World of Vacuum Technology

SCHMALZ

Industry Solutions Glass

Applications and Products

Schmalz

The World of Vacuum Technology

Schmalz is one of the leading suppliers in the fields of automation, handling and clamping technology and offers innovative and efficient vacuum solutions to customers in numerous different industries.

Facts and Figures

Founded:	1910 by Johannes Schmalz
Market position:	Leading global supplier of vacuum technology in the fields of automation, handling and clamping technology
Business areas:	Vacuum Components Vacuum Gripping Systems Vacuum Handling Systems Vacuum Clamping Systems
Employees:	More than 1,000 worldwide; 13% of staff in Germany are trainees
Innovation figures:	Around 450 industrial rights registered and granted 8,5% (of revenue) invested in research and development
Branches:	In 17 countries worldwide
Sales partners:	In over 60 countries worldwide
Certifications:	DIN ISO 9001 (quality management) since 1994 DIN ISO 14001 (environmental management) since 1997 DIN ISO 5001 (energy management) since 2012 AEO C (authorized economic operator, customs simplifications) since 2012

Contents

Industry Solutions Glass

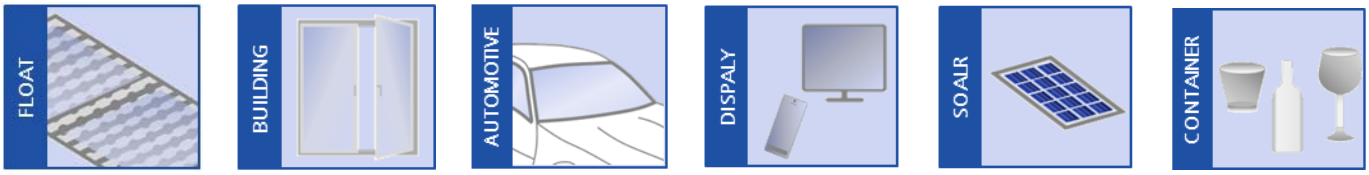
Applications

Different Sectors in the Glass Industry

Schmalz is a full line supplier for vacuum components, vacuum gripping systems, vacuum clamping systems and manually controlled vacuum handling devices in the glass industry. From the Float Glass production to Display Glass manufacturing this catalogue offers solutions for your specific production process.

Due to deep knowledge in the glass production processes and products specifically developed for this industry we offer both support in vacuum automation as well as leading vacuum technology.

For easier navigation in the catalogue please use the index of contents and the process icons to identify the application area of the products:



Learn more about the requirements and applications in the different sectors of the glass industry on the following pages.

Float Glass

In the float production process the molten raw materials are fed on a tin bath and due to the lower specific gravity the glass flows on the tin surface. A continuous ribbon of glass with perfectly smooth surface and even thickness is produced. The glass is cooled down to room temperature, coated with separation powder, cut and stacked in vertical position for the transport for further processing.

High process stability and availability are the main requirements for vacuum technology used in the Float Glass sector. Handling on separation powder requires high lateral forces of the suction cups. To provide process stability vacuum generators with high product efficiency as well as process efficiency are crucial.

Suction plates SGF for high friction force on separation powder

Building Glass

The Float Glass is processed to building glass during various production steps. The glass is coated, cut to the appropriate size, ground on the edges and processed further if necessary. Insulation Glass Units (IGU) are produced using several layers of glass that are combined and framed. Throughout the entire value chain glass is handled, transported and clamped using vacuum technology. Even the final installation of the glass on the building construction site is done by using vacuum lifting devices.

Vacuum technology of Schmalz is used in the individual processes from manual to automated handling and grinding of glass.

VacuMaster Window being used during the framing of windows

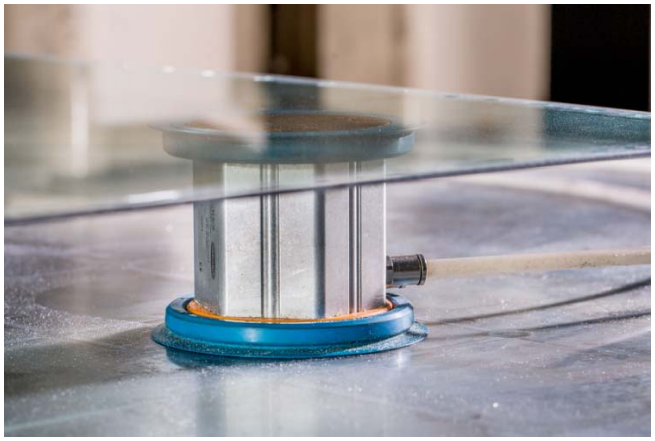
Industry Solutions Glass

Applications

Automotive Glass

Automotive Glass is produced in highly automated processes. In the cold end production process the glass is destacked and fed to the line where the cutting, grinding and drilling process takes place. Openings are applied for installation of additional components to the glass. The subsequent bending process shapes the glass while it is heated to up to 600°C. The cooling process provides the glass with the required strength. Windshields are laminated with PVB film. After the finishing and assembly processes, the final cleaning and quality control, the packaged windows are provided to the automotive assembly line. High speed automation and precise grinding are just two requirements where the solutions of Schmalz can improve the performance of the production line.

Suction cups FSGA made of Vulkollan being used on destackers

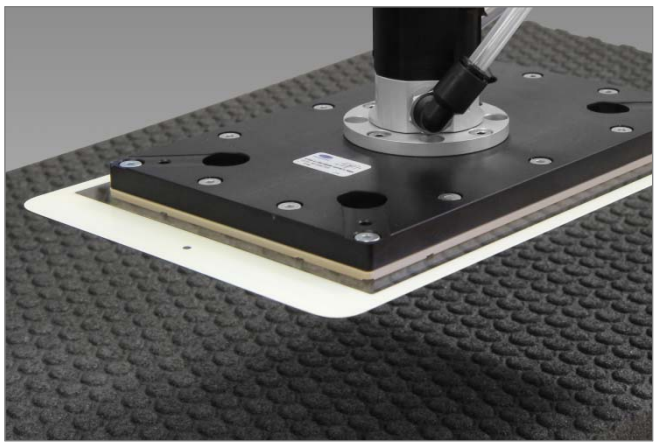


Vacuum blocks VCBL-GL used for automotive glass grinding

Vacuum area gripping system FXP used in automotive glass assembly

Display Glass

The Display Glass sector is undergoing rapid growth and development in technology. Not only are the displays getting larger and larger with an increasing number of integrated functions, but also the requirements for vacuum technology are increasing steadily. The glass is getting thinner and the coatings more complex and sensitive. From raw glass production, to cutting, grinding, coating and the various assembly processes, the output quantities are constantly increased.
This leads to high requirements not only for a gentle, contamination free handling, but also high acceleration rates and high positioning accuracy. The technology of Schmalz offers high performance solutions for the different production steps.



Thin Glass Gripper STGG being used for display glass handling

Flat suction cups SPF used for the pick&place handling of display glass

Industry Solutions Glass

Applications

Solar Glass

Glass handling applications are an important part in the module production. Starting from the loading of the production line with destacking glass to handling steps along the entire value chain - from the layup and lamination process to the trimming and framing station. Also during final assembly and flashing the modules are handled and gripped on the glass surface “sunny side“. Gentle handling with high forces will not only affect the production process but also will have a great influence on the electrical output of the module.

Vacuum solutions of Schmalz are used for the automated as well as manual handling of modules.

Vacuum suction spider SSP being used for the backsheet layup

Vacuum suction spiders SSP being used in the framing station

Vacuum tube lifter JumboErgo being used for the module handling

Container Glass

Hollow glass or container glass refers to glass that is used for the packaging of products or table ware. Glass is easy to clean, hygienic, tasteless, odorless and inert, which is why container glass is primarily used in the food and beverage, pharmaceutical and cosmetic packaging. Some 40% of all beverages are packaged in glass. The workpieces are mostly produced in blow mould processes. For this purpose, the glass is melted and shaped. After being cooled down the glass is packed or provided to further processes like filling.

The glass is handled very gentle using vacuum technology. Workpieces can be handled individually, several at a time or in entire layers on pallets, e.g. in filling machines in the food and beverage industry.

Vacuum layer gripping system SPZ for handling of container glass

Overview of Section 2

Vacuum Suction Cups

Information

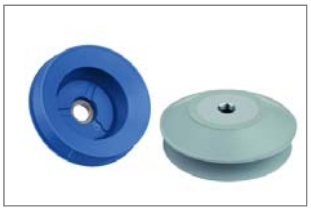
Suction Cups for Handling Glass

- Diameter: 125 to 400 mm
- Material: EPDM, HT1

Round suction plates for the automated and manual handling of glass. Gentle handling with high friction force – even on separation powder.

- Diameter: 15 to 40 mm
- Material: NK, HT1
- Connection nipple plugged into elastomer part

Round suction cups with very flexible and soft sealing lip for the gentle handling of thin glass and paper, e.g. slip sheets.



- Diameter: 100 to 250 mm
- Material: NBR, HT1
- Support plate vulcanized

Round suction cups for the handling of higher loads. Flexible sealing lip and defined support area for a gentle handling with high forces.

- Dimensions: Ø 22 to 125 mm
  60 x 30 to 140 x 70 mm
- Material: HT1
- Connection nipple vulcanized

Round and oval suction cups. High performance suction cups for the automatic handling of narrow glass for maximum forces on separation powder.

- Dimensions: 15 to 110 mm
- Material: VU1
- Connection nipple plugged into elastomer part

Extremely wear-resistant suction cups made of Vulkollan for long service life automatic handling of glass.

Overview of Section 2

Vacuum Suction Cups

Suction Cups SPF / SPB1 ED-65 (Flat / 1.5 Folds)

- Diameter: 10 to 80 mm
- Material: ED
- Connection nipple modular

Suction cups round (flat / 1.5 folds) with very soft and flexible sealing lip for a gentle handling of thin and coated glass.

Suction Plates for High-Temperature SPL-HT FPM-F

- Diameter: 90 to 190 mm
- Material: FPM, coated with felt
- Temperature resistance 400°C

Suction plates with felt coating for high temperature applications such as unloading of bending lines.

Suction Plates for High-Temperature SPL-HT

- Diameter: 35 to 140 mm
- Material: Special textile
- Temperature resistance 600°C

Suction plate with replaceable seal and stainless steel basic body for high temperature applications such glass handling in tempering lines.

Suction Cup Inserts SPI PEEK

- Diameter: 6 to 32 mm
- Material: PEEK
- For the use with bellows suction cups

Suction cup inserts for the use in combination with bellows suction cups type FSGA / FSG to avoid workpiece contamination.

Suction Cup Covers SU

- Diameter: 25 to 360 mm
- For suction cups and suction plates

Suction cup covers for the handling glass to avoid marks on the surface.

Protection Covers PC

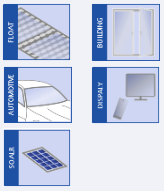
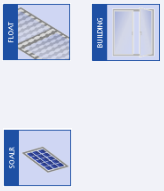
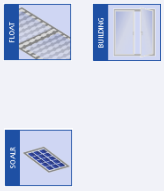
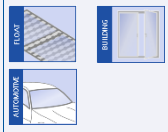
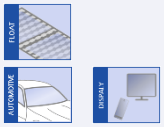
- Diameter: 125 to 400 mm
- For suction cups and suction plates

Protection covers to protect non-used suction cups or suction plates from dust and dirt.

Suction Cups for Handling Glass

Material Overview

Material Overview

Description	Abbreviation	HT1	EPDM	NBR	VU1	ED	NK
	Chemical designation / Trade name	Non-marking material	Ethylenepro-pylenecaou-tchuc	Nitrile caou-tchuc	Vulkollan®*	Elastodur	Natural rubber
	Color	blue	dark grey	light grey	dark green	green	light brown
	Example						
Chemical resistance	General weathering resistance	●●●	●●●●	●●	●●●	●●●	●●
	Ozone resistance	●●●●	●●●●	●	●●●	●●●	●●
	Oil resistance	●●●●	●●**	●●●●	●●●	●●●	●
	Fuel resistance	●●	●	●●	●●	●●	●
	Alcohol resistance, ethanol 96%	●●●●	●●●●	●●●●	●●●●	●●●	●●●●
	Solvents resistance	●●	●●	●●	●	●	●
	General resistance to acids	●	●●●	●	●	●	●●
	Steam resistance	●●●	●●●	●●	●	●	●
Mechanical characteristics	Wear resistance	●●●	●●	●●	●●●●	●●●(●)	●●
	Resistance to per-manent deformation	●●	●●	●●	●●	●	●●●
	Tensile strength	●●	●●	●●	●●●●	●●●(●)	●●
	Shore hardness	60 ± 5	55 ± 5	55 ± 5	72 ± 5	65 ± 5	40 ± 5
Temp. resist-ance*****	Short-term (<30 sec.)	-25°C to +170°C *-13°F to 338°F*	-35°C to +130°C *-31°F to 266°F*	-30°C to +120°C *-22°F to 248°F*	-40°C to +100°C *-40°F to 212°F*	-40°C to +100°C *-40°F to 212°F*	-35°C to +120°C *-31°F to 248°F*
	Longer-term	-10°C to +140°C *14°F to 284°F*	-25°C to +100°C *-13°F to 212°F*	-10°C to +70°C *14°F to 158°F*	-40°C to +80°C *-40°F to 176°F*	-25°C to 80°C *-13°F to 176°F*	-25°C to 80°C *-13°F to 176°F*
Further characteristics	Target application						 ***
	Non-/Low-marking	✓				✓	
	Silicone free	✓	✓	✓	✓	✓	✓
	Clean room applications****	✓				✓	

* Vulkollan® is a registered trademark of Bayer AG
** With slight oil contamination
*** Natural rubber NK is used for the paper and foil handling in the target applications / not recommended for direct glass contact
**** Detailed information on page 10
***** Approximate value: depends on ambient temperature, application force, recovery time and wall thickness of suction pad

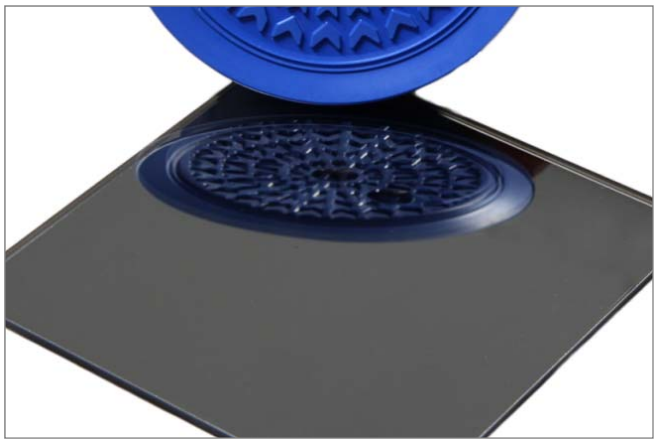
●●●● Excellent ●●● Very good ●● Good ● Poor to satisfactory

Suction Cup Requirements for Handling Glass

At the first sight handling glass seems to be simple and easy with low requirements for the suction cups – glass is a non-porous workpiece with smooth surface. But with a more detailed view and it is obvious that the requirements for the suction cups are very high since the suction cups are the components that are in contact with sensitive thin or coated glass. Marking of the glass surface is crucial in most applications. Or even the force of the suction cup on separation powder can influence the entire production process and line output. Therefore Schmalz develops highly specialized suction cups – the structural design and the properties of the material are the key features of suction cups to be used in the Glass Industry.

Low/-Non Marking Handling

For the marking characteristics the design of the suction cup as well as the material is crucial. The design of the suction cup has an influence on the behavior of the suction cups during gripping and release – the travel of the sealing lip on the glass surface. The more travel the higher the risk of marks being it from the abrasion of the material itself or dust and dirt from the process environment. Besides this the suction cup material has a great influence of the marking characteristic. The material HT1 of Schmalz offer the best results – non-marking and minimum chemical fingerprint:



Marking of HT1

Marking of Nitrile PVC (Commonly used material for glass handling)

The material HT1 offer the lowest marking of the glass surface. Dust and dirt in the process environment can influence the marking characteristics, in this case suction cup covers SU (page 47) or foam SU (page 109) are recommended. To avoid any chemical contamination suction cup inserts SPI PEEK (page 44) or Thin Glass Gripper STGG (page 54) can be used.

Clean Room Use of Suction Cups

The requirements in glass handling applications are increasing and especially in the Display Glass production, handling of glass in clean room environment becomes more and more important. Schmalz is able to offer clean room-compliant suction cups.

Tested by Fraunhofer IPA

Clean room-compliant suction cups

- Suction cups dedicated for the use in clean room environment are tested/specified according to VDI 2083-9.1 and ISO 14644-1
- Based on the material and the design the defined suction cups meet the requirements of Class 4 or Class 3 according to ISO 14644-1
- For example the SGF 125 HT1-60 G1/4-IG is ready for the use in Class 4 clean rooms
- Test reports and detailed information on request

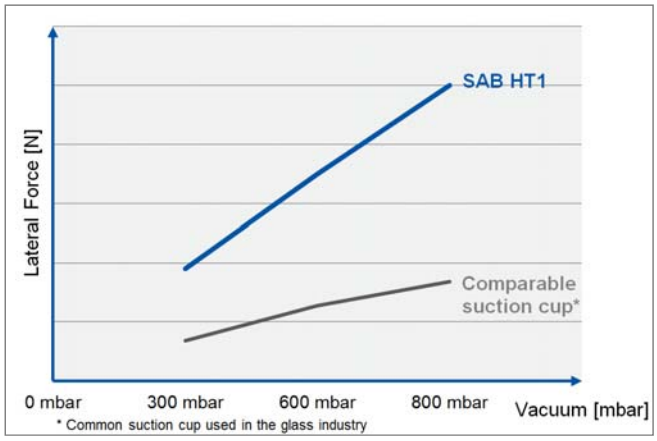
Suction Cups for Handling Glass

Suction Cup Characteristics

Force on Separation Powder

Handling glass is in the most cases directly linked to the handling of a glass surface with separation powder. Used between glass sheets to reduce adhesion force separation powder is common in the glass industry.
The suction cups of Schmalz offer:

- Special design of sealing lip and integrated sealing edge for high vacuum levels and very good sealing properties
- Structured profile on the suction area for high lateral forces on powder – up to 4 times higher with the same diameter!
- Long service life of suction cups due reduced loss in lateral force and high vacuum levels even in case of strong contamination of sealing lip (see comparison below)



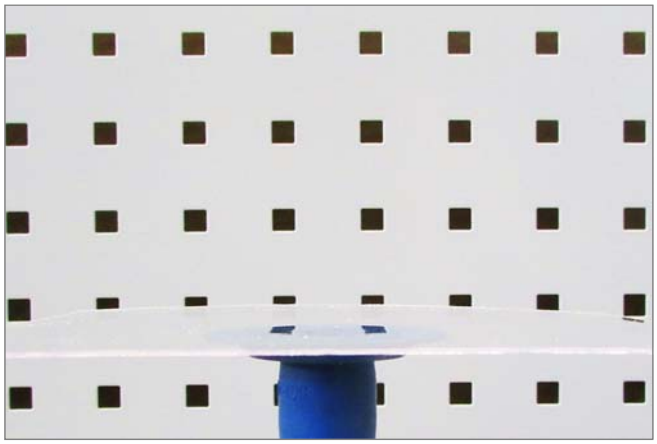
Lateral force on separation powder (PMMA 50 to 80 µm)

Suction cup SAB HT1 with special profile (no leakage / high force)

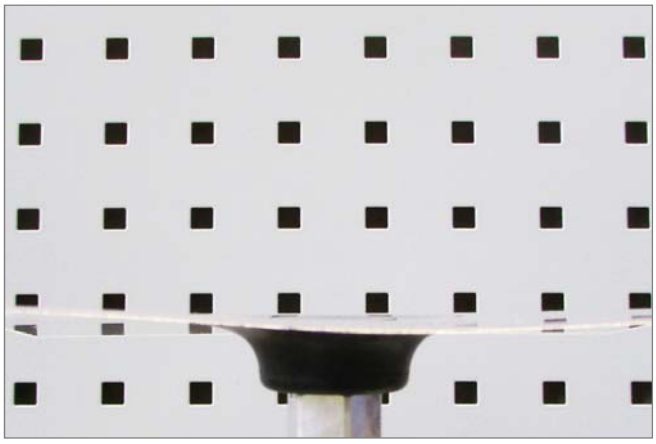
Standard bellows cup (leakage / low force)

Stress and Surface Pressure on the Glass

Handling sensitive, thin glass requires a low stress on the glass surface since a deformation of the glass will have a negative influence on the production process, the quality of the final product or will even damage the glass during handling. Suction cups of Schmalz are designed to have a homogeneous surface pressure on the glass during the handling. This will reduce local stress on the glass and thus deformation. In addition will the low reset force of the sealing lip reduce the risk of surface damages.



Schmalz suction cup SGPN with soft and flexible sealing lip



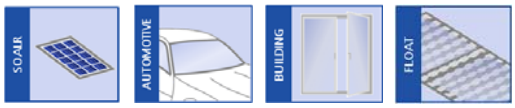
Standard suction cup used in the glass industry

Lowest surface pressure can be realized using the Schmalz Thin Glass Gripper STGG with full contact surface and low vacuum level (page 56).

Suction Cups for Handling Glass

Suction Plates SGF

Suction area (Ø) from 125 mm to 400 mm

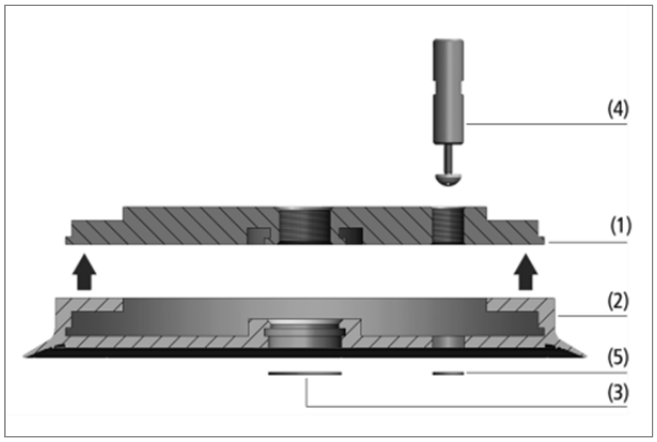


Suitability for Process-Specific Applications

Suction plates SGF

Applications

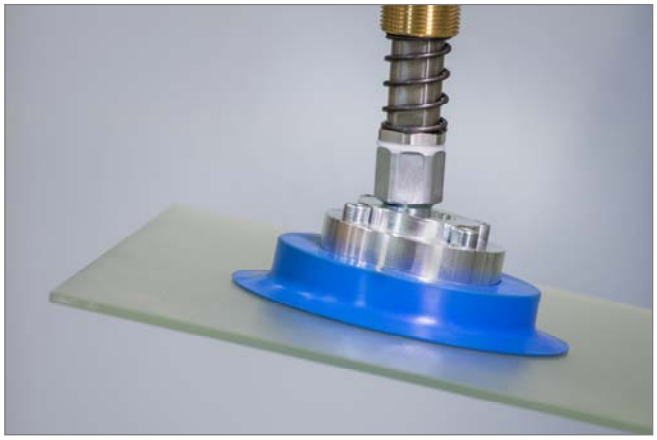
- Suction plate for the automated or manual handling of glass
- Used on stacker units for the loading and unloading of lines, e.g. float line
- Used on glass with separation powder in order to provide a high friction force
- Applications where a high horizontal force is required such as manual handling tasks in the building industry, e.g. outdoor crane systems
- Handling of glass in the production process of PV modules, like loading of the line, framing or sorting process



System design suction plates SGF

Design

- Aluminum support plate (1) and sealing ring (2)
- Diameters 125 to 200 mm: Replaceable sealing ring and flat sealing lip with focus on automated applications (e.g. stackers)
- Diameters 250 to 400 mm: Vulcanized sealing ring (not replaceable) and steep sealing lip with focus on manual handling tasks (e.g. outdoor crane systems)
- Type “HS” (High Stroke): With additional stroke for gentle and fast gripping of glass in manual handling tasks and additional height compensation in automatic handling systems
- Central vacuum connection, optionally available clip-in filter screen as pre-filter (3), eccentric connection for sensing valve (4) or pre-filter (5)



Suction plates SGF HT1 with FLK-HD

Our Highlights…	Your Benefits…
• Thin, flexible and flat sealing lip	> Low relative movement of sealing lip during gripping to prevent the surface from being damaged
• Special inner structure / profile on the entire suction area	> High horizontal forces on separation powder and optimum distribution of surface pressure
• Low internal volume and high force due to large effective diameter	> Short evacuation times for reduced cycle times and high force for high accelerations
• Special material HT1	> Non-marking handling, even at higher temperatures (170°C)
• Material EPDM	> High friction force on wet glass and outdoor applications

Suction Cups for Handling Glass

Suction Plates SGF

Suction area (Ø) from 125 mm to 400 mm

Designation Code Suction Plates SGF

Abbreviated designation	Stroke type	Suction area Ø in mm	Material and Shore hardness	Connection type
Example SGF 125 HT1-60 G1/4-IG:		**125**	**HT1-60**	**G1/4-IG**
SGF	HS High stroke	125 to 400	HT1-60 EPDM-55	G1/4-IG (IG = female (F)) G3/8-IG G1/2-IG FM1 Flange type 1

Ordering Data Suction Plates SGF

Suction plate SGF (sealing ring + support plate) is delivered assembled. The assembly consists of:

- Sealing ring of type DR-SGF – elastomer part, available in various diameters and materials
- Aluminum support plate – available with various threads
- Diameters 250 to 400 mm with vulcanized sealing ring (not replaceable)

Available spare parts: sealing ring of type DR-SGF (Diameter 125 to 200 mm)
Available accessories: Flexolink FLK-HD, sensing valve, filter screen

