

## MMI

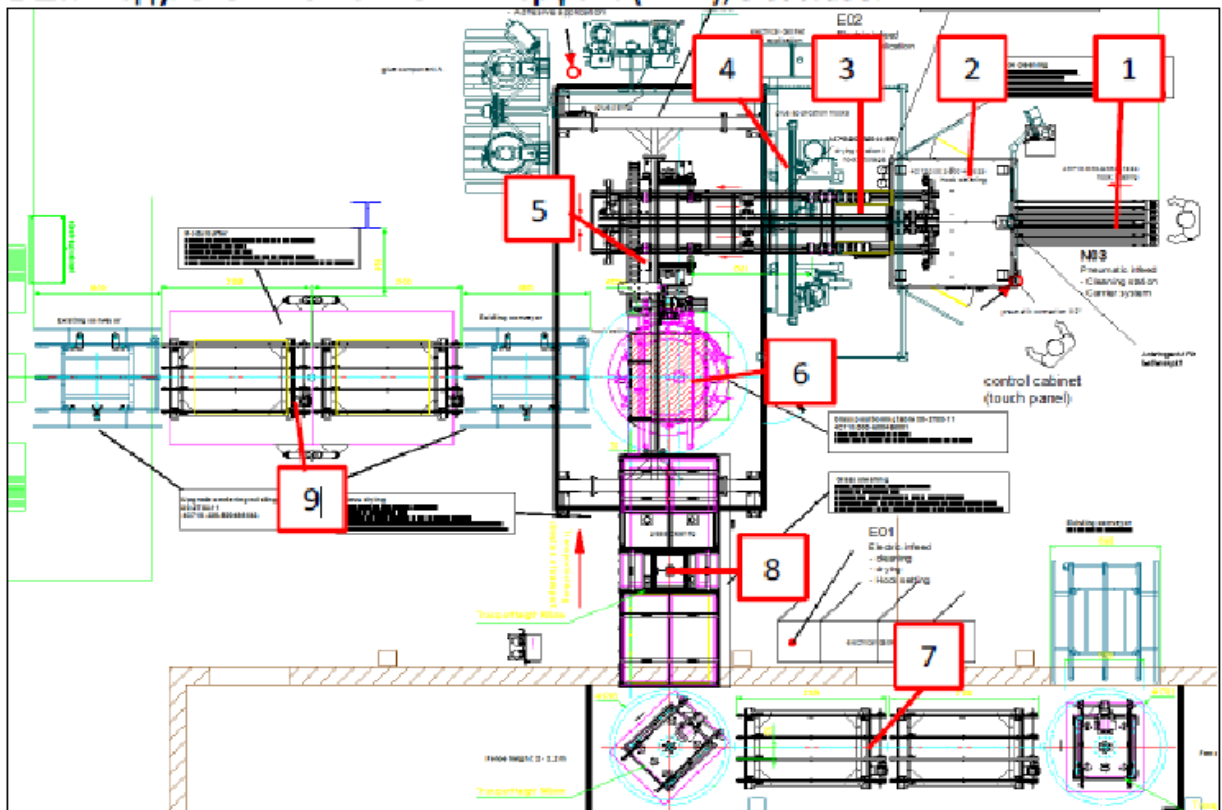
### General Description of the tool

Dimensions as assembled:

Length – 14600 mm;

Width – 11822 mm;

Height – 6988 mm;

