store-tower offers even greater performance when equipped with a **sorting device:** the automatic MCU or the manual TN. The store-tower manages different materials, thicknesses and sizes, reducing waiting times and making loading/unloading extremely fast: just 50 seconds. STORE, the store control software, is able to identify the loading trays, once emptied, as trays on which to stack the cut material, thus increasing operational autonomy.

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Experience and innovation.

Automation
Storage and automatic loading/unloading/sorting devices **increase the autonomy of the system, regaining efficiency** both in individual processing steps and throughout the production process, eliminating bottlenecks and reducing the impact of labor costs.

Simple to use
Proprietary functions such as TRADJUST, the simple and intuitive multi-task interface, together with great accessibility, the portable terminal on board the machine, artificial vision applications and the part tracing and identification solutions, allow operators to effortlessly solve any problems they come across in their day-to-day work, making the L5 agile and easy to use.



Process efficiency
Advanced technical solutions, full control of the process with cutting-edge sensors, digitalization and the OPS software for real-time production management, **eliminate low added-value operations, eliminating downtimes** and **reducing the cost** per part, thus increasing factory performance.

High dynamics and productivity
The compass is a winning solution for nest cutting, where the optimized positions of the parts require fast but very short head movements and precision cutting. Parameter modulation, the proprietary algorithms that control the kinematics, full process control and advanced sensors help to improve overall efficiency.

The result of extensive experience in the field.
Salvagnini was **one of the first companies in the world** to invest in fiber technology. The L5 comes from this long-standing tradition: it is a versatile, productive solution, with **reduced consumption** and **competitive running costs**, that respects the environment, humans and their work.

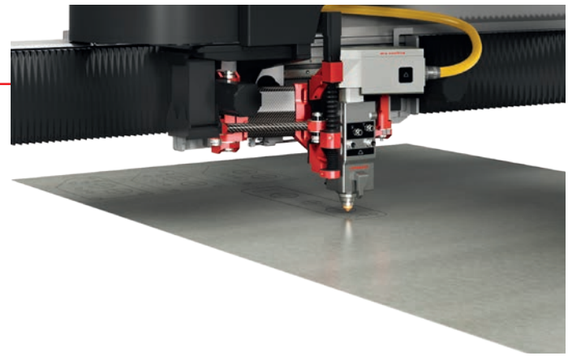
Two versatile models with working ranges from 3 to 4 meters in length: cutting has never been easier!

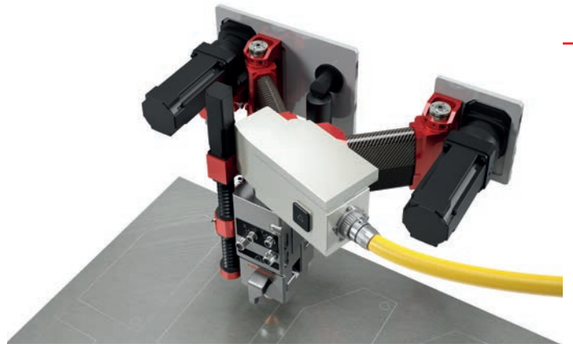
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Unique solutions for today's production.

AIRPLANE STRUCTURE

Salvagnini has patented a **load-bearing beam structure**, with a lightweight **airplane manipulator**, which offers many advantages: high rigidity, rapidity, positioning precision and accessibility to the whole worktable.



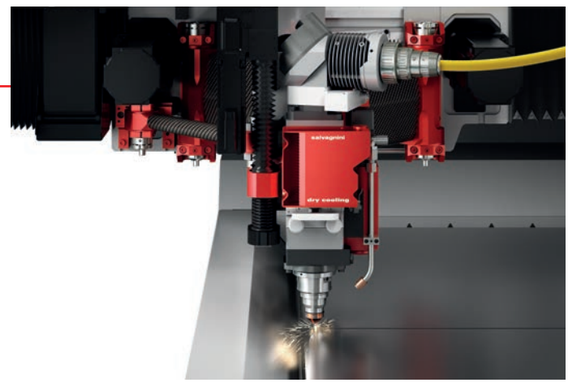


ADVANCED COMPASS

The head is coupled with the compass, a strong mechanical structure with a carbon fiber arm hooked to the machine airplane structure, which guarantees high precision even in the most aggressive cutting mode. With reduced inertia, using only rotary motors, the compass moves the head on the XY plane with high dynamics, reaching 5g accelerations on short movements. The compass is controlled by a specific algorithm, integrated into the proprietary numerical control.

SALVAGNINI LASER HEAD

The L5 has a **single optical head** that cuts the whole range of workable thicknesses with the **highest quality**. Production changes are extremely rapid, because **no adjustments are necessary**. The patented **DRY-COOLING** technology actively controls the temperature of the optics.



ADAPTABLE CUTTING FUNCTIONS

The **Standard, PowerCut** and **DynamicCut** cutting functions allow the operating mode best suited to each production to be chosen. They are easy to activate: **Standard** guarantees greater safety in unmanned manufacturing; **PowerCu**t ensures increased reactivity and operational speed, while the more aggressive **DynamicCut** improves performance on medium-thin sheets by making the most of machine dynamics.