Suction Plates SGF

Type*	Non-marking material HT1 60±5ShA	EPDM 55±5ShA
SGF 125 G1/4-IG	10.01.01.12892	10.01.01.12475
SGF 125 G3/8-IG	10.01.01.13205	10.01.01.13263
SGF 150 G1/2-IG	10.01.01.13021	10.01.01.13019
SGF 150 FM1	10.01.01.13486	10.01.01.13502
SGF-HS 150 G1/2-IG	10.01.01.13178	10.01.01.13492
SGF-HS 150 FM1	10.01.01.13490	10.01.01.13503
SGF 200 G1/2-IG	10.01.01.12893	10.01.01.12476
SGF 200 FM1	10.01.01.13865	-
SGF-HS 250 G1/2-IG	10.01.01.13153	10.01.01.13038
SGF-HS 300 G1/2-IG	10.01.01.13794	10.01.01.13793
SGF-HS 350 G1/2-IG	10.01.01.13154	10.01.01.13039
SGF 400 G1/2-IG	-	10.01.01.12478

* Additional material specifications at the beginning of the section “Vacuum Suction Cups”

Ordering Data Spare Parts Suction Plates SGF

Type	Suitable for	Part Number
DR-SGF 125 EPDM-55	SGF 125 EPDM-55 G1/4-IG / G3/8-IG	10.01.01.12473
DR-SGF 125 HT1-60	SGF 125 HT1-60 G1/4-IG / G3/8-IG	10.01.01.12890
DR-SGF 150 EPDM-55	SGF 150 EPDM-55 G1/2-IG / FM1	10.01.01.13018
DR-SGF 150 HT1-60	SGF 150 HT1-60 G1/2-IG / FM 1	10.01.01.13020
DR-SGF-HS 150 EPDM-55	SGF-HS 150 EPDM-55 G1/2-IG / FM1	10.01.01.13491
DR-SGF-HS 150 HT1-60	SGF-HS 150 HT1-60 G1/2-IG / FM1	10.01.01.13176
DR-SGF 200 EPDM-55	SGF 200 EPDM-55 G1/2-IG	10.01.01.12474
DR-SGF 200 HT1-60	SGF 200 HT1-60 G1/2-IG / FM1	10.01.01.12891

Ordering Data Accessories Suction Plates SGF

Suitable for	FLK-HD G3/8-AG*	FLK-HD G1/4-IG*	FLK-HD G1/2-IG*	Sensing valve (eccentric)	Filter screen (center)	Filter screen (eccentric)
SGF 125	10.07.06.00235	10.07.06.00241	10.07.06.00242	10.05.10.00061	10.07.01.00215	10.07.01.00215
SGF 150	10.07.06.00235	10.07.06.00241	10.07.06.00242	10.05.10.00061	10.07.01.00110	10.07.01.00215
SGF-HS 150	10.07.06.00235	10.07.06.00241	10.07.06.00242	10.05.10.00061	10.07.01.00215	10.07.01.00215
SGF 200	10.07.06.00235	10.07.06.00241	10.07.06.00242	10.05.10.00061	10.07.01.00110	10.07.01.00215
SGF-HS 250	10.07.06.00235	10.07.06.00241	10.07.06.00242	10.05.10.00061	10.07.01.00110	10.07.01.00215
SGF-HS 300	10.07.06.00235	10.07.06.00241	10.07.06.00242	10.05.10.00061	10.07.01.00110	10.07.01.00215
SGF-HS 350	10.07.06.00235	10.07.06.00241	10.07.06.00242	10.05.10.00061	10.07.01.00110	10.07.01.00215
SGF 400	10.07.06.00235	10.07.06.00241	10.07.06.00242	10.05.10.00061	10.07.01.00110	10.07.01.00215

*not for use with FM1 type

Suction Cups for Handling Glass

Suction Plates SGF

Suction area (Ø) from 125 mm to 400 mm

Technical Data Suction Plates SGF

Type	Suction force Ds [N]*	Suction force d2 [N]**	Volume [cm³]	Min. curve radius [mm] (convex)	Recom. internal hose-Ø d [mm]***
SGF 125	730	470	44	1500	9
SGF 150	1060	730	65	2000	9
SGF-HS 150	1060	730	119	370	9
SGF 200	1880	1610	145	3500	12
SGF-HS 250	2900	2220	372	1600	12
SGF-HS 300	4240	3480	573	2400	12
SGF-HS 350	5700	4730	780	3000	12
SGF 400	7530	6520	560	13500	12

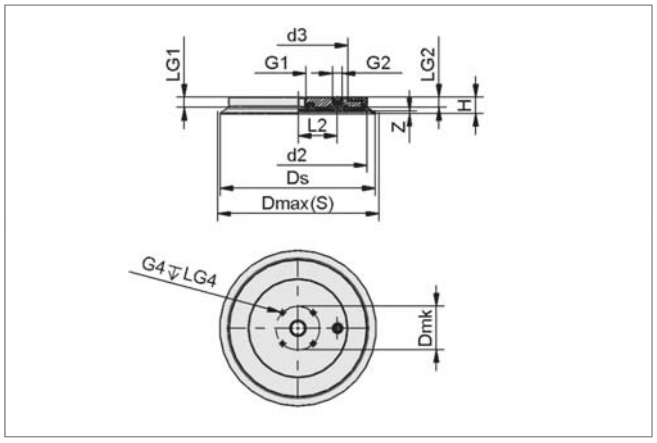
* The specified suction forces are theoretical values at a vacuum of -0.6 bar and with a smooth, dry workpiece surface - they do not include a safety factor
** Suction force applied to sealing-edge diameter d2
*** The recommended hose diameter refers to a hose length of approx. 2 m

Technical Data Flexolink FLK-HD

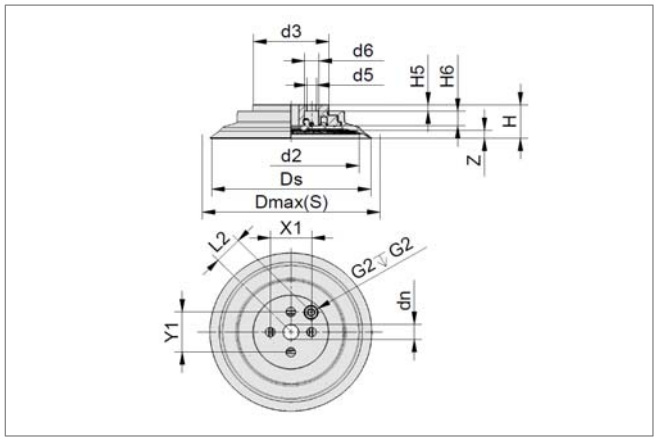
Type	Vertical load [N]*	Horizontal load [N]*	Weight [g]
FLK-HD G3/8-AG	7530	6000	248
FLK-HD G1/4-IG	7530	6000	214
FLK-HD G1/2-IG	7530	6000	235

* Maximum static load

Design Data Suction Plates SGF



SGF 125 to 200



SGF 150 to 200 FM1

Type	Dimensions in mm*												
	Dmax (S)***	Ds	d2	d3	Dmk	G1	G2**	G4	H	L2	LG1	LG2	LG4	Z
SGF 125 G1/4-IG	130	123	100	70	58.3	G1/4“-F	G1/4“-F	M6-F	21.4	26.5	14	14	11	3.0
SGF 125 G3/8-IG	130	123	100	70	58.3	G3/8“-F	G1/4“-F	M6-F	21.4	26.5	14	14	11	3.0
SGF 150 G1/2-IG	156	148	125	93	58.3	G1/2“-F	G1/4“-F	M6-F	21.7	36.5	14	14	11	3.3
SGF-HS 150 G1/2-IG	165	149	126	70	58.3	G1/2“-F	G1/4“-F	M6-F	25.9	26.5	14	14	11	7.5
SGF 200 G1/2-IG	213	206	185	134	58.3	G1/2“-F	G1/4“-F	M6-F	22.0	52.8	14	14	11	3.6

Type	Dimensions in mm*													
	Dmax (S)***	Ds	d2	d3	d5	d6	dn	G2**	H	H5	H6	L2	LG2	X1/Y1	Z
SGF 150 FM1	156	148	125	93	8.7	13.2	14.5	G1/4“-F	27.7	6	7.8	36.5	20	38.2	3.3
SGF-HS 150 FM1	165	149	126	70	8.7	13.2	14.5	G1/4“-F	31.9	6	7.8	26.5	20	38.2	7.5
SGF 200 FM1	213	206	185	134	8.7	13.2	14.5	G1/4”-F	28.0	6	7.8	52.8	20	38.2	3.6

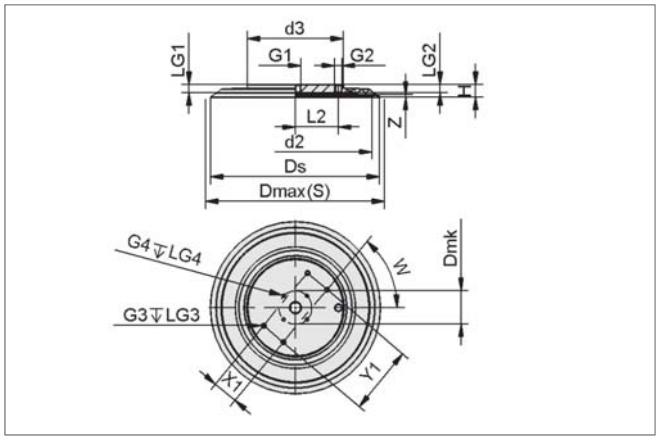
* Acceptable dimensional tolerances for rubber parts concerning to DIN ISO 3302-1 M3
** A replaceable plug is mounted to the connection in the factory
*** Dmax(S) is the external dimension of the suction pad when it is pressed against the workpiece by the vacuum

Suction Cups for Handling Glass

Suction Plates SGF

Suction area (Ø) from 125 mm to 400 mm

Design Data Suction Plates SGF

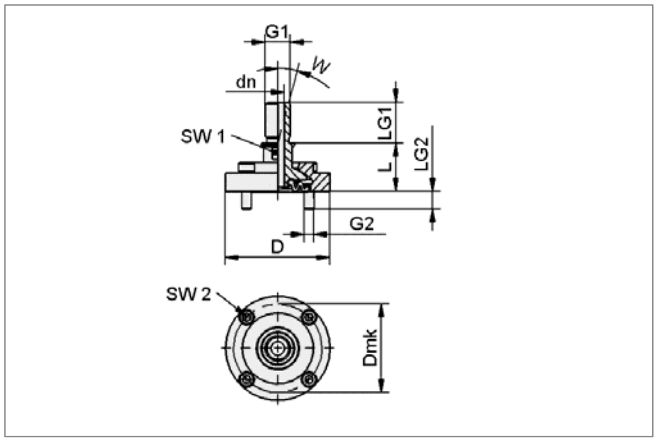


SGF 250 to 400

Type	Dimensions in mm*																	
	Dmax (S)***	Ds	d2	d3	Dmk	G1	G2**	G3	G4	H	L2	LG1	LG2	LG3	LG4	W [°]	X1	Y1	Z
SGF-HS 250	260	248	217.0	140	58.3	G1/2“-F	G1/4“-F	M8-F	M6-F	26.8	52.5	14.5	14.5	12.0	11	70	45	100	9.0
SGF-HS 300	309	305	272.3	170	58.3	G1/2“-F	G1/4“-F	M8-F	M6-F	22.3	76.0	14.5	14.5	12.0	11	50	45	120	9.0
SGF-HS 350	360	348	317.0	170	58.3	G1/2“-F	G1/4“-F	M8-F	M6-F	26.8	76.0	14.5	14.5	12.0	11	50	45	120	9.0
SGF 400	405	398	372.3	170	58.3	G1/2“-F	G1/4“-F	M8-F	M6-F	22.3	76.0	14.5	14.5	12.0	11	50	45	120	4.5

* Acceptable dimensional tolerances for rubber parts concerning to DIN ISO 3302-1 M3
** A replaceable plug is mounted to the connection in the factory
*** Dmax(S) is the external dimension of the suction pad when it is pressed against the workpiece by the vacuum

Design Data Accessories Suction Plates SGF



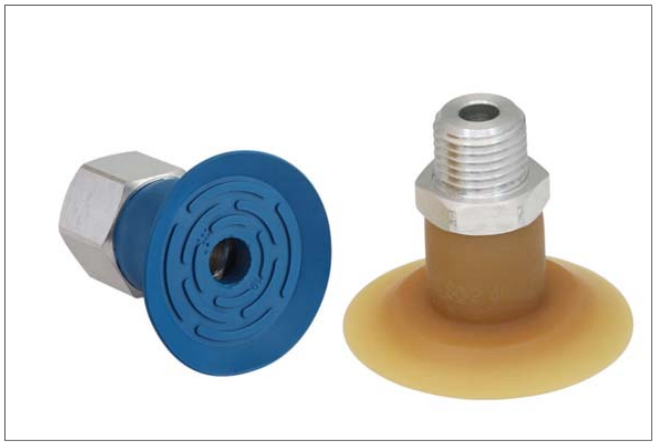
FLK-HD

Type	Dimensions in mm*									
	L	G1	G2	LG1	LG2	SW1	SW2	D	Dmk	dn	W[°]
FLK-HD G3/8-AG	31.6	G3/8”-M	M6-M	27	10.5	17	5	69	58.3	9	7.5
FLK-HD G1/4-IG	31.6	G1/4”-F	M6-M	12	10.5	17	5	69	58.3	9	7.5
FLK-HD G1/2-IG	41.6	G1/2”-F	M6-M	14	10.5	24	5	69	58.3	9	7.5

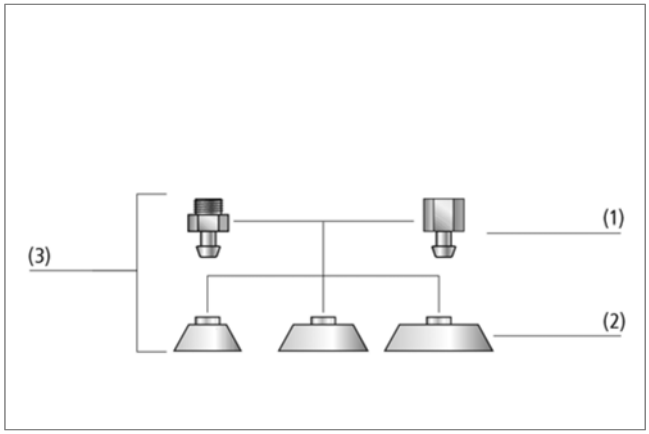
Suction Cups for Handling Glass

Flat Suction Cups SGPN

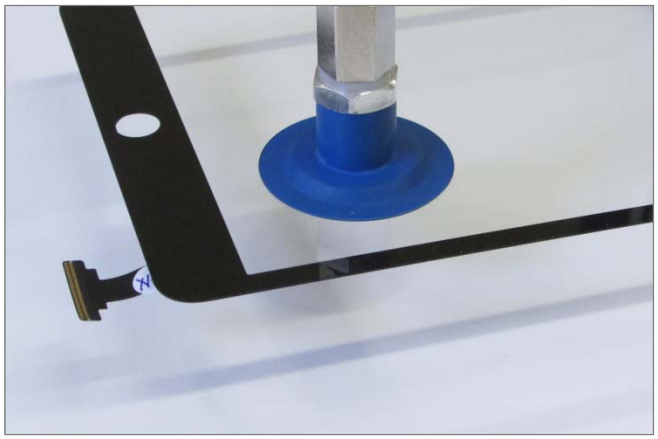
Suction area (Ø) from 15 mm to 40 mm



Flat suction cups SGPN



System design flat suction cups SGPN



Flat suction cups SGPN HT1 being used in the display glass assembly

Suitability for Process-Specific Applications

Applications

- Handling of glass workpieces that are fragile and very thin such as thin glass or display glass
- Used in the different handling processes in the preprocessing of display glass as well as in the assembly processes of displays
- Handling of foils in the production process of laminated glass – layup of the PVB foil
- Used in stacking or destacking processes of glass for the handling of slip sheets/intermediate layers, e.g. paper (material NK)

Design

- Flat suction cup SGPN (3) with very thin and flexible sealing lip
- Inner structure of the suction cup with defined support points of the workpiece for minimum surface pressure
- Replaceable spare part suction cup due to plug-in connection between suction cup SGP (2) and nipple (1)
- Suction cups are available in different materials – the most suitable material for glass handling the non-marking material HT1 (blue) or very soft natural rubber NK (light brown) for the use on foils or paper

Our Highlights...	Your Benefits...
• Very soft and adaptable sealing lip	> Gentle handling and low surface pressure during gripping
• Inner structure of the suction area with support rips	> No deformation or damaging of thin glass or foil/paper by avoiding the “pull-in-effect” into the suction cup
• Special material HT1	> Suction cup does not leave any visible marks on glass; even at high temperatures (up to 170°C)
• Soft natural rubber material NK	> Safe handling of paper and foils without deformation

Suction Cups for Handling Glass

Flat Suction Cups SGPN

Suction area (Ø) from 15 mm to 40 mm

Designation Code Flat Suction Cups SGPN

Abbreviated designation	Suction area Ø in mm	Material and Shore hardness	Connection thread
Example SGPN 15 HT1-60 M5-AG:			
SGPN	**15**	**HT1-60**	**M5-AG**
SGPN	15 to 40	HT1-60 NK-40	M5-AG (AG = male (M)) G1/8-AG G1/8-IG (IG = female (F))

Ordering Data Flat Suction Cups SGPN

Flat suction cup SGPN (elastomer part + connection nipple) is delivered unassembled. The delivery consists of:

- Suction cup of type SGP – elastomer part, available in various diameters and materials
- Connection nipple of type SA-NIP – available with various threads

Available spare parts: suction cup SGP, connection nipple SA-NIP

Flat Suction Cups SGPN

Type*	Non-marking 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 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 Catalog “Vacuum Components“ on page 216 or on www.schmalz.com/**sgpn**
Additional material specifications at the beginning of the section “Vacuum Suction Cads”

Ordering Data Spare Parts Flat Suction Cups SGP and Connection Nipples

Type	Non-marking 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 40	10.01.01.12812	10.01.01.00789

Suction Cups for Handling Glass

Flat Suction Cups SGPN

Suction area (Ø) from 15 mm to 40 mm

Ordering Data Spare Parts Flat Suction Cups SGP and Connection Nipples

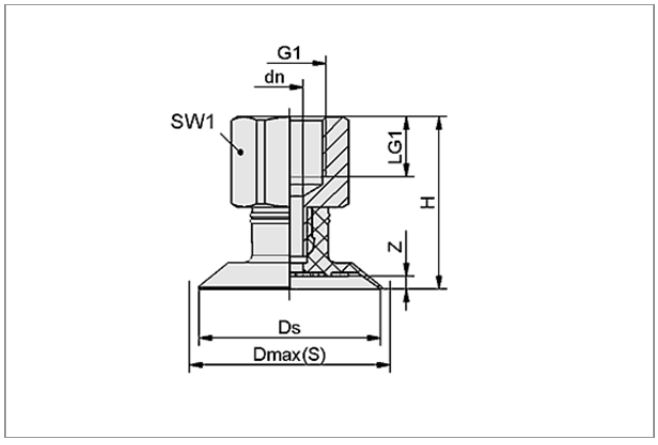
For Type*	Connection nipple	
SGPN 15 M5-AG	SA-NIP N016 M5-AG DN250	10.01.06.00123
SGPN 15 G1/8-AG	SA-NIP N016 G1/8-AG DN350	10.01.06.05735
SGPN 15 G1/8-IG	SA-NIP N016 G1/8-IG DN350	10.01.06.05731
SGPN 20 M5-AG	SA-NIP N016 M5-AG DN250	10.01.06.00123
SGPN 20 G1/8-AG	SA-NIP N016 G1/8-AG DN350	10.01.06.05735
SGPN 20 G1/8-IG	SA-NIP N016 G1/8-IG DN350	10.01.06.05731
SGPN 24 M5-AG	SA-NIP N016 M5-AG DN250	10.01.06.00123
SGPN 24 G1/8-AG	SA-NIP N016 G1/8-AG DN350	10.01.06.05735
SGPN 24 G1/8-IG	SA-NIP N016 G1/8-IG DN350	10.01.06.05731
SGPN 30 G1/4-AG	SA-NIP N033 G1/8-AG DN550	10.01.01.00818
SGPN 30 G1/4-IG	SA-NIP N033 G1/8-IG DN550	10.01.01.00817
SGPN 34 G1/4-AG	SA-NIP N033 G1/8-AG DN550	10.01.01.00818
SGPN 34 G1/4-IG	SA-NIP N033 G1/8-IG DN550	10.01.01.00817
SGPN 40 G1/8-AG	SA-NIP N035 G1/8-AG DN500	10.01.01.11738
SGPN 40 G1/4-AG	SA-NIP N035 G1/4-AG DN550	10.01.01.00822
SGPN 40 G1/4-IG	SA-NIP N035 G1/4-IG DN550	10.01.01.00821

Technical Data Flat Suction Cups SGPN

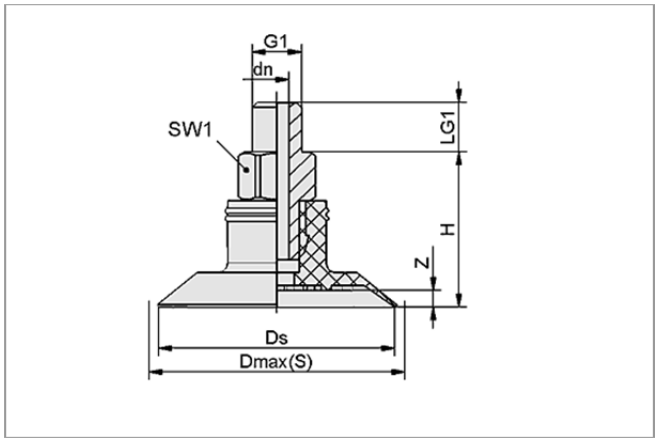
Type	Suction force [N]*	Volume [cm³]	Recom. internal hose-Ø d [mm] **	Nipple family
SGPN 15	5.5	0.12	2	N 016
SGPN 20	8.5	0.31	3	N 016
SGPN 24	11.0	0.70	4	N 016
SGPN 30	19.0	1.50	4	N 033
SGPN 34	25.0	2.10	4	N 033
SGPN 40	33.0	2.90	4	N 035

* 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 Cups SGPN



SGPN 15 to 40 IG (female)



SGPN 15 to 40 AG (male)

Suction Cups for Handling Glass

Flat Suction Cups SGPN

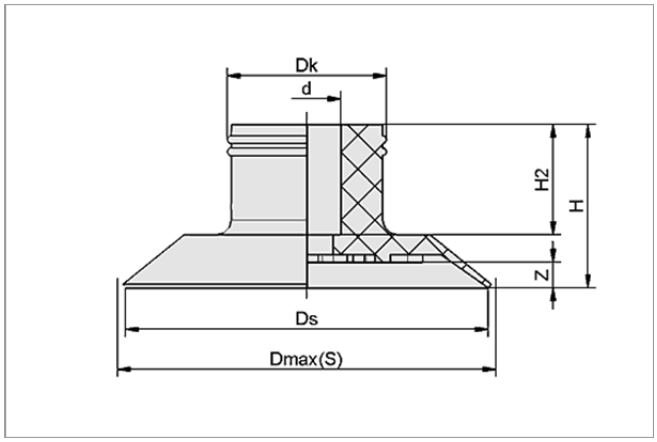
Suction area (Ø) from 15 mm to 40 mm

Design Data Flat Suction Cups SGPN

Type	Dimensions in mm*							
	dn	Dmax(S)**	Ds	G1	H	LG1	SW1	Z (Stroke)
SGPN 15 M5-AG	2.5	15.5	14.5	M5-M	15.0	5.0	7	0.9
SGPN 15 G1/8-AG	3.5	15.5	14.5	G1/8"-M	16.0	7.5	14	0.9
SGPN 15 G1/8-IG	3.5	15.5	14.5	G1/8"-F	22.0	8.0	14	0.9
SGPN 20 M5-AG	2.5	22.0	20.9	M5-M	15.4	5.0	7	1.5
SGPN 20 G1/8-AG	3.5	22.0	20.9	G1/8"-M	16.4	7.5	14	1.5
SGPN 20 G1/8-IG	3.5	22.0	20.9	G1/8"-F	22.4	8.0	14	1.5
SGPN 24 M5-AG	2.5	25.5	24.0	M5-M	15.8	5.0	7	1.7
SGPN 24 G1/8-AG	3.5	25.5	24.0	G1/8"-M	16.8	7.5	14	1.7
SGPN 24 G1/8-IG	3.5	25.5	24.0	G1/8"-F	22.8	8.0	14	1.7
SGPN 30 G1/4-AG	5.5	32.0	30.0	G1/4"-M	27.2	10.0	17	2.0
SGPN 30 G1/4-IG	5.5	32.0	30.0	G1/4"-F	37.2	12.0	17	2.0
SGPN 34 G1/4-AG	5.5	37.5	34.5	G1/4"-M	28.0	10.0	17	1.4
SGPN 34 G1/4-IG	5.5	37.5	34.5	G1/4"-F	38.0	12.0	17	1.4
SGPN 40 G1/8-AG	5.0	42.0	40.0	G1/8"-M	25.6	9.0	17	2.3
SGPN 40 G1/4-AG	5.0	42.0	40.0	G1/4"-M	25.6	10.0	17	2.3
SGPN 40 G1/4-IG	5.0	42.0	40.0	G1/4"-F	35.6	12.0	17	2.3

* Acceptable dimensional tolerances for rubber parts concerning to DIN ISO 3302-1 M3
** Dmax(S) is the external dimension of the suction pad when it is pressed against the workpiece by the vacuum

