

Innovative vacuum for automation



Vacuum Components
Wafer-Gripper SWG

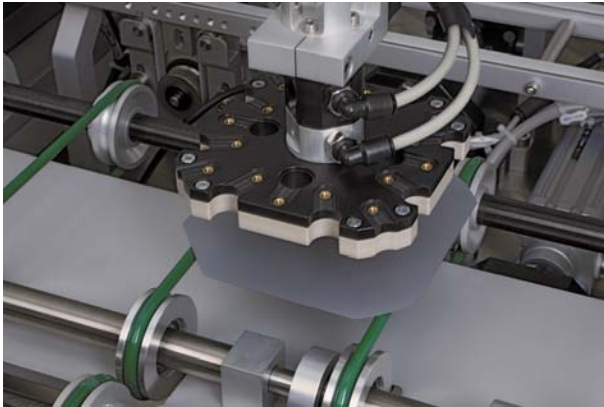
Wafer-Gripper SWG



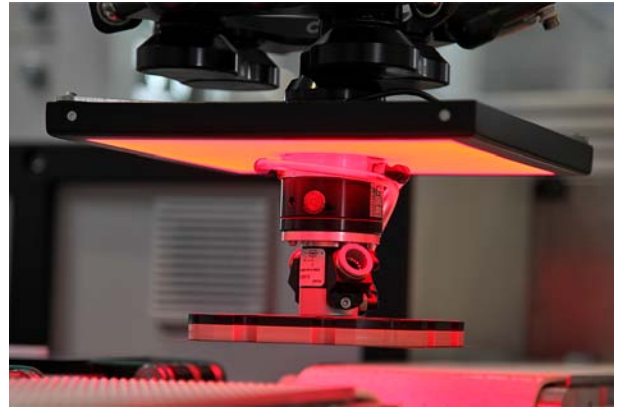
Application Areas

The Schmalz Wafer-Gripper SWG 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.

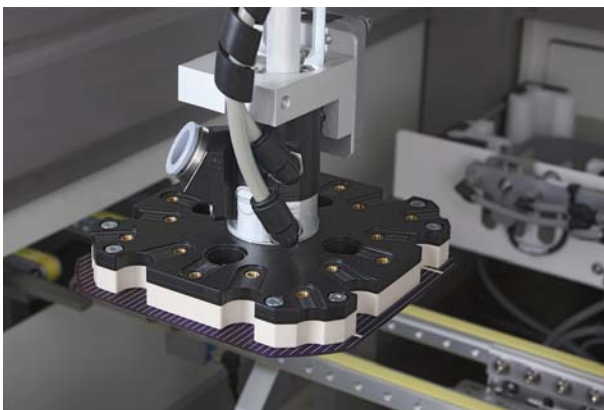
Process steps



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	<ul style="list-style-type: none"> Contamination-free handling of thin c-Si wafers (<math><160 \mu\text{m}</math>) without damaging microstructures 	✓	✓	✓		✓
Wafer and cell inspection	<ul style="list-style-type: none"> Highest positioning accuracy and placement of the wafers/cells in the visual field of a camera 			✓	✓	
Cell manufacturing	<ul style="list-style-type: none"> Slip-free, delicate handling in extremely short cycles Absorbing high lateral forces for maximum process dynamics 	✓	✓	✓	✓	✓
String manufacturing	<ul style="list-style-type: none"> Highest positioning accuracy when layering Temperature-resistant gripper material that leaves no marks 	✓		✓	✓	

