Fully Automatic Vacuum Insulated Glass Production Line

From loading tempered glass to the vacuum sealing furnace, one line handles washing, measuring, pillar placement, frit dispensing, drying, glass pairing and clipping. Glass moves between stations automatically, and the whole line needs only 5 operators.



Vacuum sealing furnace · real photo

2400 × 1800	±0.2 mm	10^{-4} Pa	5 operators
Max. glass size, mm Thickness 3–19 mm	Measuring and pairing accuracy	Ultimate vacuum Mechanical + diffusion pump	For the whole line Automatic from loading to furnace

WHY THIS LINE

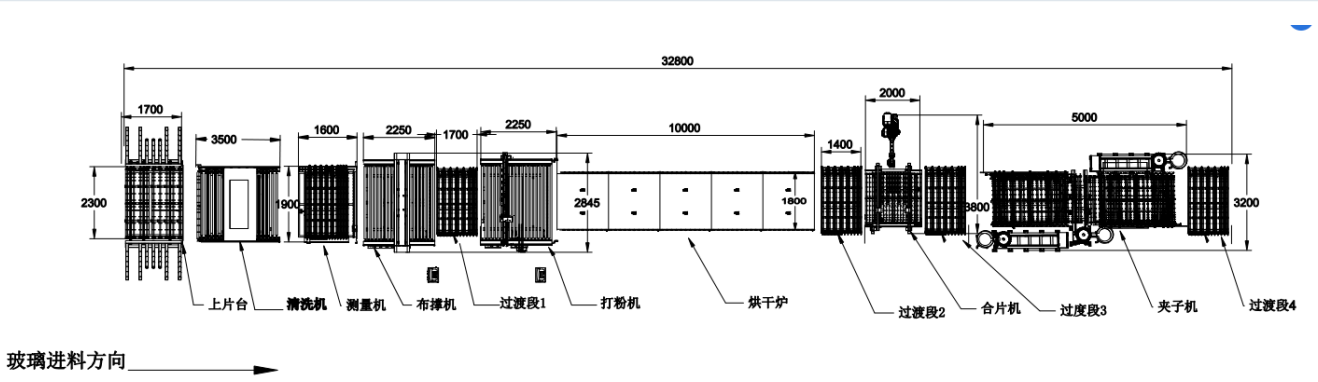
Key features

- **Fully connected line.** Loading to furnace is automatic. Measured glass data is sent by cable to every machine downstream.
- **46-head pillar placement.** Calculates head count and edge margins, then picks, glues and places pillars. Alarms on missing pillars and can re-place them automatically.
- **Precise pairing.** Double-gantry positioning and a robot that flips the glass 180°. Pairing accuracy ±0.2 mm.
- **Fast, accurate measuring.** Laser sensors locate the glass quickly, then a mechanical probe re-checks it. Max. 1 minute per sheet, ±0.2 mm.
- **Even frit dispensing.** In-house two-stage screw feeder in 304 stainless steel. Edge distance, corner radius and grams per metre are all programmable.
- **High-vacuum sealing.** Two vacuum systems with 48 independent branches, mechanical + diffusion pumps, 10^{-4} Pa. Evacuation and sealing are automatic.

LINE OVERVIEW

Process flow and line layout

Tempered glass › Loader › Washer › Measuring table › Pillar placer › Buffer › Frit dispenser › Buffer › Drying oven › Buffer › Pairing machine › Buffer › Clipping machine › Buffer › Vacuum sealing furnace



Line layout for reference. Final dimensions follow the confirmed layout drawing.