Design Data Spare Parts Flat Suction Cups SGP



SGP 15 to 40

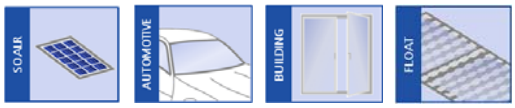
Type	Dimensions in mm*						
	d	Dk	Dmax(S)**	Ds	H	H2	Z (Stroke)
SGP 15	4.5	9.0	15.5	14.5	10.0	7.2	0.9
SGP 20	4.5	10.5	22.0	20.9	10.4	7.1	1.5
SGP 24	4.5	10.5	25.5	24.0	10.8	7.3	1.7
SGP 30	11.2	15.6	32.0	30.0	22.2	15.7	2.0
SGP 34	11.2	14.8	37.5	34.5	23.0	16.8	1.4
SGP 40	8.0	16.0	42.0	40.0	20.6	14.5	2.3

* Acceptable dimensional tolerances for rubber parts concerning to DIN ISO 3302-1 M3
** Dmax(S) is the external dimension of the suction pad when it is pressed against the workpiece by the vacuum

Suction Cups for Handling Glass

Bellows Suction Cups FSGPL (1.5 Folds)

Suction area (Ø) from 100 mm to 250 mm

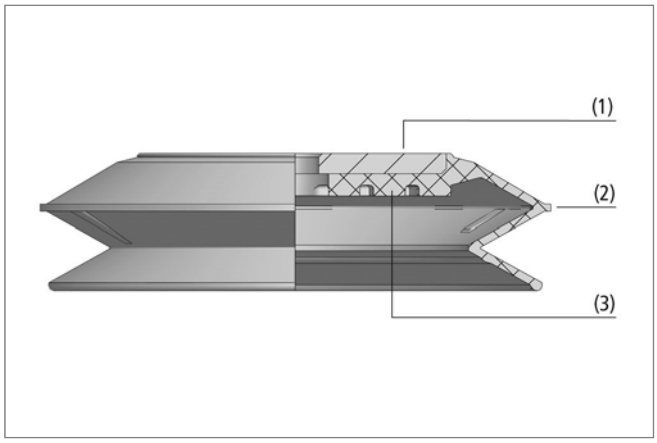


Suitability for Process-Specific Applications

Bellows suction cups FSGPL HT1 (1.5 Folds)

Applications

- Handling of flat and curved glass in the different steps of the production process
- Use in gantry systems to compensate the positioning tolerance of the glass plates
- Gentle handling of glass in stacker systems due to very soft bellows, e.g. overhead stacker
- Handling of bended glass with the adaptation of the sealing lip to the radius of the workpiece
- Non-marking material HT1 for the handling of glass even at temperatures of 170°C



System design bellows suction cups FSGPL (1.5 Folds)

Design

- Bellows suction cup FSGPL with 1.5 folds (2) and very flexible and adaptable sealing lip
- Steel support plate (1) with female thread vulcanized to the suction cup for high forces, especially horizontal forces. Optionally available without thread
- Contact surface covered with elastomer (3)
- Non-marking material HT1 with 60°ShA (blue) with temperature resistance up to 170°C
- Standard material Perbunan NBR with 55°ShA (grey)

Bellows suction cups FSGPL NBR (1.5 Folds)

Our Highlights…	Your Benefits…
• Large effective suction area and vulcanized support plate	> High vertical and horizontal forces on glass
• Flexible sealing lip and bellows in combination with defined suction surface	> Low surface pressure of the sealing lip on the glass and distribution of the pressure over the entire suction area
• High stroke with low movement of sealing lip on the glass	> Flexibility and gentle handling to reduce the risk of scratches on the glass surface
• Special material HT1	> Non-marking handling, even at higher temperatures

Suction Cups for Handling Glass

Bellows Suction Cups FSGPL (1.5 Folds)

Suction area (Ø) from 100 mm to 250 mm

Designation Code Bellows Suction Cups FSGPL (1.5 Folds)

Abbreviated designation	Suction area Ø in mm	Material and Shore hardness	Connection thread
Example FSGPL 200 HT1-60 G1/2-IG:			
FSGPL	**200**	**HT1-60**	**G1/2-IG**
FSGPL	100 to 250	HT1-60 NBR-55	G1/2-IG (IG = female (F))

Ordering Data Bellows Suction Cups FSGPL

Suction cup FSGPL, available in various diameters and materials is delivered with support plate vulcanized to elastomer part.

Bellows Suction Cups FSGPL

Type*	Non-marking material HT1 60±5ShA	Perbunan NBR 55±5ShA
FSGPL 100 G1/2-IG	10.01.06.03150	10.01.06.02932
FSGPL 120 G1/2-IG	10.01.06.03151	10.01.06.02933
FSGPL 150 G1/2-IG	10.01.06.03145	10.01.06.00101
FSGPL 200 G1/2-IG	10.01.06.03146	10.01.06.00102
FSGPL 250 G1/2-IG	10.01.06.03421	10.01.06.00103

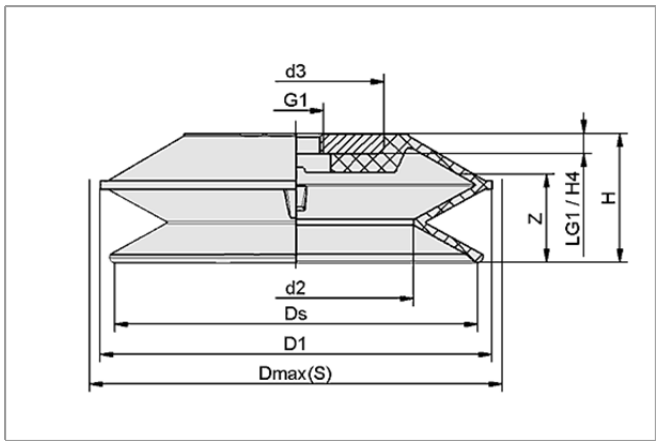
*Additional material specifications at the beginning of the section “Vacuum Suction Cups”

Technical Data Bellows Suction Cups FSGPL

Type	Suction force [N]*	Pull-off force [N]	Volume [cm³]	Min. curve radius [mm] (convex)	Recom. internal hose-Ø d [mm] **
FSGPL 100 G1/2-IG	150	250	150	100	12
FSGPL 120 G1/2-IG	280	400	300	150	12
FSGPL 150 G1/2-IG	370	600	490	250	12
FSGPL 200 G1/2-IG	850	950	790	350	12
FSGPL 250 G1/2-IG	1610	2000	1590	500	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
** The recommended hose diameter refers to a hose length of approx. 2 m

Design Data Bellows Suction Cups FSGPL



FSGPL 100 to 250

Type	Dimensions in mm*				
	d2	d3	D1	Dmax (S)***	Ds
FSGPL 100	57.2	44.0	101	106.5	96.1
FSGPL 120	79.3	69.4	128	135.0	118.2
FSGPL 150	93.0	69.4	155	160.0	143.5
FSGPL 200	137.0	119.4	202	208.0	191.0
FSGPL 250	186.0	167.0	250	256.0	239.3

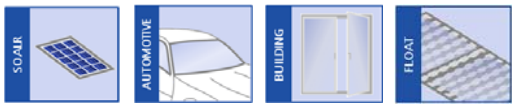
Type	Dimensions in mm*				
	G1**	H	H4	LG1	Z (Stroke)
FSGPL 100	G1/2"-F	43.3	8	8	29.1
FSGPL 120	G1/2"-F	51.0	8	8	35.7
FSGPL 150	G1/2"-F	51.0	8	8	35.7
FSGPL 200	G1/2"-F	54.0	8	8	37.2
FSGPL 250	G1/2"-F	60.0	8	8	43.0

* Acceptable dimensional tolerances for rubber parts concerning to DIN ISO 3302-1 M3
** Mounting plate optionally available without thread connection
***Dmax (S) is the external dimension of the suction Cup when it is pressed against the workpiece by the vacuum

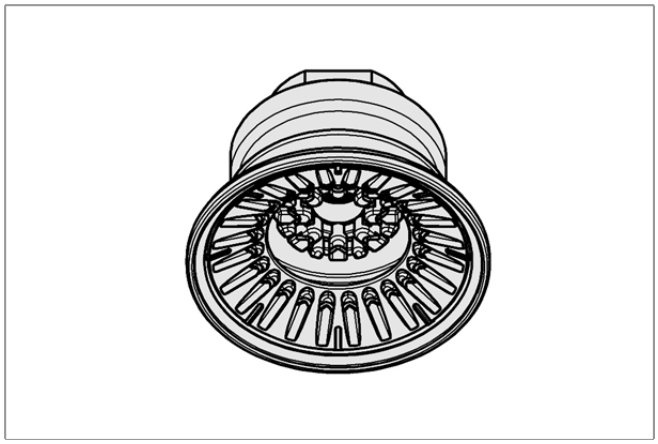
Suction Cups for Handling Glass

Bellows Suction Cups SAB / SAOB HT1 (1.5 Folds)

Suction area (Ø) from 22 mm to 125 mm / Suction area (LxW) from 60 x 30 to 140 x 70 mm



Bellows suction cups SAB / SAOB HT1 (1.5 Folds)



System design bellows suction cups SAB HT1 (1.5 Folds)

Bellows suction cups SAB HT1 for glass handling with wet surface

Suitability for Process-Specific Applications

Applications

- High performance suction cups for the automated handling of glass for maximum forces on separation powder and wet glass surfaces
- Especially used where the flexibility of the bellows suction cup in combination with a high intrinsic stability is required, such as glass grinding in the automotive glass production or the framing of solar modules
- Non-marking material HT1 for the handling of glass along the entire production process of automotive glass – even handling at temperatures of 170°C after the bending or tempering

Design

- Robust and wear-resistant bellows suction cup with 1.5 folds
- Special structure on the suction surface with high performance profile
- Non-marking material HT1 with 60°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 mm to 125 mm and dimensions 60 x 30 to 140 x 70 mm and different connection options

Our Highlights…	Your Benefits…
• Special profile on the suction surface	> High lateral forces on all glass surfaces – even on separation powder
• Flexible sealing lip and bellows	> Low surface pressure of the sealing lip on the glass and distribution of the pressure over the entire suction area
• Very stiff top fold and metal inlay in combination and defined suction surface	> High accelerations with maximum positioning accuracy
• Special design of the bellows for a high wear-resistance to glass dust	> High lifetime in glass grinding processes – up to 3 times higher
• Special material HT1	> Non-marking handling, even at higher temperatures
• Low internal volume in combination with high stroke	> Fast and gentle gripping with low evacuation times

Suction Cups for Handling Glass

Bellows Suction Cups SAB / SAOB HT1 (1.5 Folds)

Suction area (Ø) from 22 mm to 125 mm / Suction area (LxW) from 60 x 30 to 140 x 70 mm

Designation Code Bellows Suction Cups SAB / SAOB HT1 (1.5 Folds)

Abbreviated designation	Suction area Ø / LxW in mm	Material and Shore hardness	Connection thread
Example SAB 80 HT1-60 G3/8-IG			
SAB	**80**	**HT1-60**	**G3/8-IG**
SAB Round 1.5 Folds	22 to 125	HT1-60 non-marking material HT1	G1/4-IG (IG = female (F))
SAOB Oval 1.5 Folds	60x30 to 140x70		G1/4-AG (AG = male (M))
			G3/8-IG; G3/8-AG; G1/2-IG; G1/8-IG

Ordering Data Bellows Suction Cups SAB / SAOB HT1 (1.5 Folds)

Suction cup SAB / SAOB, available in different diameters and dimensions, is delivered with connection nipple vulcanized to elastomer part.

Bellows Suction Cups SAB HT1 (Round / 1.5 Folds)

Type*	Connection					
	G1/4"-F	G1/4"-M	G3/8"-F	G3/8"-M	G1/8"-F	G1/2"-F
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	10.01.06.03570	10.01.06.03632
SAB 100 HT1-60	10.01.06.02961	10.01.06.02927	10.01.06.02728	10.01.06.03063	-	10.01.06.03679
SAB 125 HT1-60	10.01.06.03064	10.01.06.03065	10.01.06.02729	10.01.06.03066	-	10.01.06.03680

* Additional materials and mounting options can be found in our Catalog „Vacuum Components“ on page 152 or on www.schmalz.com/sab
Additional material specifications at the beginning of the section “Vacuum Suction Cups”

Oval Bellows Suction Cups SAOB HT1 (Oval / 1.5 Folds)

Type*	Connection			
	G1/4"-F	G1/4"-M	G3/8"-F	G3/8"-M
SAOB 60x30 HT1-60	10.01.06.03175	10.01.06.03156	10.01.06.03202	10.01.06.03201
SAOB 80x40 HT1-60	10.01.06.03176	10.01.06.03203	10.01.06.03205	10.01.06.03204
SAOB 110x55 HT1-60	10.01.06.03178	10.01.06.03206	10.01.06.03208	10.01.06.03207
SAOB 140x70 HT1-60	10.01.06.03177	10.01.06.03209	10.01.06.03211	10.01.06.03210

*Additional materials and mounting options can be found in our Catalog „Vacuum Components“ on page 160 or on www.schmalz.com/saob
Additional material specifications at the beginning of the section “Vacuum Suction Cups”

Technical Data Bellows Suction Cups SAB HT1 (Round / 1.5 Folds)

Type	Suction force [N]*	Pull-off force [N]	Volume [cm³]	Min. curve radius [mm] (convex)	Recom. internal 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

Suction Cups for Handling Glass

Bellows Suction Cups SAB / SAOB HT1 (1.5 Folds)

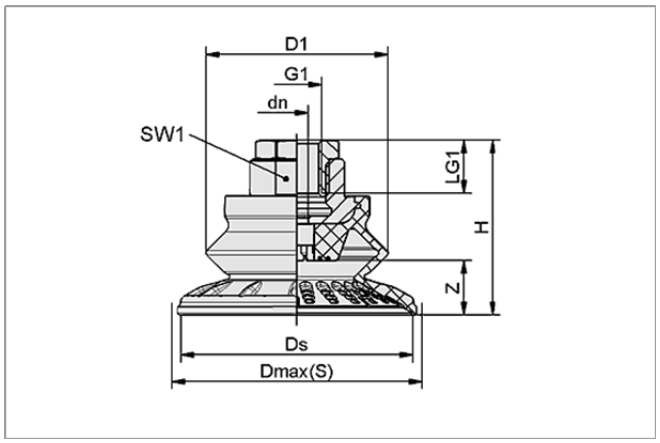
Suction area (Ø) from 22 mm to 125 mm / Suction area (LxW) from 60 x 30 to 140 x 70 mm

Technical Data Oval Bellows Suction Cups SAOB HT1 (Oval / 1.5 Folds)

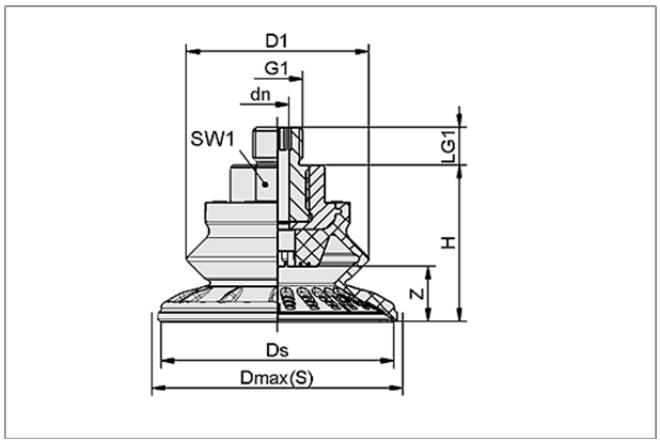
Type	Suction force [N]*	Pull-off force [N]	Volume [cm³]	Min. curve radius [mm] (convex)	Recom. internal hose-Ø d [mm] **
SAOB 60x30 HT1-60	38	55	10.5	30	4
SAOB 80x40 HT1-60	65	100	21.8	40	6
SAOB 110x55 HT1-60	110	185	53.1	50	6
SAOB 140x70 HT1-60	165	258	106.0	70	6

* 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 Cups SAB HT1 (Round / 1.5 Folds)



SAB 22 to 125 IG (female)



SAB 22 to 125 AG (male)

Suction Cups for Handling Glass

Bellows Suction Cups SAB / SAOB HT1 (1.5 Folds)

Suction area (Ø) from 22 mm to 125 mm / Suction area (LxW) from 60 x 30 to 140 x 70 mm

Design Data Bellows Suction Cups SAB HT1 (1.5 Folds)

Type	Dimensions in mm*								
	D1	dn	Ds	Dmax(S)**	G1	H	LG1	SW1	Z (Stroke)
SAB 22 HT1-60 G1/4-IG	22	3.5	21	24	G1/4"-F	25.0	12.0	16	5.8
SAB 22 HT1-60 G1/4-AG	22	3.5	21	24	G1/4"-M	25.0	10.0	16	5.8
SAB 22 HT1-60 G3/8-IG	22	3.5	21	24	G3/8"-F	41.0	9.5	22	5.8
SAB 22 HT1-60 G3/8-AG	22	3.5	21	24	G3/8“-M	25.0	10.0	16	5.8
SAB 30 HT1-60 G1/4-IG	32	4.0	31	34	G1/4"-F	28.0	12.0	17	9.0
SAB 30 HT1-60 G1/4-AG	32	4.0	31	34	G1/4"-M	28.0	10.0	17	9.0
SAB 30 HT1-60 G3/8-IG	32	4.0	31	34	G3/8"-F	44.0	9.5	22	9.0
SAB 30 HT1-60 G3/8-AG	32	4.0	31	34	G3/8“-M	28.0	10.0	17	9.0
SAB 40 HT1-60 G1/4-IG	32	4.0	40	45	G1/4"-F	28.8	12.0	17	10.0
SAB 40 HT1-60 G1/4-AG	32	4.0	40	45	G1/4"-M	28.8	10.0	17	10.0
SAB 40 HT1-60 G3/8-IG	32	4.0	40	45	G3/8"-F	44.8	9.5	22	10.0
SAB 40 HT1-60 G3/8-AG	32	4.0	40	45	G3/8“-M	28.8	10.0	17	10.0
SAB 50 HT1-60 G1/4-IG	40	6.0	50	56	G1/4"-F	42.0	20.0	22	11.5
SAB 50 HT1-60 G1/4-AG	40	6.0	50	56	G1/4"-M	36.9	10.0	22	11.5
SAB 50 HT1-60 G3/8-IG	40	6.0	50	56	G3/8"-F	36.9	15.0	22	11.5
SAB 50 HT1-60 G3/8-AG	40	6.0	50	56	G3/8“-M	36.9	10.0	22	11.5
SAB 60 HT1-60 G1/4-IG	48	6.0	61	67	G1/4"-F	46.3	20.0	22	14.5
SAB 60 HT1-60 G1/4-AG	48	6.0	61	67	G1/4"-M	41.3	10.0	22	14.5
SAB 60 HT1-60 G3/8-IG	48	6.0	61	67	G3/8"-F	41.3	15.0	22	14.5
SAB 60 HT1-60 G3/8-AG	48	6.0	61	67	G3/8“-M	41.3	10.0	22	14.5
SAB 80 HT1-60 G1/4-IG	64	6.0	81	89	G1/4"-F	54.9	20.0	22	22.1
SAB 80 HT1-60 G1/4-AG	64	6.0	81	89	G1/4"-M	49.9	10.0	22	22.1
SAB 80 HT1-60 G3/8-IG	64	6.0	81	89	G3/8"-F	49.9	15.0	22	22.1
SAB 80 HT1-60 G3/8-AG	64	6.0	81	89	G3/8“-M	49.9	10.0	22	22.1
SAB 80 HT1-60 G1/8-IG	64	6.0	81	89	G1/8“-F	49.9	11.0	22	22.1
SAB 80 HT1-60 G1/2-IG	64	6.0	81	89	G1/2“-F	49.9	15.0	24	22.1
SAB 100 HT1-60 G1/4-IG	77	6.0	101	110	G1/4"-F	61.8	20.0	22	25.8
SAB 100 HT1-60 G1/4-AG	77	6.0	101	110	G1/4"-M	56.6	10.0	22	25.8
SAB 100 HT1-60 G3/8-IG	77	6.0	101	110	G3/8"-F	56.6	15.0	22	25.8
SAB 100 HT1-60 G3/8-AG	77	6.0	101	110	G3/8“-M	56.6	10.0	22	25.8
SAB 100 HT1-60 G1/2-IG	77	6.0	101	110	G1/2“-F	56.6	15.0	24	25.8
SAB 125 HT1-60 G1/4-IG	94	6.0	126	135	G1/4"-F	72.8	20.0	22	32.0
SAB 125 HT1-60 G1/4-AG	94	6.0	126	135	G1/4"-M	67.8	10.0	22	32.0
SAB 125 HT1-60 G3/8-IG	94	9.0	126	135	G3/8"-F	67.8	15.0	22	32.0
SAB 125 HT1-60 G3/8-AG	94	6.0	126	135	G3/8“-M	67.8	10.0	22	32.0
SAB 125 HT1-60 G1/2-IG	94	9.0	126	135	G1/2“-F	67.8	15.0	24	32.0

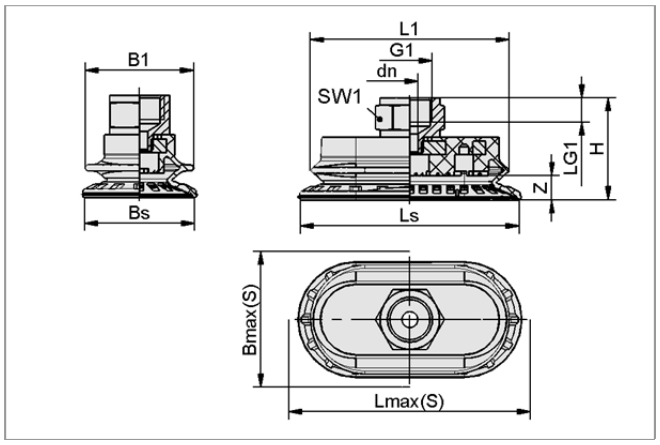
* Acceptable dimensional tolerances for rubber parts concerning to DIN ISO 3302-1 M3
** Dmax(S) is the external dimension of the suction cup when it is pressed against the workpiece by the vacuum

Suction Cups for Handling Glass

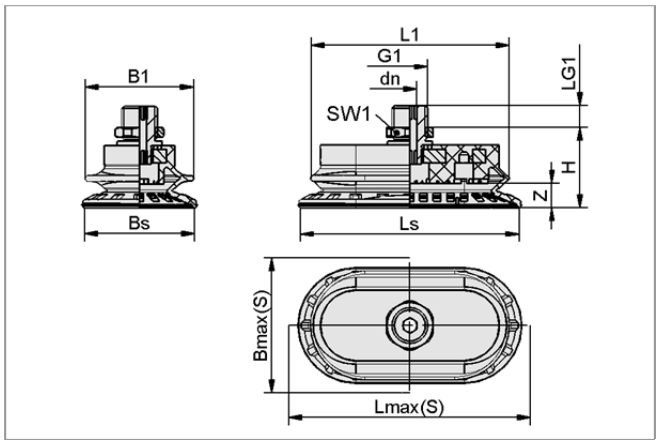
Bellows Suction Cups SAB / SAOB HT1 (1.5 Folds)

Suction area (Ø) from 22 mm to 125 mm / Suction area (LxW) from 60 x 30 to 140 x 70 mm

Design Data Oval Bellows Suction Cups SAOB HT1 (Oval / 1.5 Folds)



SAOB 60x30 to 140x70 IG (female)



SAOB 60x30 to 140x70 AG (male)

Type	Dimensions in mm*											
	B1	Bmax(S)**	Bs	dn	G1	H	L1	LG1	Lmax(S)**	Ls	SW1	Z (Stroke)
SAOB 60x30 HT1-60 G1/4-IG	31	33	30.6	6	G1/4"-F	34.5	55.7	8.0	63	60.6	17	7.0
SAOB 60x30 HT1-60 G1/4-AG	31	33	30.6	5	G1/4"-M	27.0	55.7	8.0	63	60.6	17	7.0
SAOB 60x30 HT1-60 G3/8-IG	31	33	30.6	6	G3/8"-F	35.0	55.7	9.0	63	60.6	22	7.0
SAOB 60x30 HT1-60 G3/8-AG	31	33	30.6	5	G3/8-M	27.5	55.7	7.5	63	60.6	19	7.0
SAOB 80x40 HT1-60 G1/4-IG	40	43	40.6	6	G1/4"-F	37.2	73.3	8.0	83	80.6	17	9.0
SAOB 80x40 HT1-60 G1/4-AG	40	43	40.6	5	G1/4"-M	29.7	73.3	8.0	83	80.6	17	9.0
SAOB 80x40 HT1-60 G3/8-IG	40	43	40.6	6	G3/8"-F	37.7	73.3	9.0	83	80.6	22	9.0
SAOB 80x40 HT1-60 G3/8-AG	40	43	40.6	5	G3/8-M	27.7	73.3	9.0	83	80.6	19	9.0
SAOB 110x55 HT1-60 G1/4-IG	53	59	55.1	8	G1/4"-F	43.0	98.8	8.0	114	110.1	17	12.0
SAOB 110x55 HT1-60 G1/4-AG	53	59	55.1	6	G1/4"-M	35.5	98.8	8.0	114	110.1	17	12.0
SAOB 110x55 HT1-60 G3/8-IG	53	59	55.1	8	G3/8"-F	43.5	98.8	9.0	114	110.1	22	12.0
SAOB 110x55 HT1-60 G3/8-AG	53	59	55.1	6	G3/8-M	33.5	98.8	9.0	114	110.1	19	12.0
SAOB 140x70 HT1-60 G1/4-IG	67	75	70.1	8	G1/4"-F	47.0	126.0	8.0	146	141.1	17	16.5
SAOB 140x70 HT1-60 G1/4-AG	67	75	70.1	6	G1/4"-M	39.5	126.0	8.0	146	141.1	17	16.5
SAOB 140x70 HT1-60 G3/8-IG	67	75	70.1	8	G3/8"-F	47.5	126.0	9.0	146	141.1	22	16.5
SAOB 140x70 HT1-60 G3/8-AG	67	75	70.1	6	G3/8-M	37.5	126.0	9.0	146	141.1	19	16.5