TRADJUST: OUR EXPERIENCE AT YOUR SERVICE

The **TRADJUST** function, integrated into the proprietary Salvagnini control system, is used to **automatically modulate the cutting parameters** according to the trajectories. It makes the L5 easier to use, because it employs a single cutting parameter for each material and thickness, regardless of the size of the cutting profile.



FACE is the Salvagnini human-machine interface, extended to the entire product range.

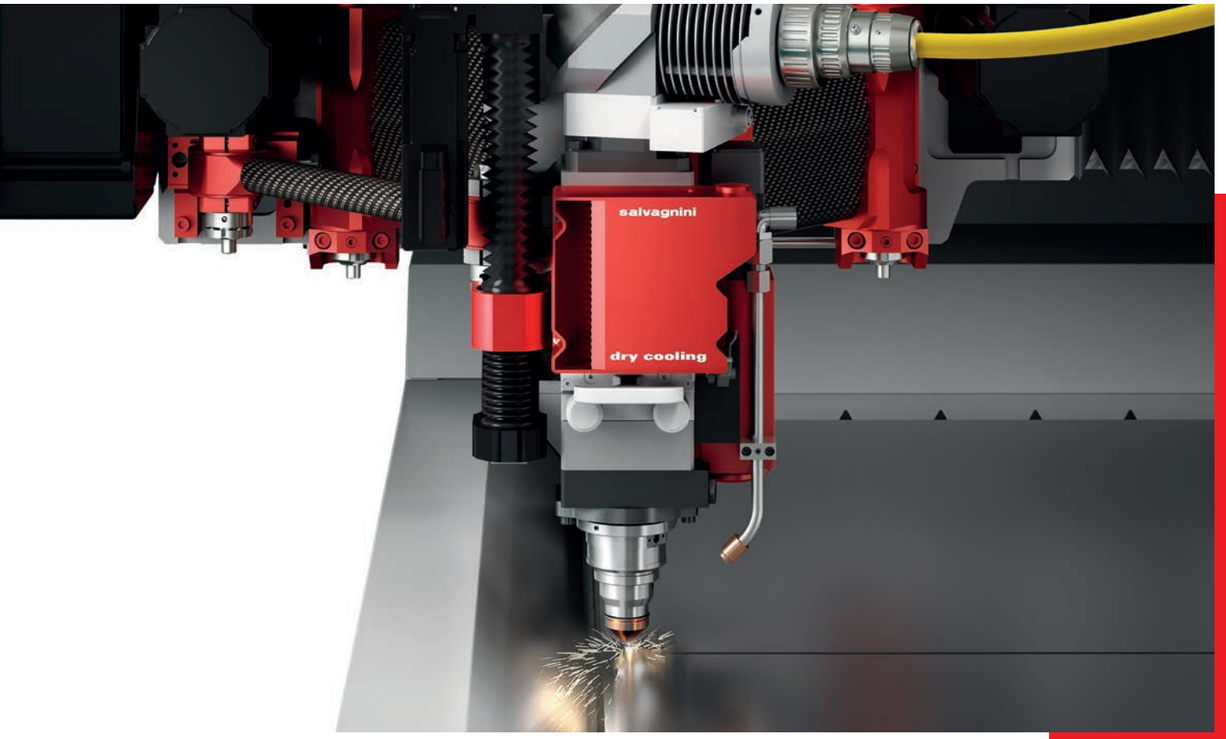
Simple and intuitive.

It reduces the time required for interaction, as each function is immediately clear and available in just a few clicks.

It is used to control production progress, dynamically manage the production lists, simulate the cutting sequence in real time, and schedule production stops and restarts. It offers support for diagnostics with EasyData2.0.

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Advanced control and process efficiency solutions.



APC2

The **adaptive process sensor** monitors piercing in real time, for greater speed and higher quality. It also checks for any cutting losses, and in the event of a fault, stops the process and resumes it with suitably remodulated parameters. It is also used to automatically search for the focal length.

ANC

The **automatic nozzle changer,** with nozzle-holder magazine, increases the autonomy of the L5 in unmanned production.



ACUT

L5 is natively set up for cutting with nitrogen and oxygen. The **ACUT option** extends the possibilities of the L5 and allows **cutting with compressed air**, if suitably treated. Productivity is similar to cutting with nitrogen, but with much lower costs.

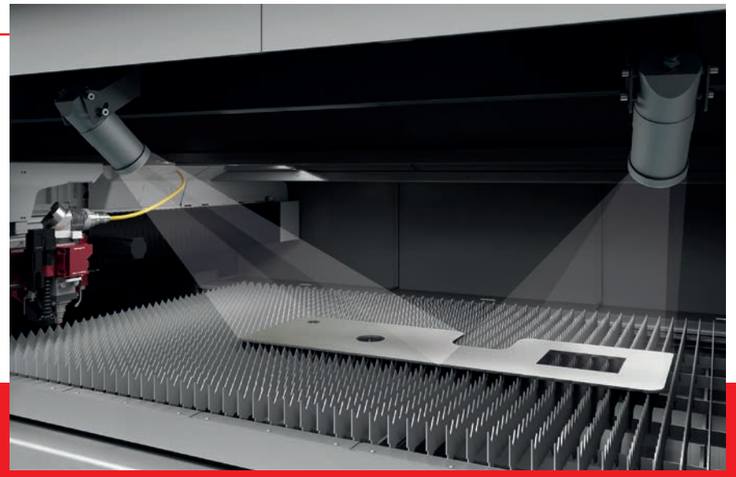
AQM/APM

These are turnkey devices that are complementary to ACUT and connect directly to the factory pneumatic supply or to a compressor upstream of the system. AQM filters the air, while APM ensures the pressure values required for the cutting process.