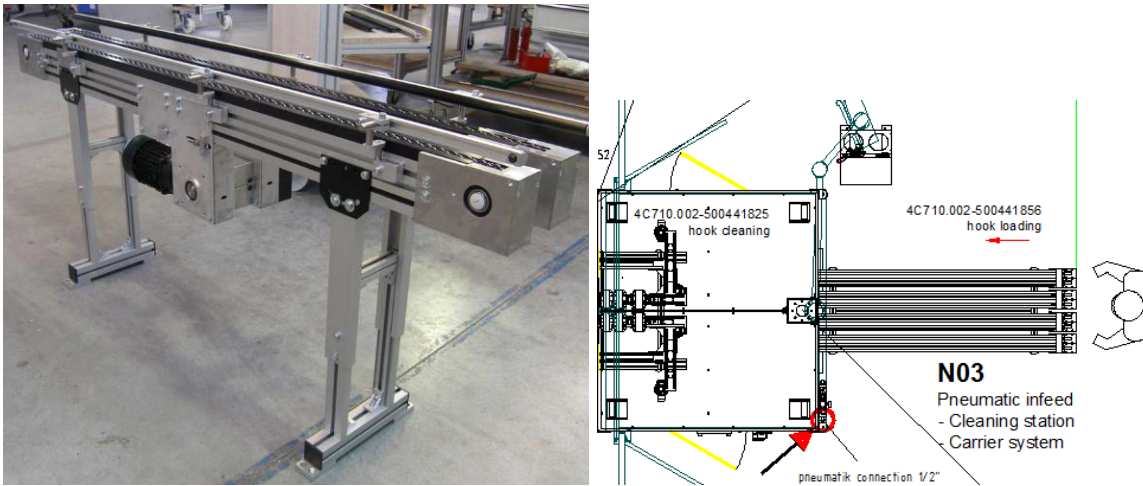


III. 1 - The MMI tool as assembled (top view)

Stations designation according to III. 1:

- 1 – chain conveyor for hooks loading;
- 2 – hooks cleaning station;
- 3 – belt conveyor for hooks transportation;
- 4 – sealant application station;
- 5 – hooks gripping and rotation node;
- 6 – aligning turntable;
- 7 – module transportation conveyor line.
- 8 – modules cleaning station
- 9 – buffer station
- 10 – sealant dosing station

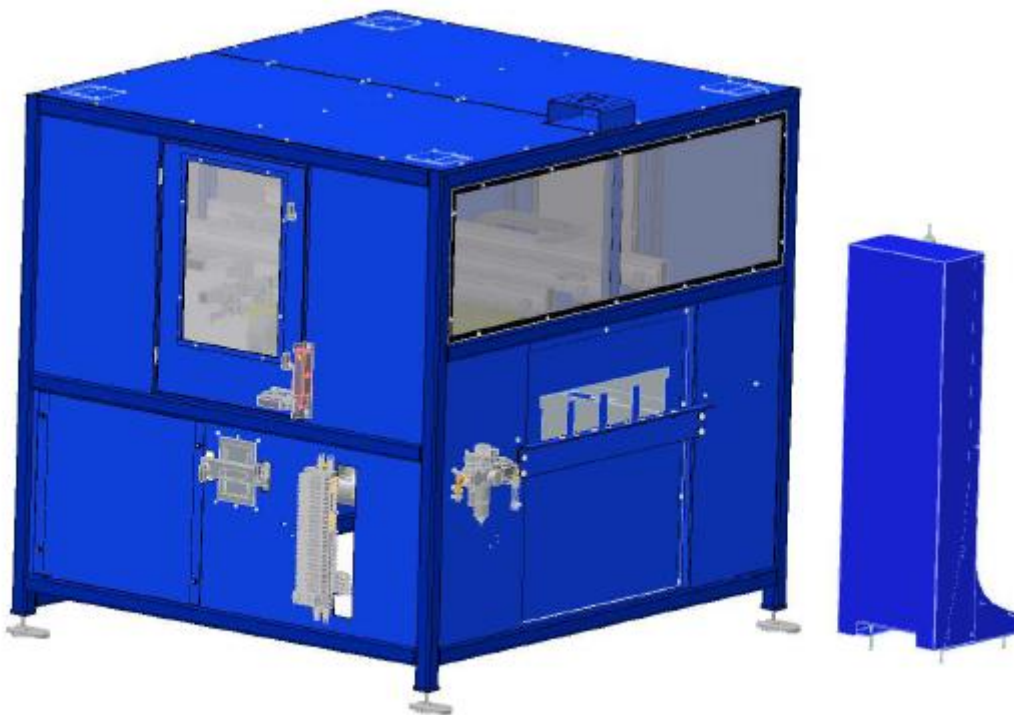
### MMI loading chain conveyor:



At the input of the line, the operator manually places the rails on the chain conveyor. Four chain conveyors (MK production) are arranged in parallel to transport the rails to the rail cleaning station.

