Innovative Vacuum for Automation

Patent pending in several countries

Vacuum Components

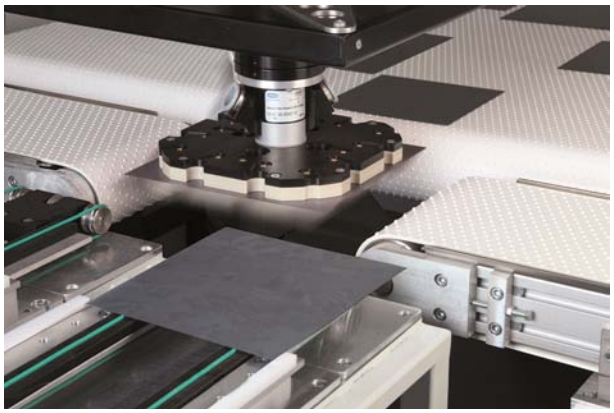
Wafer Gripper SWGm

Wafer Gripper SWGm

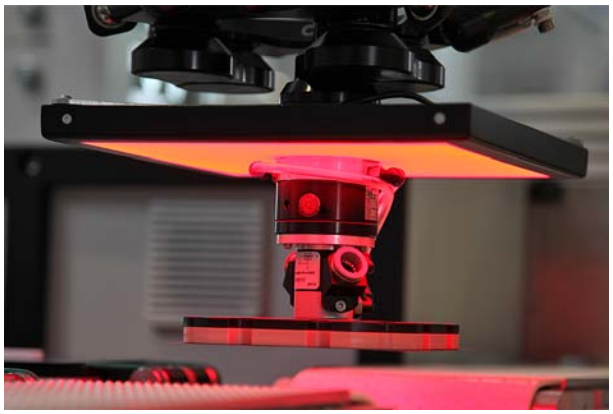
Application Areas

The Schmalz wafer gripper SWGm is ideal for all handling and inspection tasks in the partially and fully automated manufacture of wafers and solar cells. In particular, these tasks include removing wafers and cells from stacks and belts, buffering and bifurcation as well as securing and exact positioning during visual inspection.

