Innovative Vacuum for Automation





Industry Solutions PV



The Whole World of Vacuum Technology



Clearly arranged industry sector identification **Broad order and product information** Helpful index arranged by application

> Detailed information on Schmalz vacuum technology for the PV industry can be found in our latest catalogues:

- Vacuum Components
- Vacuum Gripping Systems
- Vacuum Handling Systems
- Vacuum Clamping Systems

We are pleased to send you a free copy of our catalogues. Just call us at or use our convenient online-shop for literature on www.schmalz.com.

The products for the PV industry are also presented on our website including user manuals and CAD-drawings for free download. Order fast and convenient on www.schmalz.com.



Industry sector icons immediately indicate which product can be used for PV applications





All contents and technical data were correct when the brochure went into print. Great care has been taken in the compilation of the catalog and all technical and other information was thoroughly checked. However, Schmalz accepts no liability for faulty or Schmalz shall not be held liable for size variation resulting from production and the materials used.

Ordering data for fast and easy ordering

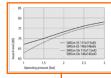


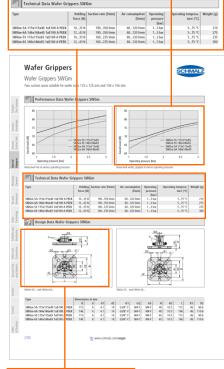


Accessories to add additional features to the selected product

Technical data provides you with

the key information to find your product







Design data including drawings make it easier to choose your product

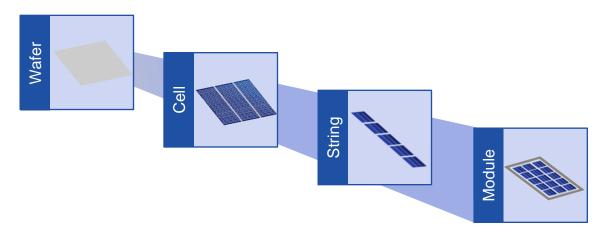
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How to find the right solutions for your application?

→ Process icons indicate which product can be used for your application along the production chain.



Applications



Wafer Handling



Wafer Gripper SWG used for the belt to belt transport of wafers:

- Minimum cycle times due to high horizontal forces
- No surface contamination and texture damage
- Handling of wet wafers with maximum process stability
- Minimum breakage rates

Floating Suction Pads SBS used for the loading and unloading of matrix carrier:

- High jumping height for the separation of wafers
- Low contact for gentle handling
- Special non-marking rubber buffers for absorption of lateral forces



Cell Handling



Wafer Gripper SWG used for the destacking of cells for the loading a stringer:

- High accelerations with maximum positioning accuracy
- Defined gripping position for on-the fly inspection
- Non-marking and temperature resistant suction plate material PEEK

Flat Suction Pads SGPN used for the positioning of the cells in a stringer:

- · Non-marking material HT
- Soft sealing lip and inner support for gentle handling
- Material HT1 with temperature resistance up to 170°C



Applications



String Handling



String Gripper SSG-A used for the layup of strings on the module/EVA-foil:

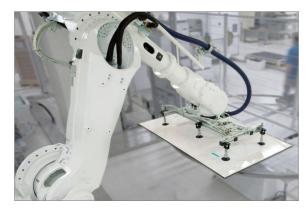
- · High accelerations due to high forces
- Gentle handling with bellows suction pads and low vacuum level
- Integrated vacuum generator with high suction capacity
- · High positioning accuracy of the strings

String Gripper SSG-M used for the manual handling of strings at repair tables

- Low weight gripper with integrated valve and vacuum generator
- Bellows suction pads with soft sealing lip for gentle gripping and release of the string
- High suction capacity to also handle stings where not all cell positions are covered



Module Handling



Vacuum Suction Spider SSP used for the module handling in framing stations:

- High horizontal forces due to special suction pads
- Intelligent vacuum generation with airsaving function to reduce the compressed-air consumption

Vacuum Tube Lifter JumboErgo used for the unloading of modules after inspection:

- · Ergonomic manual handling for fast handling
- Integrated swiveling unit to take the modules in horizontal position and release in vertical position
- · Crane system with easy to move rail design



Wafer Grippers SWGm









Suitable for Process-Specific Applications



Wafer Grippers SWGm

Applications

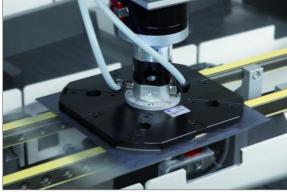
- Wafer gripper for extremely fast and gentle handling of wafers and solar cells along the entire production process
- Loading and unloading from stack and conveyor belts
- Exact positioning during visual inspection and position measurement allow on-the-fly breakage detection during the handling process
- Fully or partially automated production of PV cells with maximum process stability, production line uptime, cell efficiency and line output

(III) (II) (II) (II) (II) (II) (II)

System design Wafer Grippers SWGm

Design

- Base model version with direction of exhaust-air (3) in axial
 (A) or lateral (S) direction
- Suction area geometries available in common cell size 125 mm and 156 mm (5" and 6")
- Optional exhaust-air unit (II) for controlled removal of exhaust-air for clean room applications
- Modular design with accessories for the mounting of sensors and modules for suction and damping (I) and different flange modules (III)



Wafer handling with Wafer Gripper SWGm

Our Highlights ...

- High suction force with low surface pressure
- High suction rate even in case partial coverage
- Gripper surface made of PEEK
- Integrated vacuum generator and blow-off function
- · Quick object release

- High speed, high accuracy handling for cycle times
 1 second at minimum breakage rates
- Reliable gripping and handling – even of deformed, broken or perforated wafers
- No surface contamination and reduction of blind spots
- > Ready to use unit with optimum efficiency
- > Precise positioning and very short cycle times

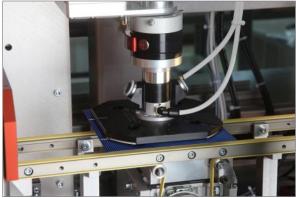
Wafer Grippers SWGm



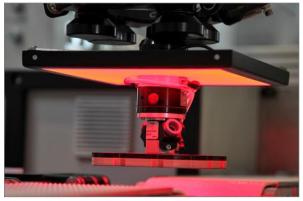
Process Steps



Wafer manufacturing



Cell manufacturing



Wafer and cell inspection



String manufacturing

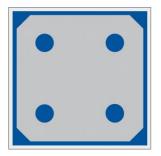
Process Requirements

Process step	Challenges and trends	Handling tasks								
		Destacking	uffering	Securing	Positioning	Stacking				
Wafer manufacturing	 Contamination-free handling of thin c-Si Wafers (180 <50 μm) without damaging of microstructures/texture Output quantity per line ≥ 3.600 Wafers/h 	√	√	√		√				
Wafer and cell inspection	 In-Line Inspection with cycle times < 1 second Positioning of Wafers/Cells with excellent definition (z = 0) of optical plane 			✓	√					
Cell manufacturing	 Slip free, gentle handling with cycle times t < 1 second (Output ≥ 3.600 cells/h) High horizontal forces with low static stress 	√	√	√	√	√				
String manufacturing	 Highest positioning accuracy during lay-up Mark-free and temperature resistant material of contact surface 	√		√	√					

Wafer Grippers SWGm



Innovative Functions Combined in One Gripper



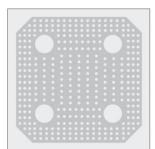
Full surface gripping

The large contact surface between the wafer and the 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 combination with a gentle, low vacuum level.



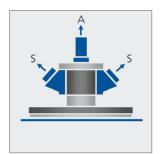
Contamination-free gripping

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 marks



Partial coverage

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



Controlled exhaust-air

Maximum process reliability is ensured through controlled removal of drawn-in air and unwanted particles from the processing room; available in two options, q 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.



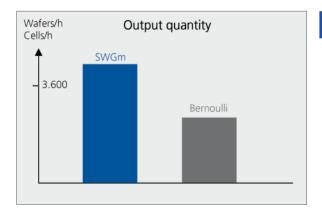
Damping elements

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

Wafer Grippers SWGm



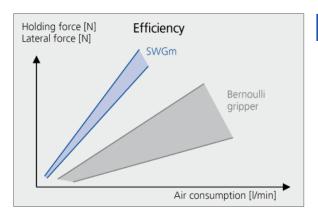
Innovative Functions Combined in One Gripper



Fast!

- 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

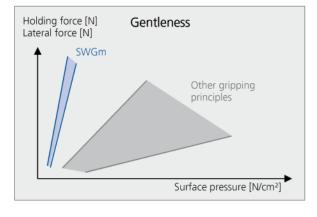
→ Maximum output with cycle times of less than one second



Efficient!

- Outstanding ratio of holding and lateral forces relative to compressed-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 based on the Bernoulli principle, and therefore considerably gentler handling
- → Significant decrease in breakage rates up to 70% compared to suction pads and 80% compared to Bernoulli grippers

Please contact our specialists for detailed information regarding the Fraunhofer analysis.

^{*} 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.

Wafer Grippers SWGm





Ordering Data Wafer Grippers SWGm

Туре	Part Number
SWGm-5A 115x115x40 1xE100 A PEEK	10.01.30.00135
SWGm-6A 146x146x40 1xE100 A PEEK	10.01.30.00136
SWGm-5S 115x115x65 1xE100 A PEEK	10.01.30.00137
SWGm-6S 146x146x65 1xE100 A PEEK	10.01.30.00138



Ordering Data Spare Parts Wafer Grippers SWGm

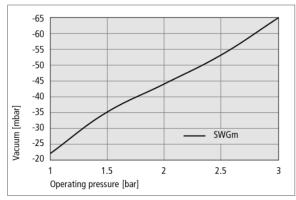
Туре	For Type	Part Number
SAUG-FL SWGm-5 110x110 PEEK	SWGm-5	10.01.30.00125
SAUG-FL SWGm-6 141x141 PEEK	SWGm-6	10.01.30.00126



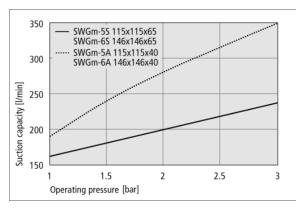
Ordering Data Accessoires Wafer Grippers SWGm

Туре	SWGm-5A	SWGm-6A	SWGm-5S	SWGm-6S
FLAN-PL 55x7.5-AB1	-	-	10.01.30.00015	10.01.30.00015
FLAN-PL 63x10.5-AD1	10.01.30.00016	10.01.30.00016	10.01.30.00016	10.01.30.00016
FLAN-PL 63x11.5-UNI	10.01.30.00017	10.01.30.00017	10.01.30.00017	10.01.30.00017
FLAN-PL 55x9.5-JP1	10.01.30.00194	10.01.30.00194	10.01.30.00194	10.01.30.00194
FLAN-PL 55x9.5-EL1	10.01.30.00208	10.01.30.00208	10.01.30.00208	10.01.30.00208
FLAN-PL 80x9-ST1	10.01.30.00167	10.01.30.00167	10.01.30.00167	10.01.30.00167
SD-MOD 4x 32x15x35 FG 9 SWGm	10.01.30.00121	10.01.30.00121	10.01.30.00121	10.01.30.00121
ABL-FUEHR 19.5x46 SWGm/SCG	10.01.30.00087	10.01.30.00087	-	-
ABL-SET 14 SWGm	-	-	10.01.30.00059	10.01.30.00059
HTR-UNI SWGm	10.01.30.00117	10.01.30.00117	10.01.30.00117	10.01.30.00117
HTR M8x1-IG SWGm	10.01.30.00118	10.01.30.00118	10.01.30.00118	10.01.30.00118
HTR M12x1-IG SWGm	10.01.30.00119	10.01.30.00119	10.01.30.00119	10.01.30.00119

Performance Data Wafer Grippers SWGm



Vacuum level SWGm

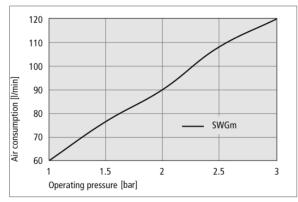


Suction capacity SWGm

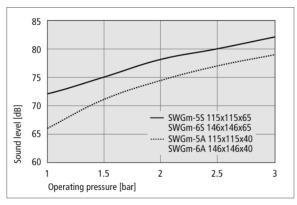
Wafer Grippers SWGm



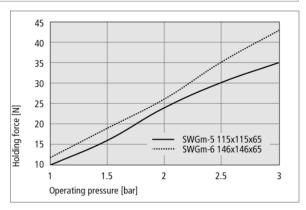
Performance Data Wafer Grippers SWGm



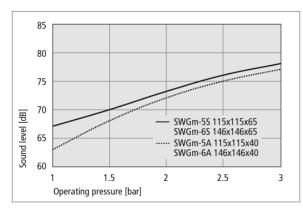
Air consumption SWGm



Noise level SWGm at free suction



Holding force SWGm



Noise level SWGm with workpiece gripped

Technical Data Wafer Grippers SWGm

Туре	Holding force [N]	Suction rate [I/min]	Air consumption [l/min]	Operating pressure [bar]*	Operating temp.	Weight [g]
SWGm-5A 115x115x40 1xE100 A PEEK	1035	190350	60120	13	575	210
SWGm-6A 146x146x40 1xE100 A PEEK	1243	190350	60120	13	575	275
SWGm-5S 115x115x65 1xE100 A PEEK	1035	160235	60120	13	575	235
SWGm-6S 146x146x65 1xE100 A PEEK	1243	160235	60120	13	575	300

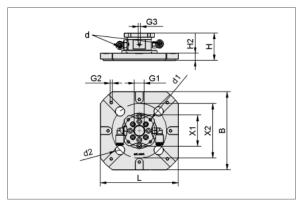
^{*} The specified value should be equal for suction and blow-off. Operating pressures below 1 bar are possible but have to be tested individually. For blow-off function no pressure at connection "suction" is allowed.