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

** Bmax(S) / Lmax(S) are the external dimension of the suction cup when it is pressed against the workpiece by the vacuum

Suction Cups for Handling Glass

Suction Cups PFYN / FSGA VU1 (Flat / 1.5 Folds)

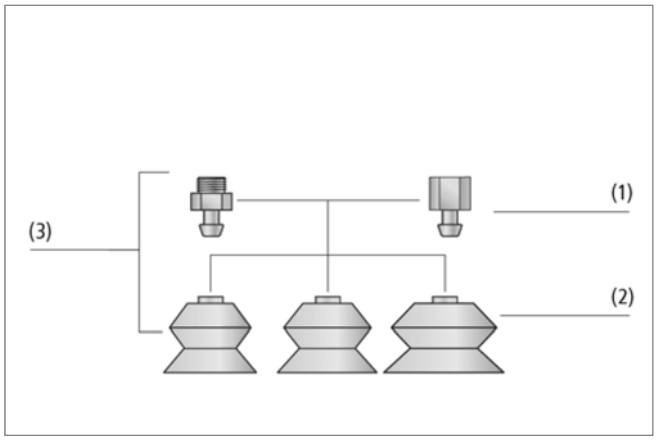
Suction area (Ø) from 15 mm to 110 mm

Suitability for Process-Specific Applications

Suction cups PFYN / FSGA VU1

Applications

- High performance suction cup for the handling of glass in applications with short cycles times
- Applications where different sizes of glass are handled and the suction cups are gripping on the cutting edge
- Handling of glass in destackers with high force on separation powder due to special groove in sealing lip (ON)
- Handling of glass without powder with standard sealing lip



System design PFYN / FSGA VU1 (picture shows FSGA)

Design

- Extremely robust and wear-resistant suction cup made of high durometer material Vulkollan VU1 with high lifetime (flat or with 1.5 folds)
- Suction cups with 1.5 folds available with special groove (ON) for high forces on powder
- Suction cups with special plug-in connection for fast and easy assembly on the nipple and high load resistance

Suction cups FSGA VU1 being used on a destacker

Our Highlights…	Your Benefits…
• Material Vulkollan VU1 with high tear resistance	> Handling of glass with powder and gripping on the glass cutting edge
• Very low wear, about 10-12 mm³ to DIN 53516	> Lifetime up to 20 times higher compared to standard materials like NBR
• Special groove (ON) of the bellows suction cups	> High friction force on glass with separation powder
• High inherent stability	> Very precise handling at high accelerations

Suction Cups for Handling Glass

Suction Cups PFYN / FSGA VU1 (Flat / 1.5 Folds)

Suction area (Ø) from 15 mm to 110 mm

Designation Code Suction Cups PFYN / FSGA VU1 (Flat / 1.5 Folds)

Abbreviated designation	Suction area Ø in mm	Material and Shore hardness	Connection thread	Product addition
Example FSGA 85 VU1-72 G1/4-IG ON				
FSGA	**85**	**VU1-72**	**G1/4-IG**	**ON**
PFYN Round Flat **FSGA Round 1.5 Folds**	15 to 110	VU1-72 low wear material VU1	G1/8-IG (IG = female (F)) G1/8-AG (AG = male (M)) G1/4-IG G1/4-AG G1/2-IG	ON Special groove

Ordering Data Suction Cups PFYN / FSGA VU1 (Flat / 1.5 Folds)

Suction cup PFYN / FSGA VU1 (elastomer part + connection nipple) is delivered assembled. The assembly consists of:
- Suction cup of type PFG / FGA VU 1 – elastomer part, available in various diameters
- Connection nipple of type SA-NIP – available with various threads

Available spare parts: suction cup PFG / FGA VU1, connection nipple SA-NIP

Flat Suction Cups PFYN VU1

Type*	Connection			
	G1/4"-M	G1/4"-F	G1/8“-M	G1/8"-F
PFYN 15 VU1-72	-	-	10.01.01.00556	10.01.01.00557
PFYN 30 VU1-72	-	-	10.01.01.00550	10.01.01.00558
PFYN 50 VU1-72	10.01.01.00521	10.01.01.00547	-	-
PFYN 60 VU1-72	10.01.01.00608	10.01.01.00609	-	-
PFYN 80 VU1-72	10.01.01.00522	10.01.01.00524	-	-
PFYN 95 VU1-72	10.01.01.00523	10.01.01.00525	-	-

*Additional material specifications at the beginning of the section “Vacuum Suction Cups”

Bellows Suction Cups FSGA VU1 (1.5 Folds)

Type*	Connection		
	G1/2"-F	G1/4"-M	G1/4"-F
FSGA 30 VU1-72	-	10.01.06.00197	10.01.06.00169
FSGA 40 VU1-72 ON	-	10.01.06.00306	10.01.06.00299
FSGA 50 VU1-72 ON	-	10.01.06.00307	10.01.06.00300
FSGA 60 VU1-72	-	10.01.06.00242	10.01.06.00240
FSGA 60 VU1-72 ON	-	10.01.06.00198	10.01.06.00172
FSGA 85 VU1-72	-	10.01.06.00243	10.01.06.00241
FSGA 85 VU1-72 ON	-	10.01.06.00199	10.01.06.00170
FSGA 110 VU1-72 ON	10.01.06.00497	-	-

*Additional material specifications at the beginning of the section “Vacuum Suction Cups”

Ordering Data Spare Parts Suction Cups and Connection Nipples

Flat Suction Cups PFG VU1

For Type	Flat suction cup (round)	
PFYN 15 VU1-72	PFG 15 VU1-72 N005	10.01.01.00555
PFYN 30 VU1-72	PFG 30 VU1-72 N007	10.01.01.00549
PFYN 50 VU1-72	PFG 50 VU1-72 N011	10.01.01.00424
PFYN 60 VU1-72	PFG 60 VU1-72 N011	10.01.01.00606
PFYN 80 VU1-72	PFG 80 VU1-72 N012	10.01.01.00426
PFYN 95 VU1-72	PFG 95 VU1-72 N012	10.01.01.00430

Suction Cups for Handling Glass

Suction Cups PFYN / FSGA VU1 (Flat / 1.5 Folds)

Suction area (Ø) from 15 mm to 110 mm

Flat Suction Cups PFG VU1

Type	Suction cup connection nipple	
PFYN 15 VU1-72 G1/8-AG	SA-NIP N005 G1/8-AG DN200	10.01.01.03529
PFYN 15 VU1-72 G1/8-IG	SA-NIP N005 G1/8-IG DN200	10.01.01.03521
PFYN 30 VU1-72 G1/8-AG	SA-NIP N007 G1/8-AG DN240	10.01.01.03531
PFYN 30 VU1-72 G1/8-IG	SA-NIP N007 G1/8-IG DN350	10.01.01.03523
PFYN 50 VU1-72 G1/4-AG	SA-NIP N011 G1/4-AG DN350	10.01.01.10663
PFYN 50 VU1-72 G1/4-IG	SA-NIP N011 G1/4-IG DN350	10.01.01.00412
PFYN 60 VU1-72 G1/4-AG	SA-NIP N011 G1/4-AG DN350	10.01.01.10663
PFYN 60 VU1-72 G1/4-IG	SA-NIP N011 G1/4-IG DN350	10.01.01.00412
PFYN 80 VU1-72 G1/4-AG	SA-NIP N012 G1/4-AG DN500	10.01.01.10664
PFYN 80 VU1-72 G1/4-IG	SA-NIP N012 G1/4-IG DN600	10.01.01.00528
PFYN 95 VU1-72 G1/4-AG	SA-NIP N012 G1/4-AG DN500	10.01.01.10664
PFYN 95 VU1-72 G1/4-IG	SA-NIP N012 G1/4-IG DN600	10.01.01.00528

Bellows Suction Cups FGA VU1 (1.5 Folds)

For Type	Bellows suction cup (round)	
FSGA 30 VU1-72	FGA 30 VU1-72 N013	10.01.06.00177
FSGA 40 VU1-72 ON	FGA 40 VU1-72 N011 ON	10.01.06.00301
FSGA 50 VU1-72 ON	FGA 50 VU1-72 N011 ON	10.01.06.00302
FSGA 60 VU1-72	FGA 60 VU1-72 N014	10.01.06.00178
FSGA 60 VU1-72 ON	FGA 60 VU1-72 N014 ON	10.01.06.00207
FSGA 85 VU1-72	FGA 85 VU1-72 N015	10.01.06.00179
FSGA 85 VU1-72 ON	FGA 85 VU1-72 N015 ON	10.01.06.00190
FSGA 110 VU1-72 ON	FGA 110 VU1-72 N037 ON	10.01.06.00492

For Type	Suction cup connection nipple	
FSGA 30 VU1-72 G1/4-AG	SA-NIP N013 G1/4-AG DN350	10.01.06.00183
FSGA 30 VU1-72 G1/4-IG	SA-NIP N013 G1/4-IG DN350	10.01.06.00180
FSGA 40 VU1-72 G1/4-AG	SA-NIP N011 G1/4-AG DN350	10.01.01.10663
FSGA 40 VU1-72 G1/4-IG	SA-NIP N011 G1/4-IG DN350	10.01.01.00412
FSGA 50 VU1-72 G1/4-AG	SA-NIP N011 G1/4-AG DN350	10.01.01.10663
FSGA 50 VU1-72 G1/4-IG	SA-NIP N011 G1/4-IG DN350	10.01.01.00412
FSGA 60 VU1-72 G1/4-AG	SA-NIP N014 G1/4-AG DN600	10.01.06.00184
FSGA 60 VU1-72 G1/4-IG	SA-NIP N014 G1/4-IG DN600	10.01.06.00181
FSGA 85 VU1-72 G1/4-AG	SA-NIP N015 G1/4-AG DN600	10.01.06.00185
FSGA 85 VU1-72 G1/4-IG	SA-NIP N015 G1/4-IG DN600	10.01.06.00182
FSGA 110 VU1-72 G1/2-IG	SA-NIP N037 G1/2-IG	10.01.06.00593

Technical Data Flat Suction Cups PFYN VU1

Type	Suction force [N]*	Volume [cm^3]	Min. curve radius [mm] (convex)	Recom. internal hose diameter d mm]**	Nipple family
PFYN 15 VU1-72	8.5	0.5	13	4	N 005
PFYN 30 VU1-72	32.0	1.7	30	4	N 007
PFYN 50 VU1-72	95.0	6.0	75	6	N 011
PFYN 60 VU1-72	130.0	15.0	75	6	N 011
PFYN 80 VU1-72	260.0	30.0	100	6	N 012
PFYN 95 VU1-72	350.0	42.0	140	6	N 012

* 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

Suction Cups for Handling Glass

Suction Cups PFYN / FSGA VU1 (Flat / 1.5 Folds)

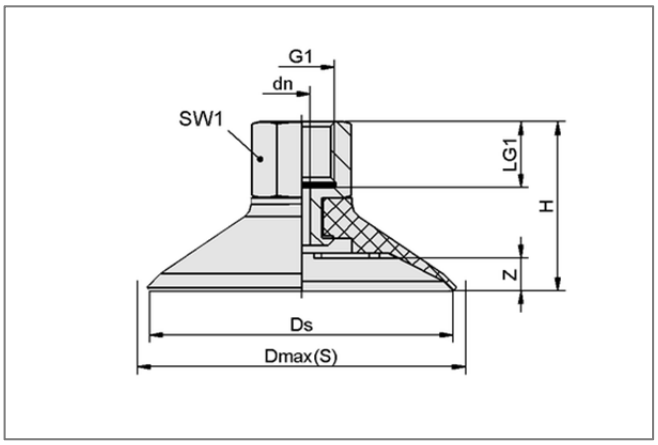
Suction area (Ø) from 15 mm to 110 mm

Technical Data Bellows Suction Cups FSGA VU1 (1.5 Folds)

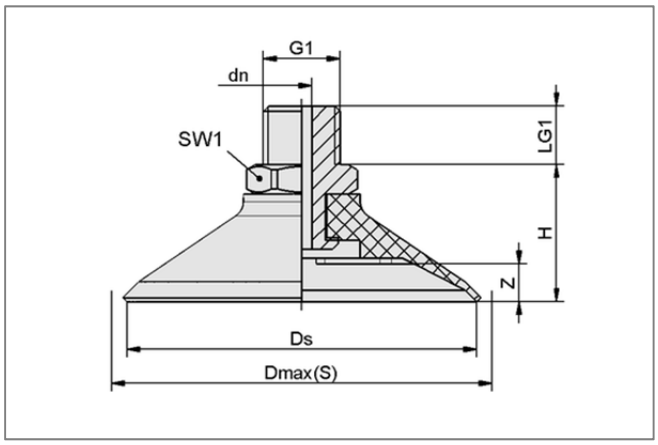
Type	Suction force [N]*	Pull-off force [N]	Volume[cm³]	Min. curve radius [mm] (convex)	Recom. internal hose diameter d [mm]**	Nipple family
FSGA 30 VU1-72	13.5	32	4.2	25	6	N 013
FSGA 40 VU1-72	33.0	56	11.3	30	6	N 011
FSGA 50 VU1-72	52.0	88	22.6	40	6	N 011
FSGA 60 VU1-72	75.0	120	31.0	50	6	N 014
FSGA 85 VU1-72	140.0	250	78.0	80	6	N 015
FSGA 110 VU1-72	295.0	420	350.0	100	9	N 037

* 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 Cups PFYN VU1



PFYN 15 to 95 VU1 IG (female)



PFYN 15 to 95 VU1 AG (male)

Type	Dimensions in mm*							
	dn	Dmax(S)**	Ds	G1	H	LG1	SW1	Z (Stroke)
PFYN 15 VU1-72 G1/8-AG	2.0	17.5	14.5	G1/8"-M	14.5	8	14	1.5
PFYN 15 VU1-72 G1/8-IG	2.0	17.5	14.5	G1/8"-F	25.5	9	14	1.5
PFYN 30 VU1-72 G1/8-AG	2.0	31.5	30.0	G1/8"-M	18.0	8	14	3.0
PFYN 30 VU1-72 G1/8-IG	2.0	31.5	30.0	G1/8"-F	29.0	9	14	3.0
PFYN 50 VU1-72 G1/4-AG	3.5	53.0	50.0	G1/4“-M	22.0	10	17	4.5
PFYN 50 VU1-72 G1/4-IG	3.5	53.0	50.0	G1/4"-F	32.0	12	17	4.5
PFYN 60 VU1-72 G1/4-AG	3.5	67.0	60.0	G1/4"-M	23.5	10	17	6.0
PFYN 60 VU1-72 G1/4-IG	3.5	67.0	60.0	G1/4"-F	33.5	12	17	6.0
PFYN 80 VU1-72 G1/4-AG	6.0	86.0	80.0	G1/4"-M	30.0	10	22	6.0
PFYN 80 VU1-72 G1/4-IG	6.0	86.0	80.0	G1/4"-F	40.0	12	22	6.0
PFYN 95 VU1-72 G1/4-AG	6.0	101.0	95.0	G1/4"-M	30.0	10	22	6.0
PFYN 95 VU1-72 G1/4-IG	6.0	101.0	95.0	G1/4"-F	40.0	12	22	6.0

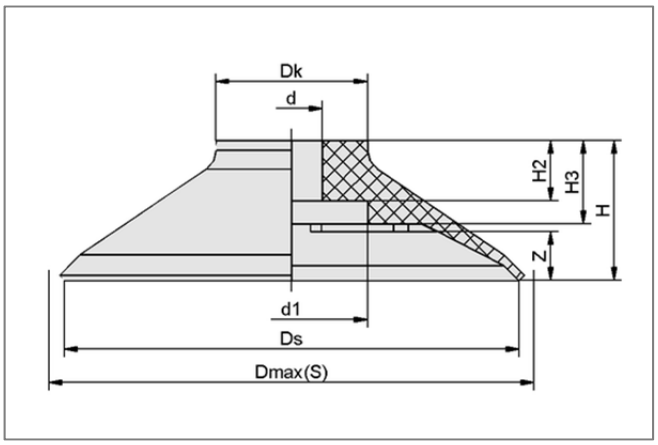
* Acceptable dimensional tolerances for rubber parts concerning to DIN ISO 3302-1 M3
** Dmax(S) is the external dimension of the suction cup when it is pressed against the workpiece by the vacuum

Suction Cups for Handling Glass

Suction Cups PFYN / FSGA VU1 (Flat / 1.5 Folds)

Suction area (Ø) from 15 mm to 110 mm

Design Data Flat Suction Cups PFG VU1 – Spare Parts for PFYN VU1



PFG 15 to 95 VU1

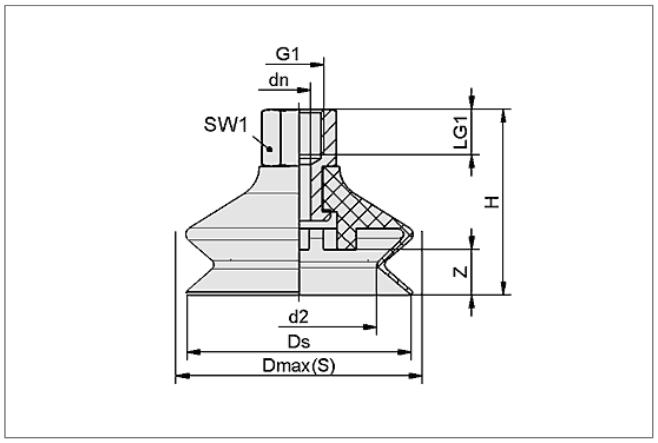
Type	Dimensions in mm*				
	D	d1	Dk	Dmax(S)**	Ds
PFG 15 VU1-72	4.5	8.5	11.5	17.5	14.5
PFG 30 VU1-72	6.0	11.0	16.0	31.5	30.0
PFG 50 VU1-72	8.0	13.0	18.0	53.0	50.0
PFG 60 VU1-72	8.0	20.0	20.0	67.0	60.0
PFG 80 VU1-72	12.0	25.0	25.0	86.0	80.0
PFG 95 VU1-72	12.0	25.0	31.0	101.0	95.0

Type	Dimensions in mm*			
	H	H2	H3	Z (Stroke)
PFG 15 VU1-72	9.5	2.5	4.5	1.5
PFG 30 VU1-72	13.0	7.0	7.0	3.0
PFG 50 VU1-72	17.0	8.0	11.0	4.5
PFG 60 VU1-72	18.5	8.0	11.0	6.0
PFG 80 VU1-72	25.0	12.0	17.5	6.0
PFG 95 VU1-72	25.0	12.0	16.5	6.0

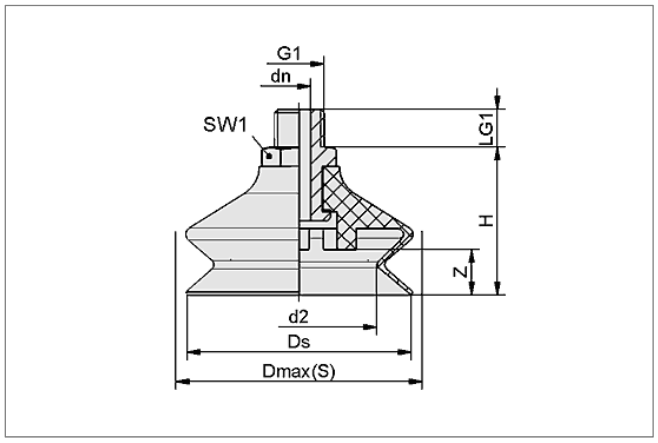
* Acceptable dimensional tolerances for rubber parts concerning to DIN ISO 3302-1 M3

** Dmax(S) is the external dimension of the suction cup when it is pressed against the workpiece by the vacuum

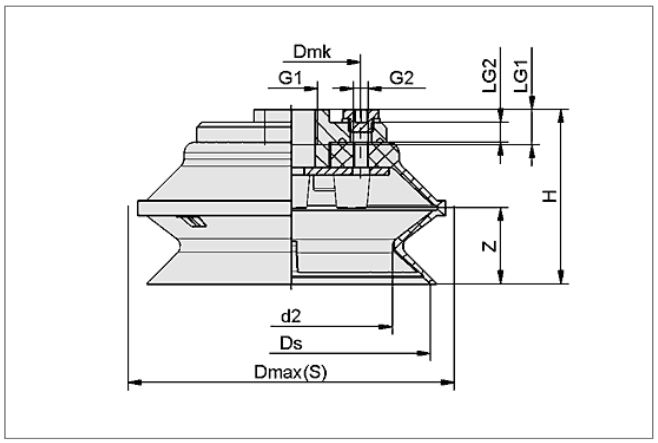
Design Data Bellows Suction Cups FSGA VU1 (1.5 Folds)



FSGA 30 to 85 VU1 IG (female)



FSGA 30 to 85 VU1 AG (male)



FSGA 110 VU1 IG (female)

Suction Cups for Handling Glass

Suction Cups PFYN / FSGA VU1 (Flat / 1.5 Folds)

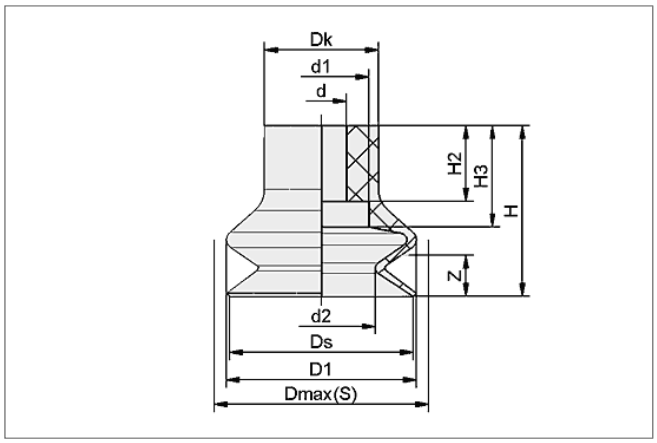
Suction area (Ø) from 15 mm to 110 mm

Design Data Bellows Suction Cups FSGA VU1 (1.5 Folds)

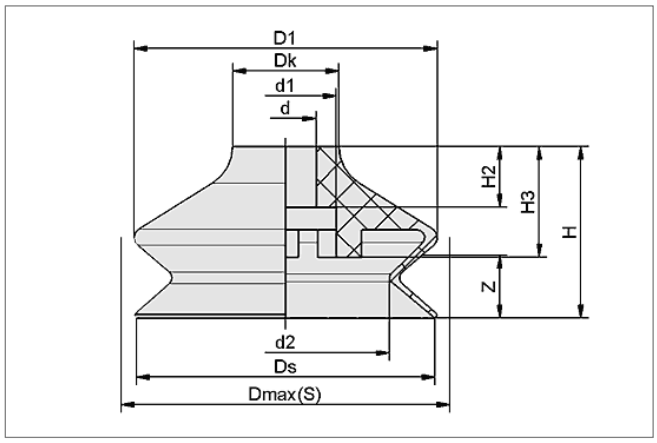
Type	Dimensions in mm*											
	d2	Dmax(S)**	dn	Ds	Dmk	G1	G2	H	LG1	LG2	SW1	Z (Stroke)
FSGA 30 VU1-72 G1/4-AG	17.0	31.5	3.5	29.0	-	G1/4“-M	-	32.0	10	-	17	8.5
FSGA 30 VU1-72 G1/4-IG	17.0	31.5	3.5	29.0	-	G1/4“-F	-	42.0	12	-	17	8.5
FSGA 40 VU1-72 G1/4-AG	26.8	42.5	3.5	38.0	-	G1/4“-M	-	31.0	10	-	17	12.8
FSGA 40 VU1-72 G1/4-IG	26.8	42.5	3.5	38.0	-	G1/4“-F	-	41.0	12	-	17	12.8
FSGA 50 VU1-72 G1/4-AG	33.5	53.0	3.5	47.0	-	G1/4-M	-	37.5	10	-	17	14.5
FSGA 50 VU1-72 G1/4-IG	33.5	53.0	3.5	47.0	-	G1/4“-F	-	47.5	12	-	17	14.5
FSGA 60 VU1-72 G1/4-AG	41.0	61.5	6.0	59.0	-	G1/4“-M	-	39.0	10	-	17	12.5
FSGA 60 VU1-72 G1/4-IG	41.0	61.5	6.0	59.0	-	G1/4“-F	-	49.0	12	-	17	12.5
FSGA 85 VU1-72 G1/4-AG	55.0	86.5	6.0	82.5	-	G1/4“-M	-	52.0	10	-	22	15.0
FSGA 85 VU1-72 G1/4-IG	55.0	86.5	6.0	82.5	-	G1/4“-F	-	62.0	12	-	22	15.0
FSGA 110 VU1-72 G1/2-IG	80.0	127.0	-	110.0	55	G1/2“-F	G1/8“-F	69.0	14	8	-	30.0

* Acceptable dimensional tolerances for rubber parts concerning to DIN ISO 3302-1 M3
** Dmax(S) is the external dimension of the suction cup when it is pressed against the workpiece by the vacuum

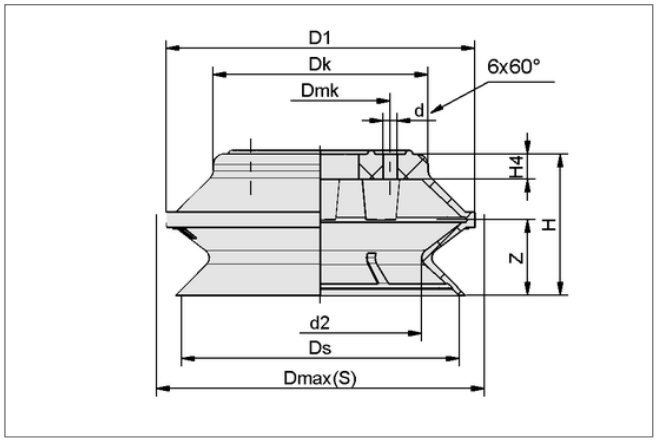
Design Data Bellows Suction Cups FGA VU1 (1.5 Folds) – Spare Parts for FSGA VU1 (1.5 Folds)