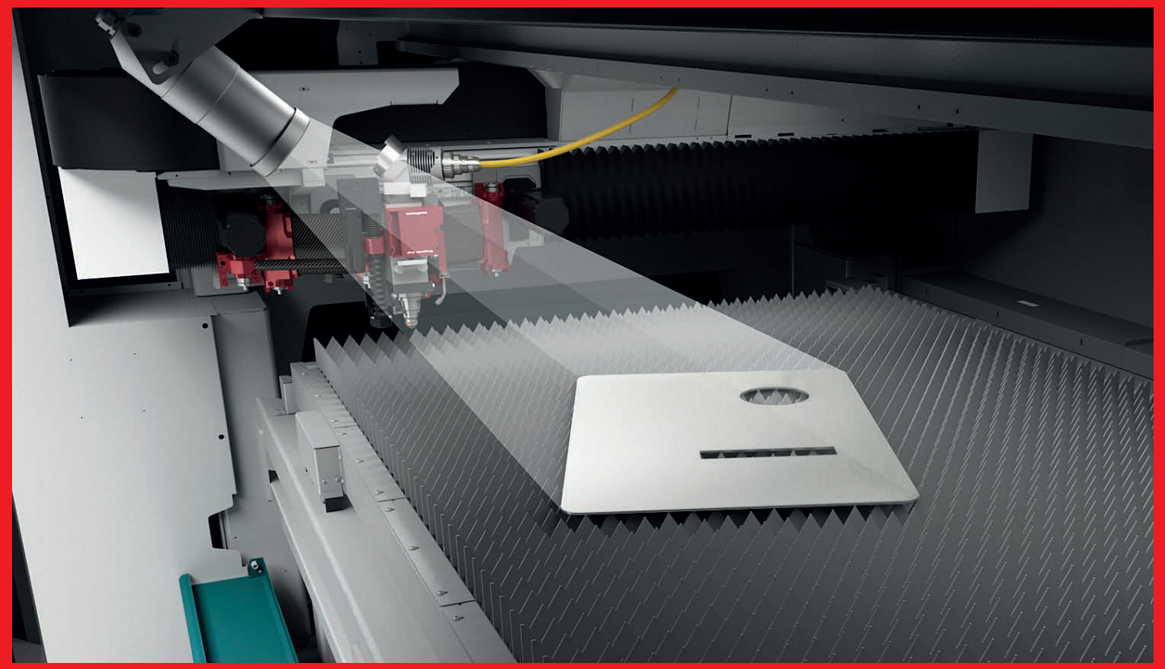
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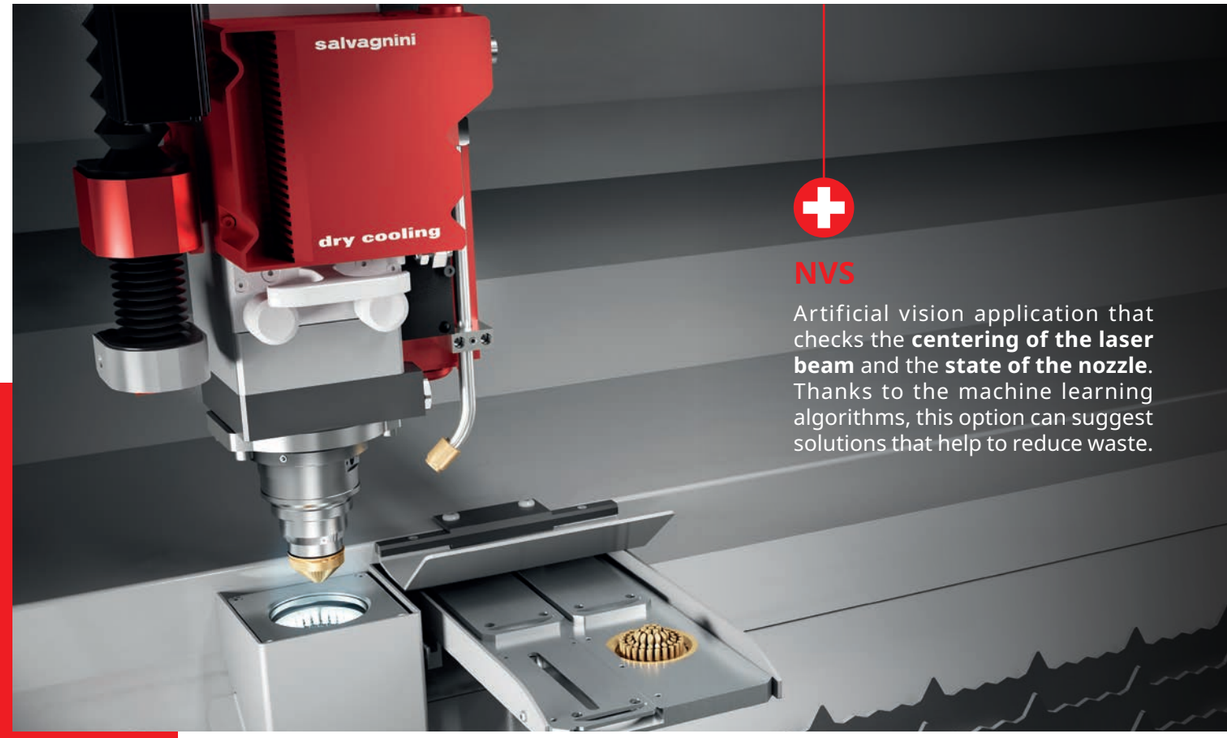
SVS

Artificial vision application that **acquires the image** of a sheet metal leftover positioned on the worktable and **transforms it into a dxf** to be used as the starting format for a new nest.