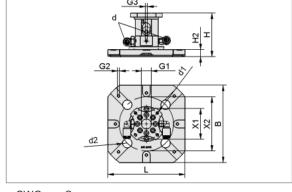
Wafer Grippers SWGm





Design Data Wafer Grippers SWGm





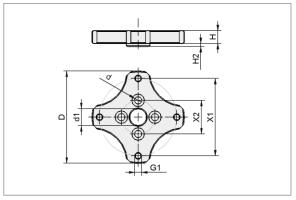
SWGm-...S

SWGm	Α
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Туре	Dimensions in mm											
	В	d	d1	d2	G1	G2	G3	Н	H2	L	X1	X2
SWGm-5A 115x115x40 1xE100 A PEEK	115	6	4.1	14	G3/8"-F	M4-F	M4-F	40	10.5	115	46	80.6
SWGm-6A 146x146x40 1xE100 A PEEK	146	6	4.1	14	G3/8"-F	M4-F	M4-F	40	10.5	146	46	110.6
SWGm-5S 115x115x65 1xE100 A PEEK	115	6	4.1	14	G3/8"-F	M4-F	M4-F	65	10.5	115	46	80.6
SWGm-6S 146x146x65 1xE100 A PEEK	146	6	4.1	14	G3/8"-F	M4-F	M4-F	65	10.5	146	46	110.6



Design Data Accessories Wafer Grippers SWGm



FLAN-PL 55x7.5-AB1

FLAN-PL 63x10.5-AD1

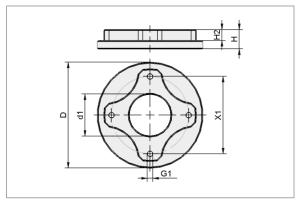
Туре	Dimensions	mensions in mm							
	d	d1	D	G1	Н	H2	X1	X2	
FLAN-PL 55x7.5-AB1	4.3	10	55	M4-F	7.5	2	46	20	
Type Dimensions in mm									
	d	d1	D	G1	н	H2	X1	X2	
FLAN-PL 63x10.5-AD1	6.6	25	63	M4-F	10.5	3	46	50	

Wafer Grippers SWGm

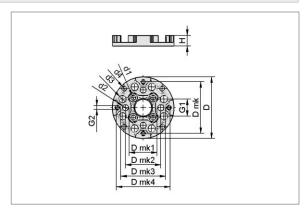




Design Data Accessories Wafer Grippers SWGm



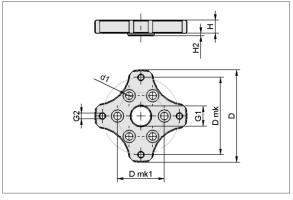




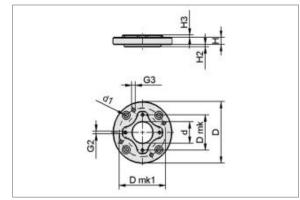
FLAN-PL 55x9.5-JP1

Туре	Dimensions in mm									
	d1	D	G1	н	H2	X1				
FLAN-PL 63x11.5-UNI	25	63	M4-F	11.5	6.5	46				

Туре	Dime	nsions	in mn	า										
	d1	d2	d3	d4	D	D mk	D mk1	D mk2	D mk3	D mk4	G1	G2	Н	
FLAN-PL 55x9.5-JP1	4.5	5.5	6.6	4.5	55	46	25	31.5	40	48	G3/8-F	M4-F	9.5	



FLAN-PL 55x9.5-EL1



FLAN-PL 80x15-ST1

Туре	Dimensions	Dimensions in mm										
	d1	D	D mk	D mk1	G1	G2	Н	H2				
FLAN-PL 55x9.5-EL1	4.3	55	24	28	10	M4-F	9.5	2				

Туре	Dimension	ons in mm								
	d	d1	D	D mk	D mk1	G2	G3	Н	H2	НЗ
FLAN-PL 80x9-ST1	50	6.6	80	46	63	M4-F	M6-F	9	3	3

Wafer Grippers SWGm



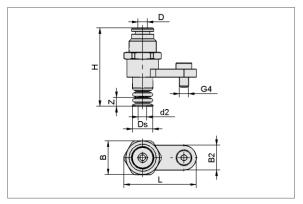


Find the Right Flange for Your Robot ...

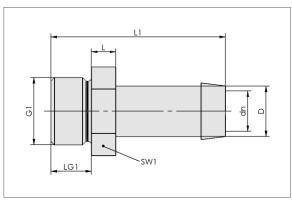
Туре	For robot type	Weight [kg]
FLAN-PL 55x7.5-AB1	ABB IRB 360 Flexpicker	0.037
FLAN-PL 63x10.5-AD1	ADEPT QUATTRO S650	0.065
FLAN-PL 63x11.5-UNI	Universal flange for rework (customer specific solutions)	0.068
FLAN-PL 55x9.5-JP1	Fanuc M-3iA, Yaskawa MPP3, Kawasaki Heavy YF03N, Murata MPS-3/MPS-4, ABB IRB 120	0.035
FLAN-PL 55x9.5-EL1	Elau (Schneider Electric) Robot P4	0.048
FLAN-PL 80x9-ST1	Stäubli TS 60	0.130



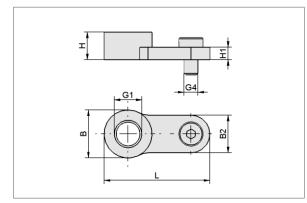
Design Data Accessories Wafer Grippers SWGm



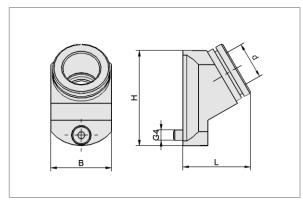
Suction-/ Absorption module SD-MOD



Exhaust-air unit ABL-FUEHR 19.5x46



Holder system HTR-... SWGm



Exhaust-air unit ABL-SET 14

Wafer Grippers SWGm



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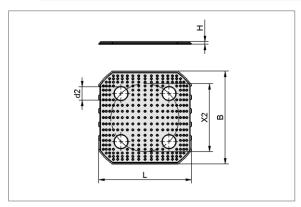
Design Data Accessories Wafer Grippers SWGm

Туре	Dimensio	Dimensions in mm						
	В	B2	d	dn	d2	D	Ds	G1
SD-MOD 4x 32x15x35 FG 9 SWGm	15	11	-	-	4.1	4.0	9	-
HTR-UNI SWGm	14	11	-	-	-	-	-	-
HTR M8x1-IG SWGm	14	11	-	-	-	-	-	M8x1-F
HTR M12x1-IG SWGm	14	11	-	-	-	-	-	M12x1-F
ABL-SET 14 SWGm	23	-	14.0	-	-	-	-	-
ABL-FUEHR 19.5x46 SWGm/SCG	-	-	-	12.5	-	19.5	-	G3/8"-M

Туре	Dimension	Dimensions in mm						
	G4	Н	H1	LG1	L	L1	SW1	Z
SD-MOD 4x 32x15x35 FG 9 SWGm	M4-M	35.0	-	-	32.0	-	-	3
HTR-UNI SWGm	M4-M	8.0	3.6	-	30.9	-	-	-
HTR M8x1-IG SWGm	M4-M	8.0	3.6	-	30.9	-	-	-
HTR M12x1-IG SWGm	M4-M	8.0	3.6	-	30.9	-	-	-
ABL-SET 14 SWGm	M4-M	36.5	-	-	25.5	-	-	-
ABL-FUEHR 19.5x46 SWGm/SCG	-	-	-	7.5	5.0	46.0	19	-



Design Data Spare Parts Wafer Grippers SWGm



Suction plate SAUG-FL SWGm-...

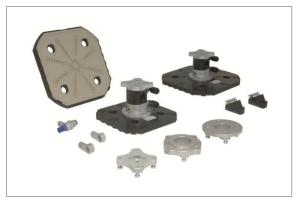
Туре	Dimensions	Dimensions in mm			
	В	d2	Н	L	X2
SAUG-FL SWGm-5 110x110 PEEK	110	16	3	110	80.6
SAUG-FL SWGm-6 141x141 PEEK	141	16	3	141	110.6

Wafer Grippers SWGm wet





Suitable for Process-Specific Applications



Wafer Grippers SWGm wet

Applications

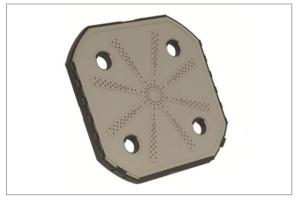
- Wafer gripper for extreme fast, reliable, precise and gentle handling of wet wafers in wet bench applications
- Handling of wafers after etching and cleaning processes
- · Loading and unloading of conveyor belts
- Fully or partially automated production of wafers with maximum process stability, production line uptime, cell efficiency and line output

(III) (II)

System design Wafer Grippers SWGm wet

Design

- Base model with exhaust-air (3) in lateral direction
- Suction area geometries available in common cell sizes 125 mm and 156 mm (5" and 6")
- · Optional component (II) for controlled exhaust-air
- Modular design with accessories for the mounting of sensors and modules for suction and damping (I) and a selection of flange modules (III)
- · Replaceable contact surfaces



Special suction plate of Wafer Grippers SWGm wet

Our Highlights ...

- Special allocation and dimension of the suction points
- Large effective area with low surface pressure
- Exhaust-air channels for controlled air discharge
- Quick object release
- Gripper surface made of PEEK (Polyetheretherketone)

- Safe handling of wet wafers without drying of the wafer surface
- High speed, high accuracy handling for cycle times below 1 second at minimum breakage rates
- No contamination of process area
- > Precise positioning and very short cycle times
- No surface contamination and reduction of blind spots

Wafer Grippers SWGm wet





Ordering Data Wafer Grippers SWGm wet

Туре	Part Number
SWGm-5S W 115x115x65 PEEK	10.01.30.00193
SWGm-6S W 146x146x65 PEEK	10.01.30.00191



Ordering Data Spare Parts Wafer Grippers SWGm wet

Туре	For Type	Part Number
SAUG-FL SWGm-5 W 110x110 PEEK	SWGm-5S W 115x115x65 A PEEK	10.01.30.00192
SAUG-FL SWGm-6 W 141x141 PEEK	SWGm-6S W 146x146x65 A PEEK	10.01.30.00190



Ordering Data Accessoires Wafer Grippers SWGm wet

Туре	Part Number
FLAN-PL 55x7.5-AB1	10.01.30.00015
FLAN-PL 63x10.5-AD1	10.01.30.00016
FLAN-PL 63x11.5-UNI	10.01.30.00017
FLAN-PL 55x9.5-JP1	10.01.30.00194
FLAN-PL 55x9.5-EL1	10.01.30.00208
FLAN-PL 80x9-ST1	10.01.30.00167
SD-MOD 4x 32x15x35 FG 9 SWGm	10.01.30.00121
HTR-UNI SWGm	10.01.30.00117
HTR M8x1-IG SWGm	10.01.30.00118
HTR M12x1-IG SWGm	10.01.30.00119
ABL-SET 14 SWGm	10.01.30.00059

Wafer Grippers SWGm wet





Performance Data Wafer Grippers SWGm wet

Please find the Performance Data of Wafer Gripper SWGm wet on page 10.