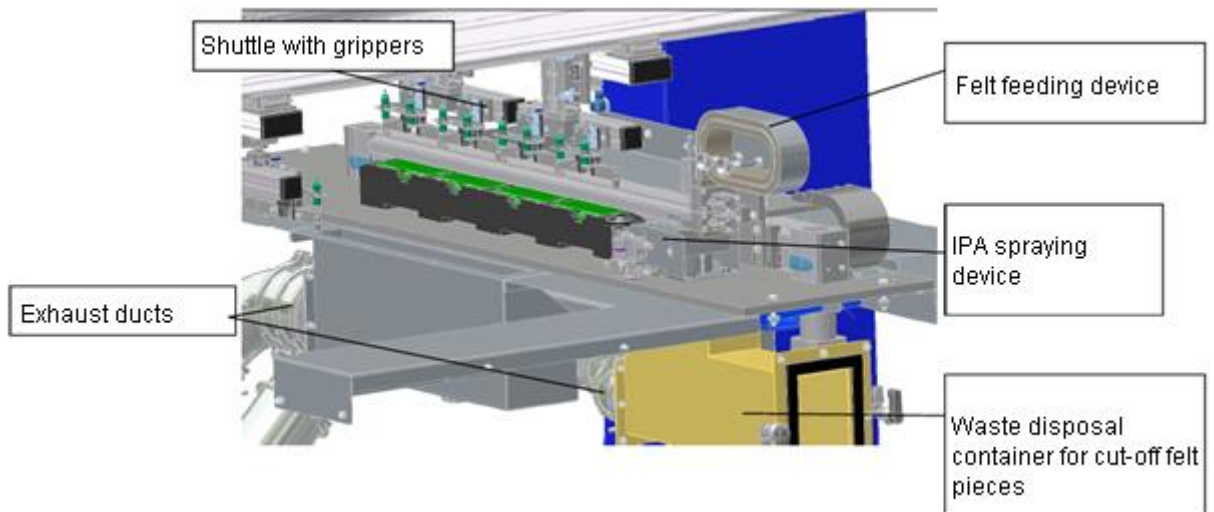
The chain is moving continuously. The rails are moving in the opposite direction consecutively as they are picked up with the gripper and sent to the rail cleaning station.

**MMI cleaning station:**



**Рисунок 6: Станция очистки рельс MMI**

The MMI rail cleaning station is located in a completely closed housing, due to isopropanol evaporations. The housing must be permanently ventilated with at least 120 m<sup>3</sup>/h exhaust system.



The rails are cleaned with ISOPROPANOL. ISOPROPANOL is sprayed onto the felt, which moves along the rail surface. The dirty felt is cut off and the felt feeder feeds a new one. The spraying rate of ISOPROPANOL is approx. 0.3 ml/cycle. The whole sprayed volume is absorbed with felt. The remnants of the cut felt are accumulated in a bin collector, which must be emptied periodically.

With the rails having been cleaned, the gripping shuttle picks up four rails and places them on a transport conveyor.

#### The Cleanser ISOPROPANOL dosing system

ISOPROPANOL is fed through a dosing system located next to the machine.

ISOPROPANOL should be refilled into the tank when the corresponding signal is displayed on the control panel.