FGA 30 VU1



FGA 40 to 85 VU1



FGA 110 VU1

Type	Dimensions in mm*						
	d	d1	d2	D1	Dk	Dmax(S)**	Ds
FSGA 30 VU1	8	15.0	17.0	30	18.0	31.5	29.0
FSGA 40 VU1	8	13.6	26.8	40	14.0	42.5	38.0
FSGA 50 VU1	8	13.6	33.5	50	17.5	53.0	47.0
FSGA 60 VU1	12	20.0	41.0	60	21.0	61.5	59.0
FSGA 85 VU1	12	25.0	55.0	85	25.0	86.5	82.5
FSGA 110 VU1	5.5	-	80.0	120	85.0	127.0	110.0

Type	Dimensions in mm*					
	Dmk	H	H2	H4	H4	Z (Stroke)
FSGA 30 VU1	-	27.0	12	16.0	-	8.5
FSGA 40 VU1	-	27.0	8	15.0	-	12.8
FSGA 50 VU1	-	32.5	8	18.0	-	14.5
FSGA 60 VU1	-	34.0	12	22.0	-	12.5
FSGA 85 VU1	-	47.0	20	25.0	-	15.0
FSGA 110 VU1	55	56.0	-	-	10	30.0

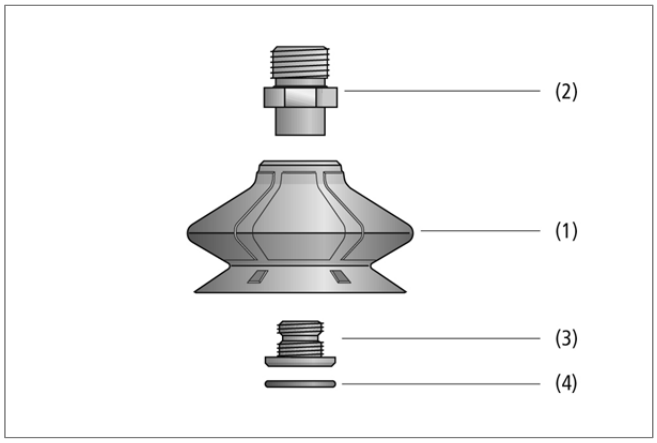
* Acceptable dimensional tolerances for rubber parts concerning to DIN ISO 3302-1 M3
** Dmax(S) is the external dimension of the suction cup when it is pressed against the workpiece by the vacuum

Suction Cups for Handling Glass

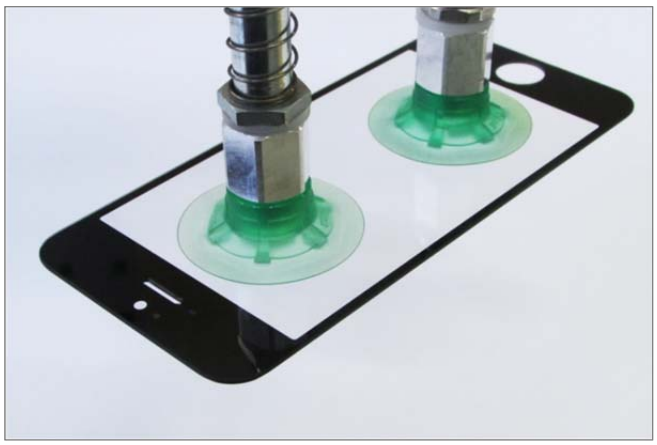
Suction Cups SPF / SPB1 ED-65 (Flat / 1.5 Folds)

Suction area (Ø) from 10 mm to 80 mm

Suction cups SPF / SPB1 ED-65



System design suction cups SPF / SPB1 ED-65 (picture shows SPB1)



Flat suction cups SPF used for the pick&place handling of display glass

Suitability for Process-Specific Applications

Applications

- Suction cup with a very soft and flexible sealing lip for gentle handling of thin glass such as display glass
- Handling of screen printed / coated glass without surface damage due to low movement of the sealing lip during gripping (SPB1)
- Used in high speed pick&place processes in the display glass production
- Used in applications with high flow and low vacuum level for high speed and low mechanical stress on the glass

Design

- Round flat suction cup SPF (1) with soft, flexible sealing lip and supporting ribs on the suction surface. Round, bellows suction cup SPB1 (1) with 1.5 folds and soft, flexible sealing lip
- Made of wear-proof material Elastodur ED-65
- Models with diameter up to 30 mm feature plug-in connection element for quick change of suction cup
- Starting at 40 mm diameter with a 2-piece connection element: consisting of machine-side component (2) and suction-side component (3)
- Clip-in filter screen (4) as pre-filter (filter pore size 250 µm)
- All connection elements with male thread are equipped with integrated sealing

Our Highlights…	Your Benefits…
• Soft and flexible sealing lip with low reset force	> Gentle handling with low surface pressure on the glass
• Robust and reinforced body with defined contact area	> Very high intrinsic stability of the suction cup for precise handling
• Large effective suction area / vacuum area	> High suction forces with small dimensions of the cup
• High friction force on glass	> Suitable for high speed handling processes
• Wear-proof and abrasion proof material Elastodur ED-65	> Very low wear, approx. 3 times longer lifetime compared to NBR

Suction Cups for Handling Glass

Suction Cups SPF / SPB1 ED-65 (Flat / 1.5 Folds)

Suction area (Ø) from 10 mm to 80 mm

Designation Code Suction Cups SPF / SPB1 ED-65 (Flat / 1.5 Folds)

Abbreviated designation		Suction area Ø in mm	Material and Shore hardness
Example SPB1 30 ED-65		30	
SPB1 30			ED-65
SPF	Round Flat	10 to 80	ED-65
SPB1	Round 1.5 Folds		

Ordering Data Suction Cups SPF / SPB1 ED-65 (Flat / 1.5 Folds)

Suction cup SPF / SPB1 (elastomer part) is supplied as an individual part. In order to receive a complete suction cup (elastomer part + connection element + accessories), the following ordering steps are required:
• Suction cup of type SPF / SPB1 (step 1) – elastomer part, available in various diameters
• Connection element of type SC (step 2) – available with various threads

Available accessories: filter screen

Step 1: Flat Suction Cups SPF

Type*	Part Number
SPF 10 ED-65 SC030	10.01.01.12894
SPF 15 ED-65 SC040	10.01.01.12895
SPF 20 ED-65 SC040	10.01.01.12370
SPF 25 ED-65 SC040	10.01.01.12371
SPF 30 ED-65 SC040	10.01.01.12372
SPF 40 ED-65 SC050	10.01.01.12373
SPF 50 ED-65 SC050	10.01.01.12374
SPF 60 ED-65 SC050	10.01.01.12896

*Additional material specifications at the beginning of the section “Vacuum Suction Cups”

Step 1: Bellows Suction Cups SPB1 (1.5 Folds)

Type	Part Number
SPB1 10 ED-65 SC030	10.01.06.02782
SPB1 15 ED-65 SC040	10.01.06.02783
SPB1 20 ED-65 SC040	10.01.06.02452
SPB1 25 ED-65 SC040	10.01.06.02453
SPB1 30 ED-65 SC040	10.01.06.02454
SPB1 40 ED-65 SC050	10.01.06.02455
SPB1 50 ED-65 SC050	10.01.06.02456
SPB1 60 ED-65 SC050	10.01.06.02457
SPB1 80 ED-65 SC065	10.01.06.03071

*Additional material specifications at the beginning of the section “Vacuum Suction Cups”

Step 2: Connection Elements Suction Cups SPF / SPB1 (Flat / 1.5 Folds)

Type	For suction cup type				
	SPF 10 / SPB1 10	SPF 15 / SPB1 15	SPF 20 / SPB1 20	SPF 25 / SPB1 25	SPF 30 /SPB1 30
SC 030 M5-AG	10.01.06.02802	-	-	-	
SC 040 G1/8-AG	-	10.01.06.02490	10.01.06.02490	10.01.06.02490	10.01.06.02490
SC 040 G1/8-IG	-	10.01.06.02482	10.01.06.02482	10.01.06.02482	10.01.06.02482

Type	For suction cup type			
	SPF 40 / SPB1 40	SPF 50 / SPB1 50	SPF 60 / SPB1 60	SPB1 80
SC 050 G1/4-AG	10.01.06.02487	10.01.06.02487	10.01.06.02487	-
SC 050 G1/4-IG	10.01.06.02488	10.01.06.02488	10.01.06.02488	-
SC 065 G1/4-AG L	-	-	-	10.01.06.03193
SC 065 G1/4-IG L	-	-	-	10.01.06.03194

Suction Cups for Handling Glass

Suction Cups SPF / SPB1 ED-65 (Flat / 1.5 Folds)

Suction area (Ø) from 10 mm to 80 mm

Ordering Data Accessories Suction Cups SPF / SPB1 (Flat / 1.5 Folds)

For Type	Filter screen
SPF 10 ED-65 SC030 / SPB1 10 ED-65 SC030	-
SPF 15 ED-65 SC040 / SPB1 15 ED-65 SC040	-
SPF 20 ED-65 SC040 / SPB1 20 ED-65 SC040	10.07.01.00309
SPF 25 ED-65 SC040 / SPB1 25 ED-65 SC040	10.07.01.00309
SPF 30 ED-65 SC040 / SPB1 30 ED-65 SC040	10.07.01.00309
SPF 40 ED-65 SC050 / SPB1 40 ED-65 SC050	10.07.01.00308
SPF 50 ED-65 SC050 / SPB1 50 ED-65 SC050	10.07.01.00308
SPF 60 ED-65 SC050 / SPB1 60 ED-65 SC050	10.07.01.00308
SPB1 80 ED-65 SC065	10.07.01.00364

Technical Data Flat Suction Cups SPF

Type	Suction force [N]*	Pull-off force [N]	Lateral force [N]	Volume [cm³]	Min. curve radius [mm] (convex)	Recom. internal hose diameter d [mm]**	Type Connection element SC…
SPF 10 ED-65 SC030	4.4	5.2	3.5	0.3	8	4	SC 030
SPF 15 ED-65 SC040	9.8	11.0	7.9	0.8	13	4	SC 040
SPF 20 ED-65 SC040	16.0	19.2	10.5	1.1	20	4	SC 040
SPF 25 ED-65 SC040	22.7	27.1	17.0	1.7	30	4	SC 040
SPF 30 ED-65 SC040	29.5	35.3	22.5	2.5	35	6	SC 040
SPF 40 ED-65 SC050	49.5	62.5	25.0	5.1	70	6	SC 050
SPF 50 ED-65 SC050	74.2	87.4	44.0	8.0	70	6	SC 050
SPF 60 ED-65 SC050	107.0	135.0	65.0	12.7	70	6	SC 050

*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

Technical Data Bellows Suction Cups SPB1 (1.5 Folds)

Type	Suction force [N]*	Pull-off force [N]	Lateral force [N]	Volume [cm³]	Min. curve radius [mm] (convex)	Recom. internal hose diameter d [mm]**	Type Connection element SC…
SPB1 10 ED-65 SC030	1.5	4.0	2.0	0.5	5	4	SC 030
SPB1 15 ED-65 SC040	4.3	9.0	5.0	1.5	8	4	SC 040
SPB1 20 ED-65 SC040	9.9	16.2	9.8	3.1	15	4	SC 040
SPB1 25 ED-65 SC040	14.9	23.4	13.0	5.3	20	4	SC 040
SPB1 30 ED-65 SC040	20.7	30.6	15.5	8.0	25	6	SC 040
SPB1 40 ED-65 SC050	35.9	46.8	24.8	18.3	40	6	SC 050
SPB1 50 ED-65 SC050	54.7	72.7	31.2	30.2	40	6	SC 050
SPB1 60 ED-65 SC050	78.0	100.9	49.4	49.2	70	6	SC 050
SPB1 80 ED-65 SC065	166.0	200.0	59.0	98.4	70	6	SC 065

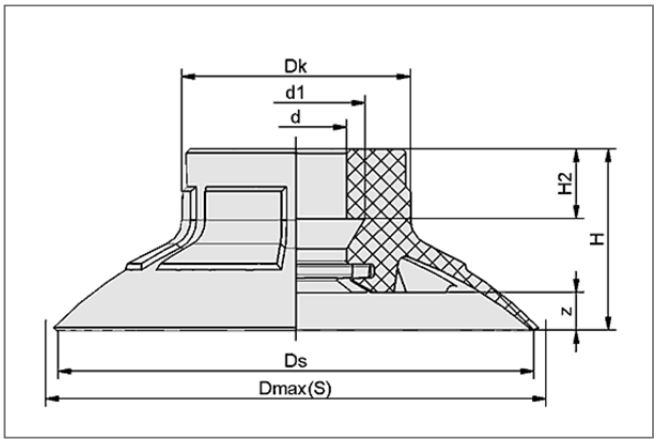
*The specified suction forces are theoretical values at a vacuum of -0.6 bar and with a smooth, dry workpiece surface – they do not include a safety factor
**The recommended hose diameter refers to a hose length of approx. 2 m

Suction Cups for Handling Glass

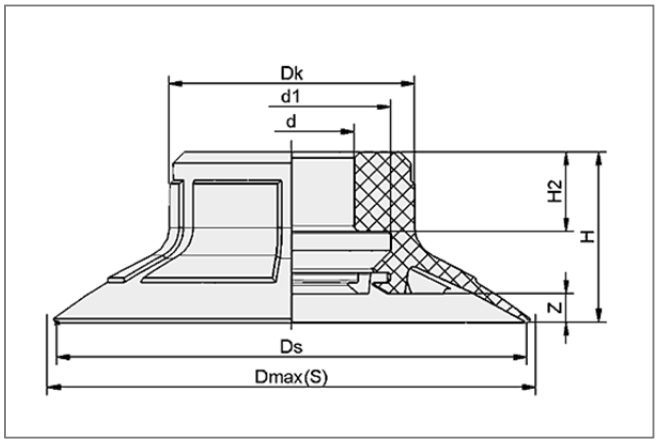
Suction Cups SPF / SPB1 ED-65 (Flat / 1.5 Folds)

Suction area (Ø) from 10 mm to 80 mm

Design Data Flat Suction Cups SPF



SPF 10…30



SPF 40…60

Type	Dimensions in mm*							
	d	d1	Dk	Ds	Dmax(S)	H	H2	Z (Stroke)
SPF 10 ED-65 SC030	5.5	7.2	9.6	10.5	12.0	9	4.2	1.0
SPF 15 ED-65 SC040	7.5	10.4	13.0	16.4	18.5	10	4.6	1.5
SPF 20 ED-65 SC040	7.5	10.5	15.1	21.4	23.3	11	4.6	2.0
SPF 25 ED-65 SC040	7.5	10.5	15.1	26.4	28.0	11	4.6	2.0
SPF 30 ED-65 SC040	7.5	10.5	15.1	31.4	33.6	12	4.6	2.5
SPF 40 ED-65 SC050	11.0	17.5	21.6	41.4	43.7	15	7.0	2.5
SPF 50 ED-65 SC050	11.0	17.5	21.6	51.4	54.0	16	7.0	3.5
SPF 60 ED-65 SC050	10.5	17.5	22.1	61.2	65.0	18	7.5	5.1

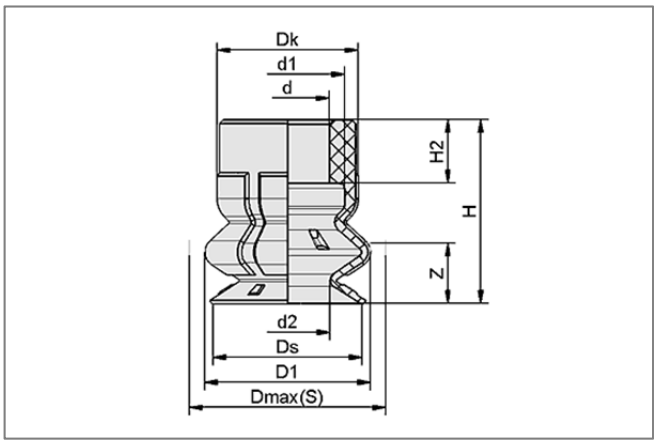
* Acceptable dimensional tolerances for rubber parts concerning to DIN ISO 3302-1 M3
** Dmax(S) is the external dimension of the suction cup when it is pressed against the workpiece by the vacuum

Suction Cups for Handling Glass

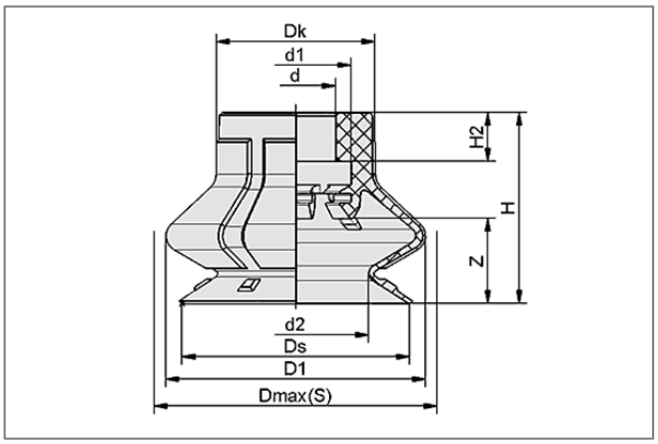
Suction Cups SPF / SPB1 ED-65 (Flat / 1.5 Folds)

Suction area (Ø) from 10 mm to 80 mm

Design Data Bellows Suction Cups SPB1 (1.5 Folds)



SPB1 10…15



SPB1 20…80

Type	Dimensions in mm*									
	d	d1	d2	D1	Dk	Dmax (S)	Ds	H	H2	Z (Stroke)
SPB1 10 ED-65 SC030	5.5	7.5	5.6	11.0	9.4	11.3	9.8	12	4.2	4
SPB1 15 ED-65 SC040	7.5	10.5	9.5	18.4	15.1	19.7	15.4	15	4.6	6
SPB1 20 ED-65 SC040	7.5	10.5	13.8	24.6	15.1	26.3	21.4	18	4.6	8
SPB1 25 ED-65 SC040	7.5	10.5	16.9	29.0	15.1	31.3	26.4	21	4.6	11
SPB1 30 ED-65 SC040	7.5	10.5	20.0	34.2	15.1	36.7	31.4	23	4.6	13
SPB1 40 ED-65 SC050	11.0	17.5	26.1	44.6	21.6	48.0	41.4	30	7.0	16
SPB1 50 ED-65 SC050	11.0	17.5	32.3	55.2	21.6	58.4	51.4	32	7.0	18
SPB1 60 ED-65 SC050	11.0	17.5	38.6	65.7	21.6	69.6	61.4	36	7.0	22
SPB1 80 ED-65 SC065	14.0	29.3	56.0	82.7	27.1	88.0	81.4	46	15.3	24

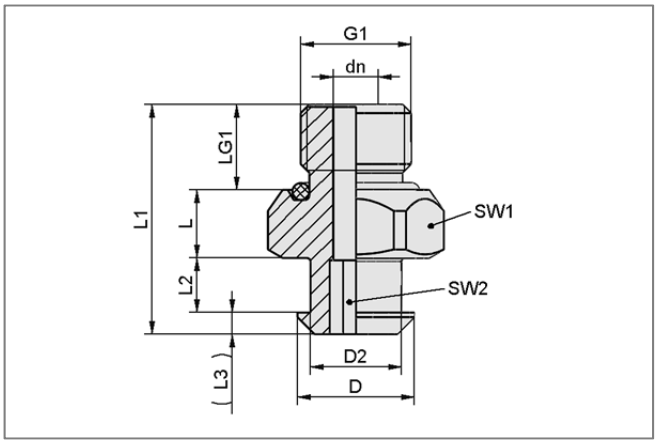
* Acceptable dimensional tolerances for rubber parts concerning to DIN ISO 3302-1 M3
** Dmax(S) is the external dimension of the suction cup when it is pressed against the workpiece by the vacuum

Suction Cups for Handling Glass

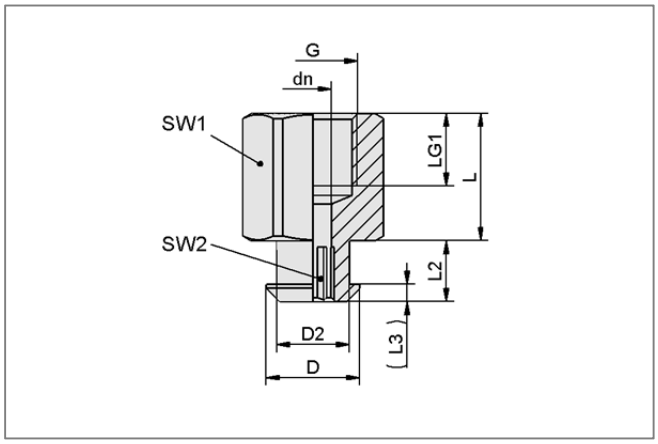
Suction Cups SPF / SPB1 ED-65 (Flat / 1.5 Folds)

Suction area (Ø) from 10 mm to 80 mm

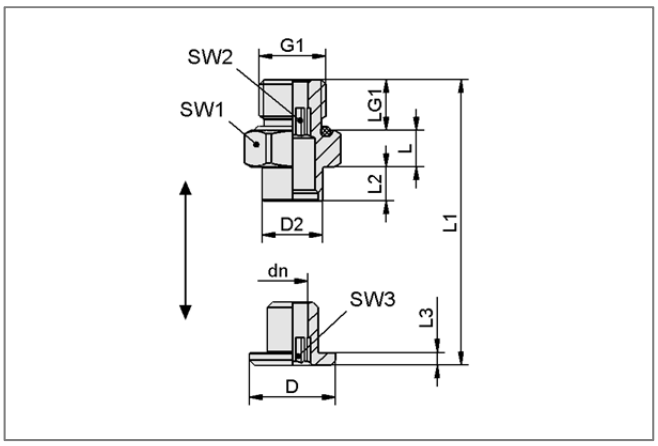
Design Data Connection Elements Suction Cups SPF / SPB1 (Flat / 1.5 Folds)



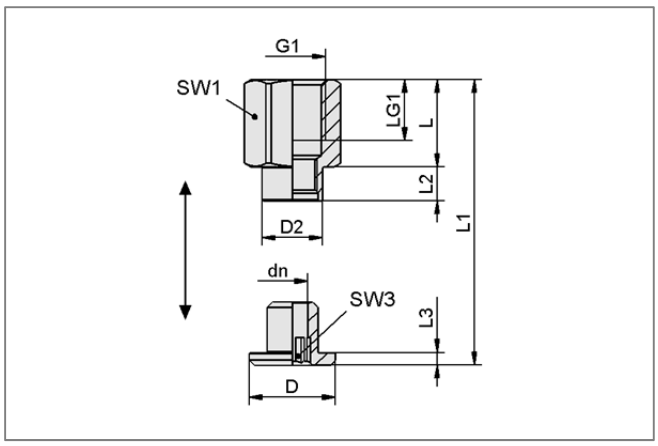
Connection element SC 030/040...AG for SPF / SPB1 10...30



Connection element SC 040 G1/8-IG for SPF / SPB1 20...30



Connection element SC 050/065 G1/4-AG for SPF / SPB1 40...80



Connection element SC 050/065 G1/4-IG for SPF / SPB1 40...80

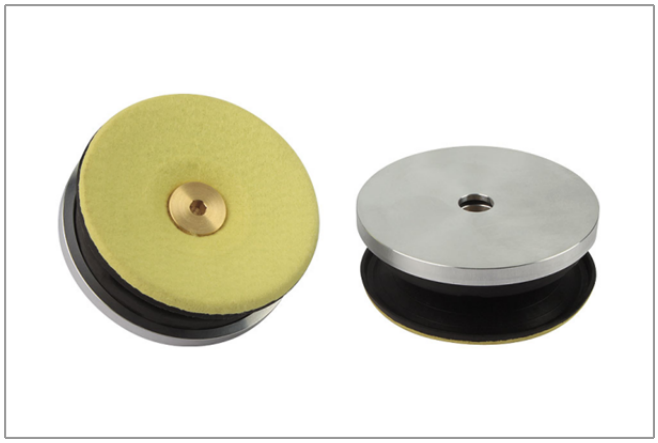
Type	Dimensions in mm											
	D	D2	dn	G1	L	L1	L2	L3	LG1	SW1	SW2	SW3
SC 030 M5-AG	7.2	6	2	M5-M	5.0	15.5	4.3	1.5	4.7	8	3	-
SC 040 G1/8-AG	10.3	8	4	G1/8“-M	6.0	20.2	4.8	1.9	7.5	14	4	-
SC 040 G1/8-IG	10.3	8	4	G1/8“F	14.0	20.7	4.8	1.9	8.0	14	4	-
SC 050 G1/4-AG	17.0	12	6	G1/4“-M	7.2	26.5	6.8	2.5	10.0	17	6	6
SC 050 G1/4-IG	17.0	12	6	G1/4“-F	17.2	26.5	6.8	2.5	12.0	17	-	6
SC 065 G1/4-AG L	29.0	15	6	G1/4“-M	8.0	36.1	15.1	3.0	10.0	22	6	6
SC 065 G1/4-IG L	29.0	15	6	G1/4“-F	18.0	36.1	15.1	3.0	12.0	22	-	6