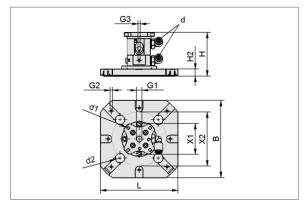
Technical Data Wafer Grippers SWGm wet

Туре	Holding force [N]	Suction rate [l/min]	Air consump. [l/min]	Operating pressure [bar]*	Operating temp. [°C]	Weight [g]
SWGm-5S W 115x115x65 PEEK	1035	160235	60120	13	575	250
SWGm-6S W 146x146x65 PEEK	1243	160235	60120	13	575	310

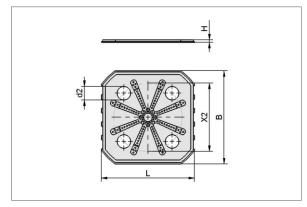
^{*} The specified value should be equal for suction and blow-off. Operating pressures below 1 bar are possible but have to be tested individually. For blow-off function no pressure at connection "suction" is allowed.



Design Data Wafer Grippers SWGm wet and Spare Parts Wafer Gripper SWGm wet







Suction plate SAUG-FL SWGm-...

Туре	Dimen	sion	s in m	m								
	В	d	d1	d2	G1	G2	G3	Н	H2	L	X1	X2
SWGm-5S W 115x115x65 PEEK	115	6	4.1	14	G1/8"-F	M4-F	M4-F	65	10.5	115	46	80.6
SWGm-6S W 146x146x65 PEEK	146	6	4.1	14	G1/8"-F	M4-F	M4-F	65	10.5	146	46	110.6

Туре	Dimensions in mm					
	В	d2	н	L	X2	
SAUG-FL SWGm-5 W 110x110 PEEK	110	16	3	110	80.6	
SAUG-FL SWGm-6 W 141x141 PEEK	141	16	3	141	110.6	



Design Data Accessories Wafer Gripper SWGm wet

Please find the Design Data of Accessories for Wafer Gripper SWGm wet on page 12.

Solenoid Valves EMV for Wafer Gripper SWGm









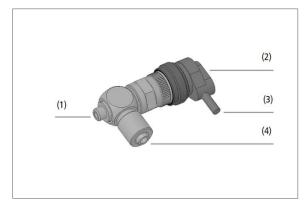
Suitable for Process-Specific Applications



Solenoid Valves EMV for Wafer Grippers SWGm

Applications

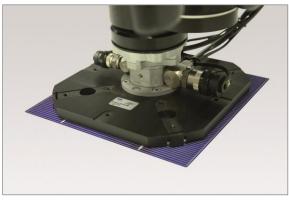
- Solenoid micro valves for high speed operation –
 connection directly at the gripper without time delay of the
 compressed-air supply from the valve to the gripper (e.g.
 the delay time with hose 2 m (6/4) is approx. 50 ms;
 switching time of the valve only 7 ms)
- Solenoid valves for direct control of compressed-air for the suction or blow-off function of the wafer gripper SWGm



System design Solenoid Valves EMV for Wafer Grippers SWGm

Design

- Solenoid valve (3/2 way) with swivel screw connection
- Switching function normally closed (NC)
- Thread (1) for connection to wafer gripper
- · LED (2) for status indication
- Connection cable (3) for energy supply; Connection (4) for compressed-air supply
- Swivel screw fitting material: nickel plated brass
- Valve base material: anodized aluminum
- · 2 pin cable with 2 m length included



SWGm with Solenoid Valves EMV for the handling of solar cells

Our Highlights ...

- Miniaturized cartridge valve for the suction and blow-off function of the SWGm
- Direct connection to wafer grippers
- Short activation times (7 ms)
- Swivel screw fitting
- Large nominal flow rate

- High performance, space saving valves with minimized effort for installing hoses
- Simple installation, no performance loss, no time delay of compressed air signal
- Optimization of cycle times
- > Flexible connection and alignment
- > Fast cell pick-up and maximum process safety

Solenoid Valves EMV for Wafer Gripper SWGm





Ordering Data Solenoid Valves EMV for Wafer Gripper SWGm

Туре	Part Number
EMV 1.5 24V-DC 3/2 NC K-2P (SWGm blow off)	10.05.01.00288
EMV 2.5 24V-DC 3/2 NC K-2P (SWGm suction)	10.05.01.00289

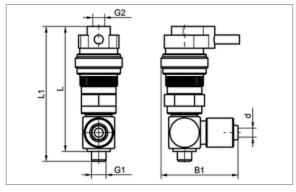


Technical Data Solenoid Valves EMV for Wafer Gripper SWGm

Туре	For inner hose-Ø [mm]	Nominal diameter [mm]	Nominal flow [NI/min]	Voltage	Thread	Function
EMV 1.5 24V-DC 3/2 NC K-2P	4	1.5	45	24V DC	M5-M	Blow off
EMV 2.5 24V-DC 3/2 NC K-2P	4	2.5	135	24V DC	G1/8"-M	Suction



Design Data Solenoid Valves EMV for Wafer Gripper SWGm



EMV ...

Туре	Dimensions in mm							
	B1	d	G1	G2	L	L1	Weight [kg]	
EMV 1.5 24V-DC 3/2 NC K-2P	26.6	4	M5-M	M5-F	43.1	46,5	0.065	
EMV 2.5 24V-DC 3/2 NC K-2P	31.7	4	G1/8"-M	M5-F	51.7	56,5	0.100	

Floating Suction Pads SBS









Suitable for Process-Specific Applications



Floating Suction Pads SBS

Applications

- Floating suction pads for the handling of wafers and solar cells with low-contact for a gentle handling
- Central support (optional) reduces forces (shear forces), which appear to the wafers and cells
- Separation of wafers and cells by high volume flow and high lifting height

Compressed-air (1) (2) (3) (4) Exhaust-air / Air cushion Compressed-air (1) (2) (3) (4) (4)

System design Floating Suction Pads SBS

Design

- Available in diameters 20, 30, 40, 60 and 100 mm
- Connection via four mounting threads on the top side (1)
- Vertical compressed-air connection (2) and horizontal compressed-air connection (closed with a plug)
- Anodized aluminum body (3) incl. Bernoulli nozzle (4)
- Mark-free rubber buffer of special material HT1 on the bottom side of the suction pad (5). Optional available with central support (see picture above) for diameter 40 mm and 60 mm



Floating Suction Pads SBS for the handling of wafers

Our Highlights ...

- Integrated vacuum generation on the Bernoulli principle
- Suction pad "floats" on an air cushion
- High volume flow rate at a low vacuum
- Elastomer buffers made of HT1 on the bottom side
- Optional with central support (Ø 40 mm and 60 mm)

- > Operating without ejector as ready to use unit
- > Low-contact handling
- High lifting heights for the separation of wafers and cells
- Absorption of lateral forces, non-marking material HT1
- Safe handling of wafer and solar cells without bending

Floating Suction Pads SBS



Ordering Data Floating Suction Pads SBS

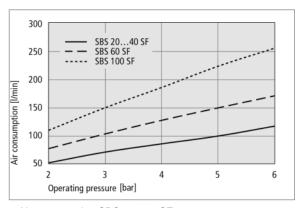
Туре	Part Number
SBS 20 SF M5-IG	10.01.01.12633
SBS 20 HF M5-IG	10.01.01.12650
SBS 30 SF M5-IG	10.01.01.12636
SBS 30 HF M5-IG	10.01.01.12651
SBS 40 SF G1/8-IG	10.01.01.12638
SBS 40 HF G1/8-IG	10.01.01.12653
SBS 40 SF G1/8-IG CS	10.01.01.12776
SBS 60 SF G1/8-IG	10.01.01.12641
SBS 60 HF G1/8-IG	10.01.01.12655
SBS 60 SF G1/8-IG CS	10.01.01.12777
SBS 100 SF G1/8-IG	10.01.01.12688
SBS 100 HF G1/8-IG	10.01.01.12689



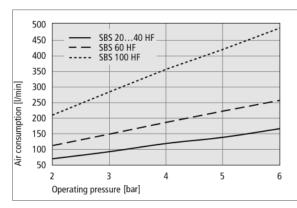
Ordering Data Spare Parts Floating Suction Pads SBS

For Type	Rubber buffer	Central Support
SBS 20 SF M5-IG	10.01.01.12585	-
SBS 20 HF M5-IG	10.01.01.12585	-
SBS 30 SF M5-IG	10.01.01.12585	-
SBS 30 HF M5-IG	10.01.01.12585	-
SBS 40 SF G1/8-IG	10.01.01.11766	-
SBS 40 HF G1/8-IG	10.01.01.11766	-
SBS 40 SF G1/8-IG CS	10.01.01.11766	10.01.01.12780
SBS 60 SF G1/8-IG	10.01.01.11766	-
SBS 60 HF G1/8-IG	10.01.01.11766	-
SBS 60 SF G1/8-IG CS	10.01.01.11766	10.01.01.12780
SBS 100 SF G1/8-IG	10.01.01.11766	-
SBS 100 HF G1/8-IG	10.01.01.11766	-

Performance Data Floating Suction Pads SBS



Air consumption SBS 20-100 SF



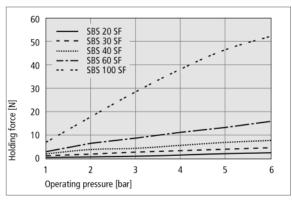
Air consumption SBS 20-100 HF

Floating Suction Pads SBS

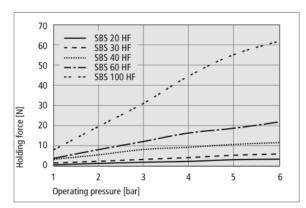




Performance Data Floating Suction Pads SBS



Holding force SBS 20-100 SF



Holding force SBS 20-100 HF



Technical Data Floating Suction Pads SBS

Туре	Holding force [N]*	Air consumption [I/min]*	Operating pressure [bar]	Weight [g]
SBS 20 SF M5-IG	2.0	100	16	12
SBS 20 HF M5-IG	3.0	140	16	12
SBS 30 SF M5-IG	4.0	100	16	31
SBS 30 HF M5-IG	5.0	140	16	31
SBS 40 SF G1/8-IG	6.5	100	16	51
SBS 40 HF G1/8-IG	10.5	190	16	51
SBS 40 SF G1/8-IG CS	6.5	100	16	53
SBS 60 SF G1/8-IG	13.0	150	16	118
SBS 60 HF G1/8-IG	18.5	225	16	118
SBS 60 SF G1/8-IG CS	13.0	150	16	120
SBS 100 SF G1/8-IG	46.0	225	16	295
SBS 100 HF G1/8-IG	55.5	420	16	295

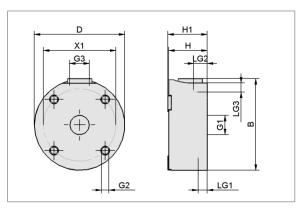
^{*} The specified values are valid for an operating pressure of 5 bar