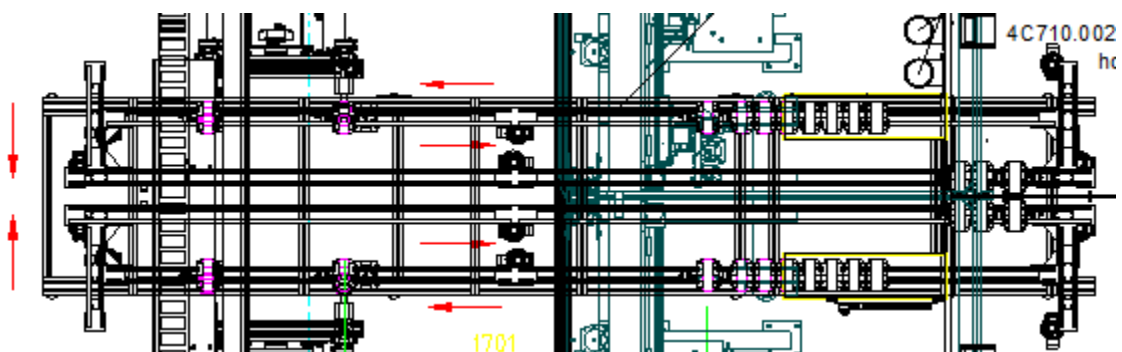
1 x 5 l (min.) tank for the cleaning solution (isopropanol)

Level indicator

1 x dosing pump

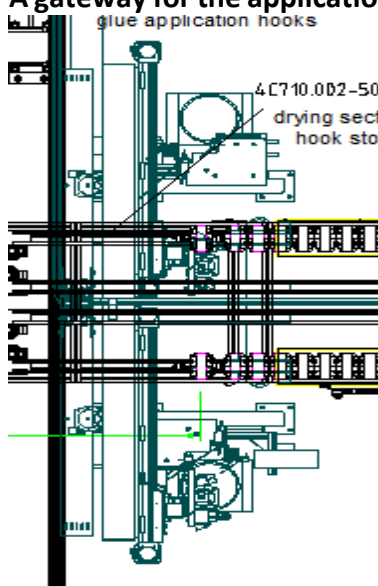
The second dosing system is located next to the module cleaning system.

#### Transportation system:





**A gateway for the application of bi-component silicone adhesive (1 tool per each filling station):**



A stable frame construction, including an automatic glue dispensing head positioning system

1 NC- driven gateway with y/z axes

1 take-up for the three-dimensional dosing unit

Dosing nozzles, depending on the customer's requirements: Flat-film extrusion head

NC Siemens SINUMERIC controller.

1 x dosing component A

Throughput approx. 4 ml/cycle

Pump materials CrNiMo 17-12-2

Rotor material CrNiMo 17-12-2

Static mixer

1 x dosing component B

Throughput approx. 1 ml/cycle, the materials are indicated above 1 x nozzle cleaning station

### **Dosing system for bi-component silicone adhesive**



1 x drum loader BET200, 200 litres (COMPONENT A)

3 pneumatic cylinders

1 x rotary pump NEMO, throughput approx. 9 ml/cycle

Material of parts contacting with silicone: CrNiMo 17-12-2

Shaft sealing: Lip seal

Stator part

Rotor CrNiMo 17-12-2 VCP

Gear motor, type Nord SK, IP55, 0,75 kW

Support plate: Sealed SS

Pneumatic mains connection

1 x drum loader BET200, 20 litres (COMPONENT B)

