MD1-3018. SMPC.M12	Destacker warehouse
S4.30.C1515.H5	Punching machine-shear c.N.C.
Cc	Right angle shears
BU31	Ashlar
EI09	Lower effect
P2R36	Double rotary punch
Df	Sheet diverter
IA3015	Universal automatic stacker
TCV3015	Scissor table
ADP2715	Feeder Unstimulator Through
TC27155C	Scissor table
P4-2512.LS.LI	Panelling machine
ALA30/600/130	Programmable pre-table
CLA	Auxiliary blade control
SAP2715.	Panel accumulator drain

TECHNICAL DESCRIPTION

MD1-3015. Mouth-to-mouth. M12+S4.30.C1515.H2.CC.BU31.EI09.P2R36.DF+IA4015+TC40155D+ADP2715+ TC27155C+RIP3015+P4-2512. LSA. Lia. Rad. ALA30/600/130.CLA. P.CUT+SAP2715. CUT+R201+ JOBS4P4. DIARY+SIMULXNT+ Programming and maintenance course

Acronyms have the following meaning:

MD1-3018. Mouth-to-mouth. M12 - Destacker warehouse

Automatic warehouse for sheet metal parcels managed for single sheets.

It is composed of:

- a shelf with 12 shelves (**M12**) on which individual sheets are stored creating 1 pack of sheet metal per shelf;
- a unidirectional brush conveyor for feeding single sheets, located under the basic shelves;
- an elevator manipulator used to pick up and deposit the sheets on the shelves or conveyor.

The operator loads the warehouse from the rear side (**RCP**), placing, in conditions of operational safety, the pack of sheets (incoming package) on the automatic loading shelf by means of a forklift or by placing the single sheet directly on the conveyor. During this operation the warehouse can continue to work in automatic mode since the loading shelf is placed outside the warehouse and its accident prevention barriers.

Following a command, given by the operator, the shelf is carried, sliding on rails, up to under the elevator manipulator. This saves handling time, avoiding a double horizontal stroke of the elevator manipulator for each unfinished sheet.

The MD1-3015 warehouse is able to recharge, in masked time, the various shelves, taking the individual sheets of sheet metal from the incoming package or from another shelf.

It is optional to add other shelves for storage, in modules of 3 or 4, up to fifteen shelves.

The sheet thickness gauge allows you to check that each sheet taken from the manipulator of the automatic warehouse is not double and is of the thickness declared by the operator. If the presence of a double sheet is detected, a sheet separation cycle is automatically activated and, in case of failure, the operator is notified by a message on the video.

The supply of the warehouse always includes the software package for the automatic management of the warehouse (**CARGRA**), loaded on the MMACH control system of the S4 shearing punching machine, which allows the loading, unloading or moving of packages of sheet metal sheets on one or more shelves of the warehouse.

The limit dimensions of the packages and sheets that can be stored are as follows:

- maximum sheet size:	3048 x 1524 mm
- minimum sheet size:	700 x 400 mm
- sheets of any intermediate size can be moved	
- maximum thickness of steel sheet:	3.5mm
- maximum thickness of aluminum foil:	5 mm
- minimum sheet thickness:	0.5mm
- maximum height of the package + pallet at the entrance:	500 mm
- maximum pack height per shelf:	130 mm
- minimum height of the incoming pallet only:	50 mm
- maximum load on each shelf:	3000 kg
- maximum weight of a single sheet:	130 kg
- maximum weight of the incoming package:	5000 kg
- total warehouse height (M12):	6800 mm

S4.30 - Punching machine-shear C.N.C.

Punching machine-shears with computerized numerical control suitable for the processing of sheet metal sheets of magnetic and non-magnetic nature.