SCOPE OF SUPPLY

Equipment list

No.	Equipment	Description	Qty
1	Glass loader	Twin arms, two loading stations, tilting	1
2	Glass washer	Brush rollers, high-pressure spray, air drying	1
3	Measuring table	X/Y measuring heads, dual-mode measuring	1
4	Pillar placement machine	46 heads	1
5	Frit dispenser (edge sealing)	Two-stage screw feeder	1
6	Drying oven	Infrared electric heating, hot-air circulation	1
7	Glass pairing machine	Double-gantry positioning table + robot	1
8	Clipping machine	Two stations, 4 feeders, 4 clip heads	2
9	Buffer conveyors	Waiting zones between stations	1 set
10	Vacuum sealing furnace (batch)	405 kW, with vacuum system and exhaust-sealing units	1

STATIONS

Machines in the line

Glass loader 01

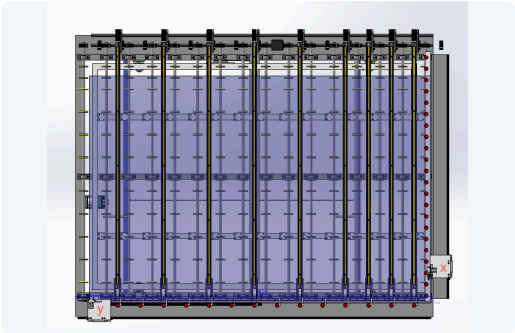
Twin-arm design with two loading stations.

- The main arm tilts up about 95° and the machine moves forward until it touches the glass. Suction cups then hold the sheet.
- The small arm lifts the glass about 80 mm. When the main arm is back down, the cups release and the glass rests on the rollers.
- The rollers carry the glass into the washer.

Glass washer 02

Brush rollers, high-pressure spray and an air-drying system clean the glass before pillar placement and frit dispensing.

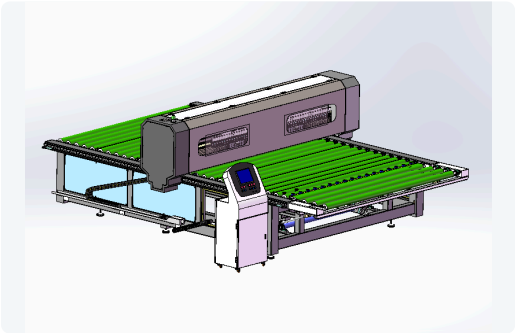
- Washing size 2400 × 1800 mm, thickness 3–19 mm.
- Connected to the loader and measuring table.



Measuring table 03

Dual-mode measuring for both speed and accuracy.

- The X and Y heads move together. When a laser sensor finds the glass edge, the head slows down and a mechanical probe measures it a second time.
- Max. 1 minute per sheet, accuracy ±0.2 mm.
- Results go by cable to every machine downstream. No manual input is needed.



Pillar placement machine 04

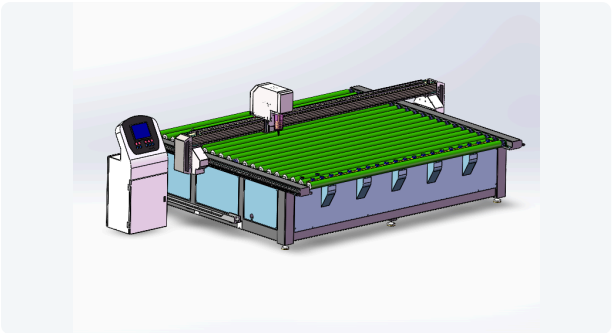
Places metal support pillars evenly on the glass. Pillars are 0.5 mm metal balls at 50 mm spacing.

- Calculates the edge distance and the number of heads needed from the glass width.
- Heads pick the pillars, dip them in glue and place them, about 8 s per row. A 1800 × 2400 mm sheet at 50 mm spacing takes about 4 minutes. Smaller sheets are faster.
- Pillar check: missing or misplaced pillars trigger an alarm. After the operator confirms, the machine can re-place them automatically.

Semi-automatic
Runs alone, off the line. Start and pause by the operator.