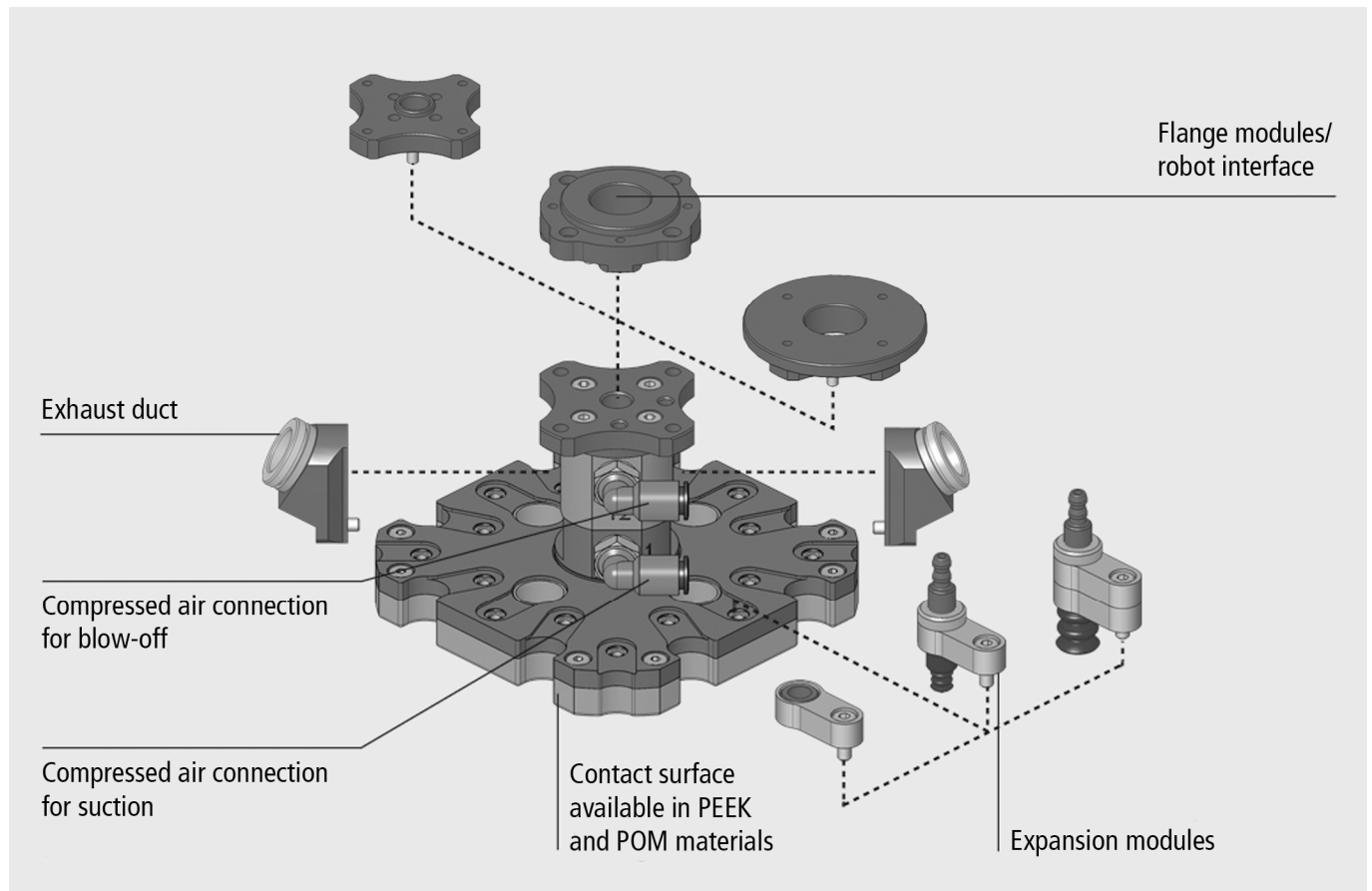
Wafer-Gripper SWG



Design and Functions

The Schmalz Wafer-Gripper SWG has a compact body with integrated suction and blow-off functions. It is available for standard cell sizes of 5" and 6". The modular design allows for the individual configuration of a robot connection, contact surfaces as well as expansion modules and sensor modules for including additional functions.