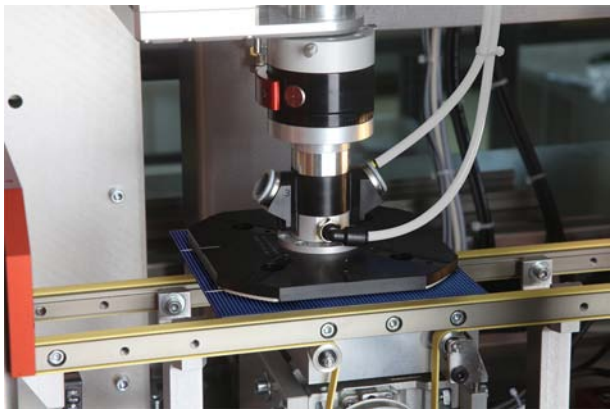
Process steps



Wafer manufacturing



Wafer and cell inspection



Cell manufacturing

String manufacturing

Process requirements

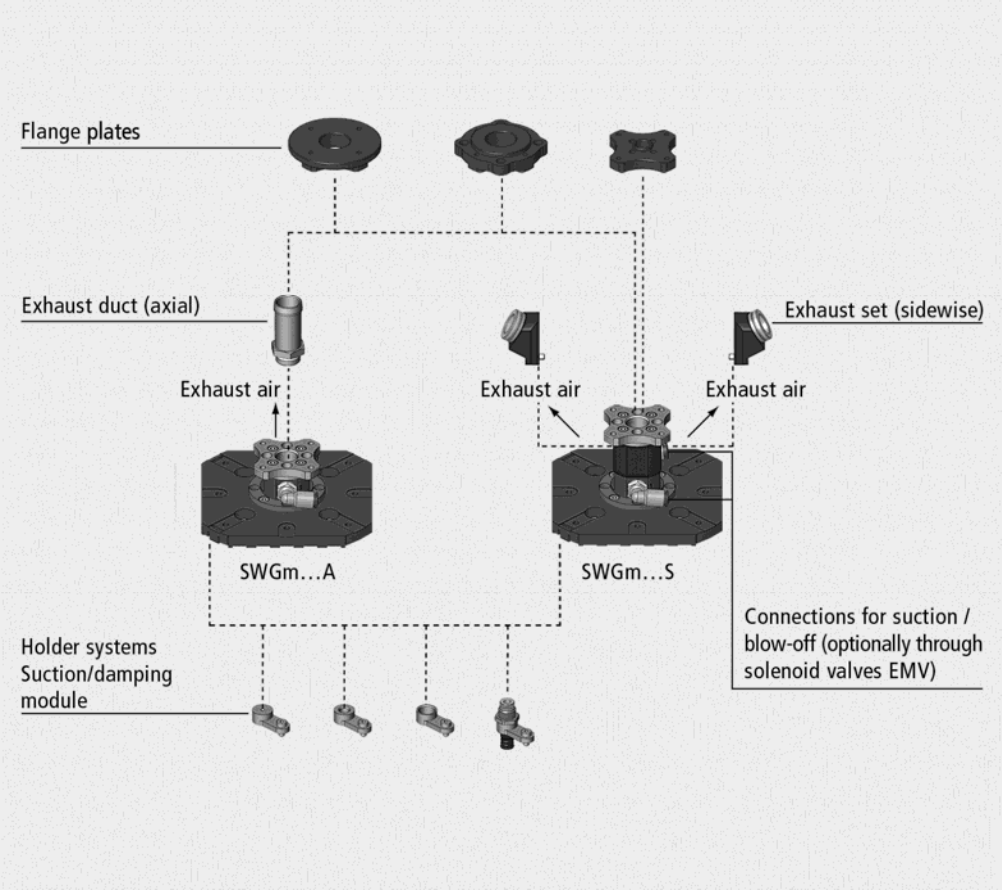
Process step	Process requirements	Handling tasks				
		Unstacking	Buffering	Securing	Positioning	Stacking
Wafer manufacturing	• Contamination-free handling of thin c-Si wafers (<100 µm) without damaging microstructures	✓	✓	✓		✓
Wafer and cell inspection	• Highest positioning accuracy and placement of the wafers/cells in the visual field of a camera			✓	✓	
Cell manufacturing	• Slip-free, delicate handling in extremely short cycles • Absorbing high lateral forces for maximum process dynamics	✓	✓	✓	✓	✓
String manufacturing	• Highest positioning accuracy when layering • Temperature-resistant gripper material that leaves no marks	✓		✓	✓	

Wafer Gripper SWGm

Design and Functions

The wafer gripper SWGm has a compact basic body with integrated suction and blow-off function. It is available in two versions – with an axial exhaust duct (SWGm…A) or an exhaust set for side extraction (SWGm…S). The modular design also allows for individual configuration of the robot interface, sensor holders and suction/damping module.

Modular design



Exhaust duct ABL-FUEHR
For controlled discharge of drawn-in air out of the process room (axial).

Exhaust set ABL-SET
For controlled discharge of drawn-in air out of the process room (sidewise).

Accessories

Flange plates FLAN-PL
For easy connection to robots and for quick gripper change; available for common robot types of all major manufacturers and as a universal flange.

Holder systems HTR
For attaching conventional sensors for measuring distances and checking configuration, available as M8x1-IG, M12x1-IG and as a universal holder.

Suction/damping module SD-MOD
For impact damping and precise positioning when depositing; for additional suction for extremely warped wafers and cells.

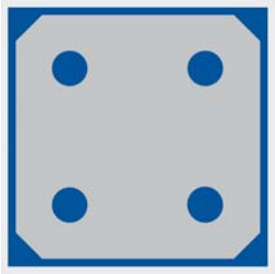
Solenoid valves EMV
Special micro valves for compressed air control without propagation delay, can be mounted directly to the connections for suction and blow-off.

Wafer Gripper SWGm

Overview of Highlights

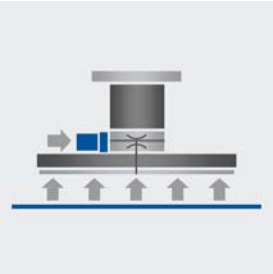
The Schmalz wafer gripper SWGm allows for extremely quick, precise and delicate handling of wafers and solar cells during the manufacturing process, and helps to decrease breakage rates. The modular design also makes it possible to integrate many additional functions that bring true added value to wafer and cell production.

