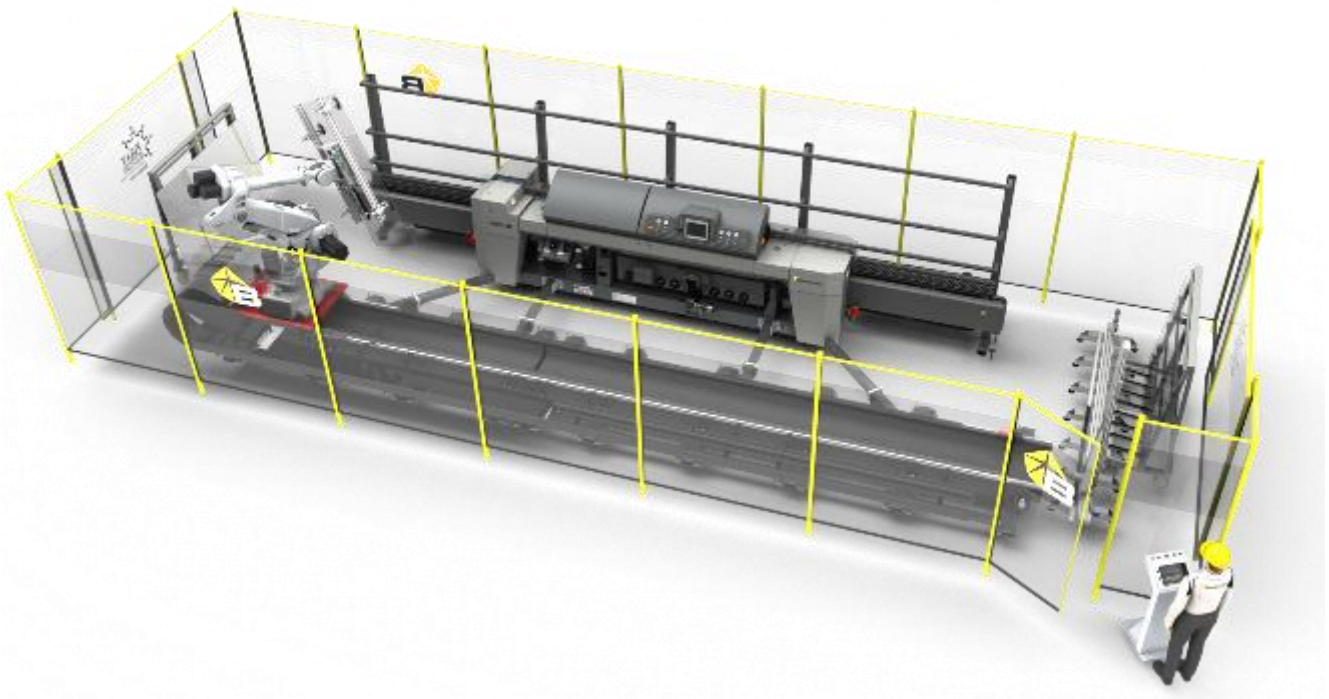


## ROBOTIC ISLAND

### N° 1 VE500 11 STRAIGHT-LINE EDGING MACHINE + N°1 ROBOT FOR GLASS HANDLING



## Robotic handling

Robotic automatic system for handling operations, specifically fitted to work in line with straight-line vertical edging machines. Glass handling will be managed by an anthropomorphic robot (see layout).

The process includes:

1. The robot will load the glass onto the edging machine inlet arm.
2. The robot, sliding on a guiderail and synchronized with the edging machine working speed, will automatically pick the glass from the edging machine outlet arm, rotate it 90° and reposition it on the inlet arm.
3. Glass rotation and transfer will end after grinding the 4<sup>th</sup> side of each glass piece.
4. Finally, the robot will unload the glass.

The system can handle square and rectangular shapes.

## Solution



Bavelloni solution consists of one multi-purpose robot **COMAU SMART5 NJ165-3.0**: maximum payload on the wrist **165 Kg**, motion area radius 3 mt, taking care of all glass handling.

The robot collects the glass from the rack through a clamping device with suction cups, dimensioned and arranged in such a way to satisfy a wide range of glass sizes.

It loads it onto the edging machine inlet arm. Then, sliding on a guiderail, it moves to the machine outlet arm, pick the glass, turn it and reload it onto the machine inlet arm till the four sides are ground.

In any case, processed glasses must have the same thickness.

Customer will use his own racks (glass racks are out of this scope), so he will have to foresee a system to fix and center them on the floor to avoid shifting during automatic loading. Max glass pack on the racks: 300 mm. We advise using racks with same features (same height and same inclination).

The control console will be positioned outside the robotic island. From there, the operator will be able to control the whole plant.