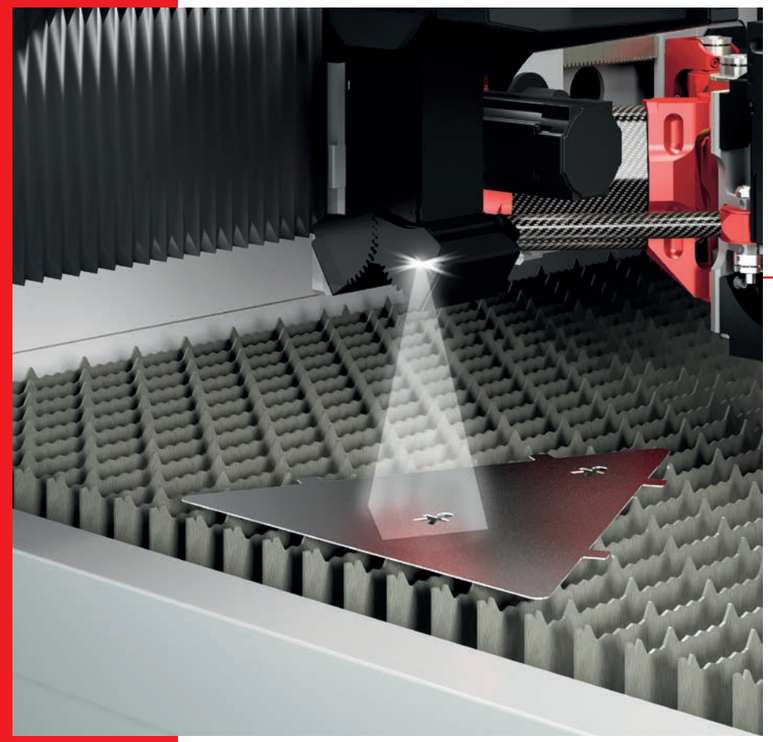
SVS is an option of STREAMLASER on machine, for speeding up the management of urgent jobs or replacing any waste in downstream machining.





NVS

Artificial vision application that checks the **centering of the laser beam** and the **state of the nozzle**. Thanks to the machine learning algorithms, this option can suggest solutions that help to reduce waste.



AVS

Artificial vision application that **speeds up the centering** of the metal sheet and allows previous **machining operations to be used as references for positioning it**, with no restriction on shape.

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Technical data

MODELS		
	L5-30	**L5-40**
XY working range (mm)	3048 x 1524	4064 x 1524
Z axis stroke (mm)	100	100
Maximum XY speed (m/min)	156	156
Precision[1]		
Position accuracy Pa	0.08	0.08
Average position range Ps	0.03	0.03

FIBER SOURCES						
	3000 W	**4000 W**	**6000 W**	**8000 WE***	**8000 W**	**10000 W**
Cutting capacity (maximum thickness in mm)[2]						
Steel	20	20	25	25	25	25
Stainless steel	12	15	20	25	25	30
Aluminum	10	15	20	25	25	30
Copper	8	8	8	10	10	10
Brass	6	8	8	10	10	10
Minimum thickness (mm)	0.5					
Consumption (in kW)						
Maximum absorbed power (in kW)[3]	18	21	28	28	34	42
Average absorbed power[4]	12	13	16	16	20	24

[1] Measurement calculated according to VDI3441 on maximum axis lengths.
[2] Cutting quality on limit thicknesses may depend on geometries required, material quality and system operating conditions. At limit values, burrs may be present on the lower edge of the cut. These values are for the Salvagnini reference materials.
[3] Maximum absorbed power calculated on the standard system configuration (machine, source, chiller, fume extractor), in 3 cutting cycles on mild steel from 0.8 to 6 mm.
[4] Average absorbed power calculated on the standard system configuration (machine, source, chiller, fume extractor), in 3 cutting cycles on mild steel from 0.8 to 6 mm.
*High efficiency version.

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Modular, scalable automation for regaining efficiency.