Modular basic design



Accessories



**Flange modules
FLAN-PL**
For easy connection to robots and for quick gripper change; available for common robot types



**Exhaust ducts
ABL-SET**
For controlled discharge of drawn-in air out of the process room and increased process reliability



**Sensor bracket
HTR UNI SWG**
For attaching conventional sensors for measuring distances and checking configuration (M8 x 1)



**Suction/Damping module
SAUG-MOD FG 7/12**
For additional suction of extremely warped wafers and cells, impact damping and precise lowering

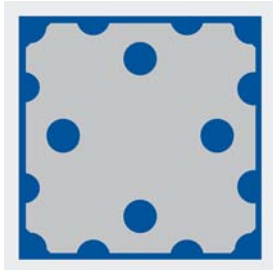
Wafer-Gripper SWG



Overview of Highlights

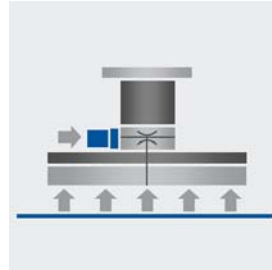
The Schmalz Wafer-Gripper SWG allows for extremely quick, precise and delicate handling of wafers and solar cells during the manufacturing process. The modular design makes it possible to integrate many additional functions that bring true added value to wafer and cell production.

Innovative functions combined in one gripper



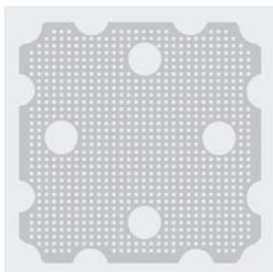
Full surface gripping

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.



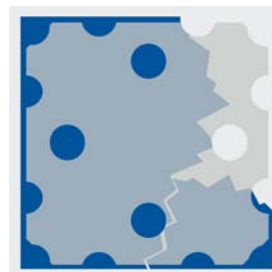
Integrated vacuum generation

Integrated vacuum generation provides high suction capacity and short 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 (polyether-etherketone), a material that leaves no mark.



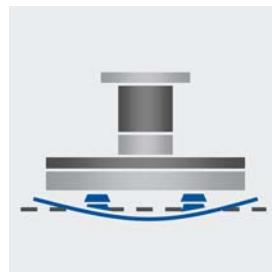
Partial coverage

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



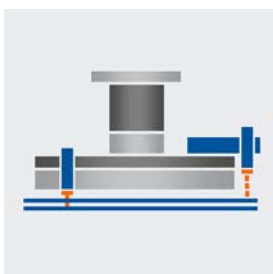
Controlled exhaust duct

Maximal process reliability is ensured through controlled removal of drawn-in air and the unwanted particles it contains from the process room; such as for production under clean room conditions (optional).



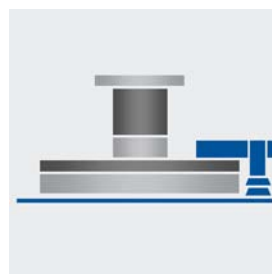
Handling of warped wafers

Optional suction modules ensure that heavily bowed or warped wafers can be lifted reliably and that the wafers 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.

*The sensors for the detection of double coverage were specially developed for the Schmalz Wafer-Gripper in cooperation with Roland Electronics.

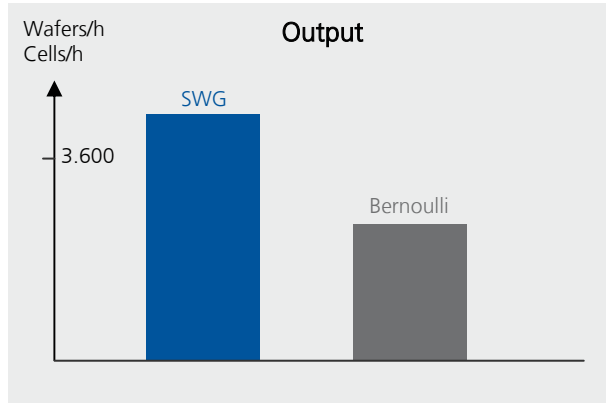
Wafer-Gripper SWG



Quick. Efficient. Gentle.

With its innovative gripping concept, the Schmalz Wafer-Gripper SWG 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.