## Scope of supply

**N° 1 Industrial robot COMAUNJ165-3.0**, maximum payload on the wrist **165 kg**, maximum glass weight **100 kg**, motion area radius 3 m, including:

- control boxes C5G
- robot connecting cables
- portable programming unit with color touch-screen display
- USB interface for program storage on memory stick.



**N° 1 Clamping devices** composed of suction cups, installed on specific aluminum profiles. The robot will activate only the necessary suction cups, according to glass size. In this way, no manual operations for suction cup setting according to glass size will be needed.

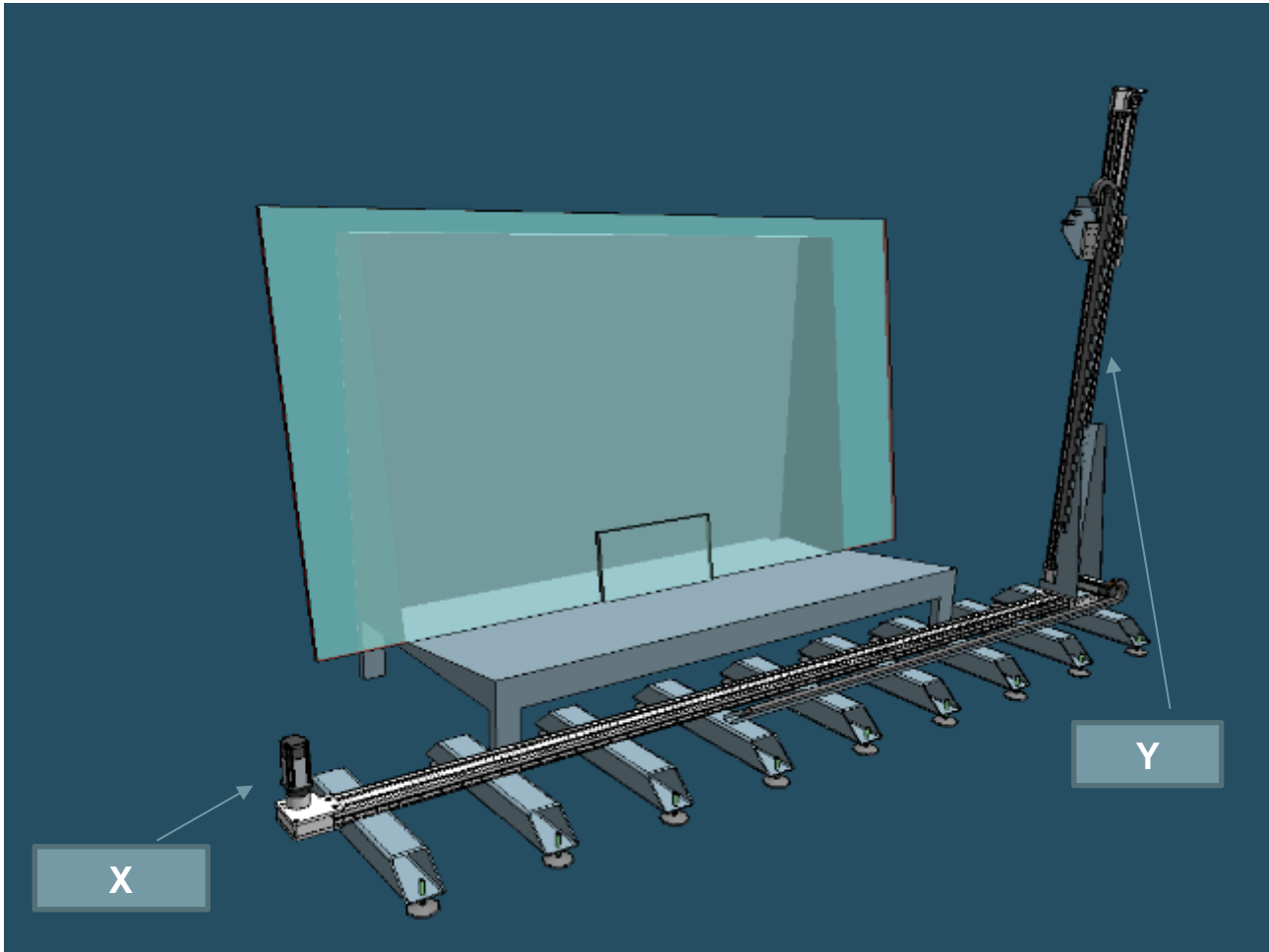
**Perimeter fences**, in wire mesh complying with current safety rules, complete with sliding doors.

**Design and execution** of mechanical, electrical and electronic parts, including all I/O and safety signals wiring for the robotic island management.

**Engineering, installation and testing of the robotic cell** in the customer's factory.



### Scanner for robotic island (optional)



SC 1622 is a scanner device capable of detecting the position and size of glasses placed on a loading stand.