CPE • **Pallet changer**
Manual loading and unloading

MANUAL — AUTO

ADC/ADLU/ADLL • **Destacker**
Automatic loading and unloading

MANUAL — AUTO

MCU • **Cartesian manipulator**
Automatic sorting

MANUAL — AUTO

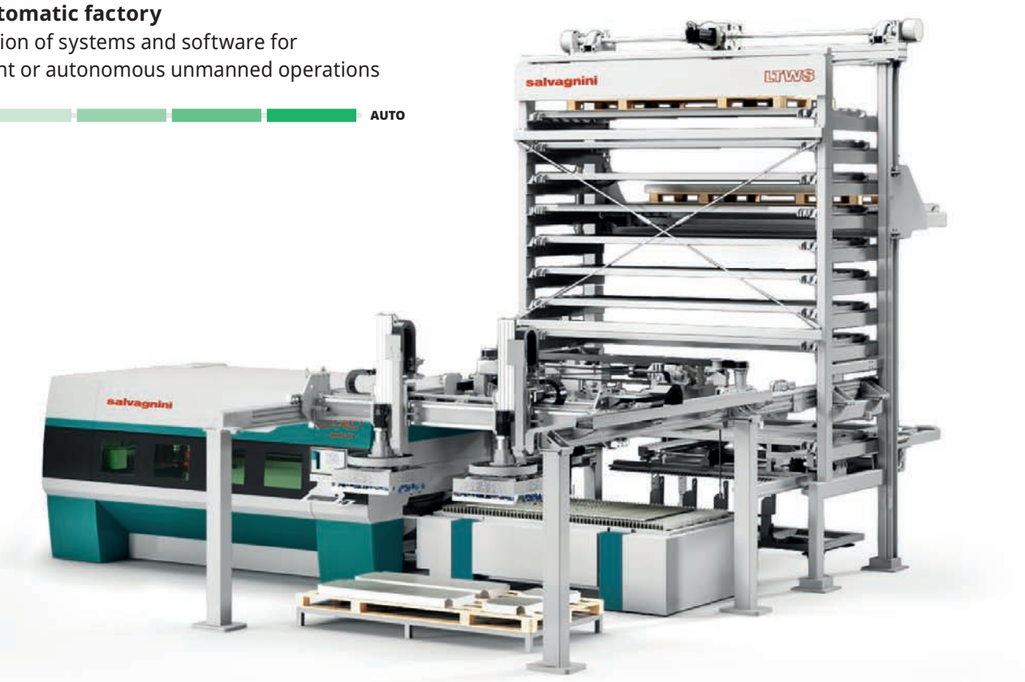
LTWS • **Store-tower**
Automatic loading and unloading

MANUAL — AUTO

FSJ • **Automatic factory**
Combination of systems and software for convergent or autonomous unmanned operations

MANUAL — AUTO

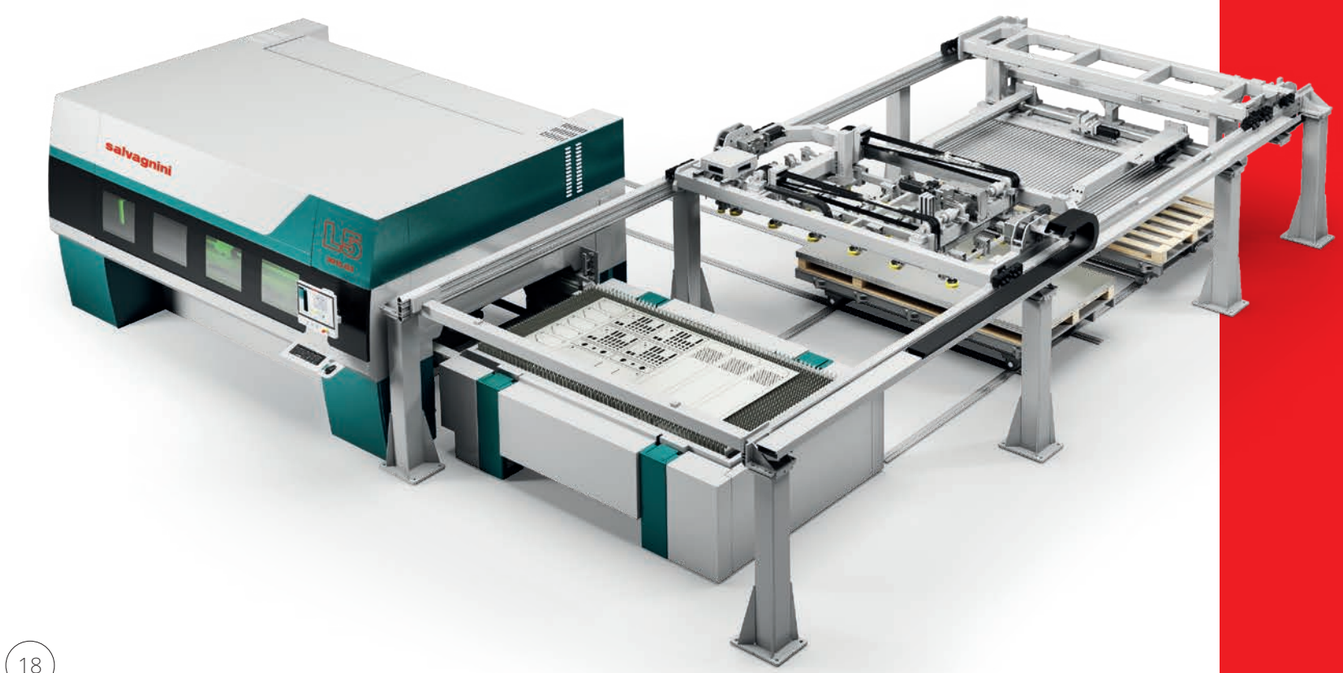
In the laser world, automation is playing an increasingly key role: on the one hand, cutting speeds risk turning loading and unloading into hazardous bottlenecks, and on the other hand, automation can help to reduce the impact of labor costs. **The loading/unloading and sorting connections satisfy all automation requirements**: from stand-alone operation, to integration in flexible cells or in automatic lights-out factories.