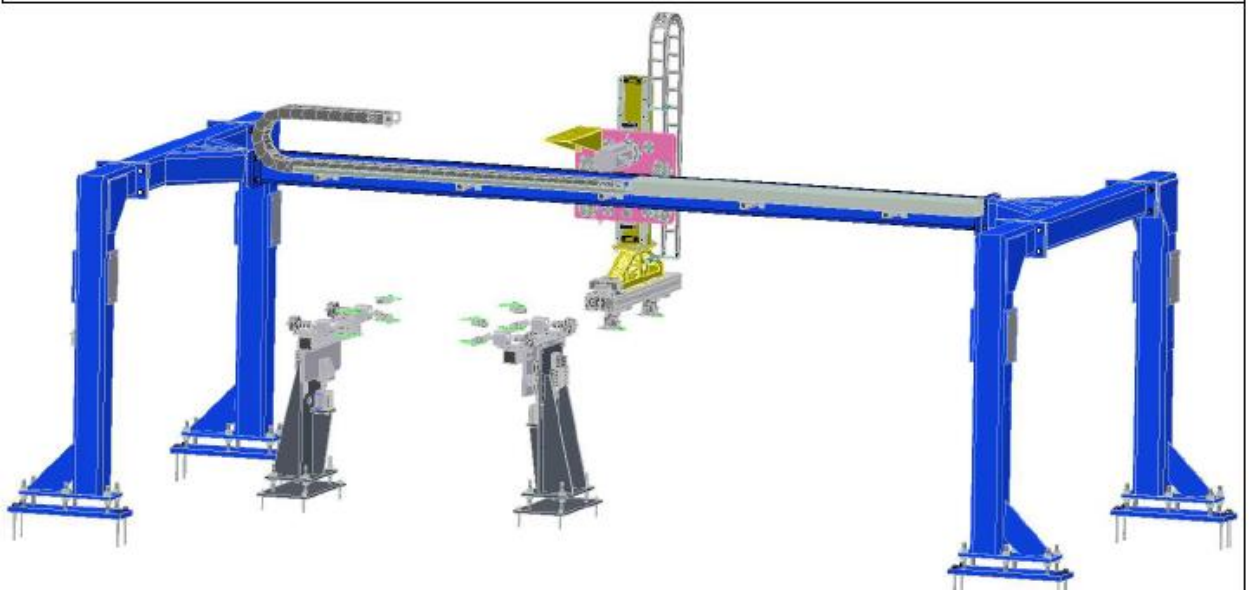
1 pneumatic cylinder

**MMI rotation loading device:**



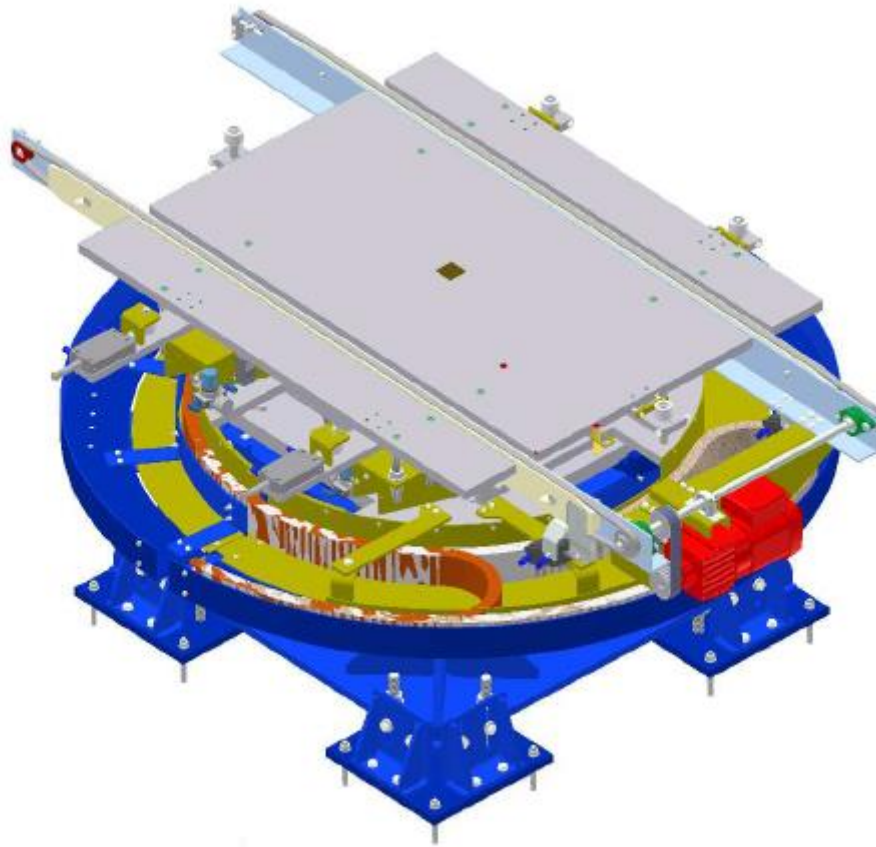
A sensitive device takes up the rails from the transporting conveyor and lifts them up. Upon rotating by 180°, the rails can be accepted by the rail mounting shuttle.