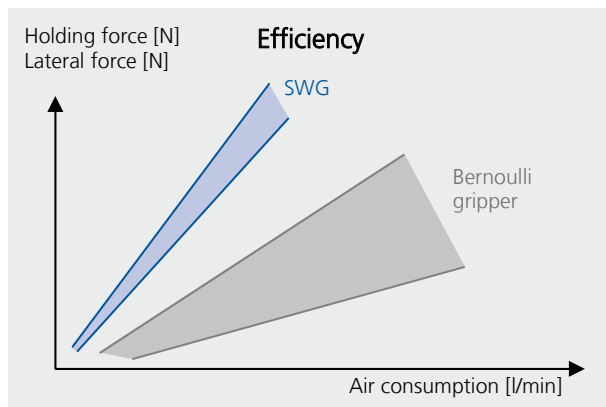
The Schmalz Wafer-Gripper offers significant advantages



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

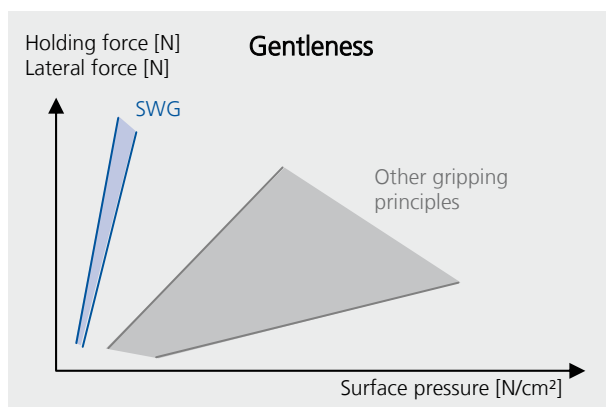
➔ **Maximum output with cycle times of less than one second**



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.

- High holding forces and lateral forces while maintaining extremely low surface pressure
- Fast speeds and short cycle times while ensuring the most delicate handling
- Proven* lower surface pressure compared to other gripping principles, such as elastomer suction grippers or grippers employing Bernoulli's principle, and therefore considerably gentler handling

➔ **Gentle handling with ultimate holding force**

* 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.

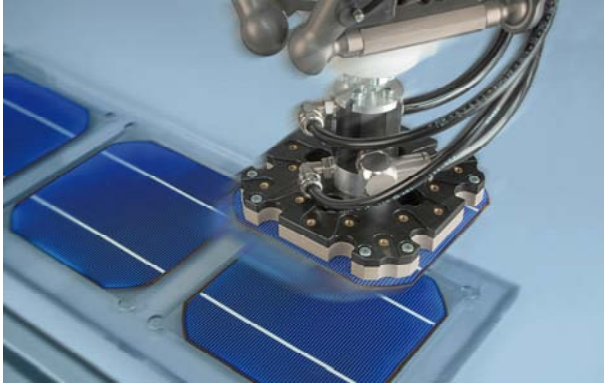


Solar Industry Solutions

Innovative Products for All Process Steps



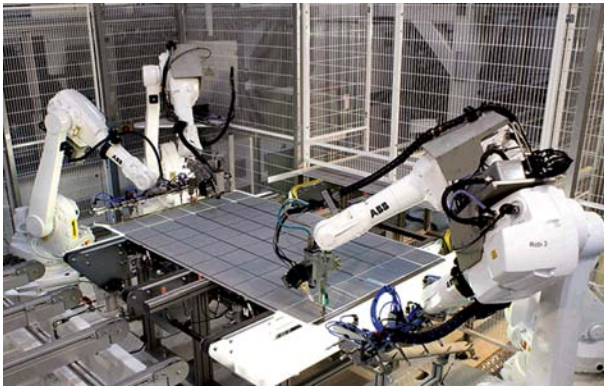
From wafer handling to module logistics – specially developed automation and handling solutions from Schmalz significantly increase productivity in all areas of partially and fully automated solar component manufacturing.



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 gripping systems
- Vacuum generators
- Mounting elements



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 gripping systems
- Vacuum generators
- Vacuum handling systems
- Mounting elements



BAYSWATER, MELBOURNE
FREECALL 1800 99 22 11
components@millsom.com.au

J. Schmalz GmbH
www.schmalz.com