Floating Suction Pads SBS





Design Data Floating Suction Pads SBS



SBS 20 to 100

Туре	Dimensions in mm*										
	В	D	G1	G2	G3	Н	H1	LG1	LG2	LG3	X1
SBS 20 SF M5-IG	21.7	20	M5-F	М3-F	M5-F	17	17.4	5	6	6	15
SBS 20 HF M5-IG	21.7	20	M5-F	M3-F	M5-F	17	17.4	5	6	6	15
SBS 30 SF M5-IG	31.5	30	M5-F	M4-F	M5-F	17	17.4	5	6	6	22
SBS 30 HF M5-IG	31.5	30	M5-F	M4-F	M5-F	17	17.4	5	6	6	22
SBS 40 SF G1/8-IG	40.5	40	G1/8"-F	M4-F	G1/8"-F	17	17.4	5	6	6	32
SBS 40 HF G1/8-IG	40.5	40	G1/8"-F	M4-F	G1/8"-F	17	17.4	5	6	6	32
SBS 40 SF G1/8-IG CS	40.5	40	G1/8"-F	M4-F	G1/8"-F	17	17.4	5	6	6	32
SBS 60 SF G1/8-IG	61.1	60	G1/8"-F	M4-F	G1/8"-F	17	17.4	5	6	6	45
SBS 60 HF G1/8-IG	61.1	60	G1/8"-F	M4-F	G1/8"-F	17	17.4	5	6	6	45
SBS 60 SF G1/8-IG CS	61.1	60	G1/8"-F	M4-F	G1/8"-F	17	17.4	5	6	6	45
SBS 100 SF G1/8-IG	100.5	100	G1/8"-F	M4-F	G1/8"-F	17	17.4	5	6	6	75
SBS 100 HF G1/8-IG	100.5	100	G1/8"-F	M4-F	G1/8"-F	17	17.4	5	6	6	75

Flat Suction Pads SGPN











Suitable for Process-Specific Applications



Flat Suction Pads SGPN

Applications

- Handling of workpieces that are fragile and very thin such as wafers, cells or EVA-Foil
- Used in wafer handling processes where no marks may be left on the workpiece (HT1 material that does not leave marks)
- Handling of cells with uneven surfaces such as bows, tap wires or busbars with soft material NK
- Handling of flexible parts such as EVA-Foil without deformation ("pull-in effect") of the foil

Within each nipple family, the replacement pads and nipples can be combined as desired. Nipple Suction pad Replacement pad

System design Flat Suction Pads SGPN

Design

- Flat suction pad with very thin and flexible sealing lip
- Inner structure of the suction pad with defined support points of the workpiece for minimum surface pressure
- Replaceable spare part suction pad due to plug-in connection between suction pad and nipple
- Suction pads are available in different materials, also with the most suitable material for the PV industry the non marking material HT1 (recommended for the use on wafers) or very soft natural rubber NK for the use on cells with tab wires, busbars and EVA-Foil



Flat Suction Pads SGPN for the handling of strings

Our Highlights ...

- Very soft and adaptable sealing lip
- Inner structure of the suction area with support rips
- Special material HT1 (blue)
- Soft natural rubber material NK (light brown)

- Gentle handling and low surface pressure during gripping
- No deformation or damaging of wafers/cells/foil by avoiding the "pull-in-effect" into the suction pad
- > Suction pad does not leave any marks on the wafer/cell; even at high temperatures (up to 170°C)
- > Gentle handling of cells with tab wire and busbars or EVA-Foil

Flat Suction Pads SGPN



Ordering Data Flat Suction Pads SGPN

Туре	High temp material HT1 60±5ShA	Natural Rubber NK 40±5ShA
SGPN 15 M5-AG	10.01.01.12396	10.01.01.11977
SGPN 15 G1/8-AG	10.01.01.12397	10.01.01.10315
SGPN 15 G1/8-IG	10.01.01.12398	10.01.01.10181
SGPN 20 M5-AG	-	10.01.01.11978
SGPN 20 G1/8-AG	-	10.01.01.10316
SGPN 20 G1/8-IG	-	10.01.01.10180
SGPN 24 M5-AG	10.01.01.12403	10.01.01.11979
SGPN 24 G1/8-AG	10.01.01.12404	10.01.01.10317
SGPN 24 G1/8-IG	10.01.01.12405	10.01.01.10182
SGPN 30 G1/4-AG	10.01.01.12399	10.01.01.00791
SGPN 30 G1/4-IG	10.01.01.12400	10.01.01.00790
SGPN 34 G1/4-AG	-	10.01.01.10831
SGPN 34 G1/4-IG	-	10.01.01.10830
SGPN 35 G1/4-AG	10.01.01.12848	10.01.01.00793
SGPN 35 G1/4-IG	10.01.01.12849	10.01.01.00792
SGPN 40 G1/8-AG	10.01.01.12847	10.01.01.11739
SGPN 40 G1/4-AG	10.01.01.12845	10.01.01.00795
SGPN 40 G1/4-IG	10.01.01.12846	10.01.01.00794

Additional materials can be found in our Catalogue "Vacuum Components" on page 216 or on www.schmalz.com/sgpn



Ordering Data Spare Parts Suction Pads SGP and Connection Nipples

Туре	High temp material HT1 60±5ShA	Natural Rubber NK 40±5ShA
SGP 15	10.01.01.12394	10.01.01.10318
SGP 20	-	10.01.01.10319
SGP 24	10.01.01.12402	10.01.01.10320
SGP 30	10.01.01.12395	10.01.01.00787
SGP 34	-	10.01.01.10829
SGP 35	10.01.01.12811	10.01.01.00788
SGP 40	10.01.01.12812	10.01.01.00789

For Type	Connection Nipple
SGPN 15 M5-AG	10.01.06.00123
SGPN 15 G1/8-AG	10.01.06.05735
SGPN 15 G1/8-IG	10.01.06.05731
SGPN 20 M5-AG	10.01.06.00123
SGPN 20 G1/8-AG	10.01.06.05735
SGPN 20 G1/8-IG	10.01.06.05731
SGPN 24 M5-AG	10.01.06.00123
SGPN 24 G1/8-AG	10.01.06.05735
SGPN 24 G1/8-IG	10.01.06.05731
SGPN 30 G1/4-AG	10.01.01.00818
SGPN 30 G1/4-IG	10.01.01.00817
SGPN 34 G1/4-AG	10.01.01.00818
SGPN 34 G1/4-IG	10.01.01.00817
SGPN 35 G1/4-AG	10.01.01.00820
SGPN 35 G1/4-IG	10.01.01.00819
SGPN 40 G1/8-AG	10.01.01.11738
SGPN 40 G1/4-AG	10.01.01.00822
SGPN 40 G1/4-IG	10.01.01.00821

Flat Suction Pads SGPN





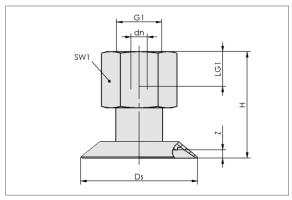
Technical Data Flat Suction Pads SGPN

Туре	Suction force [N]*	Volume [cm³]	Recom. interal hose-Ø d [mm] **	Nipple family
SGPN 15	5.5	0.12	2	N 016
SGPN 20	8.5	0.31	2	N 016
SGPN 24	11.0	0.70	4	N 016
SGPN 30	19.0	1.50	4	N 033
SGPN 34	25.0	2.10	4	N 033
SGPN 35	31.0	2.20	4	N 034
SGPN 40	33.0	2.90	4	N 035

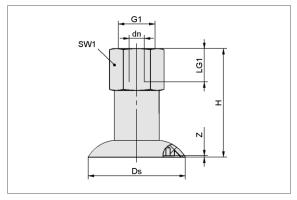
^{*} The specified suction forces are theoretical values at a vacuum of -0.6 bar and with a smooth, dry workpiece surface - they do not include a safety factor ** The recommended hose diameter refers to a hose length of approx. 2 m



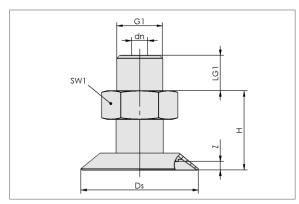
Design Data Flat Suction Pads SGPN



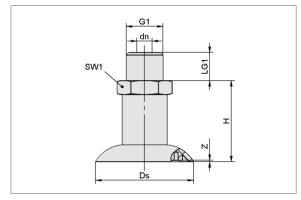
SGPN 15 to 40 IG (female)



SGPN 35 IG (female)



SGPN 15 to 40 AG (male)



SGPN 35 AG (male)

Flat Suction Pads SGPN



7

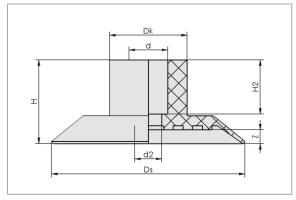
Design Data Flat Suction Pads SGPN

Туре	Dimensions in mm*						
	dn	Ds	G1	Н	LG1	SW1	Z (Stroke)
SGPN 15 M5-AG	2.5	14.5	M5-M	15.0	5.0	7	0.9
SGPN 15 G1/8-AG	3.5	14.5	G1/8"-M	16.0	7.5	14	0.9
SGPN 15 G1/8-IG	3.5	14.5	G1/8"-F	22.0	8.0	14	0.9
SGPN 20 M5-AG	2.5	20.9	M5-M	15.4	5.0	7	1.5
SGPN 20 G1/8-AG	3.5	20.9	G1/8"-M	16.4	7.5	14	1.5
SGPN 20 G1/8-IG	3.5	20.9	G1/8"-F	22.4	8.0	14	1.5
SGPN 24 M5-AG	2.5	24.4	M5-M	15.8	5.0	7	1.7
SGPN 24 G1/8-AG	3.5	24.4	G1/8"-M	16.8	7.5	14	1.7
SGPN 24 G1/8-IG	3.5	24.4	G1/8"-F	22.8	8.0	14	1.7
SGPN 30 G1/4-AG	5.5	30.6	G1/4"-M	27.2	10.0	17	2.0
SGPN 30 G1/4-IG	5.5	30.6	G1/4"-F	37.2	12.0	17	2.0
SGPN 34 G1/4-AG	5.5	34.5	G1/4"-M	28.0	10.0	17	1.4
SGPN 34 G1/4-IG	5.5	34.5	G1/4"-F	38.0	12.0	17	1.4
SGPN 35 G1/4-AG	5.5	35.0	G1/4"-M	28.5	10.0	17	0.5
SGPN 35 G1/4-IG	5.5	35.0	G1/4"-F	38.5	12.0	17	0.5
SGPN 40 G1/8-AG	5.0	40.5	G1/8"-M	25.6	9.0	17	2.3
SGPN 40 G1/4-AG	5.5	40.5	G1/4"-M	25.6	10.0	17	2.3
SGPN 40 G1/4-IG	5.5	40.5	G1/4"-F	35.6	12.0	17	2.3

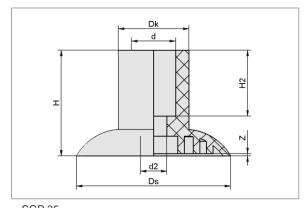
^{*} Acceptable dimensional tolerances for rubber parts concerning to DIN ISO 3302-1 M3



Design Data Flat Suction Pads SGP



SGP 15 to 40



SGP 35

Туре	Dimensions in	mm*					
	d	d2	Dk	Ds	н	H2	Z (Stroke)
SGP 15	4.5	3.5	9.0	14.5	10.0	7.2	0.9
SGP 20	4.5	3.5	10.5	20.9	10.4	7.1	1.5
SGP 24	4.5	3.5	10.5	24.4	10.8	7.3	1.7
SGP 30	11.2	6.6	15.6	30.6	22.2	15.7	2.0
SGP 34	11.2	5.8	14.8	34.5	23.0	16.8	1.4
SGP 35	10.0	5.4	16.5	35.0	23.5	14.8	0.5
SGP 40	8.0	5.0	16.0	40.5	20.6	14.5	2.3

^{*} Acceptable dimensional tolerances for rubber parts concerning to DIN ISO 3302-1 M3

Suction Plates SGF made of HT1





Suitable for Process-Specific Applications



Suction Plates SGF HT1

Applications

- Suction plate for the automatic or manual handling of glass and modules without leaving marks
- · Loading of glass for the module production process
- Used on glass with interleavant powder in order to provide a high horizontal force
- Module handling after the lamination in processes that required a high force such as framing
- · Handling of thin or structured glass

(4) (1) (2) (5) (3)

System design Suction Plates SGF HT1

Design

- Thin and flexible sealing lip with additional inner sealing edge and structured suction surface with high performance profile
- Easy separation of the sealing ring (2) and the supporting plate (1)
- Non-marking material HT1 60 ShA with temperature resistance up to 170°C
- Centered vacuum connection, optionally available with prefilter (3), Eccentric connection for sensing valve (4) or prefilter (5)



Suction Plates SGF HT1 for the non marking handling of glass

Our Highlights ...