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Salvagnini offers different scalable loading/unloading automation solutions:

- the **CPE** pallet changer for **manual loading-unloading** is used for rapid pallet exchange; the raw material always enters above the outgoing cut sheet;
- The **ADC, ADLU** and **ADLL** devices automate the loading of the sheet metal and the unloading of the cut sheets, with **very rapid cycle times**; they also eliminate the intermediate handling that is usually done by the operator. ADLU and ADLL are designed for integration with the MCU;
- the **LTWS** and **LTWS Compact** store-towers are designed for unmanned loading, unloading and storage of materials; they are compact in size and have **extremely short cycle times** of up to 50 seconds; the loading and unloading devices are independent, **increasing process efficiency** even in extremely rapid cutting programs; autonomy is guaranteed by the availability of several materials, and by the STORE software, which identifies the empty loading trays as trays on which to stack the machined material;
- the **MV** tray store with picker-crane allows unmanned operation, offering high autonomy in the management of sheet metal and semi-finished or finished parts.





Sorting solutions.

- The **TN manual sorting** device helps operators to separate the cut parts from the skeleton, allowing cutting and sorting to proceed in parallel.
- The **MCU automatic sorting** device is used to easily stack parts of different shapes, sizes and weights. In addition to the standard sorting strategy, MCU can also work in multigripping mode, picking up several parts in sequence with the same gripping device, or in double picking mode, where two gripping devices descend at the same time to pick up two independent parts, reducing the part pick-up time by over 25%. MCU makes the operators' work easier, and **drastically reduces the waiting times** between the end of cutting and the start of the next production step. It can make single parts available for downstream processing in urgent cases or, if necessary, physically integrate the laser with panel benders or robotized bending cells downstream.

Advanced automation in sorting processes

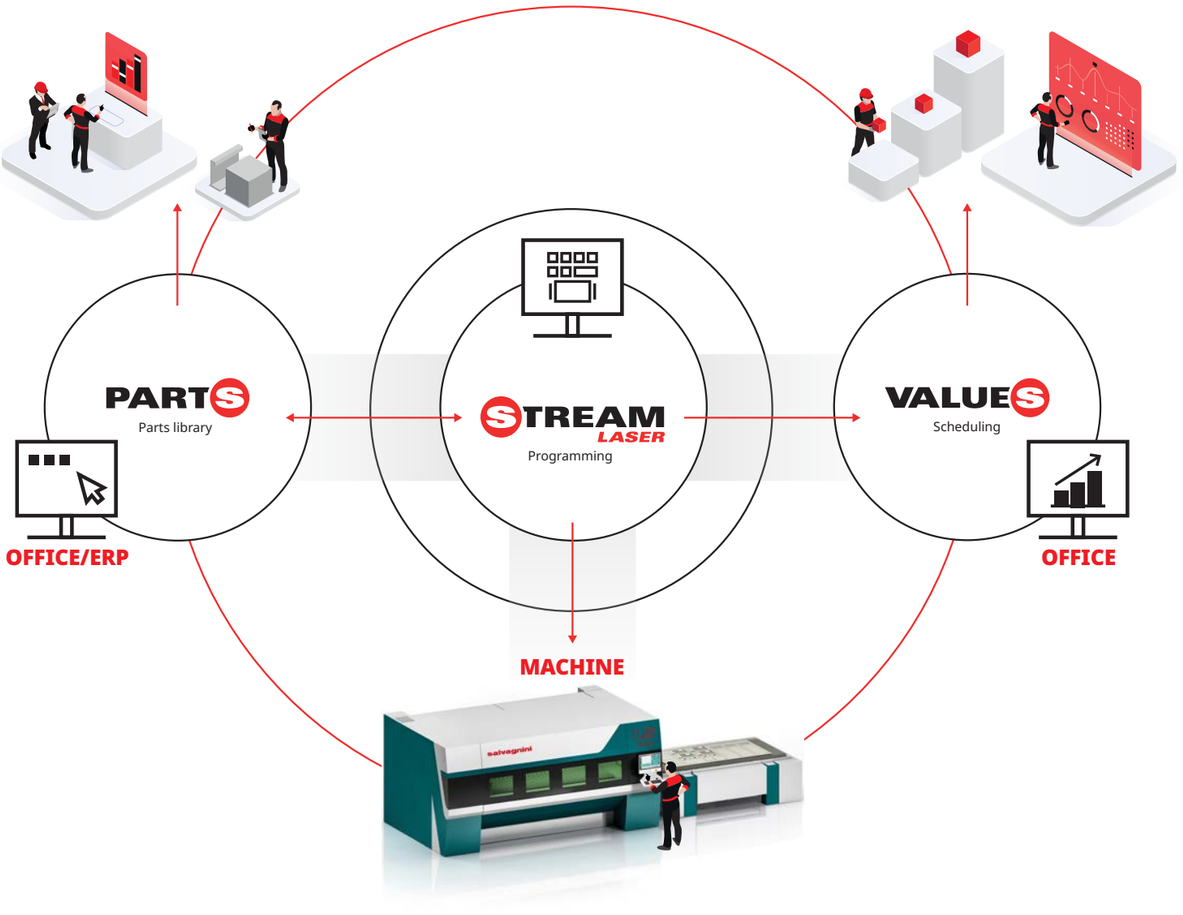
- **NEXUS** is the Salvagnini software for programming MCU automatic sorting devices. Its algorithms **optimize grips and movements and minimize stacking times**. Its first strength is **simplicity**. All the MCU features can be used according to need, reducing intermediate waiting times and assuring maximum reactivity for sorting automation.