Suction Cups for Handling Glass

Suction Plates for High-Temperature SPL-HT FPM-F

Suction area (Ø) 90 mm to 190 mm

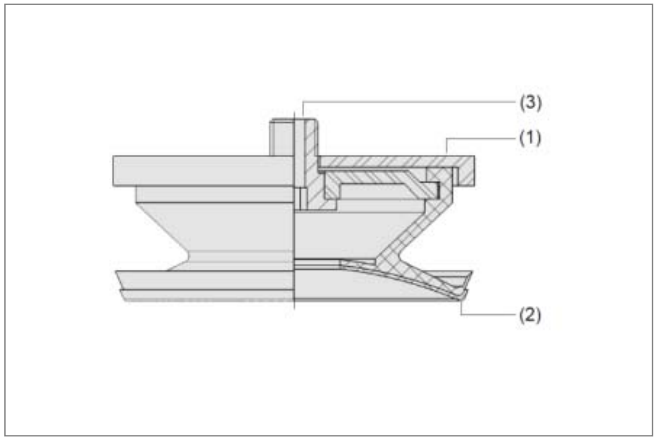
Suitability for Process-Specific Applications



High-temperature suction plates SPL-HT 90 and 120 FPM-F

Applications

- Round suction plate for the handling of hot glass
- Handling of the glass directly after the furnace on the bending or tempering line
- Automotive glass handling after the bending furnace with different bending radius
- Glass handling up to 400°C (short-term workpiece contact)



System design high-temperature suction plates SPL-HT FPM-F

Design

- Robust and wear-resistant suction plate SPL-HT FPM-F with single sealing lip, consisting of suction plate SPL (available as spare part) and metal mounting plate
- Suction pad (2) mounted by one screw to the mounting plate (1) for fast and easy replacement.
- Special temperature resistant felt coating on the suction pad
- SPL-HT 90 and 120 FPM-F with bellow
- SPL-HT 190 FPM-F as flat suction plate

High-temperature suction plates SPL-HT 190 FPM-F

Our Highlights…	Your Benefits…
• Fluorocaoutchuc FPM-F with special felt coating	> High temperature resistance (up to 400°C short-term)
• Spare part suction pad screwed to mounting plate	> Fast and easy replacement
• Flexible bellow and high stoke of flat suction pad	> Flexibility even when handling bended glass
• Large diameter metal mounting plate	> Good heat distribution and large surface for short cooling times; protective shield for other components such as fittings or hoses

Suction Cups for Handling Glass

Suction Plates for High-Temperature SPL-HT FPM-F

Suction area (Ø) 90 mm to 190 mm

Designation Code Suction Plates for High-Temperature SPL-HT FPM-F

Abbreviated designation	Suction area Ø in mm	Material and Shore hardness	Connection thread
Example SPL-HT 90 FPM-F-65 G1/4-AG:			
SPL-HT	**90**	**FPM-F-65**	**G1/4-AG**
SPL-HT	90 120 190	FPM-F-65	G1/4-AG (AG = male (M)) G1/2-AG

Ordering Data Suction Plates for High-Temperature SPL-HT FPM-F

Suction plate SPL-HT FPM-F (elastomer part + mounting) is delivered unassembled. The delivery consists of:

- Suction plate of type SPL-HT FPM-F – elastomer part, available in various diameters
- Mounting – available with various threads

Available spare parts: suction plate of type SPL-HT FPM-F

Suction Plates for High-Temperature SPL-HT FPM-F

Type	Part Number
SPL-HT 90 FPM-F-65 G1/4-AG	10.01.01.00551
SPL-HT 120 FPM-F-65 G1/4-AG	10.01.01.13438
SPL-HT 190 FPM-F-65 G1/2-AG	10.01.01.00832

Ordering Data Spare Parts Suction Plates for High-Temperature SPL-HT FPM-F

Type	Part Number
SPL-HT 90 FPM-F-65	10.01.01.00553
SPL-HT 120 FPM-F-65	10.01.01.13435
SPL-HT 190 FPM-F-65	10.01.01.00834

Technical Data Suction Plates for High-Temperature SPL-HT FPM-F

Type	Suction force [N]*	Volume [cm³]	Min. curve radius [mm] (convex)	Weight [g]	Recom. internal hose diameter d [mm]**
SPL-HT 90 FPM-F-65 G1/4-AG	230	66.5	250	225	6
SPL-HT 120 FPM-F-65 G1/4-AG	675	250.0	300	295	9
SPL-HT 190 FPM-F-65 G1/2-AG	1050	165.0	350	1420	9

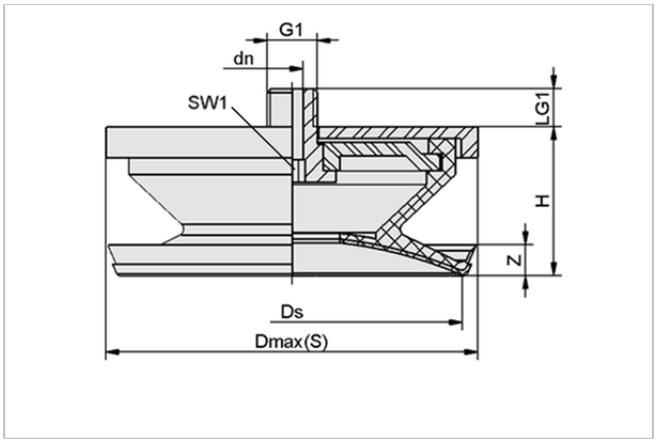
* The specified suction forces are theoretical values at a vacuum of -0.6 bar and with a smooth, dry workpiece surface - they do not include a safety factor
** The recommended hose diameter refers to a hose length of approx. 2 m

Suction Cups for Handling Glass

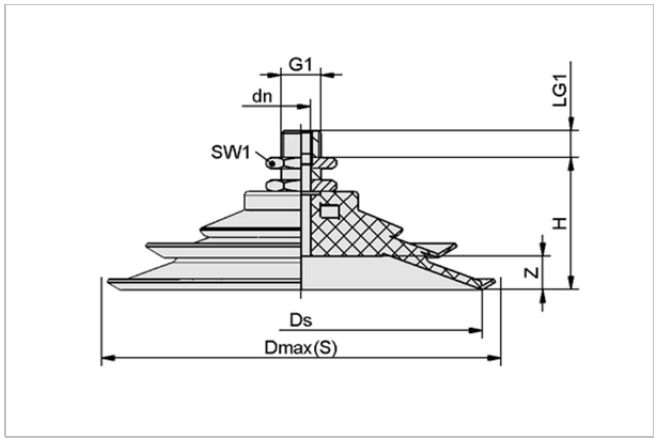
Suction Plates for High-Temperature SPL-HT FPM-F

Suction area (Ø) 90 mm to 190 mm

Design Data Suction Plates for High-Temperature SPL-HT FPM-F



SPL-HT 90/120 FPM-F G1/4-AG (male)

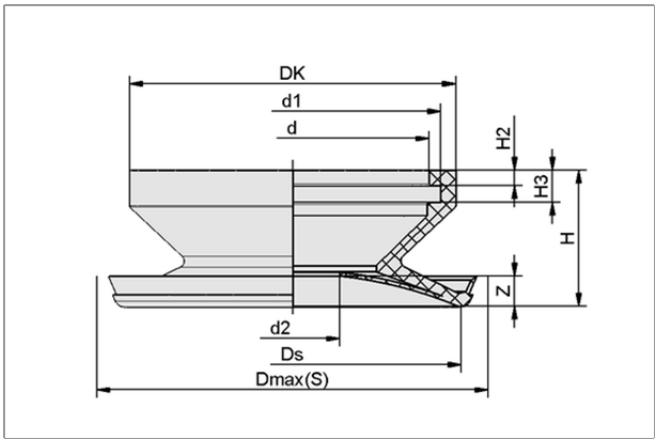


SPL-HT 190 FPM-F G1/2-AG (male)

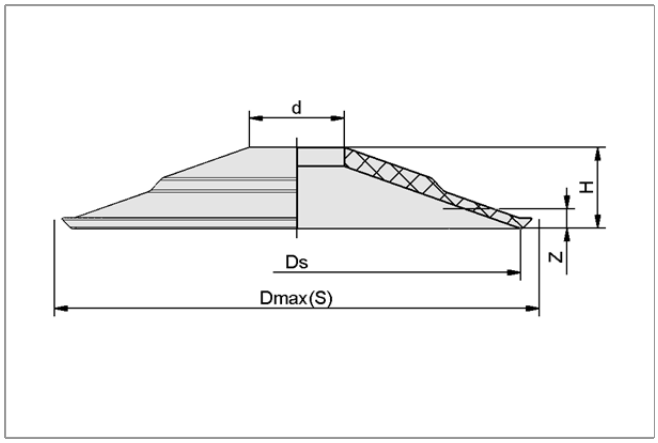
Type	Dimensions in mm*							
	Dmax(S)**	dn	Ds	G1	H	LG1	SW1	Z (Stroke)
SPL-HT 90 FPM-F-65 G1/4-AG	98	6	90	G1/4-M	39	11	6	16.5
SPL-HT 120 FPM-F-65 G1/4-AG	130	6	120	G1/4-M	46	11	6	25.0
SPL-HT 190 FPM-F-65 G1/2-AG	209	10	190	G1/2-M	66	18	32	8.0

* Acceptable dimensional tolerances for rubber parts concerning to DIN ISO 3302-1 M3
** Dmax(S) is the external dimension of the suction plate when it is pressed against the workpiece by the vacuum

Design Data Spare Parts Suction Plates for High-Temperature SPL-HT FPM-F



SPL-HT 90/120 FPM-F



SPL-HT 190 FPM-F

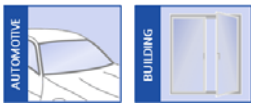
Type	Dimensions in mm*									
	d	d1	d2	Dk	Dmax(S)**	Ds	H	H2	H3	Z (Stroke)
SPL-HT 90 FPM-F-65	72	78	15	86	98	90	36	4	8.5	16.5
SPL-HT 120 FPM-F-65	88	96	15	105	130	120	43	5	10.0	25.0
SPL-HT 190 FPM-F-65	40	-	-	-	209	190	17	-	-	8.0

* Acceptable dimensional tolerances for rubber parts concerning to DIN ISO 3302-1 M3
** Dmax(S) is the external dimension of the suction plate when it is pressed against the workpiece by the vacuum

Suction Cups for Handling Glass

Suction Plates for High-Temperature SPL-HT

Suction area (Ø) from 35 mm to 140 mm

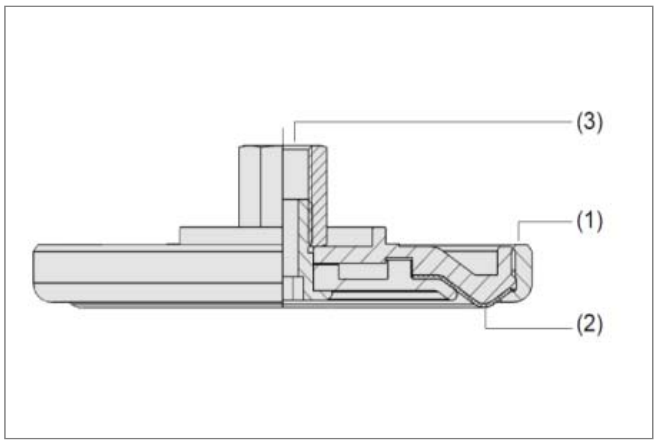


Suitability for Process-Specific Applications

High-temperature suction plates SPL-HT 60

Applications

- Round suction plate for the handling of hot glass
- Handling of the glass directly after the furnace on the bending or tempering line
- Glass handling up to 600°C with a long-term contact to the workpiece
- Applications with high temperature process environment up to 600°C



System design high-temperature suction plates SPL-HT

Design

- Stainless-steel mounting plate with a large surface area (1)
- Sealing ring (2) made of a special textile material with a high temperature resistance
- The replaceable sealing ring is clamped into the mounting plate by means of a thread connection
- Female thread (3) for system integration

High-temperature suction plates SPL-HT 140

Our Highlights…	Your Benefits…
• Stainless-steel mounting plate and sealing ring made of special textile	> Very high temperature resistance up to 600°C – even for long periods
• Temperature resistance up to 600°C	> Gentle handling of hot glass without additional mechanical clamps
• Large area stainless-steel mounting plate	> Good heat distribution and large surface for short cooling times; protective shield for other components such as fittings or hoses
• Sealing ring fast and easy replaceable	> Spare part separately re-placeable to avoid downtimes of the machine/process

Suction Cups for Handling Glass

Suction Plates for High-Temperature SPL-HT

Suction area (Ø) from 35 mm to 140 mm

Designation Code Suction Plates for High-Temperature SPL-HT

Abbreviated designation	Suction area Ø in mm	Material	Connection thread
Example SPL-HT 90 ST G1/4-IG:			
SPL-HT	**90**	**ST**	**G1/4-IG**
SPL-HT	35 to 140	ST special textile	G1/8-IG (IG = female (F)) G1/4-IG G3/8-IG

Ordering Data Suction Plates for High-Temperature SPL-HT

Suction plate SPL-HT (sealing ring + mounting) is delivered assembled. The assembly consists of:

- Sealing ring of type DR-SPL-HT – available in various diameters
- Stainless-steel mounting – available with various threads

Available spare parts: sealing ring of type DR-SPL-HT

Suction Plates for High-Temperature SPL-HT

Type	Part Number
SPL-HT 35 ST G1/8-IG	10.01.23.00023
SPL-HT 60 ST G1/4-IG	10.01.23.00006
SPL-HT 90 ST G1/4-IG	10.01.23.00007
SPL-HT 140 ST G3/8-IG	10.01.23.00008

Ordering Data Spare Parts Suction Plates for High-Temperature SPL-HT

Type	Suitable for	Part Number
DR-SPL-HT 35 ST	SPL-HT 35 ST G1/8-IG	10.01.23.00022
DR-SPL-HT 60 ST	SPL-HT 60 ST G1/4-IG	10.01.23.00001
DR-SPL-HT 90 ST	SPL-HT 90 ST G1/4-IG	10.01.23.00016
DR-SPL-HT 140 ST	SPL-HT 140 ST G3/8-IG	10.01.23.00018

Technical Data Suction Plates for High-Temperature SPL-HT

Type	Suction force [N]*	Volume [cm³]	Min. curve radius [mm] (convex)	Required suction capacity for pu = -0.7 bar [l/min]**	Weight [g]	Recom. internal hose diameter d [mm]***
SPL-HT 35 ST G1/8-IG	47	6	90	55	225	4
SPL-HT 60 ST G1/4-IG	130	12	440	78	375	6
SPL-HT 90 ST G1/4-IG	320	25	1060	100	675	6
SPL-HT 140 ST G3/8-IG	740	50	1700	120	1390	9

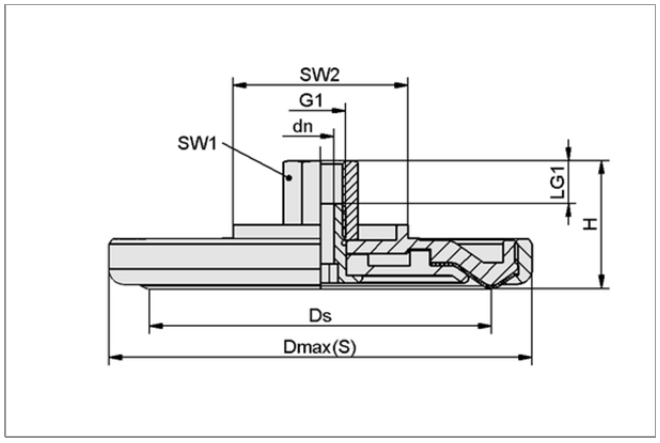
* The suction force figures are theoretical values at a vacuum of -0.6 bar and with a smooth, flat workpiece surface. They are specified without any safety factor. For the system design the safety factors should be increased at least by the factor 3.
** The recommended suction capacity is based on an average workpiece temperature of about 300°C. We recommend testing with original workpieces.
*** The recommended hose diameter refers to a hose length of approx. 2 m

Suction Cups for Handling Glass

Suction Plates for High-Temperature SPL-HT

Suction area (Ø) from 35 mm to 140 mm

Design Data Suction Plates for High-Temperature SPL-HT



SPL-HT 35 to 140

Type	Dimensions in mm							
	dn	D1	Ds	G1	H	LG1	SW1	SW2
SPL-HT 35 ST G1/8-IG	5	53.0	35	G1/8“-F	29	12	14	27
SPL-HT 60 ST G1/4-IG	7	79.5	58	G1/4“-F	39	12	17	27
SPL-HT 90 ST G1/4-IG	7	111.5	90	G1/4“-F	39	12	17	46
SPL-HT 140 ST G3/8-IG	8	159.5	138	G3/8“-F	39	12	22	95

Suction Cups for Handling Glass

Suction Cup Inserts SPI PEEK

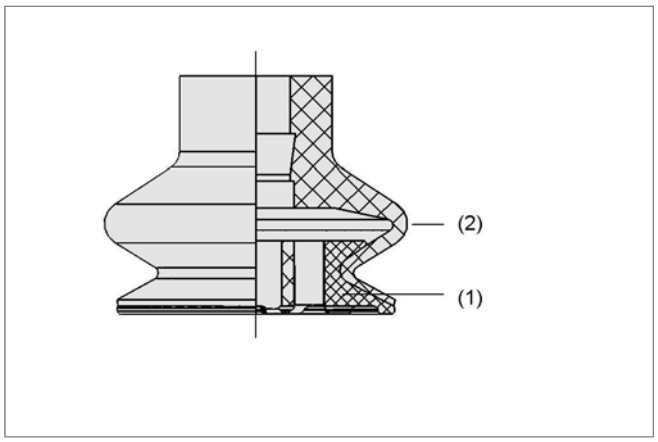
Diameter (Ø) from 6 mm to 32 mm

Suitability for Process-Specific Applications

Suction cup inserts SPI PEEK

Applications

- Contamination free handling of glass in the display glass production process
- Gentle handling of thin glass <0.1 mm with low surface pressure on the glass and thus minimum stress
- Used in combination with suction cups with 1.5 or 2.5 bellows to provide a flexible suction cup unit for a soft placement of the insert on the workpiece surface



System design suction cup inserts SPI PEEK

Design

- The inserts (1) are mounted into the lower suction cup fold of bellows suction cups (2) – without tools
- The outer diameters of the inserts match the diameters of suction cups type FSGA (1.5 bellows) and FSG (2.5 bellows) of Schmalz
- Suction area of the inserts with special support structure and vacuum channels for a 100% PEEK contact area between workpiece and suction cup

Suction cup inserts SPI PEEK being used for display glass handling

Our Highlights…	Your Benefits…
• Suction cup inserts made of PEEK	> Handling of glass without chemical fingerprint / contamination
• Structure on the suction surface with defined contact area	> Defined and low surface pressure as well as stress on the glass
• Intelligent vacuum distribution on the suction surface	> High leakage compensation for high effective suction forces
• Clip-in assembly in suction cups without tools	> Fast and easy assembly and replacement

Suction Cups for Handling Glass

Suction Cup Inserts SPI PEEK

Diameter (Ø) from 6 mm to 32 mm

Designation Code Suction Cup Inserts SPI PEEK

Abbreviated designation	Diameter Ø in mm	Material
Example SPI 11 PEEK:		
SPI	**11**	**PEEK**
SPI	6 to 32	PEEK

Ordering Data Suction Cup Inserts SPI PEEK

Suction cup inserts SPI PEEK are delivered in the desired diameter.

Suction Cup Inserts SPI PEEK

Type	Part Number
SPI 6 PEEK	10.01.06.03279
SPI 9 PEEK	10.01.06.03280
SPI 11 PEEK	10.01.06.03281
SPI 14 PEEK	10.01.06.03282
SPI 17 PEEK	10.01.06.03283
SPI 18 PEEK	10.01.06.03284
SPI 21 PEEK	10.01.06.03285
SPI 25 PEEK	10.01.06.03286
SPI 32 PEEK	10.01.06.03287

Technical Data Suction Cup Inserts SPI PEEK

Type*	Max. blow-off pressure [bar]	For suction cup type FSGA / FGA** (1.5 Folds)	For suction cup type FSG / FG** (2.5 Folds)
SPI 6 PEEK	1.5	FSGA / FGA 6	FSG / FG 5
SPI 9 PEEK	1.5	-	FSG / FG 9
SPI 11 PEEK	1.5	FGSA / FGA 11	-
SPI 14 PEEK	1.5	FSGA / FGA 14	FSG / FG 12 - 14
SPI 17 PEEK	1.5	FSGA / FGA 16	FSG / FG 18
SPI 18 PEEK	1.5	FSGA / FGA 20	-
SPI 21 PEEK	1.5	FSGA / FGA 22	FSG / FG 20
SPI 25 PEEK	1.5	FSGA / FGA 25	FSG / FG 25
SPI 32 PEEK	1.5	FSGA / FGA 33	FSG / FG 32

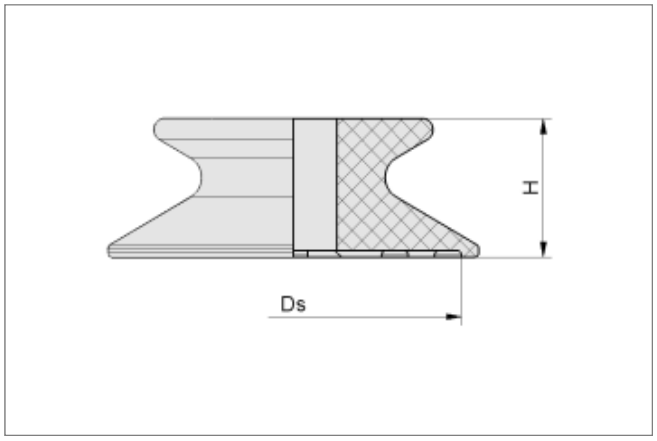
* A suction capacity of min. 2 l/min is recommended. In order to define the required suction capacity for the specific applications tests with the original workpiece and suction cup have to be carried out.
In vertical applications the lateral force will be reduced. We recommend tests with the original suction cup before the use of suction cup inserts SPI.
** Please find suitable suction cups in the catalogue “Vacuum Components” on page 110 (FSGA / FGA) and page 127 (FSG / FG). The use with all suction cup materials is possible.

Suction Cups for Handling Glass

Suction Cup Inserts SPI PEEK

Diameter (Ø) from 6 mm to 32 mm

Design Data Suction Cup Inserts SPI PEEK



SPI 6 … 32 PEEK

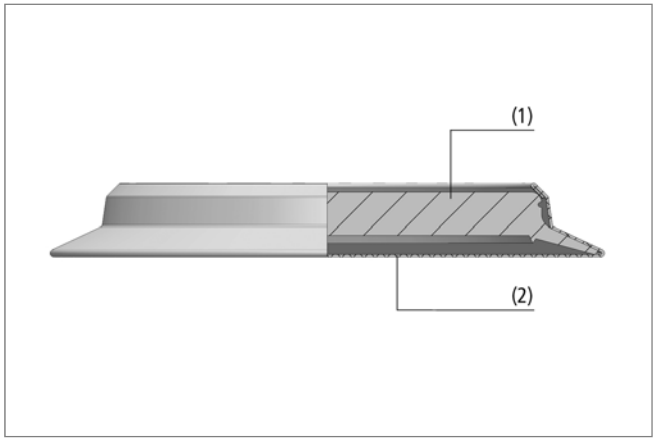
Type	Dimensions in mm	
	Ds	H
SPI 6 PEEK	5.2	3.3
SPI 9 PEEK	7.4	3.5
SPI 11 PEEK	8.8	5.1
SPI 14 PEEK	11.8	6.3
SPI 17 PEEK	14.8	6.7
SPI 18 PEEK	16.0	5.3
SPI 21 PEEK	19.0	6.3
SPI 25 PEEK	22.6	10.1
SPI 32 PEEK	29.0	10.3

Suction Cups for Handling Glass

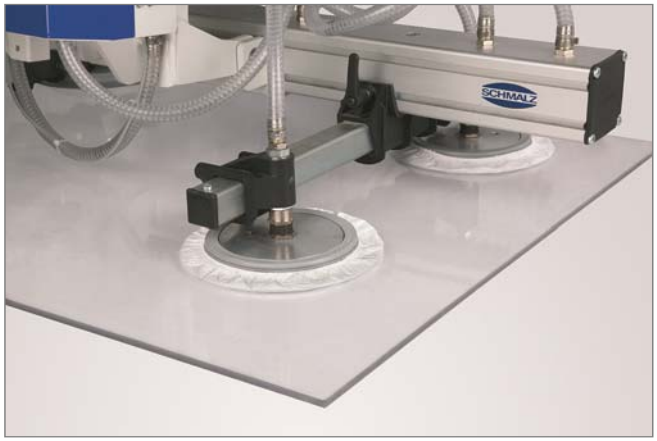
Suction Cup Covers SU

Diameter (Ø) from 25 mm to 360 mm

Suction cup covers SU



System design suction cup covers SU



Suction cup covers SU for handling sensitive glass sheets

Suitability for Process-Specific Applications

Applications

- Suction cup covers for the glass handling to prevent marks and surface damage
- Handling of cleaned or coated glass in the entire glass industry, e.g. used for the glass loading in solar module production lines or display glass production
- Used in combination with suction cups and suction plates

Design

- Suction cup 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 mounted to suction cups and suction plates (1) and fastened with the integrated rubber band
- With different diameters from 25 mm to 360 mm, the covers are designed to match the corresponding diameter ranges of the suction plates and suction cups

Our Highlights…	Your Benefits…
• Suction cup cover made of special fleece material (PP/PE)	> No marks on sensitive workpieces, highly wear-resistant
• Integrated elastic band	> Fast and easy installation on suction plates and suction cups
• Large range of diameters	> Installation on flat suction cups, bellows suction cups and suction plates

Suction Cups for Handling Glass

Suction Cup Covers SU

Diameter (Ø) from 25 mm to 360 mm

Designation Code Suction Cup Covers SU

Abbreviated designation	Diameter Ø in mm
Example SU 120:	
SU	**120**
SU	25 to 360

Ordering Data Suction Cup Covers SU

Suction cup cover SU is delivered in the desired diameter

Suction Cup Covers SU

Type	Part Number
SU 25	10.01.01.13584
SU 30	10.01.01.12889
SU 40	10.01.01.12856
SU 50	10.01.01.12837
SU 60	10.01.01.13585
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 Cup Covers SU

Type*	Clamping range [mm]	Suitable for the following suction cups/plates**	Operating temperature [°C]	Weight [g]
SU 25	25…30	PFYN 25; SPF 25	-20…80	0.9
SU 30	30…35	PFYN 30 und 35; SPF 30; SAF 30; SGPN 34	-20…80	1.2
SU 40	40…45	PFYN 40; SPF 40; SAF 40	-20…80	1.3
SU 50	50…60	PFYN 50; SPF 50; SAF 50	-20…80	1.5
SU 60	60…70	PFYN 60; SPF 60; SAF 60	-20…80	1,7
SU 70	70…75	SPK 55	-20…80	1.8
SU 80	80…900	PFYN 80; SAF 80	-20…80	1.9
SU 100	100…115	PFYN 95; SPU 100; SAF 100; SPK 80	-20…80	2.0
SU 120	120…130	PFYN 120; SPU 125; SAF 125; SGF 125	-20…80	3.0
SU 160	150…180	SGF(-HS) 150; PFYN 150; SPU 160; SPK 110	-20…80	4.0
SU 210	210…220	SGF 200; SPU 210; PFYN 200; SPK 160	-20…80	4.0
SU 230	230…250	SPK 200	-20…80	5.0
SU 280	250…300	SGF-HS 250; SPU 250; SPK 250	-20…80	9.0
SU 300	300…330	SGF 300; SPU 300	-20…80	17.0
SU 360	360…400	SGF-HS 350; SPU 360	-20…80	23.0

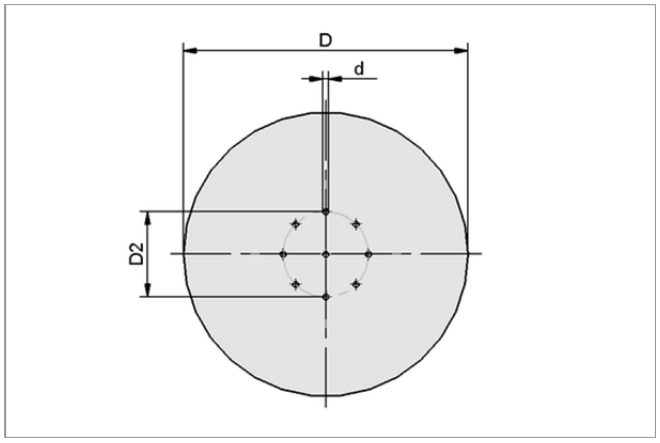
* The suction capacity of the vacuum generator has to be increased. In order to define the required suction capacity for the use of the SU tests with the original workpiece and suction plate/cup have to be carried out.
In vertical applications the lateral force will be reduced. We recommend tests with the original suction plate/cup before the use of suction cup covers SU.
** You can find suitable suction cup types in the Vacuum Components catalog on page 61 and following. The use on bellows suction cups is possible and should be tested in individual cases.