- Thin, flexible and flat sealing lip
- Special inner structure/profile on the entire suction area
- Low internal volume and high force due to large effective diameter
- Special material HT1

- No relative movement of sealing lip during gripping to prevent the surface from being damaged
- High horizontal forces (also on interleavant powder) and optimum distribution of surface pressure
- Short evacuation times for reduced cycle times and high accelerations
- Non-marking handling, even at higher temperatures

Suction Plates SGF made of HT1





Ordering Data Suction Plates SGF made of HT1

Туре	Part Number
SGF 125 HT1-60 G1/4-IG	10.01.01.12892
SGF 200 HT1-60 G1/2-IG	10.01.01.12893

Additional materials and sizes can be found in our Catalogue "Vacuum Components" on page 226 or on www.schmalz.com/sgf



Ordering Data Spare Parts Suction Plates SGF made of HT1

Туре	Suitable for	Part Number
DR-SGF 125 HT1-60	SGF 125 HT1-60 G1/4-IG	10.01.01.12890
DR-SGF 200 HT1-60	SGF 200 HT1-60 G1/2-IG	10.01.01.12891



Ordering Data Accessoires Suction Plates SGF made of HT1

For Type	Sensing valve	Sieve (center)	Sieve (excentric)
SGF 125 HT1-60 G1/4-IG	10.05.10.00061	10.07.01.00215	10.07.01.00215
SGF 200 HT1-60 G1/2-IG	10.05.10.00061	10.07.01.00110	10.07.01.00215



Technical Data Suction Plates SGF made of HT1

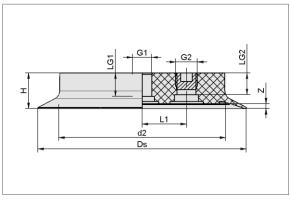
Туре	Suction force Ds [N]*	Suction force d2 [N]**	Volume [cm³]	Min. curve radius [mm] (convex)	Recom. inner hose-Ø d [mm]***
SGF 125 HT1-60 G1/4-IG	730	410	39	1500	9
SGF 200 HT1-60 G1/2-IG	1880	1490	134	3500	12

^{*} The specified suction forces are theoretical values at a vacuum of -0.6 bar and with a smooth, dry workpiece surface - they do not include a safety factor

^{**} Suction force applied to sealing edge diameter d2
*** The recommended hose diameter refers to a hose length of approx. 2 m



Design Data Suction Plates SGF made of HT1



SGF 125 to 200

Туре	Dimensions in mm*								
	d2	L1	Ds	G1	G2	н	LG1	LG2	Z (stroke)
SGF 125 HT1-60 G1/4-IG	94	26.5	125	G1/4"-F	G1/4"-F	21.5	14	14	3.0
SGF 200 HT1-60 G1/2-IG	178	52.8	208	G1/2"-F	G1/4"-F	22.1	14	14	3.6

 $^{^{\}star}$ Acceptable dimensional tolerances for rubber parts concerning to DIN ISO 3302-1 M3

Bellows Suction Pads FG 19









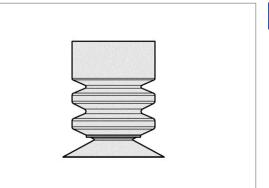
Suitable for Process-Specific Applications



Bellows Suction Pads FG 19

Applications

- Very gentle handling wafers and solar cells in the cell production and string production as well as layup
- Very soft bellows in combination with soft sealing lip to avoid the use of spring plungers for a gentle handling
- Handling of uneven workpieces, such as photovoltaic strings with tab wires and photovoltaic cells with busbars
- Used in wafer handling processes where no marks may be left on the workpiece (special material HT1 does not leave marks)



System design Bellows Suction Pads FG 19

Design

- Bellows suction pad with 2.5 bellows and a thin, flexible sealing lip
- Replaceable spare part suction pad due to plug-in connection between suction pad and nipple
- Suction pads are available in different materials, also with the most suitable material for the PV industry the non marking material HT1 (recommended for the use on wafers) or very soft natural rubber NK for the use on cells with tab wires or busbars or silicone SI



Bellows Suction Pads FG 19 used for layup of strings

Our Highlights ...

- Thin and soft sealing lip
- Suction pad with reduced inner diameter at the sealing surface
- Special material HT1 (blue)
- Soft natural rubber material NK (grey)

- Gentle handling of cells/wafers
- No pull-in effect into the suction pad (no deformation or damaging of the workpiece)
- > Suction pad does not leave any marks on the workpiece; even at high temperatures (up to 170°C)
- > Gentle handling and perfect sealing on tap wires or busbars

Bellows Suction Pads FG 19





Step 1: Ordering Data Bellows Suction Pads FG 19

Туре	High temp. material HT1 60±5 ShA	Natural rubber NK 45±5 ShA
FG 19	10.01.06.02611	10.01.06.02612



Step 2: Ordering Data Suction Pad Connection Nipple

Туре	For type FG 19 HT1-60	For type FG 19 NK-45
SA-NIP G1/8-M	10.01.01.12491	10.01.01.12491
SA-NIP M5-M	10.01.01.12685	10.01.01.12685

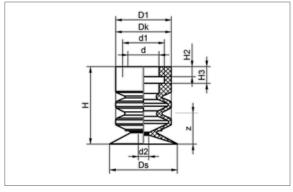


Technical Data Bellows Suction Pads FG 19

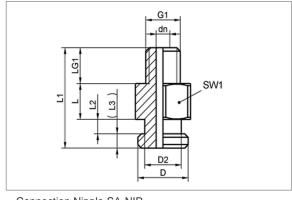
Туре	Suction force [N]*	Pull-off force [N]**	Volume [cm³]	Recom. interal hose- Ø d [mm]***
FG 19	2.6	12.5	1.45	4

^{*} The specified suction forces are theoretical values at a vacuum of -0.6 bar and with a smooth, dry workpiece surface - they do not include a safety factor
** The Pull-off force for NK pads is reduced by 40%

Design Data Bellows Suction Pads FG 19 and Suction Pad Connection Nipple







Connection Nipple SA-NIP

Туре	Dimensions in mm*										
	d	d1	d2	D1	Dk	Ds	н	H2	НЗ	Z (stroke)	
FG 19	9	12	3	16	16	19.5	22.3	2.9	4.8	6	

^{*} Acceptable dimensional tolerances for rubber parts concerning to DIN ISO 3302-1 M3

Туре	Dimension	Dimensions in mm								
	D	D2	dn	G1	L	L1	L2	L3	LG1	SW1
SA-NIP G1/8-M	12.3	9.3	3.5	G1/8"-M	7	19.8	2.8	2	8	14
SA-NIP M5-M	12.3	9.3	2	M5-M	7	17.8	2.8	2	6	14

^{***} The recommended hose diameter refers to a hose length of approx. 2 m

Bellows Suction Pads SAB made of HT1





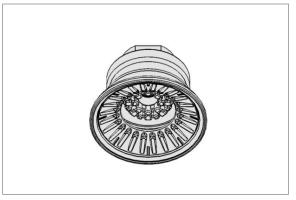
Suitable for Process-Specific Applications



Bellows Suction Pads SAB HT1

Applications

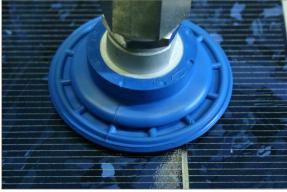
- High performance suction pads for the automatic handling of glass or modules in the module production process
- Especially used where the flexibility of the bellows suction in combination with the high intrinsic stability is required, such as glass grinding or trimming, sealing and framing of PV modules
- Used in applications where interleavant powder is on the glass in order to avoid slippage of the glass



System design Bellows Suction Pads SAB HT1

Design

- Robust and wear resistant bellows suction pad SAB with 1.5 folds
- Special structure on the suction surface with high performance profile
- Non-marking material HT1 ShA with temperature resistance up to 170°C
- Defined suction area with metal inlay for high intrinsic stability when workpiece is gripped
- Available in diameters 22 to 125 mm and different connection options



Bellows Suction Pads SAB HT1 for the module handling

Our Highlights ...

- Special profile on the suction surface
- Flexible sealing lip and bellows
- Very stiff top fold in combination with metal inlay and defined suction surface
- Special material HT1

- High horizontal forces on all glass surfaces – even on interleavant powder
- > Low surface pressure of the sealing lip on the glass and distribution of the surface pressure on the entire suction area
- High accelerations with maximum positioning accuracy during the handling process
- Non-marking handling, even at higher temperatures

Bellows Suction Pads SAB made of HT1





Ordering Data Bellows Suction Pads SAB made of HT1

Туре	Connection							
	G1/4"-IG	G1/4"-AG	G3/8"-IG	G3/8"-AG				
SAB 22 HT1-60	10.01.06.02722	10.01.06.02753	10.01.06.03006	10.01.06.03015				
SAB 30 HT1-60	10.01.06.02723	10.01.06.03048	10.01.06.03050	10.01.06.03049				
SAB 40 HT1-60	10.01.06.02724	10.01.06.03051	10.01.06.03053	10.01.06.03052				
SAB 50 HT1-60	10.01.06.02760	10.01.06.03057	10.01.06.02725	10.01.06.03058				
SAB 60 HT1-60	10.01.06.02779	10.01.06.03059	10.01.06.02726	10.01.06.03060				
SAB 80 HT1-60	10.01.06.02778	10.01.06.03061	10.01.06.02727	10.01.06.03062				
SAB 100 HT1-60	10.01.06.02961	10.01.06.02927	10.01.06.02728	10.01.06.03063				
SAB 125 HT1-60	10.01.06.03064	10.01.06.03065	10.01.06.02729	10.01.06.03066				

Additional materials and mounting options can be found in our Catalogue "Vacuum Components" on page 153 or on www.schmalz.com/sab



Technical Data Bellows Suction Pads SAB made of HT1

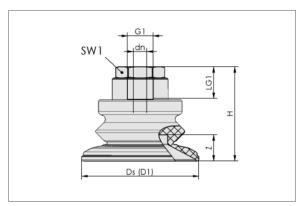
Туре	Suction force [N]*	Pull-off force [N]	Volume [cm³]	Min. curve radius [mm] (convex)	Recom. interal hose-Ø d [mm] **
SAB 22 HT1-60	16	24	1.5	20	4
SAB 30 HT1-60	22	33	5.9	40	4
SAB 40 HT1-60	38	59	7.0	40	4
SAB 50 HT1-60	53	87	11.5	50	4
SAB 60 HT1-60	82	130	24.0	65	6
SAB 80 HT1-60	135	221	56.5	75	6
SAB 100 HT1-60	190	357	92.5	90	6
SAB 125 HT1-60	250	558	191.0	140	9

^{*} The specified suction forces are theoretical values at a vacuum of -0.6 bar and with a smooth, dry workpiece surface - they do not include a safety factor

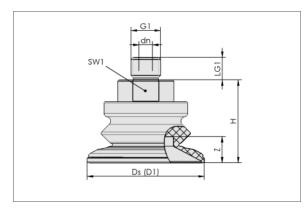
^{**} The recommended hose diameter refers to a hose length of approx. 2 m



Design Data Bellows Suction Pads SAB made of HT1



SAB 22 to 125 IG (female)



SAB 22 to 125 AG (male)