It is extremely flexible in managing diversified production scenarios: in fact, programming can be done in the office, on-board the machine or in a mix of the two environments; furthermore **NEXUS** can adapt its functional logics to dynamic industrial contexts and to the production strategy chosen for a specific job, stacking by production order, kit, subsequent workstations and so on. Furthermore, it is not necessary to select a specific production strategy in the design step and therefore manages changing production scenarios (large batches, small batches, kits, batch ones) according to need.

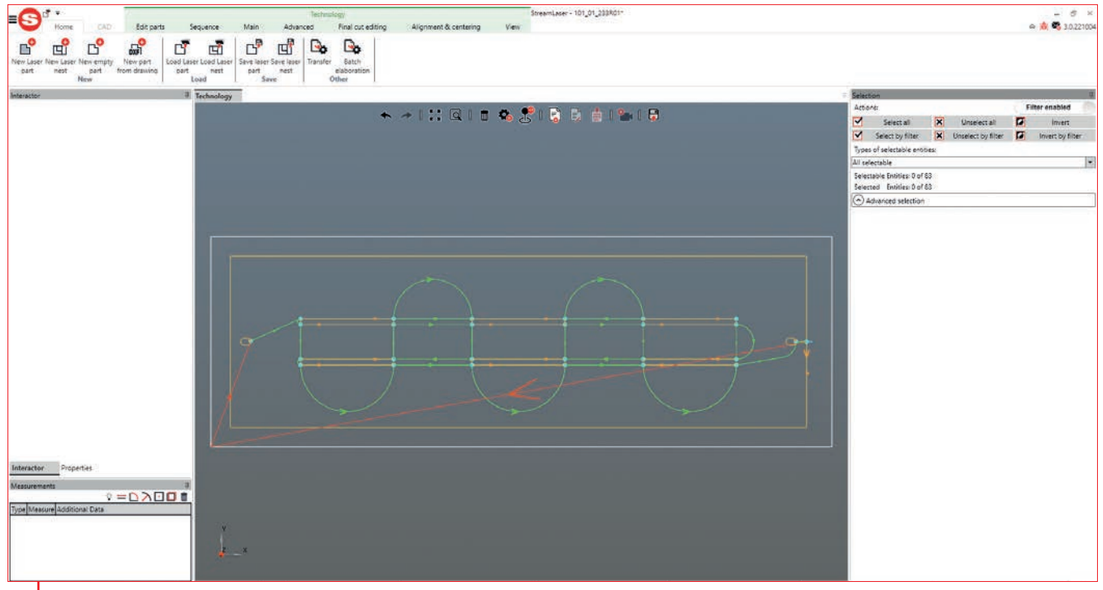
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The software ecosystem.

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



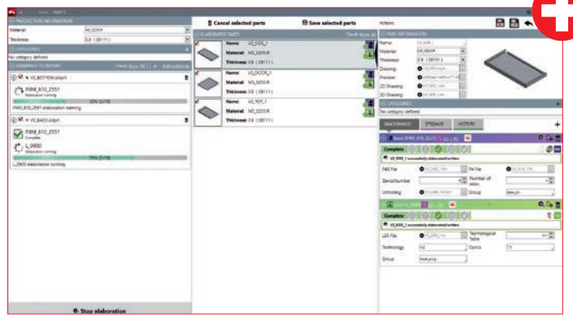
It is the integrated environment for **managing all activities in the office and on the shop floor;** it constitutes a single **point of access for all technologies,** from cutting to bending; it is capable of meeting all planning, programming, production, management, control and optimization needs throughout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



STREAMLASER

STREAMLASER is the programming software for generating cutting programs; it includes the following functions:

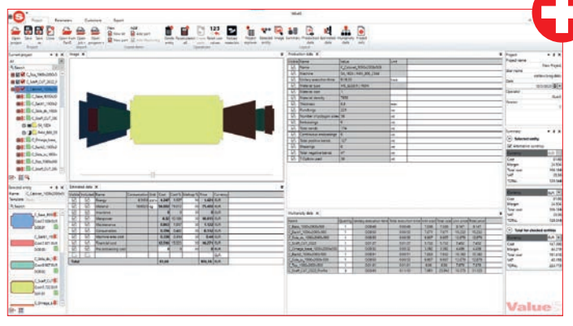
- **CAM**: creates or allows editing of the 2D model, automatically defines lead-ins and cutting sequences, and calculates the processing path, allowing for manual intervention.
- **Nesting**: automatically, semi-automatically or manually optimize sheet composition starting from a list of parts to be produced.
- **Reverse engineering**: generates the drawing starting from the program.
- **OPTI**: optimizes the use of the sheet and repeatability of the diagrams, minimizing the variability of the nesting layouts.
- **Parametric shapes**: easily and quickly prepares programs and prototypes without starting from a drawing.



PARTS

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

- it classifies the elements according to common or customized categories;
- it defines the production flows for each part to be machined;
- it is integrated with the CAM software.