Specifically designed to be used in systems consisting of straight grinders and robots, the device automatically records the dimensional data of the glass without the need to set it manually.

SC 1622 can also handle glasses of different sizes placed on the same stand.

In this way, the robots automatically synchronize for loading the first edging machine, for transferring glass to the second, and for unloading the finished glass on the specific rack.

SC 1622 consists of a load-bearing structure anchored to the floor in front of the glass picking stand, where two motorized linear guides with special servo motors are housed (see figure X-Y axis).

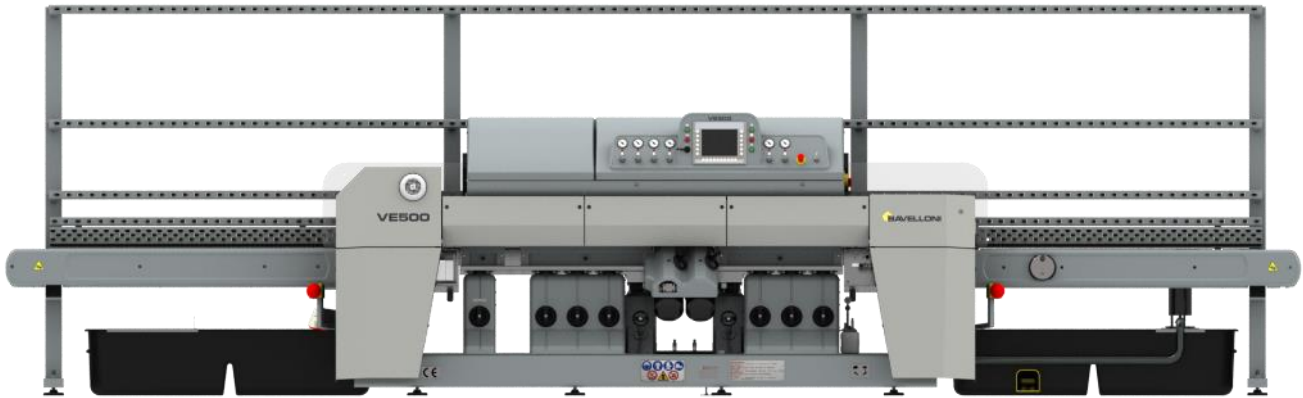
Dimension sensors which transmit the data from the scanned glass to the loading robot are installed on the Y-axis linear guide.

The Bavelloni scanner works in masked time with respect to the robot, avoiding any idle time.

## Technical specifications

Workable thickness	3÷12 mm
Minimum glass sizes	500 x 500 mm
Maximum glass sizes	1600 x 2200 mm
Maximum glass weight	100 Kg

## BAVELLONI VE500 11



Automatic vertical straight-line machine with 11 cup wheels to perform flat edge with arrises on glass sheets and/or on mirrors, having a thickness from 3 to 40 mm.

The structure specifically conceived for loading heavy weights, the control panel enriched with intuitive functions supporting the operator, the wide range of available options underline the versatility and reliability of this new model.

### Structure

By using modern systems of three-dimensional modeling, Bavelloni optimized VE500's structure, composed of a strong electro-welded modular basement supporting the spindles and the glass sheets conveyor for loading a maximum load of 350 Kg/m and for better quality of the final product.

### Inlet and outlet arms



The inlet and outlet arms, for the loading/unloading of the glass sheets, have conveying chains in anti-friction material. The inlet arm is equipped with a device to change the glass removal without the necessity to operate on the position of the diamond wheels. Said removal can be read on a proper mechanical indicator.

Besides, there is a special function to stop the movement of the inlet arm and reactivate it using a pedal. This system exchanging electric-pneumatic signals, automatically managed by the PLC, permits safe loading of large size glasses while the machine is working.

## Conveyor

To make the conveyor fit to the different thicknesses of glasses, it is composed by two parts: a fixed and a mobile one.

The opening of the conveyor (according to the glass thickness) is operated by a motorized mechanical device, which is controlled by NC. VE500 machines have a patented conveyor sliding on high precision steel guides without the aid of ball bearings.



The new **double drive motorization** grants a better mechanical efficiency thanks to the lack of gearbox and exploiting the typical sliding of the induction motor. This solution allows conveying high thicknesses and big sizes.

The speed variation is performed by inverter controlled by NC.

The machine is equipped with a centralized lubrication plant controlled by the NC.