Bellows Suction Pads SAB made of HT1





Design Data Bellows Suction Pads SAB made of HT1

Туре	Dimensions in mm*							
	D1**	Dn	Ds	G1	Н	LG1	SW1	Z (Stroke)
SAB 22 HT1-60 G1/4-IG	22	3.5	21	G1/4"-F	25.0	12.0	16	5.8
SAB 22 HT1-60 G1/4-AG	22	3.5	21	G1/4"-M	25.0	10.0	16	5.8
SAB 22 HT1-60 G3/8-IG	22	3.5	21	G3/8"-F	41.0	9.5	22	5.8
SAB 22 HT1-60 G3/8-AG	22	3.5	21	G3/8"-M	25.0	10.0	16	5.8
SAB 30 HT1-60 G1/4-IG	34	4.0	32	G1/4"-F	28.0	12.0	17	9.0
SAB 30 HT1-60 G1/4-AG	34	4.0	32	G1/4"-M	28.0	10.0	17	9.0
SAB 30 HT1-60 G3/8-IG	34	4.0	32	G3/8"-F	44.0	9.5	22	9.0
SAB 30 HT1-60 G3/8-AG	34	4.0	32	G3/8"-M	28.0	10.0	17	9.0
SAB 40 HT1-60 G1/4-IG	45	4.0	42	G1/4"-F	29.0	12.0	17	10.0
SAB 40 HT1-60 G1/4-AG	45	4.0	42	G1/4"-M	29.0	10.0	17	10.0
SAB 40 HT1-60 G3/8-IG	45	4.0	42	G3/8"-F	44.0	9.5	22	10.0
SAB 40 HT1-60 G3/8-AG	45	4.0	42	G3/8"-M	29.0	10.0	17	10.0
SAB 50 HT1-60 G1/4-IG	56	6.0	52	G1/4"-F	42.0	20.0	22	11.5
SAB 50 HT1-60 G1/4-AG	56	6.0	52	G1/4"-M	37.0	10.0	22	11.5
SAB 50 HT1-60 G3/8-IG	56	6.0	52	G3/8"-F	37.0	15.0	22	11.5
SAB 50 HT1-60 G3/8-AG	56	6.0	52	G3/8"-M	37.0	10.0	22	11.5
SAB 60 HT1-60 G1/4-IG	67	6.0	63	G1/4"-F	46.5	20.0	22	14.5
SAB 60 HT1-60 G1/4-AG	67	6.0	63	G1/4"-M	41.5	10.0	22	14.5
SAB 60 HT1-60 G3/8-IG	67	6.0	63	G3/8"-F	41.5	15.0	22	14.5
SAB 60 HT1-60 G3/8-AG	67	6.0	63	G3/8"-M	41.5	10.0	22	14.5
SAB 80 HT1-60 G1/4-IG	89	6.0	83	G1/4"-F	55.0	20.0	22	22.0
SAB 80 HT1-60 G1/4-AG	89	6.0	83	G1/4"-M	50.0	10.0	22	22.0
SAB 80 HT1-60 G3/8-IG	89	6.0	83	G3/8"-F	50.0	15.0	22	22.0
SAB 80 HT1-60 G3/8-AG	89	6.0	83	G3/8"-M	50.0	10.0	22	22.0
SAB 100 HT1-60 G1/4-IG	110	6.0	103	G1/4"-F	62.0	20.0	22	26.0
SAB 100 HT1-60 G1/4-AG	110	6.0	103	G1/4"-M	57.0	10.0	22	26.0
SAB 100 HT1-60 G3/8-IG	110	6.0	103	G3/8"-F	57.0	15.0	22	26.0
SAB 100 HT1-60 G3/8-AG	110	6.0	103	G3/8"-M	57.0	10.0	22	26.0
SAB 125 HT1-60 G1/4-IG	135	6.0	128	G1/4"-F	73.0	20.0	22	32.0
SAB 125 HT1-60 G1/4-AG	135	6.0	128	G1/4"-M	68.0	10.0	22	32.0
SAB 125 HT1-60 G3/8-IG	135	9.0	128	G3/8"-F	68.0	15.0	22	32.0
SAB 125 HT1-60 G3/8-AG	135	6.0	128	G3/8"-M	68.0	10.0	22	32.0

^{*} Acceptable dimensional tolerances for rubber parts concerning to DIN ISO 3302-1 M3
** D1 is the external dimension of the suction pad when it is pressed against the workpiece by the vacuum

Suction Pad Covers SU





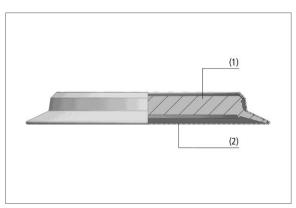
Suitable for Process-Specific Applications



Suction Pad Covers SU

Applications

- Suction pad covers for handling sensitive, flat and smooth workpieces (coated, processed or painted) to prevent marks and damage
- Used for the glass loading in module production lines
- Handling of cleaned glass within the module production
- Handling of modules after the lamination process of the module production such as flashing or sorting of modules
- Used combination with suction pads and suction plates



System design Suction Pad Covers SU

Design

- Suction pad covers SU are made of a robust fleece material (PP/PE) that is highly tear-resistant as well as extremely resistant to chemicals
- The cover (2) can be easily slid over the suction pad or the suction plate (1) and fastened with the integrated rubber band
- With different diameters the covers are designed to match the corresponding diameter ranges of the suction plates and suction pads



Suction Pad Covers SU for the sensitive handling of glass sheets

Our Highlights ...

- Suction pad cover made of special fleece material
- Integrated elastic band
- Large range of diameters

- No marks on sensitive work-pieces, highly wear resistant
- Quick and easy installation on suction plates and suction pads
- Installation on flat suction pads, bellows suction pads and suction plates

Suction Pad Covers SU



Ordering Data Suction Pad Covers SU

Туре	Part Number
SU 50	10.01.01.12837
SU 70	10.01.01.12838
SU 80	10.01.01.12839
SU 100	10.01.01.12840
SU 120	10.01.01.12437
SU 160	10.01.01.12438
SU 210	10.01.01.12439
SU 230	10.01.01.12440
SU 280	10.01.01.12485
SU 300	10.01.01.12843
SU 360	10.01.01.12842



Technical Data Suction Pad Covers SU

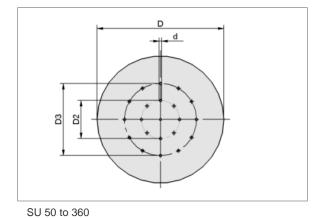
Type*	Clamping range
SU 50	5060 mm
SU 70	7080 mm
SU 80	80100 mm
SU 100	100115 mm
SU 120	120130 mm
SU 160	160180 mm
SU 210	210220 mm
SU 230	230250 mm
SU 280	280320 mm
SU 300	300330 mm
SU 360	360400 mm

^{*}In vertical applications with a suction plate or pad, the lateral force is reduced by up to 70% when using SU.

The suction capacity of the vacuum generator has to be increased. In order to define the required suction capacity for the use of the SU tests with the original workpiece and suction plate or pad have be to carried out.



Design Data Suction Pad Covers SU



Туре	Dimensi			
	D	D2	D3	d
SU 50	50	30	-	5
SU 70	70	30	-	5
SU 80	80	30	-	5
SU 100	100	50	-	6
SU 120	120	50	-	6
SU 160	160	50	-	6
SU 210	210	50	-	6
SU 230	230	50	-	6
SU 280	280	50	-	6
SU 300	300	90	170	6
SU 360	360	90	170	6

Compact Ejectors SCPi Solar









Suitable for Process-Specific Applications



Compact Ejectors SCPi "Solar"

Applications

- Gentle Handling of workpieces that are fragile and very thin such as silicon wafers or solar cells in the cell, string production as well as flipping of strings and layup
- Thin parts in critical production processes with short cycle times are picked up with extremely low stress
- Intelligent vacuum generation with air-saving function and system monitoring for maximum efficiency
- Remote configuration and diagnosis in process automation via IO-Link connection

Control and Electrical display element connection plua M12, 5-pin Blow-off pilot valve Suction pilot Hand-operated valve blow-off Compressed air connection G 1/4" Vacuum connector G 3/8' Power module Valve screw for blow-off volume flow blow-off volume flow (type SMPi) Silencer

System design Compact Ejectors SCPi "Solar"

Design

- Special venturi nozzle for high suction rate and vacuum level adjusted for the gentle handling of wafers and cells
- SCPi compact ejector with integrated control functions for suction and blow-off
- Integrated electronic air-saving function
- Blow-off strength adjustable via adjusting screw
- 7-segment user display with operating keyboard
- Electrical connection via 5-pin M12 plug
- Suction valve available with NO or NC function



Compact Ejector for the vacuum supply for flipping stations of strings

Our Highlights ...

- High suction rate at low vacuum level in the range of -200 to -515 mbar
- Integrated air-saving function
- Blow-off strength can be throttled and precise adjusted
- Freely adjustable values for "part present" signal
- Integrated IO-Link technology

Your Benefits ...

- Short evacuation times (50% less compared to standard ejectors) and gentle handling of wafers and cells
- Minimum compressed-air consumption
- Optimum adaptation of the blow-off pulse for the wafer and cell handling
- Maximum process reliability
- Remote configuration and diagnosis - minimum installation time

Compact Ejectors SCPi Solar





Ordering Data Compact Ejectors SCPi Solar

Туре	Part Number
SCPi 15/25 NC RD M12-5 SO	10.02.02.03562
SCPi 15/25 NO RD M12-5 SO	10.02.02.03528

Additional types/nozzle diameters, valve types and system monitoring versions are available on request. The entire range of standard SCPi ejectors can be in our Catalogue "Vacuum Components" on page 432 or on www.schmalz.com/scpi

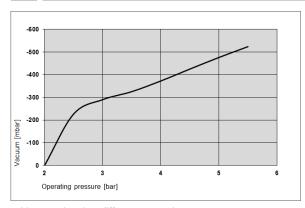


Ordering Data Accesories Compact Ejectors SCPi Solar

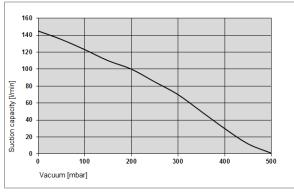
Туре	Part Number
Connecting cable M12, 5-pole	21.04.05.00080
Compressed-air connection plate GP 2	10.02.02.00917
Compressed-air connection plate GP 3	10.02.02.00918
Compressed-air connection plate GP 4	10.02.02.00919
Compressed-air connection plate GP 5	10.02.02.00920
Compressed-air connection plate GP 6	10.02.02.00921
Ejector blanking plate EJEK-PL*	10.02.02.00728
Quick Change connection ADP-Q1**	10.02.02.03463
Ejector tester EJEK-TEST SCPi	10.02.0.203588

^{*} Plate for covering unused connections when using compressed-air connection plates

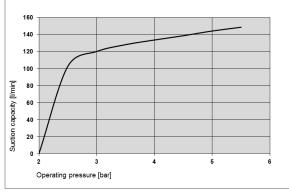
Performance Data Compact Ejectors SCPi Solar



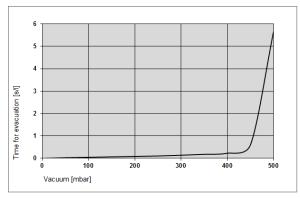
Vacuum level at different operating pressures



Suction capacity at various degress of evacuation



Suction capacity at different operating pressures



Evacuation times for various degrees of evecuation

^{**} For additional quick-mounting function (tool-free change of ejectors). When using with compressed-air connection plates, order 1x per ejector.