It is equipped with:

- worktop having dimensions such as to contain inside the maximum sheet during all its possible evolutions, preventing any interference with the operator. It is partially covered with brushes, easily

replaceable, which allow to obtain a remarkable silence during the processing of the sheet and not to damage the surface. In the right part of the worktop is incorporated a conveyor, also partially covered with brushes, which allows the machined sheet to be transferred to the output;
- feeding pliers, which brings the incoming sheet to the work surface;
-input sheet positioning device. It consists of a retractable rake, for positioning along Y, and a programmable reference, optical and mechanical, for positioning along X;
- multi-press operating head, described below;
- bar manipulator, equipped with thirteen grippers for gripping the sheet, moved by brushless motors;
- sheet rotator with 4 angular positions, driven by a brushless motor and mounted laterally to the operating head;
- efficient liquid cooling circuit, installed on board the machine, which must be connected to an external refrigeration system;
- hermetically insulated power cabinet equipped with a circuit for ventilation and an automatic device for controlling the internal temperature; it uses coolant from an external refrigeration system;
- scrap conveyor, equipped with mesh belt, able to collect the gripping scrap and all the scrap produced during the processing cycle and convey them to a collection box (not included in the system supply) located upstream, next to the main structure of the machine, on the opposite side from the manipulator; scrap discharge height: 700 mm above the ground;
- programmable opening/closing hatch for unloading good parts, with a maximum size of 250 x 250 mm, directly under the CC right angle shear, into a collection box placed under the worktop through a special slide and an automatically controlled diverter/selector. This device is present only when the CC right angle shear is installed.

Operational features:

maximum length of the inlet sheet:	3048 mm
maximum width of the inlet sheet:	1524 mm
minimum length of the inlet sheet:	370 mm
minimum width of the inlet sheet:	300 mm
maximum diagonal of the input sheet:	3408 mm
maximum length of the output sheet:	3048 mm
maximum width of the output sheet:	1524 mm
minimum length of the output sheet:	250 mm
minimum width of the output sheet:	60 mm
maximum thickness of sheet metal sheets with tensile tensile strength of 410 N/mm^2:	3,5 mm
Minimum Sheet Thickness:	0.5mm

The minimum dimensions of the output sheet, transferred via the brush conveyor, given in the table, are valid provided that their product is not less than 21000 mm ^{2}.

C1515- Hydraulic control unit

Open circuit hydraulic control unit equipped with three motor pump groups. The first, 15 kW 300/450 bar, is used for the supply of the high-pressure hydraulic circuit of the operating head; the second, 15 kW 125 bar, is used to power auxiliary hydraulic services; the third is represented by the oil recirculation group which is also used for the introduction of the first filling oil. The control unit is also equipped with electrical controls for temperature, oil levels and filter clogging.

H5 - Operating head

The machine is equipped with a punching operating head including 24 single-acting hydraulic presses with a maximum force of 7 tons. (maximum figure of the tool inscribable in u n circle with a diameter of 33 mm) and 8 single-acting hydraulic presses with a maximum force of 26 tons. (maximum figure of the tool inscribable in a rectangle of size 90 x 70 mm). The head is equipped with an efficient liquid cooling circuit connected to the general one of the machine.

It is possible to install, in the external position of the operating head, up to 5 optional hydraulic presses with a single effect with a force of 12 tons. (maximum figure of the tool inscribable in a square of side 60 mm) or double acting with maximum force 8 tons. down and 7 tons. upwards (maximum figure of the tool inscribable in a circle with a diameter of 60 mm); it is also possible to install, always in the external position

of the operating head and as an alternative to the other optional presses, up to two optional double rotary punching units with a single effect force of 12 tons. equipped with matrices, also rotating, and controlled by a numerical control device that allows them to assume many angular positions with a resolution of 2'42" (maximum figure of the tool inscribable in a circle with a diameter of 60 mm). On the side of the operating head, on the same side of the shear at right angles, it is possible to install another optional unit of double rotary punching with a single effect with a force of 12 tons. equipped with matrices, also rotating, with the same operational characteristics just described.

Finally, it is possible to install up to 5 optional hydraulic presses with a lower effect in as many positions of the operating head to obtain ashlars or upward bends of a maximum height of 6.5 mm inscribable in a circle with a diameter of 20 mm; maximum force 6 tons.

The machine supplies a complete set of four-position loaders for tools with a maximum diameter of Ø 33, to be mounted on the 7 ton positions, and a complete set of two-position loaders for the tools to be mounted in the 26 ton positions.

CC - Right angle shears

Option of the S4 punching machine installed on the side of the punching head, on the side of the outgoing mobile conveyor.