**Rail mounting shuttle:**



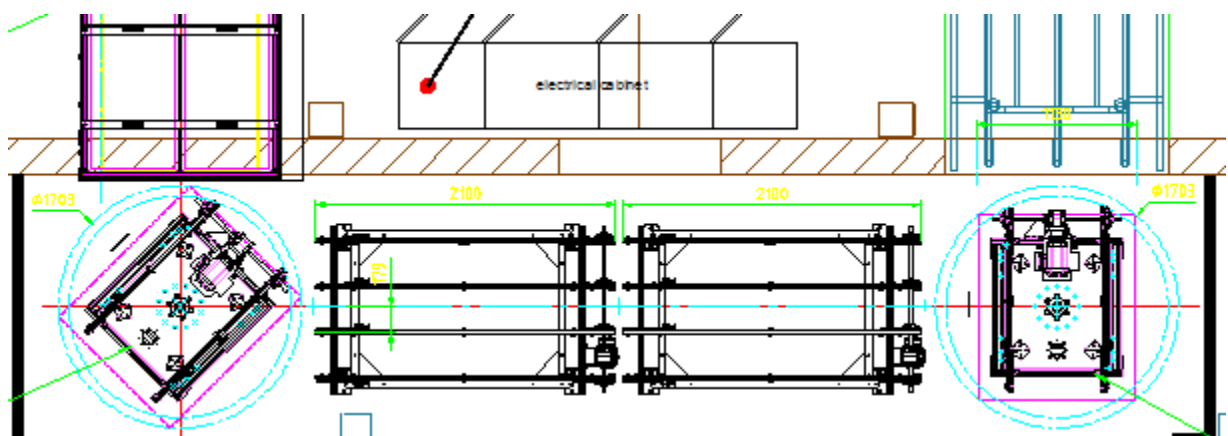
Massive side alignment/rotating table for solar modules (according to Oerlikon specifications)  
 A gateway with 2 grippers to enable processing of 2 MMIs per one processing cycle  
 It can be upgraded to reach the processing capacity of 3 MMIs. Z-axis with a programmable stop position (servo drive). "MMI placement" to provide a certain adhesive thickness, Additional mechanical stops are also included in the supply scope.  
 Y-axis with a programmable stop position (servo drive)