Compact Ejectors SCPi Solar





Suction Capacity in I/min at Various Degrees of Evacuation Compact Ejectors SCPi Solar

Туре	Degree o	Degree of evacuation in mbar											
	0	0 -50 -100 -150 -200 -250 -300 -350 -400 -450 -50											
SCPi 15/25	145	135	123	110	100	85	70	50	30	12	1		



Evacuation Time s/I for Various Vacuum Ranges Compact Ejectors SCPi Solar

Туре	Degree o	Degree of evacuation in mbar										
	0	-50	-100	-150	-200	-250	-300	-350	-400	-450	-500	
SCPi 15/25	0	0.02	0.04	0.07	0.09	0.11	0.14	0.18	0.25	0.4	5.6	



Technical Data Compact Ejectors SCPi Solar

Туре	Nozzle-Ø [mm]	Degree of evacuation [%]	Max. suction rate [I/min]	Air consumpt. during evac. [l/min]*	Max air consumpt blow-off [l/min]
SCPi 15/25	1.5 / 2.5	51.5	145	115	200

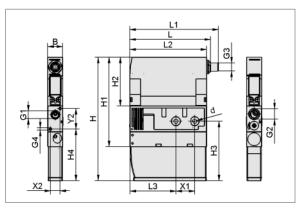
Туре	Noise level [dB]	Operating pressure [bar]	Recomm. int. hose-Ø vacuum [mm]**	Recomm. int. hose-Ø compressed-air [mm]**	Weight [kg]	Operating temperaure [°C]
SCPi 15/25	74	3.55.5	8	6	0.56	050

[!]The supply voltage is 24V DC

^{**} For max. length 2 m



Design Data Compact Ejectors SCPi Solar



Compact Ejectors SCPi "Solar"

Туре	Dimens	Dimensions in mm									
	В	D	G1	G2	G3	G4	н	H1	H2		
SCPi 15/25	22	6.6	G1/4"-F	G3/8"-F	M12x1-M	M4-F	181.5	131.5	71.5		
Туре	Dimens	ions in n	nm								
	Н3	H4	L	L1	L2	L3	X1	X2	Y2		
SCPi 15/25	87.5	76	118.5	129.7	112.5	67.5	27.5	14	30		

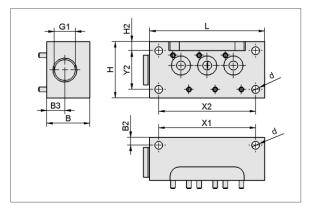
^{*} At optimal operating pressure

Compact Ejectors SCPi Solar

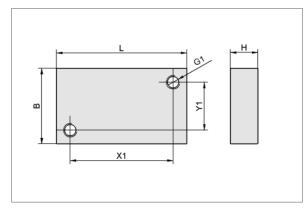


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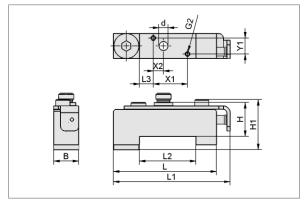
Design Data Accessories Compact Ejectors SCPi Solar



Compressed-air connection plate GP



Ejector blanking plate EJEK-PL



Quick Change connection ADP-Q1

Туре	Dimensions	mensions in mm									
	В	B2	В3	d	G1	G2	Н	H1	H2		
GP 2	38	7	16	7	G1/2-F	-	49.5	-	8		
GP 3	38	7	16	7	G1/2-F	-	49.5	-	8		
GP 4	38	7	16	7	G1/2-F	-	49.5	-	8		
GP 5	38	7	16	7	G1/2-F	-	49.5	-	8		
GP 6	38	7	16	7	G1/2-F	-	49.5	-	8		
EJEK-PL	22	-	-	-	M4-F	-	8.0	-	-		
ADP-Q1	22	_	-	8	_	M5-F	29.7	43.9	-		

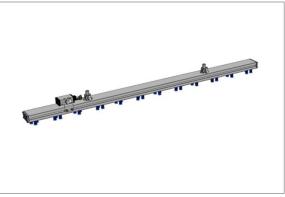
Туре	Dimension	limensions in mm									
	X1	X2	Y1	Y2	L	L1	L2	L3	No. of outputs		
GP 2	62	62	-	34	78.0	-	-	-	2		
GP 3	85	85	-	34	101.0	-	-	-	3		
GP 4	108	108	-	34	124.0	-	-	-	4		
GP 5	131	131	-	34	147.0	-	-	-	5		
GP 6	154	154	-	34	170.0	-	-	-	6		
EJEK-PL	30	-	14	-	38.0	-	-	-	-		
ADP-Q1	30	9	14	-	90.5	102.5	49.6	12.1	1		

String Grippers SSG





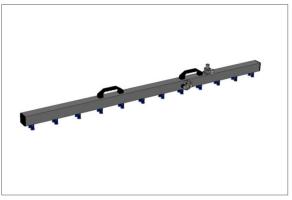
Suitable for Process-Specific Applications



String Grippers SSG-A for the automatic string handling

Applications

- Save, secure and gentle handling of PV strings in the layup process of PV modules
- Handling of strings in automated layup processes with SSG-A version with high accelerations and high positioning accuracy
- Manual handling of strings with SSG-M for the layup or loading/unloading of repair tables



String Grippers SSG-M for the manual string handling

Design

- Gripper with integrated vacuum generator for high suction capacity and low vacuum level
- 2.5 bellows suction pad FG 19 with thin, flexible sealing lip
- Available for different string lengths/number of cells, cell dimension 125 mm or 156 mm and different cell pitches
- SSG-A for automated handling and layup by robots
- SSG-M for manual handling and layup
- Also available as a set of components SSG-A SET / SSG-M SET for the design of individual string grippers



String Grippers SSG-M for the manual handling of strings

Our Highlights ...

- Suction pad with reduced internal diameter at the sealing surface
- Special material HT1 of suction pads
- Integrated vacuum generator and direct vacuum connection
- Low weight
- SSG "Set" with all components and detailed mounting instruction

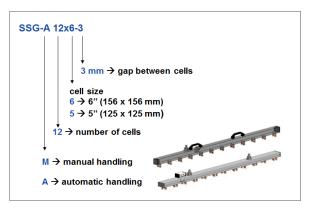
Your Benefits ...

- No pull into the suction pad and decrease of leakage during sealing, for example caused by tab wires and busbars
- No marking of the cells
- No costly piping, no spring plungers or moving parts required
- > Secure, fast and precise handling
- Quick and simple assembly of your own string gripper with high quality components

String Grippers SSG



Ordering Data String Grippers SSG Package Solution

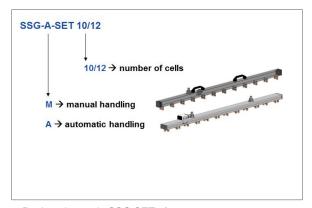


Туре	Part Number
SSG-A 12x6-3	10.01.11.02040
SSG-A 12x5-3	10.01.11.02041
SSG-A 10x6-3	10.01.11.02069
SSG-A 10x5-3	10.01.11.02070
SSG-M 12x6-3	10.01.11.02036
SSG-M 12x5-3	10.01.11.02038
SSG-M 10x6-3	10.01.11.02060
SSG-M 10x5-3	10.01.11.02067

Designation code SSG complete solution



Ordering Data String Grippers SSG-...-SET

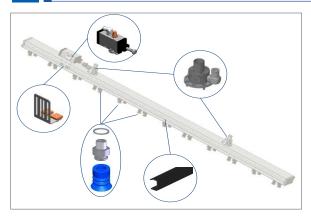


Designation code SSG SET of compo	nents
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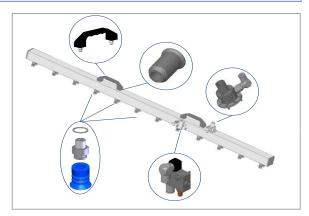
Type*	Part Number
SSG-A-SET 6/8	10.01.11.02165
SSG-A-SET 10/12	10.01.11.02166
SSG-M-SET 6/8	10.01.11.02167
SSG-M-SET 10/12	10.01.11.02168

* The SSG-...-SET includes all required vacuum components to design an individual string gripper except the vacuum profile and end covers for the profile. The Set is delivered with a detailed assembly instruction and drawing for the production of the profile.

Ordering Data String Grippers SSG-...-SET – Scope of Delivery



SSG-A-SET Sope of delivery



SSG-M-SET Sope of delivery

String Grippers SSG





Ordering Data String Grippers SSG-...-SET - Scope of Delivery

Туре	Part Number	Included quantity per set			
		SSG-A- SET 6/8	SSG-A- SET 10/12	SSG-M- SET 6/8	SSG-M- SET 10/12
Vacuum generator - SCE 100 A	10.01.30.00231	2	2	-	-
Vacuum generator - SCE 100 A	10.01.30.00232	-	-	1	1
Bellows suction pad - FG 19 HT1-60	10.01.06.02611	24	36	16	24
Connection nipple - SA-NIP G1/8-AG	10.01.01.12491	24	36	16	24
Sealing ring - DR G1/8 PA	10.07.08.00020	26	38	18	28
Manual valve - HHV 3/2 G1/8-IG R	10.01.15.00511	-	-	1	1
Solenoid valve (EMV) - ERS-SET EMV 7.5	10.05.01.00312	1	1	-	-
Mounting-plate EMV - BEF-WIN 50x42x79.5 EMV	10.05.01.00311	1	1	-	-
Handle - BUEG-GRIF 146x23x39	20.01.09.00033	-	-	1	1
Blind-rivet nut - MUTT M6x15	20.07.04.00012	-	-	4	4
Vacuum hose - VSL 8-6 PU	10.07.09.00003	3 m	3.5 m	2 m	2.5 m
Mounting plate for hose - KLEB-SOCK WH	21.05.02.00045	8	8	4	4
Cable strap - KAB-BIND 2.4 95	21.05.02.00016	8	8	4	4
Cap for profile slot - KAPP 2000x10x7	26.07.03.00002	2	2	-	-



Ordering Data Accessories String Grippers SSG-A and SSG-A-SET

Туре	Part Number
Mounting profile (for SSG-A-SET)* - MO-PROF 80x40 2TN	10.01.11.02174
Customization of mounting profile - (for SSG-A-SET)**	1039
Sealing plate for profile - VRS-PL-80x40 MO-PROF	25.09.06.00001
Sealing frame for profile - DI-RA 80x40x1 MO-PROF	10.07.08.00132
Counter sink screw 5x20 - SCHR WN1552 5x20-ST-VZ-T5	20.10.03.00008
Sensor holder - BLEC-LFOR 44.5x30x50	10.01.11.02051
Flange - BLEC-BIEG 200x140x35	10.01.11.02049
Sliding block (for sensor holder and flange) - NUT-STEI 20x20 M6-IG 10	25.09.06.00002
Washer (for sensor holder and flange) - SCHE 7090 M6 HV	20.06.01.00004
Machine screw (for sensor holder and flange) - SCHR 4762 M6x10-8.8	20.01.02.01001

^{*}Please inform about requested length (see design data of vacuum profile). Price for customization is defined in part No. 1039
** Contains the production step of cutting to length of the profile. Please indicate required length according to design data.



Ordering Data Accessories String Grippers SSG-M and SSG-M-SET

Туре	Part Number
Vacuum profile 50x50 (SSG-M-SET)* - ROHR 50x50x3 AL	10.01.11.02173
Customization of vacuum profile** - (SSG-M-SET) **	1039
End cap for profile - KAPP 50x50x24.5	20.12.01.00067
Plug to close unused suction pads - GUMM-PUF 6x8 SBS	10.01.01.11767
Blind-rivet nut - MUTT M6x15	20.07.04.00012
Assembly pliers for blind-riveted nuts - BLIND-ZANG SSG-M-SET	27.04.01.00007

^{*}Please inform about requested length (see design data of vacuum profile). Price for customization is defined in part No. 1039
** Contains the production step of cutting to length of the profile. Please indicate required length according to design data.