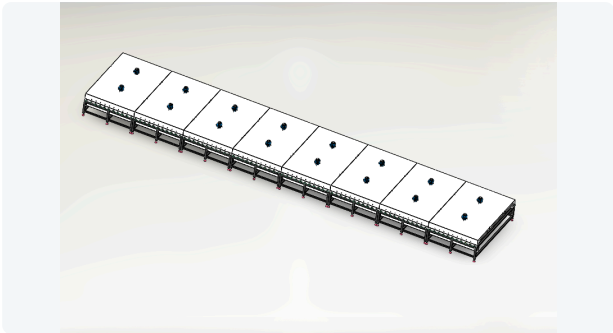
Automatic
Starts when glass arrives and stops when done. Glass waits on the machine.

Inline
Takes glass from the measuring table and sends it on when done (except on alarm).



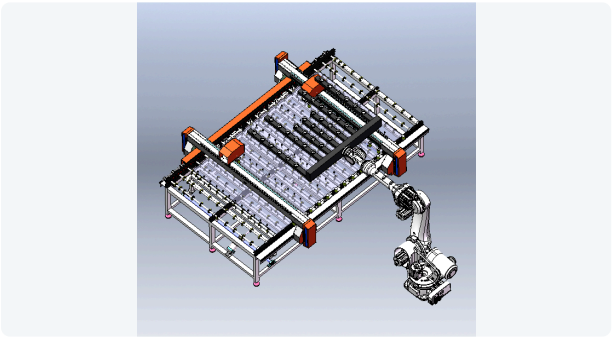
Frit dispenser 05

- In-house two-stage screw feeder: stage one stirs, stage two presses, so the glass frit stays even. This solves uneven feeding and fast wear.
- Feeder assembly in 304 stainless steel: easy to clean, maintenance-free, long life. Tank size matches the line output, enough for one shift.
- Edge distance, corner radius and grams per metre are preset. Alarms when frit runs low. Speed adjustable from 1–10 m/min.



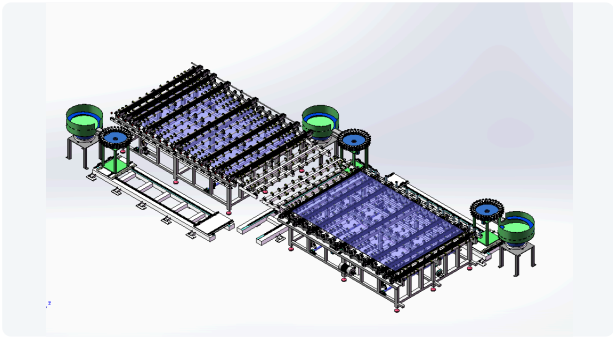
Drying oven 06

- Infrared electric heating, evenly spread above and below, with low energy use. Internal conveyor parts are mostly stainless steel and heat-resistant materials.
- Two hot-air fans per section blow air horizontally for even temperature. Extra-thick insulation.
- PID control, each section monitored separately, ±1 °C. Drying is step by step, so the frit does not crack from drying too fast.
- Over-temperature protection, timed start and alarms.



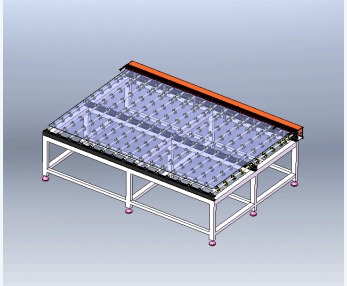
Glass pairing machine 07

- A positioning table with double gantry, plus a robot.
- Ball transfer units lift the glass. The gantries clamp it front and back, side stops position it, and suction cups hold it.
- The robot picks the sheet and flips it 180°. When the next sheet is in position, it pairs them along the taught path, accuracy ±0.2 mm, then returns home.



Clipping machine 08

- Two work tables, four clip feeders and four clip heads, one for each glass edge.
- Feeders sort clips during idle time, so the clip heads are always full.
- Feeder 1 holds 24 clips for a long edge up to 3660 mm. Feeder 2 holds 16 clips for a short edge up to 2440 mm.
- Station 1 clips one long and one short edge, station 2 clips the other two. The glass then waits on a buffer before the furnace.