Innovative functions combined in one gripper



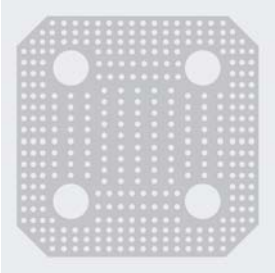
Full surface gripping

The large contact surface between the wafer and gripper provides powerful holding forces and slip-free handling. At the same time, it prevents deformation of the wafer when gripping and moving.



Integrated vacuum generation

Integrated vacuum generation provides high suction capacity and the shortest possible evacuation times in connection with a delicate, low vacuum level.

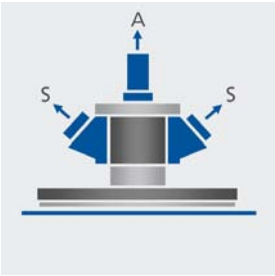


Contamination-free gripping

The wafers remain free of texture damage and chemical contamination because the contact surface of the gripper is made of PEEK (polyetheretherketone), a material that leaves no mark.

Partial coverage

Broken or damaged wafers are gripped securely and can be sorted out of the process room reliably.

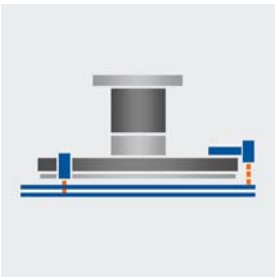


Controlled exhaust air

Maximal process reliability is ensured through controlled removal of drawn-in air and unwanted particles from the processing room; available in two options of either axial (A) or side (S) extraction.

Handling of warped wafers

Optional suction modules ensure that heavily bowed wafers can be lifted reliably and that they are placed in the optical field of the camera during visual inspection.



Parts control

Optional sensor brackets ensure parts “on the fly” control, such as coverage monitoring, for the first time detection of double coverage, distance measurement and break detection.

Damping elements

Optional damping elements support stack separation and provide additional protection to prevent damaging the sensitive wafers.

Wafer gripper SWGm in figures

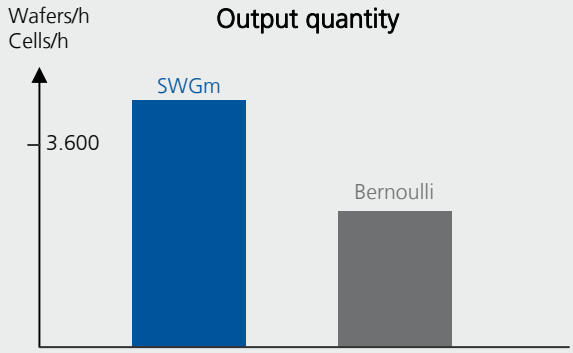
Type	Cell size [inch]	Exhaust air	Holding force [N]	Suction rate [l/min]	Air consumption [l/min]	Operating pressure [bar]	Dimensions [mm]	Weight [g]
SWGm-5A	5 (125 mm)	axial	10…35	190…350	60...120	1…3	115x115x40	210
SWGm-6A	6 (156 mm)	axial	12…43	190…350	60...120	1…3	146x146x40	275
SWGm-5S	5 (125 mm)	sidewise	10…35	160…235	60...120	1…3	115x115x65	235
SWGm-6S	6 (156 mm)	sidewise	12…43	160…235	60...120	1…3	146x146x65	300

Wafer Gripper SWGm

Quick. Efficient. Gentle.

With its innovative gripping concept, the Schmalz wafer gripper SWGm sets new standards in process reliability, process dynamics, precision and damage-free handling. Compared to current gripping principles, the Schmalz wafer gripper achieves a significantly faster cycle speed and prevents damage to sensitive wafer surfaces.

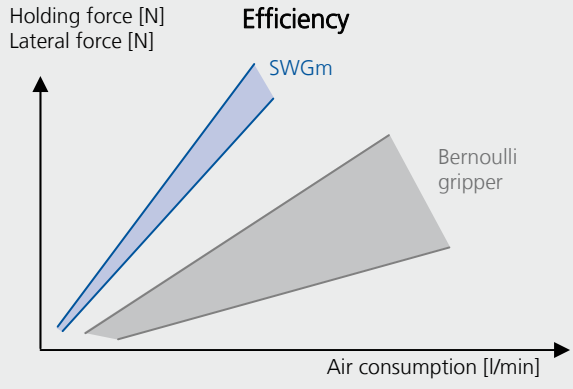
The Schmalz wafer gripper offers significant advantages



Quick.