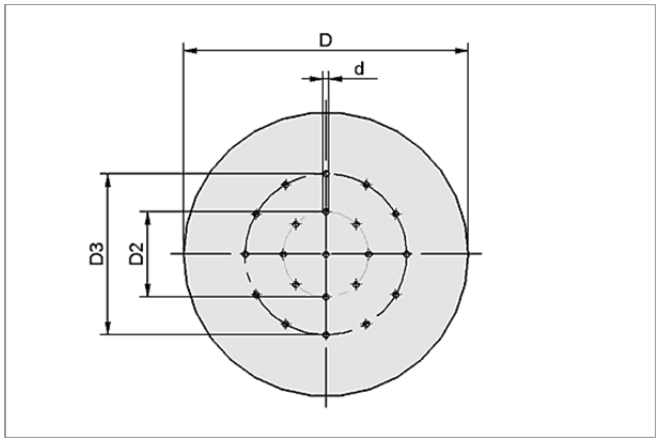
Suction Cups for Handling Glass

Suction Cup Covers SU

Diameter (Ø) from 25 mm to 360 mm

Design Data Suction Cup Covers SU





SU 25 to 360

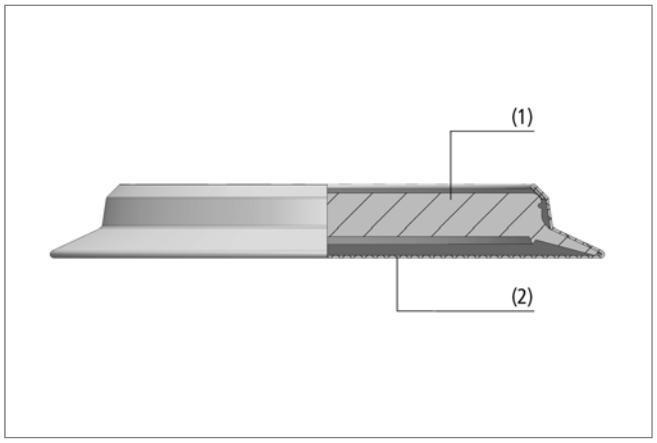
Type	Dimensions in mm			
	D	D2	D3	d
SU 25	28	-		3
SU 30	39	-	-	3
SU 40	47	-	-	3
SU 50	57	30	-	5
SU 60	67	30	-	5
SU 70	77	30	-	5
SU 80	88	30	-	5
SU 100	111	50	-	6
SU 120	132	50	-	6
SU 160	170	50	-	6
SU 210	200	50	-	6
SU 230	219	50	-	6
SU 280	267	50	-	6
SU 300	300	90	170	6
SU 360	360	90	170	6

Suction Cups for Handling Glass

Protection Covers PC

Diameter (Ø) from 125 mm to 400 mm

Protection covers PC



System design protection covers PC

Protection covers PC used on suction plates

Suitability for Process-Specific Applications

Applications

- Protection of unused suction plates from dust and dirt, e.g. on manual handling systems that are not in use
- High quality protection cover for suction cups and suction plates
- Used during storage and transport of suction cups / plates
- Used on suction plates of outdoor handling devices to protect the suction plates from environmental influences
- The protection covers PC are NOT for the use during handling / active vacuum

Design

- Protection covers (2) made of robust material resistant to chemicals
- The cover (2) can be easily mounted to suction cups and suction plates (1) and fastened with the integrated rubber band
- With diameters from 125 to 400 mm, the covers are designed to match the corresponding diameter ranges of the suction plates and suction cups

Our Highlights…	Your Benefits…
• Protection of the suction cups/plates from environmental influences (e.g. ozone / UV)	> Higher lifetime of the suction cup material
• Protection from dust and dirt	> Reduced risk of contamination and damage of the glass surface
• Integrated elastic band	> Fast and easy installation on suction plates and suction cups
• Large range of diameters	> Installation on flat suction cups, bellows suction cups and suction plates

Suction Cups for Handling Glass

Protection Covers PC

Diameter (Ø) from 125 mm to 400 mm

Designation Code Protection Covers PC

Abbreviated designation	Diameter Ø in mm
Example PC 125:	
PC	**125**
PC	125 to 400

Ordering Data Protection Covers PC

Protection cover PC is delivered in the desired diameter.

Protection Covers PC

Type	Part Number
PC 125	10.01.01.13086
PC 150	10.01.01.13087
PC 175	10.01.01.13088
PC 200	10.01.01.13089
PC 250	10.01.01.13090
PC 300	10.01.01.13091
PC 350	10.01.01.13092
PC 400	10.01.01.13093

Technical Data Protection Covers PC

Type*	Clamping range [mm]
PC 125	110...135
PC 150	135…165
PC 175	165…190
PC 200	190…220
PC 250	220…275
PC 300	275…325
PC 350	325…375
PC 400	375…425

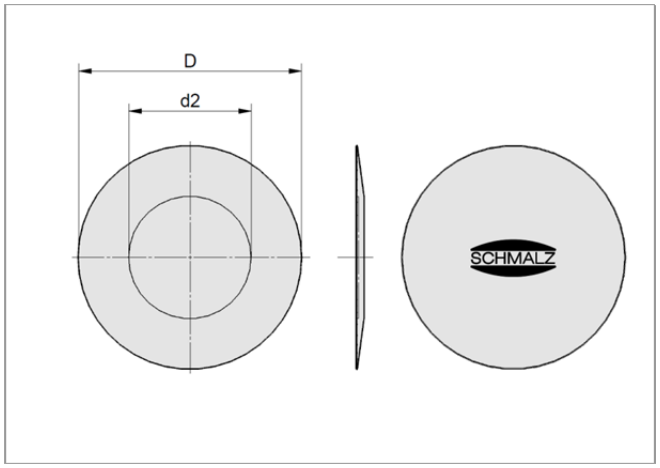
* The protection cover is designed for the use with suction cups / plates that out of use. The PC can not be used for / during handling.

Suction Cups for Handling Glass

Protection Covers PC

Diameter (Ø) from 125 mm to 400 mm

Design Data Protection Covers PC



PC 125 to 400

Type	Dimensions in mm	
	D	d2
PC 125	125	65
PC 150	150	75
PC 175	175	90
PC 200	200	100
PC 250	250	125
PC 300	300	150
PC 350	350	175
PC 400	400	200

Overview of Section 2

Special Grippers

Special Grippers for Handling Glass

Thin Glass Gripper STGG

56

- Dimension: 105 x 55 mm and 170 x 105 mm
- Different vacuum generators
- Material suction plate: PEEK, POM-ESD

Thin Glass Gripper for extremely dynamic, contamination-free and gentle handling of thin glass / display glass with maximum process reliability.

Floating Suction Cups SBS

64

- Diameter: 20 to 120 mm
- Holding force: 2.0 to 104 N
- Rubber buffers on the bottom side of the suction cup

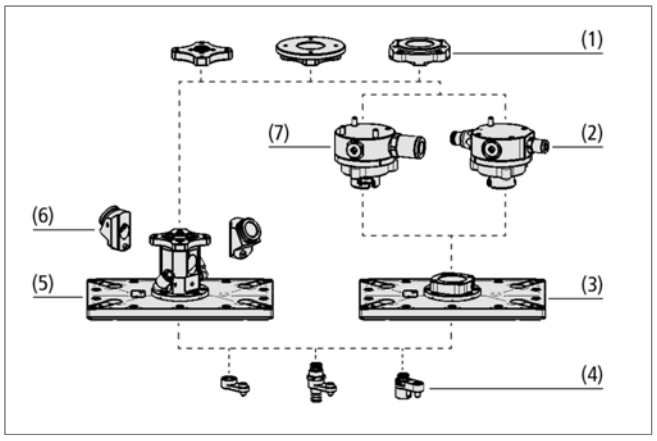
Floating suction cup for the low-contact handling of sensitive and coated glass.

Special Grippers for Handling Glass

Thin Glass Gripper STGG

Suction area (LxW) 105 x 55 mm and 170 x 105 mm

Thin glass gripper STGG (left QCMV / right E100)



System design thin glass gripper STGG

Thin glass gripper STGG being used for handling display glass

Suitability for Process-Specific Applications

Applications

- Special gripper for the gentle handling of thinnest glass
- Used e.g. in the production process of 0.1 mm thin display glass
- Extremely fast and gentle handling of sensitive workpieces in fully or semi-automated production of displays, e.g. TFT screens, smartphones or tablets
- Handling without contamination and thus no negative effect on subsequent processes such as coating

Design

- Basic body (5) made of lightweight plastic and aluminium with integrated vacuum generation and blow-off function (type E100)
- Basic body (3) made of lightweight plastic and aluminium with integrated vacuum generator (QCMV) (2); alternatively for connection to an external vacuum generator (QCM) (7)
- PEEK or POM-ESD (Specific resistance 10^6 to $10^9\Omega$) suction area in standard sizes 100 x 55 mm and 170 x 105 mm, custom made sizes available on request
- Modular design: optional mounting of sensors and modules for suction and damping as well as Bernoulli modules (4); different robot flange modules (1) available
- Optional exhaust unit (6) for controlled discharge of exhaust air for clean room applications (only type E100)

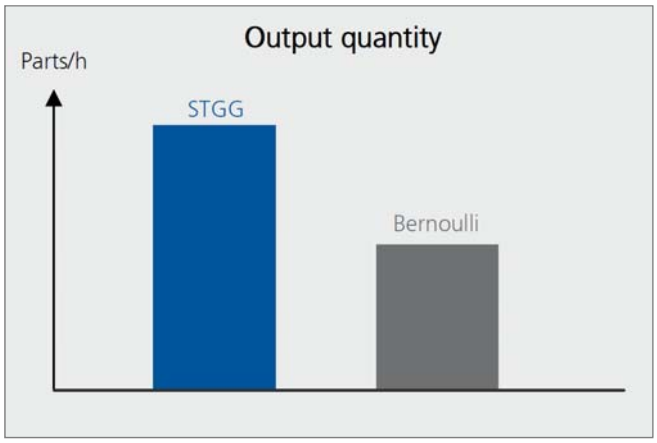
Our Highlights…	Your Benefits…
• Suction plate made of mark-free material PEEK or POM-ESD	> No contamination of the glass surface or for ESD requirements
• High suction capacity and maximum effective suction area (type E100)	> Gentle handling with high forces
• High vacuum level (type QVCM) with ejector ecoPump	> Extremely high gripping forces for high dynamic processes
• Type QCM for external vacuum generation	> Flexible vacuum generation, e.g. compact ejector incl. process monitoring
• Full surface gripping	> Low surface pressure and stress on the glass

Special Grippers for Handling Glass

Thin Glass Gripper STGG

Suction area (LxW) 105 x 55 mm and 170 x 105 mm

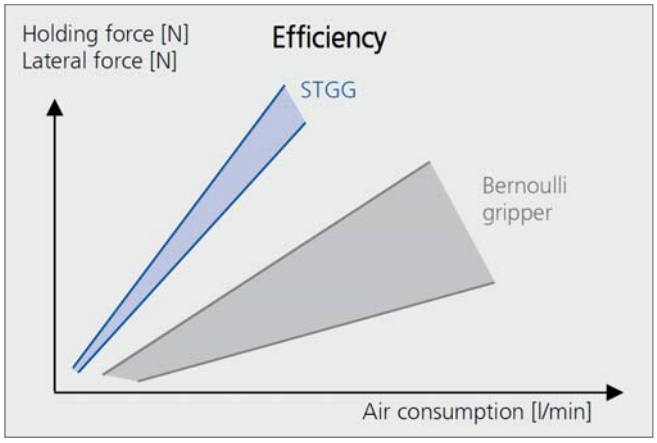
Innovative Functions Combined in One Gripper



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

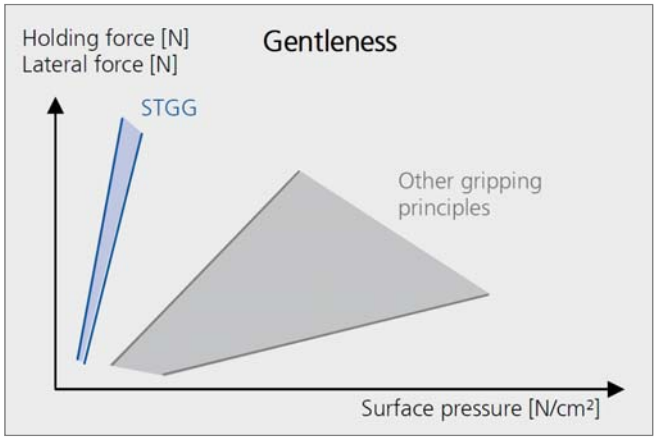
  → **Maximum output with cycle times of less than one second**



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 workpiece 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 glass 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 and damage of coatings**

* Even on PV wafers!
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. Please contact our specialists for detailed information regarding the Fraunhofer analysis.

Special Grippers for Handling Glass

Thin Glass Gripper STGG

Suction area (LxW) 105 x 55 mm and 170 x 105 mm

Designation Code Thin Glass Gripper STGG

Abbreviated designation	Design	Dimensions in mm	Vacuum generator	Blow-off function	Material suction area
Example STGG S 100x55 1xE100 A PEEK:					
STGG	**S**	**100x55**	**1xE100**	**A**	**PEEK**
STGG	S lateral exhaust air	100x55 170x105	1xE100 integrated QCMV HV 1 13 integrated QCMV 51 external	A Blow-off function	PEEK POM-ESD

Ordering Data Thin Glass Gripper STGG

Thin glass gripper STGG is delivered assembled.

- Gripper available in various dimensions with integrated vacuum generation (1xE100 or QCMV) or with connection for external vacuum generation (QCM)

Available accessories: flange plate, holder, suction/damping module, floating suction cup (Bernoulli) module, exhaust set

Thin Glass Gripper STGG

Type*	Part Number
STGG S 100x55 1xE100 A PEEK	10.01.30.00469
STGG S 170x105 1xE100 A PEEK	10.01.30.00473
STGG 100x55 QCMV HV 2 13 PEEK	10.01.30.00517
STGG 170x105 QCMV HV 2 13 PEEK	10.01.30.00518
STGG 100x55 QCM 51 PEEK	10.01.30.00519
STGG 170x105 QCM 51 PEEK	10.01.30.00520
STGG S 100x55 1xE100 A POM-ESD	10.01.30.00756
STGG S 170x105 1xE100 A POM-ESD	10.01.30.00775

* Additional dimensions on request

Ordering Data Accessories Thin Glass Gripper STGG

Type*	Suitable for	Part Number
Flange plate FLAN-PL 55x7.5-AB1	STGG …	10.01.30.00015
Flange plate FLAN-PL 63x10.5-AD1	STGG …	10.01.30.00016
Flange plate FLAN-PL 63x11.5-UNI	STGG …	10.01.30.00017
Flange plate FLAN-PL 55x9.5-JP1	STGG …	10.01.30.00194
Bernoulli module SBSm 14 90-3 S1	STGG S 170x105 … (4 pcs required)	10.01.01.12912
Bernoulli module SBSm 14 90-3 S1 90	STGG S 100x55 … (2 pcs required)	10.01.01.13171
Suction-/Absorption module SD-MOD 4 x 32x15x35 FG 9 SWGm	STGG …	10.01.30.00121
Exhaust-air duct ABL-SET 14 SWGm	STGG S … 1xE100 A	10.01.30.00059
Holder HTR-UNI SWGm	STGG …	10.01.30.00117
Holder HTR M8x1-IG SWGm	STGG …	10.01.30.00118
Holder HTR M12x1-IG SWGm	STGG …	10.01.30.00119
Valve EMV 1.5 24V-DC 3/2 NC K-2P**	STGG S … 1xE100 A	10.05.01.00288
Valve EMV 2.5 24V-DC 3/2 NC K-2P***	STGG S … 1xE100 A	10.05.01.00289

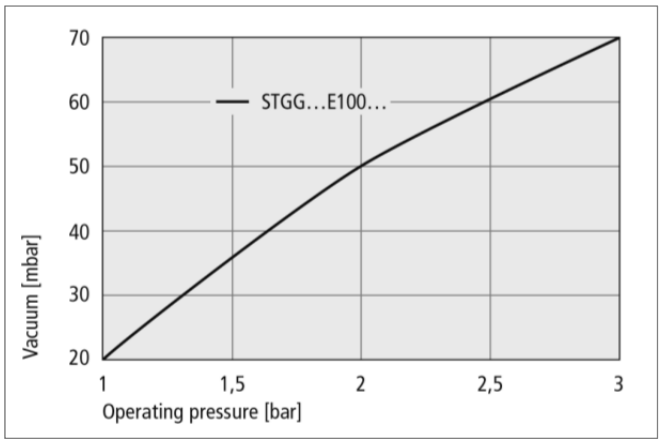
* Additional flange plates on request
** Suitable for compressed-air connection „suction“
*** Suitable for compressed-air connection „blow-off“

Special Grippers for Handling Glass

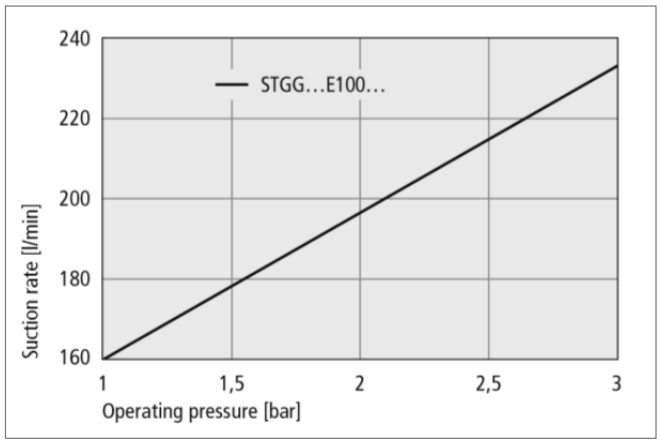
Thin Glass Gripper STGG

Suction area (LxW) 105 x 55 mm and 170 x 105 mm

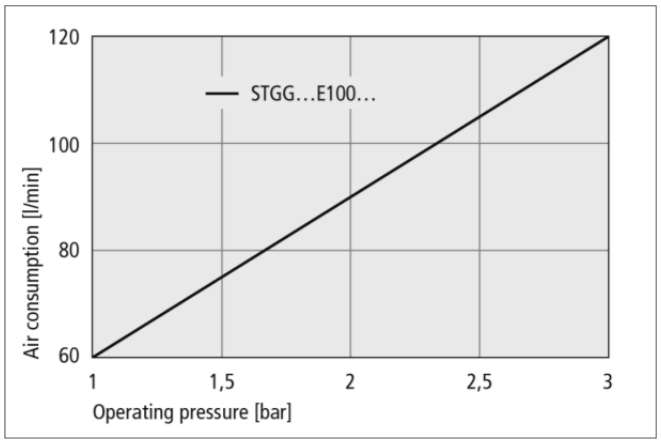
Performance Data Thin Glass Gripper STGG



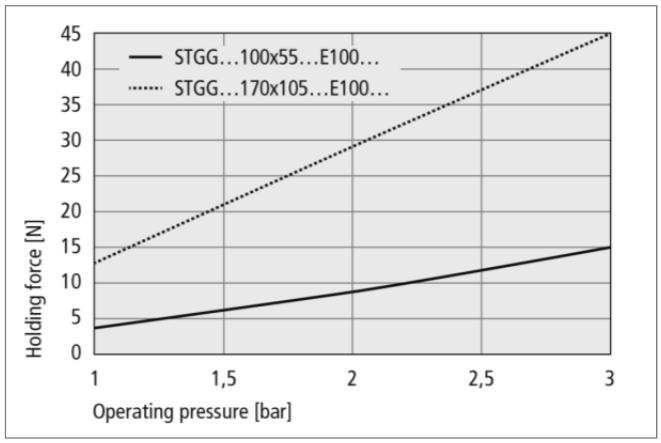
STGG…E100 achievable vacuum at various operating pressures



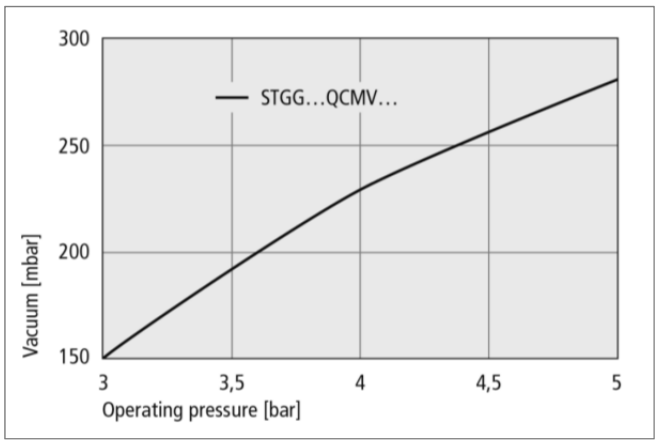
STGG…E100 suction rate at various operating pressures



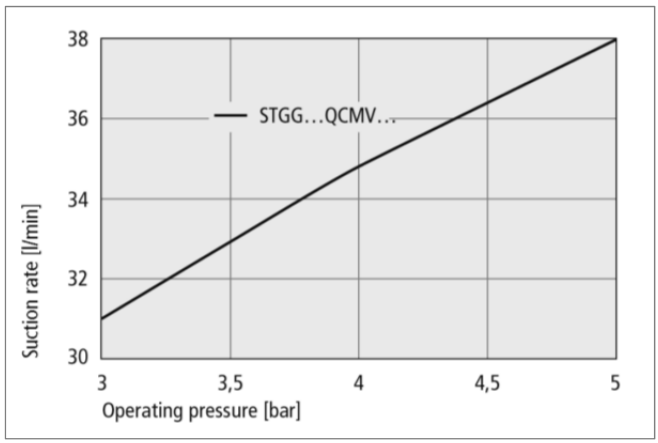
STGG…E100 air consumption at various operating pressures



STGG…E100 holding force at various operating pressures



STGG…QCMV achievable vacuum at various operating pressures



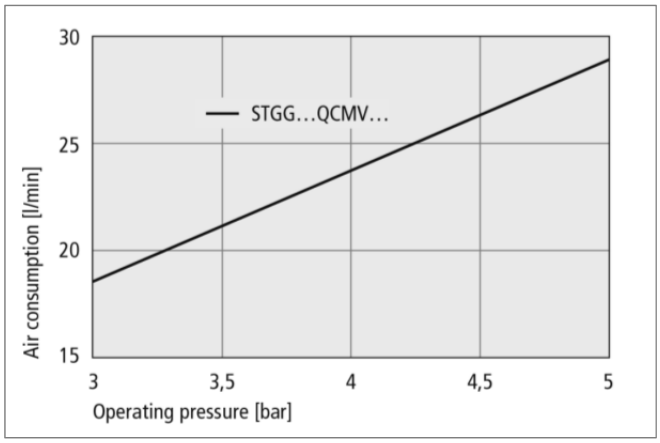
STGG…QCMV suction rate at various operating pressures

Special Grippers for Handling Glass

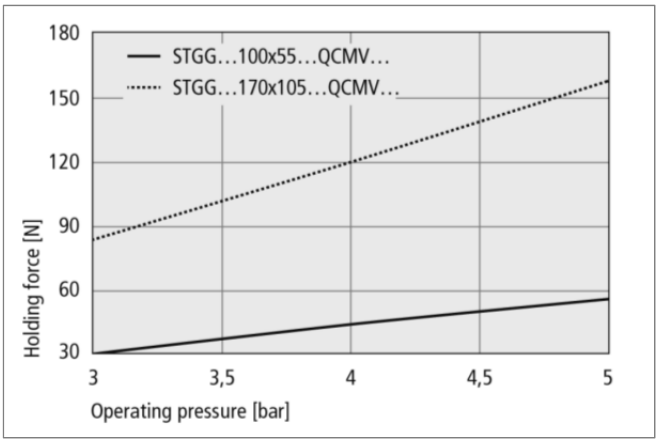
Thin Glass Gripper STGG

Suction area (LxW) 105 x 55 mm and 170 x 105 mm

Performance Data Thin Glass Gripper STGG



TGG…QCMV air consumption at various operating pressures



STGG…QCMV holding force at various operating pressures

Technical Data Thin Glass Gripper STGG … 1xE100 / QCMV (with integrated vacuum generator)

Type	Holding force [N]*	Suction rate [l/min]	Air consumption [l/min]	Oper. pressure [bar]	Oper. temperature [°C]	Weight [g]
STGG S 100x55 1xE100 A	4 … 15	160 … 235	60 … 120	1 … 3	5 … 60	215
STGG S 170x105 1xE100 A	13 … 45	160 … 235	60 … 120	1 … 3	5 … 60	360
STGG 100x55 QCMV HV 2 13	30 … 56	31 … 38	18 … 28	3 … 5	5 … 60	300
STGG 170x105 QCMV HV 2 13	86 … 160	31 … 38	18 … 28	3 … 5	5 … 60	450

* Indicated values are based on a full surface contact to the workpiece. The holding force is influenced by the characteristics of the workpiece (planarity, inherent stability) – For the system layout tests with the original workpiece are necessary. Values based on the indicated pressure range.