Buffer conveyor 09

Balances the cycle-time differences between stations. After one process, the glass waits here for the next, so the line keeps running.

Frame and build quality

Frames are welded from manganese steel to national standards and stress-relieved. They are milled flat on a 5-axis machining centre and tempered again for stability and accuracy. Surfaces are pickled, phosphated, sandblasted and powder-coated for a long-lasting finish.

SPECIFICATIONS

Technical parameters of the line

Machine	Max. glass size mm	Thickness mm	Total power	Footprint mm
Glass loader	2400 × 1800	3–19	5–10 kW	2300 × 1700
Glass washer	2400 × 1800	3–19	5–10 kW	2200 × 3500
Measuring table	2400 × 1800	3–19	3–5 kW	1900 × 1600
Pillar placement machine	2400 × 1800	3–19	3–5 kW	2845 × 2250
Frit dispenser	2400 × 1800	3–19	3–5 kW	2845 × 2250
Drying oven	2400 × 1800	3–19	10–60 kW	1800 × 10000
Glass pairing machine	2400 × 1800	3–10	3–5 kW	3800 × 2000
Clipping machine	2400 × 1800	3–10	3–6 kW	3200 × 5000
Buffer conveyor	2400 × 1800	3–19	3–5 kW	2000 × 1400
General				
Power supply	AC 380 V / 50 Hz			
Compressed air	0.6–0.8 MPa			
Loader vacuum	−50 to −99 kPa			
Conveyor height	800 ± 50 mm, adjustable on request			

VACUUM SEALING FURNACE

Vacuum glass sealing furnace

An electrically heated, hot-air circulation chamber furnace for heating and sealing vacuum glass. Glass sits on dedicated racks, 10 rack levels per set. The system includes the furnace, its vacuum system, exhaust-sealing units and an industrial PC control system.



Site requirements

- Ambient temperature 5–40 °C.
- Monthly average max. relative humidity in the wettest month ≤ 90 %.
- No conductive dust, explosive gas, or gas that corrodes metal or insulation.
- No noticeable vibration or shocks.

Main technical parameters

No.	Item	Value
1	Rated heating power	405 kW
2	Rated temperature	400 °C
3	Effective heating zone (L × W × H)	3000 × 2000 × 2200 mm
4	Temperature uniformity, holding	±5 °C
5	Temperature uniformity, heating / cooling	±10 °C (above 300 °C); ±15 °C (below 300 °C)
6	Heating rate	≥ 5 °C/min (full load)
7	Cooling rate	≥ 3 °C/min (full load, 400 → 290 °C); ≥ 2 °C/min (full load, 290 → 60 °C)
8	Control accuracy	±1 °C
9	Temperature sensors	Sheathed thermocouples, type E
10	Heating zones	3 controlled zones
11	Furnace surface temperature rise	≤ 30 °C
12	Max. load	12 rack levels
13	Temperature control	Automatic PID control

FURNACE DESIGN

Furnace structure and control system

Main parts: shell, lining, heating elements, hot-air circulation, doors with lifting and clamping, cooling system, temperature and electrical control, and vacuum system.