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.



The adoption of evolved digital technologies makes it possible to implement and manage complex, integrated, highly automated high-performance systems, and can help 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 from the factory ERP/MRP in **real time** and supports the programming activities.

OPS defines the **rules and algorithms** used to automate the process, **adding intelligence to the system**: it can set limits in terms of maximum tolerable scrap, efficiency, or the number of kits to include in a single nesting, ensuring that the system complies with these logics.

OPS can make **independent solutions**, according to a production logic – or according to a mix of multiple production logic. It is used to exchange information between different technologies, such as the components of an FSJ cell (Flexible Smart Job shop).

- **It 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;
- **It automatically creates cutting nests**, grouping parts by material, thickness, production and job order;
- **It provides feedback to the factory ERP**, updating material availability and state of production in real time, part by part.

Advanced solutions for logistics management

The OPS Shop Floor Control module integrates solutions for labelling, traceability and warehouse management, both upstream and downstream of cutting activities, to support operators in the logistics management of parts.

The software makes it possible to display on a touch monitor with an intuitive interface, or to print on a label, the characteristic information of the part such as the identification code, job code, next work station; it can also display a barcode on the label to automatically call up the next machining program.

OPS Shop Floor Control also returns the information to the factory ERP, marking the part picked up as completed and updating the production list. It is a simple technology, which helps reduce the time for sorting and logistics of parts produced, avoiding identification errors, reducing process costs and increasing reactivity in production.

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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.

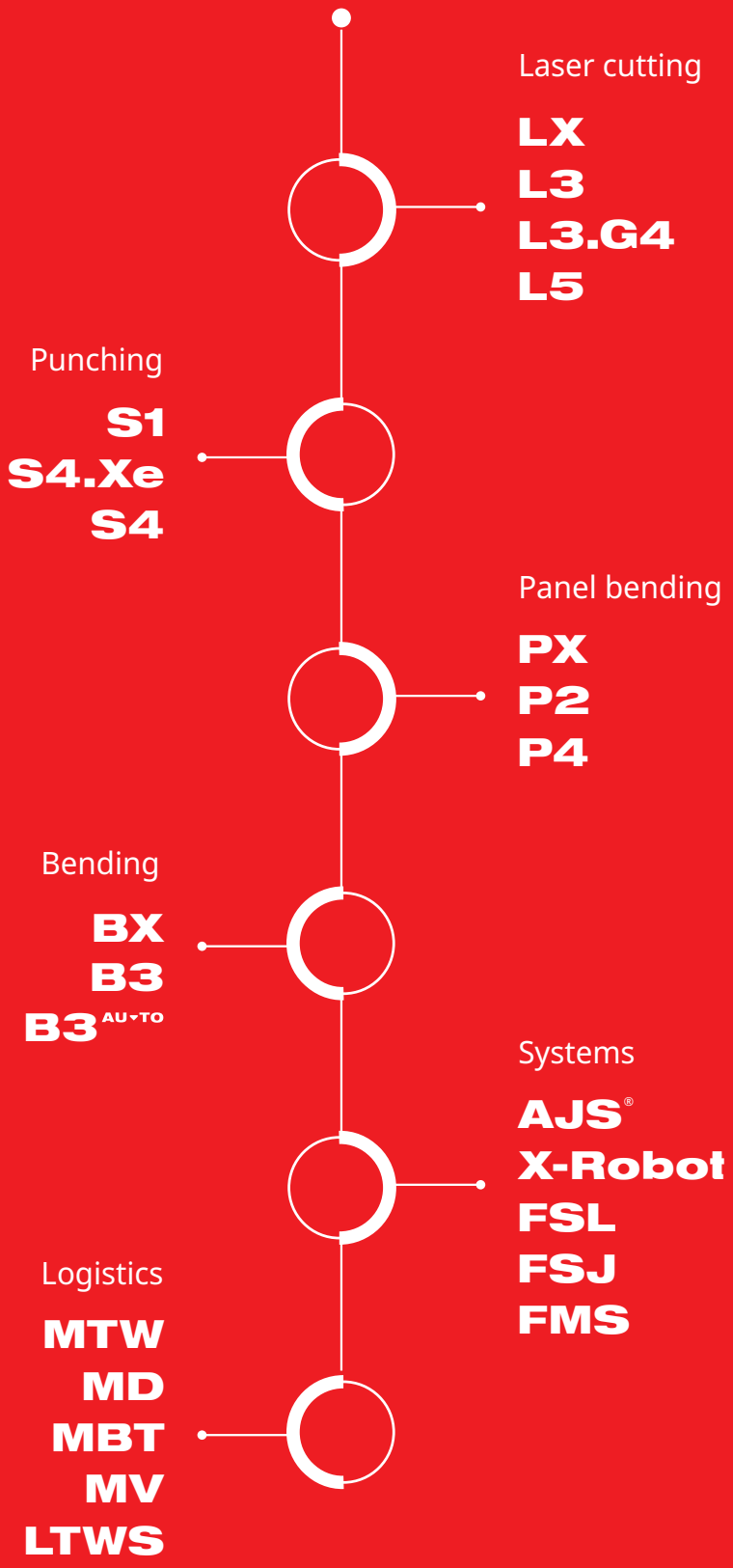
Rethinks

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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