- Increased output quantity through faster processing speed
- No slips with the highest possible accelerations (>10 g) due to high holding and lateral forces
- Integration of testing and inspection tasks starting in the handling process with an optionally integrated sensor function

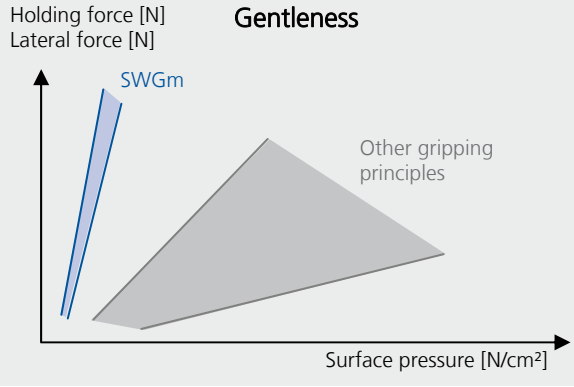
➔ Maximum output with cycle times of less than one second



Efficient.

- Outstanding ratio of holding and lateral forces relative to air consumption
- Fast speeds and shortest cycle times while obtaining high positioning and depositing accuracy
- No wafer slips, not even in extremely dynamic processes
- Minimal operating costs due to low compressed air consumption

➔ Highest dynamic handling with minimal operating costs



Gentle.

- Reduces dynamic and static forces on the wafer with optimal dimensioning and distribution of suction cells
- Proven* lower surface pressure compared to other gripping principles, such as elastomer suction grippers or grippers employing the Bernoulli principle, and therefore considerably gentler handling

➔ Significant decrease in breakage rates

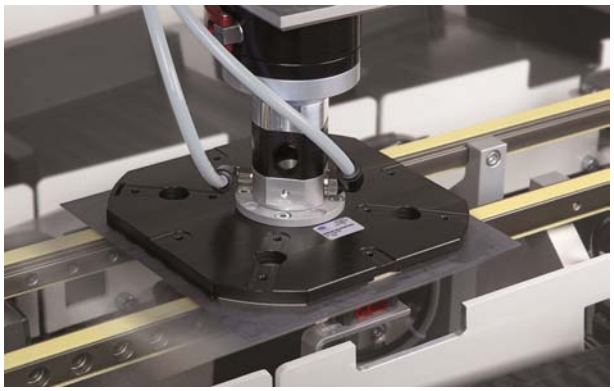
* The Fraunhofer Institute for Solar Energy Systems (ISE) did not find any interference from the Schmalz wafer gripper in its test for impact marks using the example of a texturing process for monocrystalline wafers. All other grippers left marks on the wafers.

Fraunhofer ISE

Solar Industry Solutions

Innovative Products for All Process Steps

From wafer handling to module logistics – specially developed automation and handling solutions from Schmalz significantly increase productivity in all areas of partially and fully automated solar component manufacturing.



Wafer and cell handling

Schmalz vacuum components guarantee quick and process-safe handling of wafers and cells in lifting them from and placing them on conveyor belts, in unstacking, buffering and bifurcation as well as in inspection and interim transportation.

- Vacuum suction pads
- Special grippers
- Vacuum generators

String- and cell matrix handling

Schmalz vacuum components and gripping systems facilitate the handling and securing of the busbar and removing it from rollers in the stringer soldering process as well as removing complete strings for even alignment for visual inspection and for precise lifting into the EVA film bed.

- Vacuum suction pads
- Vacuum generators
- Mounting elements
- Vacuum gripping systems

Glass and module handling

Schmalz vacuum components and gripping systems facilitate automated transferring, positioning and securing of solar glass and modules in processes steps such as film cutting and framing. Manually guided vacuum handling systems streamline all areas of module logistics.

- Vacuum suction pads
- Vacuum generators
- Mounting elements
- Vacuum gripping systems
- Vacuum handling systems
- Vacuum clamping systems

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