## Spindles

The machine is equipped with the following spindles:

- diamond metal bonded cup wheel for edge grinding -  $\varnothing$  150 mm.
- diamond metal bonded cup wheel for middle edge grinding -  $\varnothing$  150 mm.
- diamond resin bonded cup wheel for fine edge grinding -  $\varnothing$  150 mm
- diamond cup wheel for rear arris -  $\varnothing$  150 mm.
- diamond cup wheel for front arris -  $\varnothing$  150 mm.
- polishing cup wheel for front arris -  $\varnothing$  150 mm.
- polishing cup wheel for rear arris -  $\varnothing$  150 mm.
- rubber polishing cup wheel for flat edge polishing -  $\varnothing$  150 mm.
- rubber polishing cup wheel for flat edge polishing -  $\varnothing$  150 mm.
- rubber polishing cup wheel with cerium oxide mixture for edge polishing -  $\varnothing$  150 mm.
- rubber polishing cup wheel with cerium oxide mixture for edge polishing -  $\varnothing$  150 mm.

All wheels have diameter 150 mm.

In case a bright finish is required, it is available as optional a polishing cerium plant consisting of tank, cerium pump, mixer, filter and connecting pipes, which foresees the use of a felt on the position N.11.

In position N.8, VE500 11 houses a double-speed polishing spindle to increase processing quality according to glass thickness.

The spindles for the processing of the flat edge are **separated from the electric motor** and the transmission is by means of belt and pulleys to eliminate any possible vibrations

The spindles body is in iron casting and slides on high-precision adjustable guides. The spindle shaft is in tempered and ground steel, lubricated by for life special grease (free from periodical maintenance).

The wheels compartments are completely in stainless steel to avoid any possible corrosion caused by the grinding water.

Polishing spindles are equipped with a pneumatic automatic adjustment system to compensate the wheel wear: this device raises the wheel position, while it is wearing, always ensuring, in this way, a perfect edge polishing.

The polishing pressure intensity is adjustable by means of a regulator according to glass thickness and to the required finishing.

The manual adjustments of the wheels are all carried out from the frontal side of the machine.



### Control equipment

The control panel is integrated in the control equipment. All the operations are managed by a HMI-PLC that executes both machine functions and user interface functions. It integrates a touch screen color monitor which represents the most complete and user-friendly equipment now existing in the market due to its innovative characteristics and its clear and immediate graphics.



By means of the control equipment it is possible:

- Activating a program automatically setting the machine for the selected working.
- Displaying the drawing of the working to be processed.
- Storing 99 different working conditions.
- Displaying maintenance intervention according to the operation time of the machine.
- Displaying partial and total working hours.
- Displaying partial and total worked meters.
- Graphically displaying motor absorption, helping the operator to adjust the tools in the optimal way, maximizing productivity, and product quality and tools life.
- Importing and exporting working programs by **USB port**
- Interfacing with the local network by **LAN port** activated on the control panel
- Using the **Ecofriendly pack** for optimizing energy consumption. The Ecofriendly pack includes **GRIND&STOP** function to stand-by spindles feeding and close pneumatic and



cooling circuits after a preset time from the last ground sheet; selection and and exclusion of the spindles that are not used during the selected working cycle.

The panel also contains the pressure regulators and the ammeters for polishing spindles.

Thanks to a purposely developed application, the control panel view can be remoted via **wifi** on tablet or compatible devices (**optional**).



### Electrical plant

The **new electrical cabinet fully integrated in the machine body**, easy to service, carried out according to latest CE standard, contains all electrical components and it includes the control panel (HMI), the ammeters/regulators for a comfortable handling during working process. Standard voltage 400V - 50Hz, others upon request.

### Hydraulic plant

Closed circuit hydraulic plant for the wheels cooling consisting of two tanks (total capacity 720 litres), water distributing/return circuit and recycle pump.



### HiWash washing machine (recommended optional)

The new washing machine is integrated mechanically and electronically in the machine outlet arm and it does not need a separated electrical box. It is totally managed by VE500 touch-screen control. Max washable height 400 mm. Glass thickness control and energy saving function (HiWash will start only when glass gets close) in the standard supply.



### Presetting for straight-line edging machines (recommended optional)

The presetting device has been developed to avoid manual positioning of the wheels as they wear out. Each spindle has a motor instead of the manual handwheel.

During the tool setting cycle, the height of each wheel is measured and correctly positioned. The arrises wheels are not preset, but it is possible to set the width of the arris from the control panel. In addition, each polishing spindle has an electronic proportional valve to automatically adjust the polishing pressure according to the thickness of the glass. The presetting system is suggested in case of fully automatic robotic island, where the operator intervention is kept to a minimum.

## Technical specifications

Workable thickness - manual loading	3÷40 mm
Min. workable height - manual loading	50 mm
Min. workable height (using the specially provided kit in standard scope) - manual loading	35 mm
Min. workable size - automatic loading	500x500 mm
Installed power	27 kW
Max glass load	350 Kg/m
Min. pressure of compressed air	6 bar
Max. consumption of compressed air	25 Nlt/min
Weight	3350 kg. about
Working speed	0,5 ÷5 m/min
Water tanks capacity	720 litres