- **Shell.** Welded steel-section frame with steel plate outer walls, and guards over the heater terminals. Floor rails and rack supports in SUS321 stainless steel carry the rack transfer cart and rack sets.
- **Lining.** 200 mm thick, with staggered layers of aluminium silicate fibre blanket. Lined inside with 1.2 mm 0Cr18Ni9 stainless steel sheets, with expansion gaps, to stop fibre erosion. Shell surface rise ≤ 30 °C at 400 °C.
- **Heating elements.** 0Cr21Al6Nb resistance wire (Shougang), surface load ≤ 2.0 W/cm². Drawer-type groups mounted vertically in the roof air duct, each removable on its own. Heat is mixed in the roof before entering the supply ducts.
- **Doors.** One at the front and one at the back, Q235 steel. Chain-driven by geared motor, about 6–8 m/min. Pneumatic clamping and ceramic fibre seals. Upper and lower limit switches, pneumatic safety pin, and door/heating interlock.
- **Hot-air circulation.** 3 high-temperature fans, 30 kW each, 48,200–63,950 m³/h, 1.0–1.2 air changes per second. Shaft and impeller in 1Cr18Ni9Ti, stress-relieved and balanced for long running at 400 °C. Soft start by inverter, adjustable speed.
- **Horizontal airflow.** Both side walls are full-height supply and return ducts, ≥ 600 mm from the inner wall. Supply outlets match the 10 rack levels, each with an adjustable damper. Curved guide plates in the corners reduce resistance and dead zones for even temperature on every level.
- **Cooling.** A high-pressure blower brings in cold air and a water-cooled exhaust fan removes hot air. Motorised butterfly valves open according to the set cooling rate. 3 roof exhaust valves work with the intake for fast cooling.
- **Vacuum system.** 2 sets, one on each side, each serving 24 sealing units (one per glass unit). Mechanical + diffusion pumps, ultimate vacuum 10^{-4} Pa. Every branch has its own high-vacuum valve. Evacuation and sealing of the pump-out hole are automatic.
- **Temperature control.** Front, middle and rear zones, each with a dual-element type E thermocouple. Control and over-temperature alarm are independent; power cuts off with an audible and visual alarm. Shimaden FP33 controllers (class 0.1) and SRS13A alarm units (class 0.3), both with RS485. Phase-angle power regulators drive the heaters.
- **Central control.** Advantech industrial PC and Siemens S7-1200 PLC on industrial Ethernet. Touch screen for setpoints, alarms, fans and process curves, with live temperature and time remaining. Remote monitoring and logging of temperature curves and process data.



Vacuum system: mechanical pump + diffusion pump

OPERATION

Operators and output

0	0	0	1	1	0	0	1	2	5
Loader	Washer	Measuring	Pillars	Frit	Oven	Pairing	Clipping	Floating	Total

- The line runs automatically from loading to unloading. Operators need no special skills, and the line is easy to manage.
- One batch furnace runs one cycle every 8 hours, with 50 glass units per load.
- One production line can supply 2 batch furnaces. Add more furnaces to raise output.

COMPONENTS

Main component brands

Part	Brand / material	Part	Brand / material
Conveyor	Imported PU rubber, 304 stainless, PTFE	Contactors	Schneider
Gear reducers	Lanba / Taiwan Shimpo	Cylinders	AirTAC
Servo motors	Inovance	Linear guides	AirTAC
PLC	Inovance	Solenoid valves	AirTAC
Inverters	Inovance	Power supplies	Mean Well
HMI	Inovance	Photoelectric sensors	Omron
Robot	Inovance		

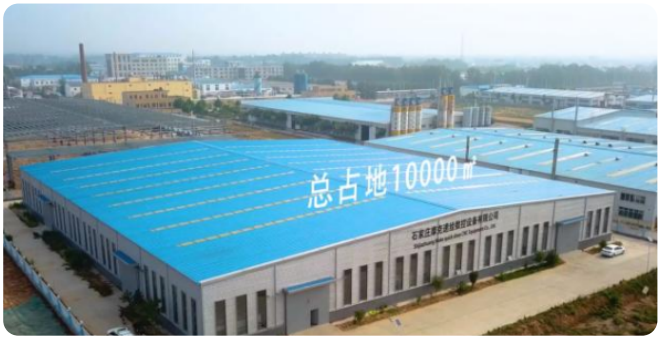
Note: depending on delivery time and technical updates, the manufacturer may replace purchased parts with parts of an equivalent brand.

ABOUT US

About us

Create is the export sales team for MOKE glass machinery. The MOKE factory in Zhao County Economic Development Zone, Hebei, covers 10,000 m² and has served the glass industry for over 20 years. Products include glass engraving, laser sandblasting and laser marking machines, and vacuum glass production lines.

On-site installation and training are available. The buyer covers the engineer's travel, accommodation and meals.



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