**Rotary positioning device for rail mounting:**



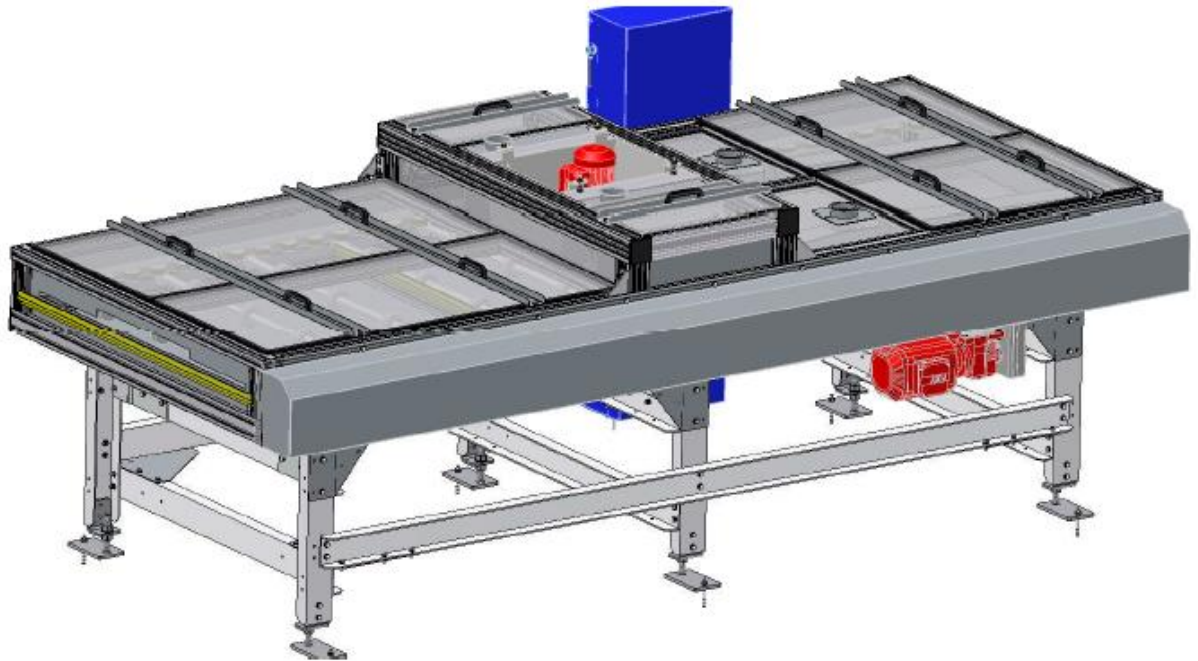
A turntable consists of a rotary device and glass transportation unit with an alignment device. The transportation system: moves the substrate via a motorized belt conveyor. The alignment unit ensures a precise substrate arrangement. The turntable is rotated through a servomotor drive. The shuttle places the rails onto a glass module with a controlled force. Upon placing the rail, the glass panel is transported to the module buffer station.

#### Module conveyor line:



The glass panels are supplied from the customer's (currently operable) process line to the Benteler turntable. The 180° turntable is equipped with a belt conveyor. A standard belt conveyor transports the glass modules to a second 180° turntable. This table is used to feed the glass modules into the module cleaning system.

#### Modules cleaning station:



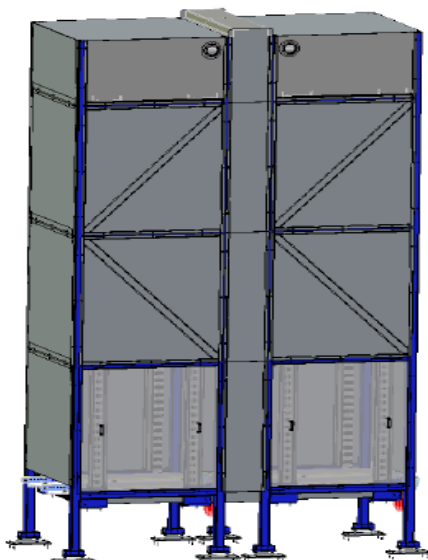
ISOPROPANOL is sprayed with the nozzles onto the rotating brush. The brushes apply a thin layer of ISOPROPANOL to the glass panels and clean the parts where the rails are located. The extraction of ISOPROPANOL fumes is provided by the customer. Exhaust connections are provided for this purpose.

To avoid accumulation of static charge during the transportation of the glass panels, four antistatic bars are provided along the entire length of the machine.

ISOPROPANOL is fed through a dosing system located next to the machine.

ISOPROPANOL should be refilled into the tank when the corresponding signal is displayed on the control panel.

#### **Module buffering station:**



The capacity of this glass buffer station is 110 modules.

As a result, the exposure time from the module feeding moment is 45 minutes.