It consists of two fixed lower blades of 400 mm, each parallel to an axis of the manipulator and converging at a point, and two upper blades, of equal length, movable vertically together with a slide, with a sharp edge slightly inclined with respect to the horizontal, parallel to the lower ones and equipped with a sheet metal press.

The CC right angle shear is able to make cuts of any length, according to the instructions contained in the program and compatibly with the capabilities of the machine, along both orthogonal axes thanks to an automatic device for inserting or disposing of each of the two upper blades during the vertical stroke of the slide on which they are fixed.

It is also able to make the final cut using both blades inserted at the same time to separate the punched sheet from the starting sheet. A numerical control device adjusts the clearance between the upper and lower blades and the useful length of each cut, depending on the thickness of the sheet.

This gives the possibility to divide the incoming sheet into several output sheets, even different from each other, without producing scraps on the separation lines and using the same machine that performs the punches and ashlars.

BU31 - Ashlar

Double acting hydraulic press with maximum force 8 ton. down and 7 tons. upwards, mounted in the external position No. 31 of the operating head. It is possible to mount tools with an inscribable figure in a circle with a maximum diameter of 60 mm to obtain ashlars or bends up to 16 mm upwards.

EI09 - Lower effect

Hydraulic press with lower effect with maximum force 6 tons. installed instead of a matrix in the 7 ton positions. of the operating head: in this case it is the position n° 9. It is able to obtain ashlars or upward bends of a maximum height of 6.5 mm, including the thickness of the sheet, using a tool with a maximum figure inscribable in a circle with a diameter of 20 mm.

P2R36 - Double rotary punch

Double rotary punching unit installed next to the operating head, shear side: it consists of two single-acting hydraulic presses with 12 tons of force. able to receive each a tool with an inscribable figure in a circle with a diameter of 60 mm. The two punches and the two matrices rotate simultaneously, controlled by a single numerical control device and can assume many angular positions with a resolution of 2'42".

Two adapters are provided to be able to use the tools of the positions with 7 ton force. and with maximum figures inscribable in a circle with a diameter of 33 mm.

DF - Sheet diverter

Deviation device consisting of two independent numerically controlled mechanical arms for unloading at height, i.e. in a position in line with the stacking position, of the punched and sheared sheets, at the end of the processing cycle, on the outgoing mobile conveyor of the S4 punching-shearing machine.

IA3015 - Universal Automatic Stacker

Stacker placed to the right of the S4 able to stack or transfer punched and / or sheared parts in sheet metal of magnetic or non-magnetic nature. It is equipped with two pairs of magnetic belt transfers, driven by a brushless motor; the positioning of each pair, in the direction perpendicular to that of transfer, takes place automatically and independently; two rows of suction cups accompany the detail on the pile in formation. The part can be stacked or transferred to any transverse position even outside the center of the longitudinal centerline of the stacker, using the programmable sheet deviation device, mounted on the brush conveyor at the exit of the punching machine-shearS S4.

Two series of rollers, mounted on two longitudinal oscillating beams, placed under the stacker transfers, are automatically activated and positioned to support the non-magnetic material parts, during the transfer and stacking cycle.

The packs of parts, formed during stacking, can be aligned in a direction perpendicular and / or parallel to that of transfer with a minimum distance between them of 10 mm.

Dimensions of the parts transferable and / or stackable:

maximum length:	3064 mm
maximum width:	1524 mm
minimum length:	250 mm
minimum width:	60 mm
Max Thickness:	3.5mm
minimum thickness:	0.5 mm
stacking accuracy with use of suction cups:	5 mm

The minimum dimensions of the transferable or stackable part are valid provided that their product is not less than 17500 mm^2; the holes, ashlars and grooves present must be compatible with the position of the transferors and suction cups. Magnetic parts of less than 130 mm wide and non-magnetic parts less than 70 mm wide cannot be accompanied on the battery by suction cups; the accuracy of deposit of these details, on the table below, depends on the design of the same.

TCV3015 - Scissor table

Motorized scissor table measuring 3000 x 1500 mm. The table can automatically translate along its short side to allow the picking, by the operator, of the pallet(s) with the punched and stacked sheet packs. The positioning cycle of the table with the pallet(s) empty, from the loading position to the working position under the stacker, is also automatically managed by the computer.