String Grippers SSG



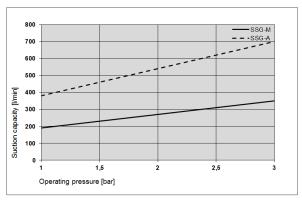


Ordering Data Spare Parts String Grippers SSG

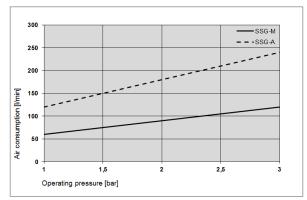
Туре	For SSG-A	For SSG-M
Vacuum generator - SCE 100 A	10.01.30.00231	10.01.30.00232
Bellows suction pad - FG 19 HT1-60	10.01.06.02611	10.01.06.02611
Connection nipple - SA-NIP G1/8-AG	10.01.01.12491	10.01.01.12491
Sealing ring - DR G1/8 PA	10.07.08.00020	10.07.08.00020
Manual valve - HHV 3/2 G1/8-IG R	-	10.01.15.00511
Solenoid valve (EMV) - ERS-SET EMV 7.5	10.05.01.00312	-
Silencer for HHV and EMV - SD G1/8-AG 18 SW12	10.07.07.00002	10.07.07.00002
Handle - BUEG-GRIF 146x23x39	-	20.01.09.00033



Performance Data String Gripper SSG



Suction capacity at different operating pressures



Air consumption at different operating pressures

Technical Data String Gripper SSG

Туре	Suction- capacity [l/min]	Air consumption	Oper. pressure [bar]	Oper. temp. [°C]	For no. of cells	For size of cells [mm]	Weight [kg]*	Length [mm]*	For cell spacing*
SSG-A 12x6-3	380700	120240	13	575	12	6"	7.0	1,853	3
SSG-A 12x5-3	380700	120240	13	575	12	5"	6.1	1,512	3
SSG-A 10x6-3	380700	120240	13	575	10	6"	6.2	1,535	3
SSG-A 10x5-3	380700	120240	13	575	10	5"	5.4	1,256	3
SSG-M 12x6-3	190350	60120	13	575	12	6"	4.7	1,830	3
SSG-M 12x5-3	190350	60120	13	575	12	5"	4.6	1,489	3
SSG-M 10x6-3	190350	60120	13	575	10	6"	3.9	1,512	3
SSG-M 10x5-3	190350	60120	13	575	10	5"	3.8	1,233	3
SSG-A-SET 6/8	380700	120240	13	575	up to 8	5" / 6"	-	-	-
SSG-A-SET 10/12	380700	120240	13	575	up to 12	5" / 6"	-	-	-
SSG-M-SET 6/8	190350	60120	13	575	up to 8	5" / 6"	-	-	-
SSG-M-SET 10/12	190350	60120	13	575	up to 12	5" / 6"	-	-	-

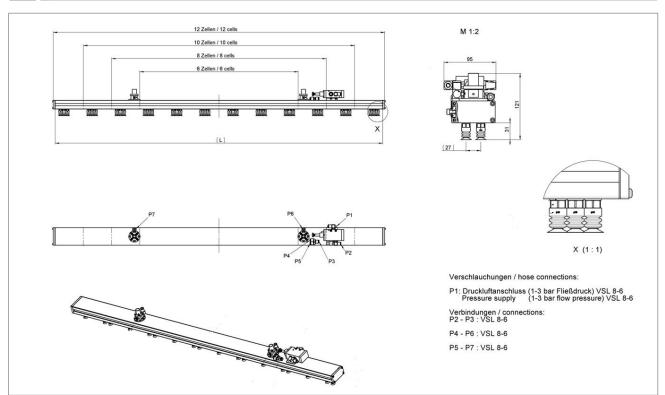
^{*} The data indicates the values for the SSG complete solution. For the SSG-...-SET the values depend on the selected profile and the design. Please check the design data of String Gripper SSG for detailed information

String Grippers SSG



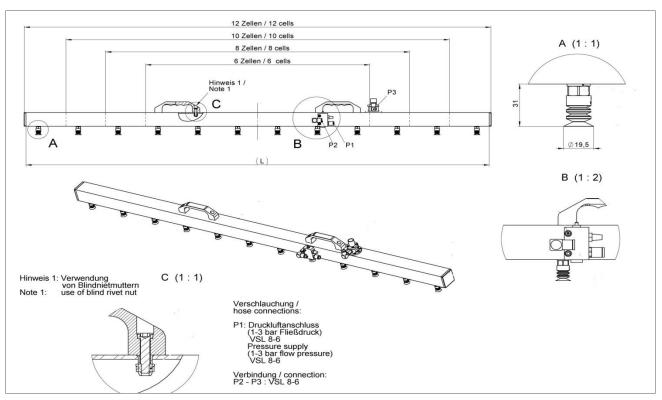


Design Data Strings Gripper SSG-A-SET





Design Data String Grippers SSG-M-SET

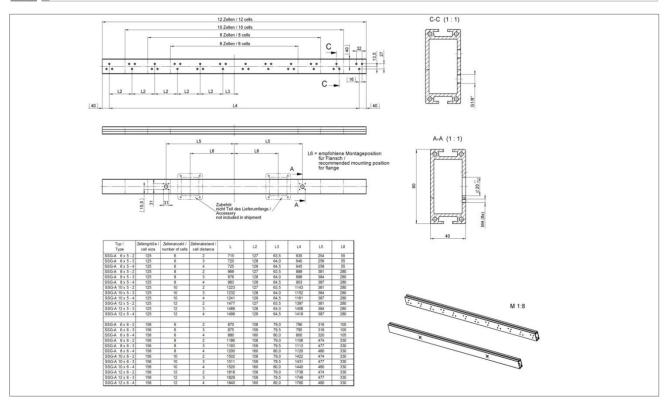


String Grippers SSG



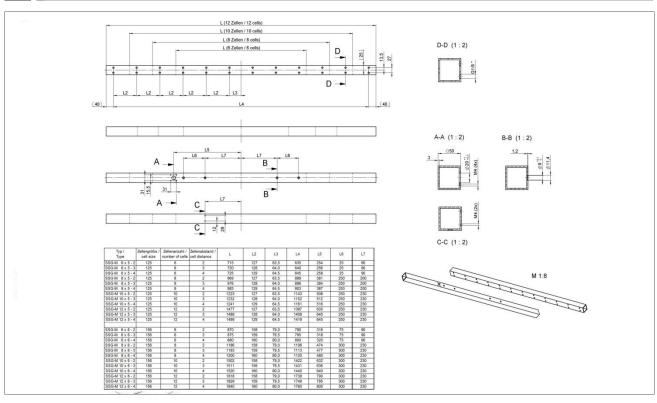
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Design Data for Profile for String Grippers SSG-A-SET



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Design Data for Profile for String Grippers SSG-M-SET



Lift-Cups ISCUP-H





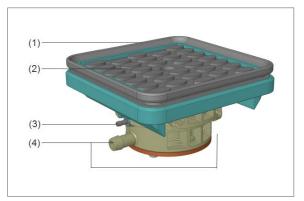
Suitable for Process-Specific Applications



Lift-Cups ISCUP-H

Applications

- Manual and (semi) automated manufacturing of PV modules requires transport of glass, laminates and framed modules from one work station to the next
- Tasks are e.g. positioning of glass, foil, and strings, crossbar soldering, EVA foil trimming, framing, sealing,...
- Using the Schmalz ISCUP-H suction cups, the workpiece can be positioned precisely in x, y, and z direction
- No need for a linear axis to position the lift-cups in the z = 0 plane



System design Lift-Cups ISCUP-H

Design

- Lift-Cups made of robust and lightweight material with integrated piston for vertical movement
- Sealing lip (1) and friction plate (2) available in different materials NK and CR
- Compressed-air connection (3) to activate the cups lifting to position z = 0 and simultaneously activation of vacuum
- Two vacuum connections (4) to connect the lift-cups in a row to one vacuum circuit with one central vacuum generator



Lift-Cups ISCUP-H for the clamping of glass during layup

Our Highlights ...

- Large contact area with special design of suction area
- One signal for activation of vacuum and lifting to position z = 0
- Lifting movement by compressed-air signal
- Activation of individual cups possible by optional valve
- Different sizes available

Your Benefits ...

- High horizontal forces for maximum accuracy and no slippage
- > Robust and reliable solution with no additional programming
- No electrical energy required
- Clamping of different module sizes with one solution
- Clamping also in positions with restricted space

Lift-Cups ISCUP-H



Ordering Data Lift-Cups ISCUP-H

Туре	Part Number
ISCUP-H 80x80 NK	10.01.12.01650
ISCUP-H 80x28 NK	10.01.12.01657
ISCUP-H 80x80 CR	10.01.12.02157
ISCUP-H 80x28 CR	10.01.12.02158



Ordering Data Spare Parts Lift-Cups ISCUP-H

For Type	Sealing Lip	Friction Plate
ISCUP-H 80x80 NK	10.01.15.00020	10.01.15.00017
ISCUP-H 80x28 NK	10.01.15.00022	10.01.15.00019
ISCUP-H 80x80 CR	10.01.15.00158	10.01.15.00017
ISCUP-H 80x28 CR	10.01.15.00419	10.01.15.00019

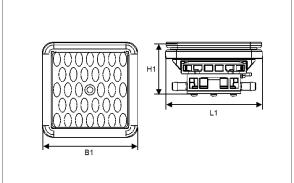


Technical Data Lift-Cups ISCUP-H

Туре	Holding force [N]*	Lifting force [N]**
ISCUP-H 80x28	100	200
ISCUP-H 80x80	350	350

^{*} The specified suction forces are theoretical values at a vacuum of -0.6 bar and with a smooth, dry workpiece surface - they do not include a safety factor
** At a pressure of 6 bar

Design Data Lift-Cups ISCUP-H





Туре	Dimensions in mm						
	L1	B1	B2	H1*	Stroke	Vacuum connection **	Compressed-air connection **
ISCUP-H 80x28	80	28	37	40.10	3.9	6	2
ISCUP-H 80x80	80	80	-	40.10	3.9	6	2

^{*} H1 = Height from mounting plate to friction plate → Height with workpiece gripped = 44 mm ** Equals the recommended hose diameter (internal diameter)

Vacuum Suction Spiders SSP





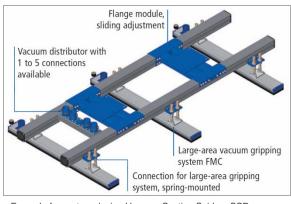
Suitable for Process-Specific Applications



Vacuum Suction Spiders SSP

Applications

- Vacuum suction spiders are providing automated handling solutions for various process steps in the module production
- They are used for handling of glass for the loading of the line or glass transport before the lamination process
- Use in the module assembly after the lamination from trimming, framing, junction-box assembly to flashing and sorting



Example for system design Vacuum Suction Spiders SSP

Design

- Modular system enables the optimum selection of suction pads, large area gripping systems or special grippers in combination with mounting elements, valves and system monitoring
- Combination of different gripping technologies like suction pads and floating suction pads is possible
- Various vacuum generators (ejectors, pumps, blowers) can be selected according to the application
- Optional available solutions for glass separation or collision protection



Vacuum Suction Spider SSP in the framing station

Our Highlights ...

- Modular design with the high quality components of Schmalz
- High technology vacuum generation
- Combination of different gripping technologies in one gripper
- Made from low weight components

Your Benefits ...

- > The optimum solution for every application / process step
- > Minimum operation costs for an economic solution
- One gripper for different workpieces, e.g. glass and slip-sheet handling to reduce process costs
- > High accelerations for low cycle times

Please contact our specialists for detailed information. Our experienced system consultants are available to answer your questions in person. You can count on professional project planning and the expert realization of your vacuum solution. Additional information can be found on **www.schmalz.com**.

Vacuum Tube Lifters JumboErgo





Suitable for Process-Specific Applications



Vacuum Tube Lifters JumboErgo

Accessories such as silencer box Crane Vacuum feed hose Under the second of the sec

System design Vacuum Tube Lifers JumboErgo

Applications

- The Vacuum tube lifter JumboErgo enables a safe and ergonomic manual handing of glass sheets and modules in various process steps in the module production
- They are used for handling of glass for the loading of the line or glass transport before the lamination process
- Use in the module assembly after the lamination from trimming, framing, junction-box assembly to flashing and sorting
- With the pneumatic swiveling the glass/modules can be picked up vertically and placed horizontally or vice versa

Design

- · Vacuum operated lifting unit by special designed lifting tube
- Due to special function principle only one vacuum generator for the lifting movement and the gripping of the glass / modules is necessary
- Operating unit with rotary handle for a simple and easy operation
- · Gripper can be equipped with different suction pads
- Optionally available with the pneumatic swiveling unit PSE and entire crane system as a turnkey solution



Vacuum Tube Lifters JumboErgo for the module handling

Our Highlights ...

- Vacuum only operation
- Special rotary handle
- Pneumatic swiveling unit (optional)
- Optional available crane system build to your requirements

Your Benefits ...

- Handling of glass and modules without any additional equipment such as chain hoist or manipulator
- > Fast, safe and ergonomic handling
- > Rotating of glass and modules at the touch of a button
- Turnkey solution with minimum integration and installation efforts

Please contact our specialists for detailed information. Our experienced system consultants are available to answer your questions in person. You can count on professional project planning and the expert realization of your vacuum solution. Additional information can be found on **www.schmalz.com**.











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