An autonomous hydraulic control unit ensures horizontal table movements and automatic height adjustment as punched and/or sheared sheets are stacked.

ADP2715 - Through Destacker Power Supply

Through unsipilator feeder, mounted to the left of the paneling machine P4-2512, allows you to take the sheets from a pack of sheets and feed the paneling machine in masked time, that is, during the processing cycle of the machine. If you are in the presence of an S4 + P4 line, the ADP is able to transfer and center the parts coming from the S4 to power the P4. The sheet metal pack is placed on top of a motorized scissor board.

A device for checking the double sheet verifies the uniqueness of the raised sheet; otherwise, separation attempts are made.

The suction cups that take the sheet are divided into zones that are automatically activated depending on the size; the individual suction cups can also be moved manually to avoid any holes or ashlars.

If you feed a P4-2512 there is a swab with the task of holding the sheet during the withdrawal cycle by the panel feeder.

The ADP2715 destacker feeder is able to feed sheets of any material and size compatible with those of the powered P4.

TC27155C - Scissor table

Motorized scissor table measuring 2700 x 1500 mm with vertical travel of 550 mm. The table can automatically translate along its short side to allow the loading or picking, by the operator, of the pallet

with the package of punched sheets. The positioning cycle of the table with the empty pallet, from the loading position to the working position, is also automatically managed by the computer.
An autonomous hydraulic control unit ensures horizontal table movements and automatic height adjustment as the sheets are unimplified.
Maximum height of the package to be unsimplified, including the pallet: 380 mm.
Payload: 5000 kg.
Dimensions of the sheets compatible with those of the enslaved P4.
The scissor table is equipped with safety devices in accordance with the law.

P4-2512.LS.LI – Panelling machine

Programmable and automatic machine for the production of sheet metal panels, through the formation of several folds on each of the four sides. It has the following characteristics:

- numerical control of the feeder and positioning pliers of the sheet, of the centering references of the sheet in both axes; automatic preparation of the references;
- ability to produce the first fold crushed at 180 degrees (positive and negative hand-saving fold);
- programmability of the stop of the blade press downhill from 0 to 127 mm to obtain, for example, an unpainted hand-saving bend;
- maximum number of folds on each side: free;
- ability to bend up and down, but the last fold of each side must be upwards; the last fold of only one side can be downwards; the evacuation trolley is able to unload even a panel with the last fold downwards;
- ability to bend pre-painted sheet metal or satin stainless steel, protected by plastic film (it is however necessary to check the quality of the material according to the application);
- discontinuous rotator at 90°, 180° and 270°;
- possibility to program the ignition in order to bring the oil of the hydraulic circuit to the optimal operating temperature before the start of the work shift; for this purpose an electric coil mounted in the oil tank of the hydraulic control unit is used;
- worktop equipped with circular inserts with plastic brushes; it allows easy movement of the panel, without marking the contact surface, and reduces the noise level during the production cycle;
- **LS. LI**: upper and lower blades at standard angles; bending angle from 0° to 125° for thicknessesless than or equal to 80% of the maximum thicknesses, from 0° to 90° for all permissible thicknesses;
- hermetically insulated power cabinet equipped with an automatic device for ventilation and internal temperature control, using an external refrigeration system.

<u>Operational features</u>

maximum length of the inlet punched sheet	2700 mm
maximum width of the inlet punched sheet	1500 mm
maximum diagonal of the rotatable punched sheet	2700 mm
maximum bending length	2500 mm
maximum footprint of the folds above the worktop	127 mm
maximum sheet thickness with tensile strength at traction of 410 N/mm2	2 mm
maximum sheet thickness with tensile strength at 600 N/mmtraction 2	1.25 mm
maximum sheet thickness with tensile strength at traction of 265 N/mm2	3 mm
minimum sheet thickness	0.50 mm

ALA30/600/130 – Programmable sheet metal press

It is composed of:

- a device for automatic setting up the length of the sheet metal press tool, in accordance with the instructions contained in the bending program;

- a series of segments, for the sheet metal press tool, having a profile of 114 mm width and front and side drains that allow to make maximum retractable folds of 45 mm and 30 mm respectively.

The sheet metal press tool can be composed in length, in increments of 5 mm, from a minimum of 595 mm to a maximum of 2500 mm. With this sheet metal press the minimum width of the panel between the folds is about 130 mm.

CLA - Auxiliary blade control

Option of the paneling machine P4-2512 consisting of a numerical control device capable of placing along the bending wire one or two auxiliary blades to achieve the modification of the profile of the lower blade during a phase of the bending cycle; maximum bendable thickness using this option: 1.5 mm sheet metal with tensile tensile tensile strength of 410 N/mm^2 and 0.9 mm sheet metal with tensile tensile strength of 600 N/mm^2; maximum length of auxiliary blades: 1000 mm, minimum 50 mm.
Bending blades are provided as an option.

SAP2715. CUT - Panel accumulator unloader

It consists of a motorized roller top of dimensions 2595 x 1250 mm placed at the same height as the worktop and installed immediately to the right of the paneling machine and a tilting rake orthogonal to the roller plane and equipped with idle wheels.
They are able to receive and accumulate a certain number of panels leaving the paneling machine, on the same side as the manipulator, that is, on the front of the machine; the panels are received, one at a time, they are lifted and then let slide by gravity on the crazy wheels placed along the rake and stopped before hitting the cushioned collision by decreasing the inclination of the rake. In this position they can then be picked up by the operator in conditions of operational safety.

THE SYSTEM COMES WITH MMACHNT CONTROL

MMACHNT - MICROMach , Control and management system

High-performance control system distributed over 3 levels.

- Processing unit for plant management and supervision (machine diagnostics, operator interface, local data processing). The unit consists of a high-performance 'multimedia' computer. The following technical characteristics refer to the current hardware configuration. At the time of supply some of these components may have different characteristics, in any case Salvagnini guarantees that the configuration will have equivalent or better performance to those described.

COMPONENT	TECHNICAL DATA
Processor (CPU)	PENTIUM INTEL III (733 Mhz)
Operating System	WINDOWS NT
Video Card	Graphics accelerator with 4 MB SGRAM
Random Memory	SDRAM 128 Mbyte
Hard Drive	UltraSCSI 9.1 Gbyte
Cdrom Drivers	600 Mbytes
Floppy disk Driver	3 1/2 inch , 1.44 Mbyte
2 network adapters	ETHERNET TCP/IP (BNC or RJ 45) .
17" color monitor	

The control unit is equipped with a telephone modem equipped with a data compression module and V42bis transmission protocol. This type of connection allows a rapid exchange of information between the system and Salvagnini's services (assistance, hardware, software, studies and applications). To activate the connection it is sufficient for the customer to provide a normal direct telephone line with its cable and RJ45 male connector, near the control unit.

- Real-time control unit, based on MOTOROLA 68030 processor and pSOS+ "real time" operating system, completely dedicated to the implementation of plant automation logic. This unit communicates with the interface section via a standard VME bus.
- interface section to peripheral devices (hydraulic motors, solenoid valves, sensors ...) including advanced motion control features.

The graphic diagnostics on video, performed in real time, allows you to view: clear indications on the status of the system, photos of the particular interested party, hypertext help with indications for the solution of the problem, notes that can be added by the customer.

Programming can be performed directly on the system's processing unit or on office stations, connected to an Ethernet network. Typical programming functions (introduction and modification of programs) do not require the current route to stop.

The language is high-level, the defined macro-instructions express geometric concepts (RECTANGLE, CIRCLE, POLYGON, ANGLE, RADIUS, HEIGHT ...) and are complemented by conditional statements (IF, THEN, ELSEIF ...), mathematical instructions (SIN, COS, TAN ...) and instructions for defining parametric variables.

This includes postprocessors, SDE for S4 and PDE for P4, which analyze the syntax and geometry of programming macro instructions and transform them into data useful for the machine's work cycle. In addition, the post processors perform specific functions for the machines to which they are dedicated. The SDE automatically manages shooting, sheet rotations and punching and shearing sequences, optimizes the path of the manipulator, estimates the cycle time. The PDE manages the movements of the manipulator, taking into account the deformations of the sheet metal, automatically calculates the gripping points and the bending force according to the quality of the material and chooses the unloading mode.

Any hardware and software network connection with other information systems is excluded from the supply.