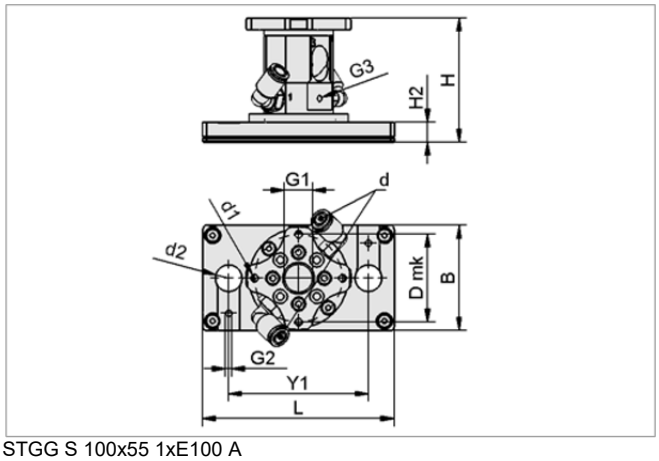
Technical Data Thin Glass Gripper STGG … QCM(with connection for external vacuum generator)

Type	Flow rate [m³/h]*	Oper. temperature [°C]	Weight [g]
STGG 100x55 QCM 51	20	5 … 60	325
STGG 170x105 QCM 51	20	5 … 60	475

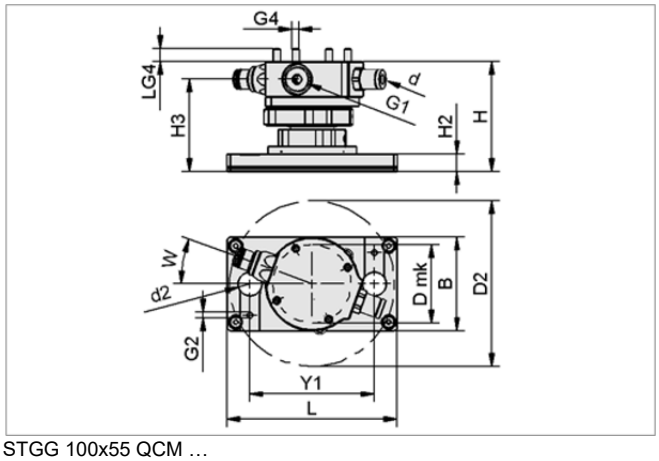
* Recommended capacity of the used vacuum generator

** Additional technical data such as holding force or vacuum level are influenced by the characteristics of the workpiece and the used vacuum generator – For the system layout tests with the original workpiece are necessary.

Design Data Thin Glass Gripper STGG



STGG S 100x55 1xE100 A



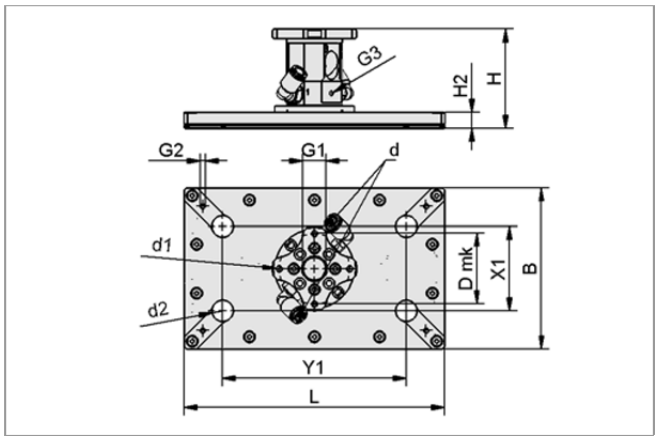
STGG 100x55 QCM …

Special Grippers for Handling Glass

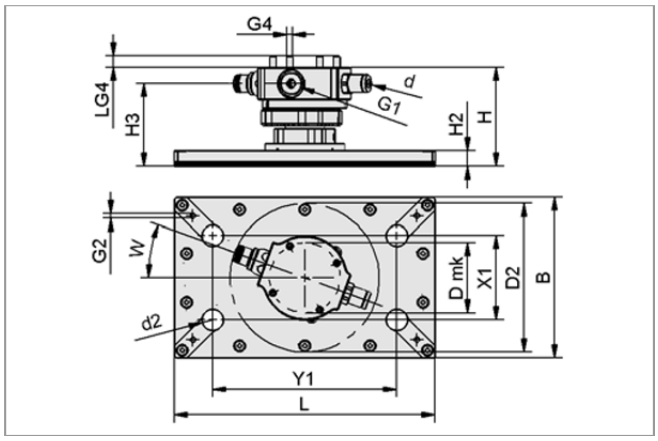
Thin Glass Gripper STGG

Suction area (LxW) 105 x 55 mm and 170 x 105 mm

Design Data Thin Glass Gripper STGG



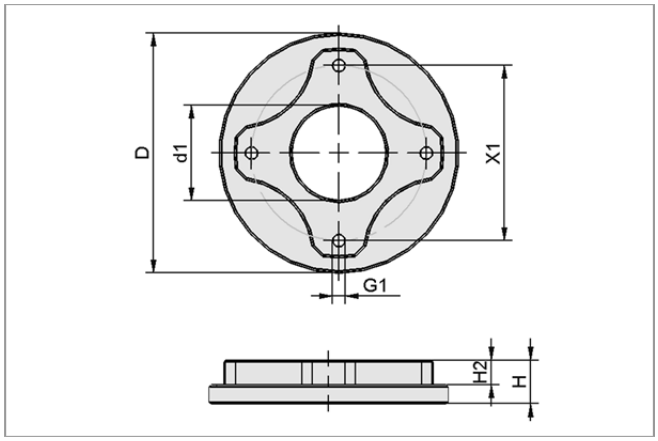
STGG S 170x105 1xE100 A



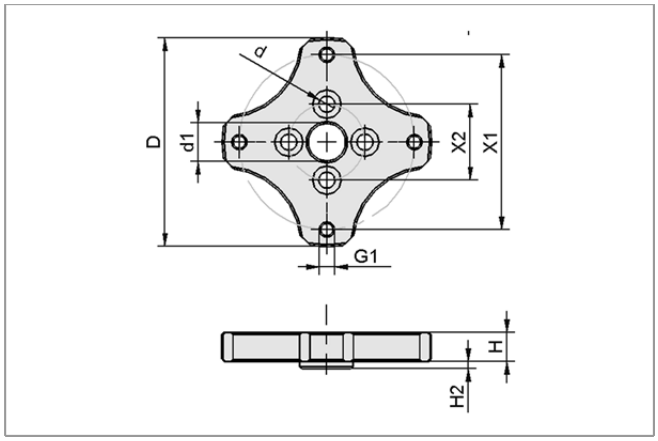
STGG 170x105 QCM …

Type	Dimension in mm																	
	L	B	d	d1	d2	G1	G2	G3	G4	H	H2	H3	LG4	D2	Dmk	X1	Y1	W [°]
STGG S 100x55 1xE100 A	100	55	6	4.0	14	G3/8-F	M4-F	M4-F	-	65.0	10.5	-	-	-	46	-	73	-
STGG S 170x105 1xE100 A	170	105	6	4.0	14	G3/8-F	M4-F	M4-F	-	65.0	10.5	-	-	-	46	55	120	-
STGG 100x55 QCMV HV 2 13	100	55	6	-	14	G1/8-F	M4-F	-	M4-M	67.4	10.5	56.9	7.6	97	46	-	73	20
STGG 170x105 QCMV HV 2 13	170	105	6	-	14	G1/8-F	M4-F	-	M4-M	67.4	10.5	56.9	7.6	97	46	55	120	20
STGG 100x55 QCM 51	100	55	12	-	14	G1/8-F	M4-F	-	M4-M	67.4	10.5	56.9	7.6	112	46	-	73	20
STGG 170x105 QCM 51	170	105	12	-	14	G1/8-F	M4-F	-	M4-M	67.4	10.5	56.9	7.6	112	46	55	120	20

Design Data Accessories Thin Glass Gripper STGG – Flange plates



Flange plate FLAN-PL 63x11.5-UNI



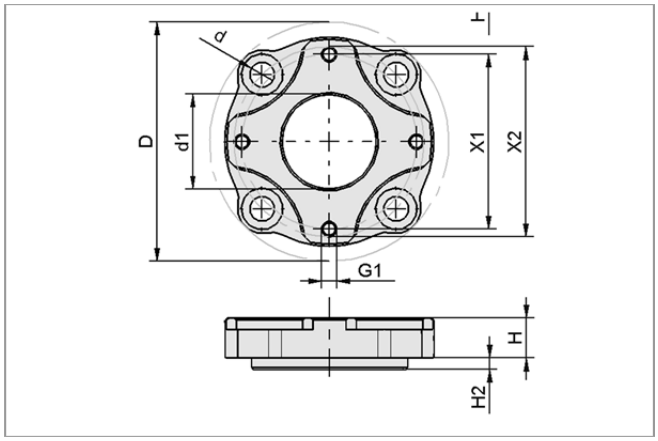
Flange plate FLAN-PL 55x7.5-AB1

Special Grippers for Handling Glass

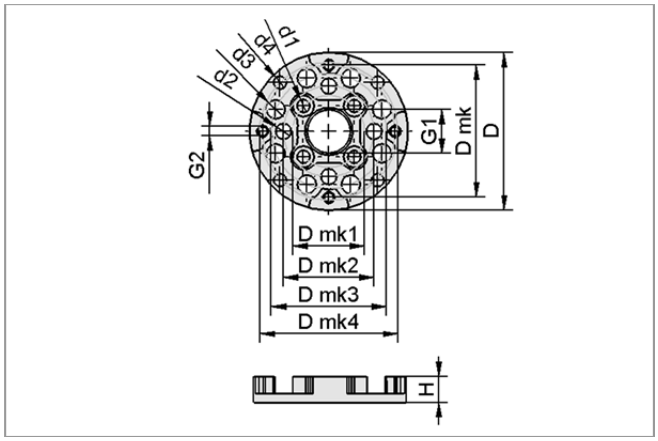
Thin Glass Gripper STGG

Suction area (LxW) 105 x 55 mm and 170 x 105 mm

Design Data Accessories Thin Glass Gripper STGG – Flange plates



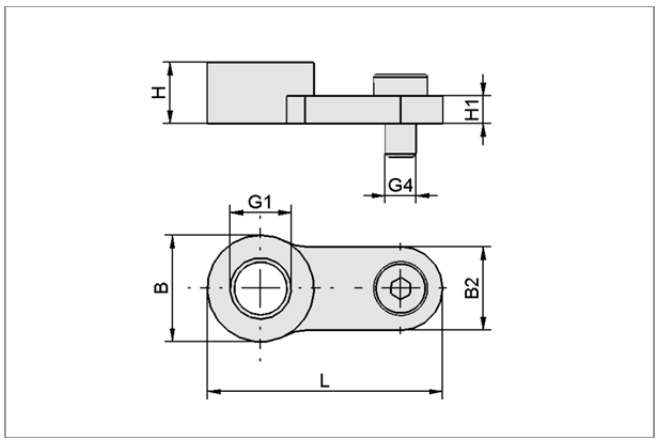
Flange plate FLAN-PL 63x10.5-AD1



Flange plate FLAN-PL 55x9.5-JP1

Type	Dimensions in mm																
	D	d	d1	d2	d3	d4	H	H2	G1	G2	X1	X2	Dmk	Dmk1	Dmk2	Dmk3	Dmk4
FLAN-PL 63x11.5-UNI	63	25	-	-	-	-	11.5	6.5	M4-F	-	46	-	-	-	-	-	-
FLAN-PL 55x7.5-AB1	55	4.3	10	-	-	-	7.5	2	M4-F	-	46	20	-	-	-	-	-
FLAN-PL 63x10.5-AD1	63	6.6	25	-	-	-	10.5	3	M4-F	-	46	50	-	-	-	-	-
FLAN-PL 55x9.5-JP1	55	-	4.5	5.5	6.6	4.5	9.5	-	G3/8-F	M4-F	-	-	46	25	31.5	40	48

Design Data Accessories Thin Glass Gripper STGG



Holder HTR-…

Type	Dimensions in mm			
	B	B2	G1	G4
HTR-UNI SWGm	14	11	-	M4-M
HTR M8x1-IG SWGm	14	11	M8x1-F	M4-M
HTR M12x1-IG SWGm	14	11	M12x1-F	M4-M

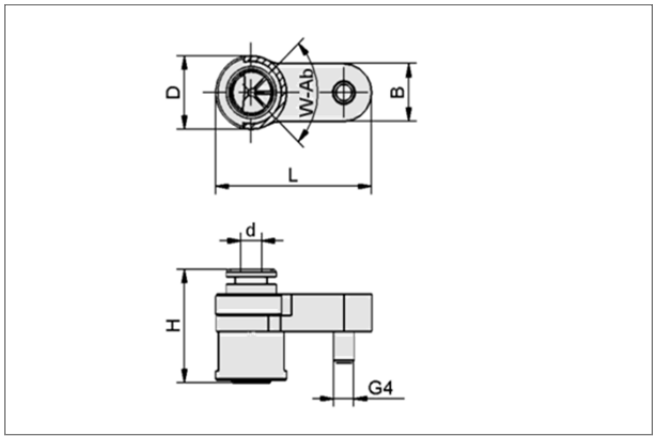
Typ	Dimensions in mm			
	H	H1	H2	L
HTR-UNI SWGm	8	3.6	-	30.9
HTR M8x1-IG SWGm	8	-	3.6	30.9
HTR M12x1-IG SWGm	8	3.6	-	30.9

Special Grippers for Handling Glass

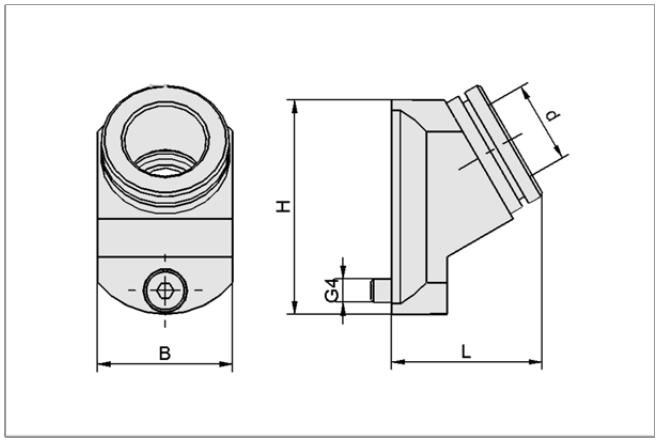
Thin Glass Gripper STGG

Suction area (LxW) 105 x 55 mm and 170 x 105 mm

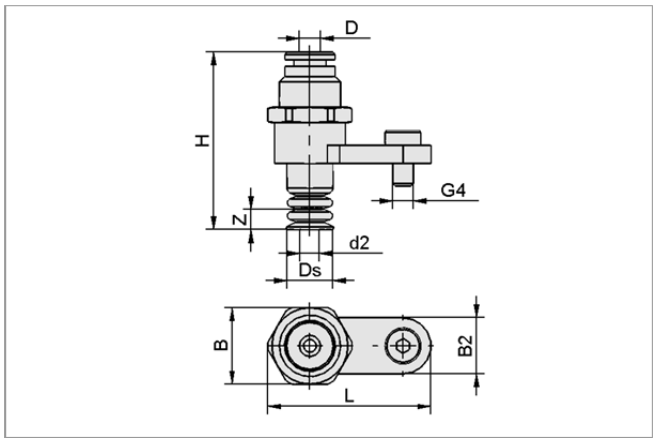
Design Data Accessories Thin Glass Gripper STGG



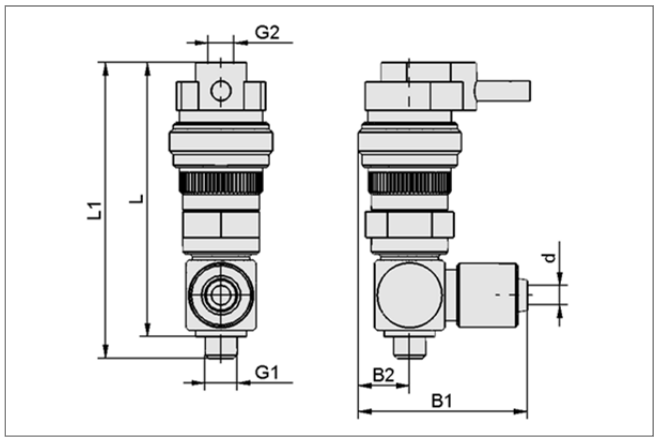
Bernoulli modules SBSm 14 90-3 S1



Exhaust-air duct ABL-SET 14 SWGm



Suction/absorption module SD-MOD 4 x 32x15x35 FG 9 SWGm



Valves EMV

Type	Dimensions in mm														
	B	B1	B2	d	d2	D	Ds	G1	G2	G4	H	L	L1	W-Ab	Z
SD-MOD 4 x 32x15x35 FG 9 SWGm	15	-	11	-	4.1	4.0	9	-	-	M4-M	35.0	32.0	-	-	3
SBSm 14 90-3 S1	11	-	-	4		14		-	-	M4-M	21.6	30.9	-	90°	-
ABL-SET 14 SWGm	23	-	-	14	-	-	-	-	-	M4-M	36.5	25.5	-	-	-
EMV 1.5 24V-DC 3/2 NC K-2P	-	26.6	8	4	-	-	-	M5-M	M5-F	-	-	43.1	46.5	-	-
EMV 2.5 24V-DC 3/2 NC K-2P	-	31.7	11	4	-	-	-	G1/8”-M	M5-F	-	-	51.7	56.5	-	-

Special Grippers for Handling Glass

Floating Suction Cups SBS

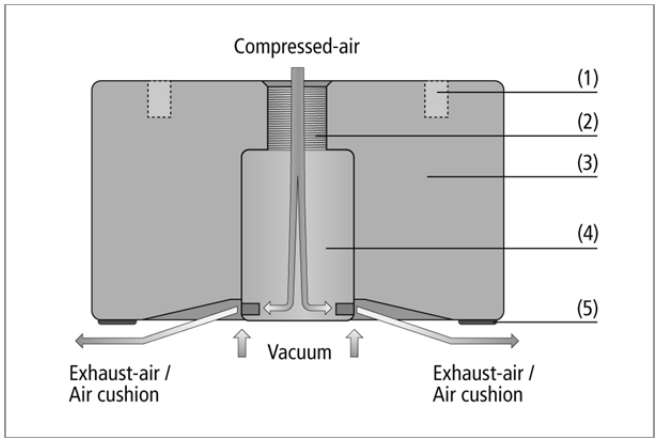
Diameter (Ø) from 20 mm to 120 mm

Suitability for Process-Specific Applications

Floating suction cups SBS

Applications

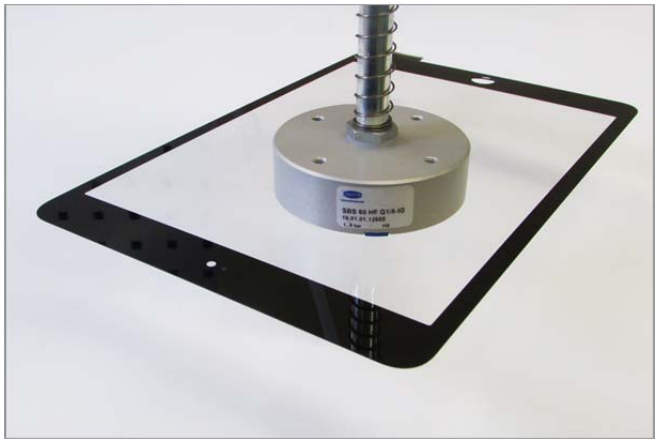
- Floating suction cups for handling glass, especially thin glass with low-contact for a gentle handling
- Central support (optional) reduces forces (shear forces), which appear to the glass
- Lifting of coated glass without contact, e.g. low-E glass in multiple layer IGU. SBS can be used without rubber buffers as a non-contact solutions (no lateral forces)
- Handling of display glass in different processes along the production chain with the contact material made of the non-marking material HT1



System design floating suction cups SBS

Design

- Available in diameters 20, 30, 40, 60, 100 and 120 mm
- Connection via four mounting threads on the top side (1) or vertical compressed-air connection (2)
- Vertical compressed-air connection (2) and horizontal compressed-air connection (closed with a plug)
- Anodized aluminum body (3) incl. Bernoulli nozzle (4)
- Non-marking rubber buffers of special material HT1 on the bottom side of the SBS (5). Optional available with central support “CS” for diameter 40 mm and 60 mm
- Version with high flow rate “HF” and standard flow rate “SF” available



Floating suction cups SBS for display glass handling

Our Highlights…	Your Benefits…
• Integrated vacuum generation on the Bernoulli principle	> Ready to use unit, operation without external ejector
• Suction cup "floats" on an air cushion	> Low-contact handling
• High volume flow rate at a low vacuum	> High engagement distances for the separation of glass or gripping from belt systems
• Elastomer buffers made of HT1 on the bottom side	> Absorption of lateral forces, non-marking material HT1
• Optional with central support (Ø 40 mm and 60 mm)	> Safe handling with reduced pressure on the glass surface, e.g. coatings

Special Grippers for Handling Glass

Floating Suction Cups SBS

Diameter (Ø) from 20 mm to 120 mm

Designation Code Floating Suction Cups SBS

Abbreviated designation	Diameter in mm	Flow characteristic	Connection thread mechanical	Product addition
Example SBS 20 SF M5-IG:		**SF**		
SBS	**20**		**M5-IG**	**H**
SBS	20 to 120	SF standard flow HF high flow	M5-IG (IG = female (F)) G1/8-IG	CS central support

Ordering Data Floating Suction Cups SBS

Floating suction cups SBS is delivered assembled in the desired diameter.

Available spare parts: rubber buffer

Floating Suction Cups SBS

Type*	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
SBS 120 SF G1/8-IG	10.01.01.13136
SBS 120 HF G1/8-IG	10.01.01.13139

* CS = central support

Ordering Data Spare Parts Floating Suction Cup SBS

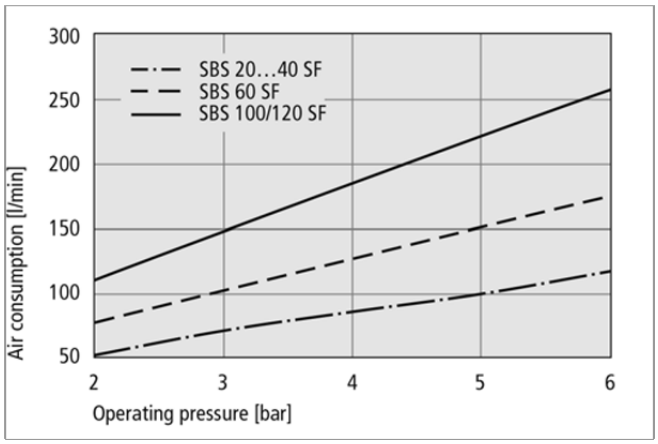
For Type	Rubber buffer (3 pcs. required)	Central support (1 pc. required)
SBS 20 SF M5-IG	10.01.01.12585	-
SBS 20 HF M5-IG	10.01.01.12585	-
SBS 30 SF M5-IG	10.01.01.12585	-
SBS 30 HF M5-IG	10.01.01.12585	-
SBS 40 SF G1/8-IG	10.01.01.12593	-
SBS 40 HF G1/8-IG	10.01.01.12593	-
SBS 40 SF G1/8-IG CS	10.01.01.12593	10.01.01.12780
SBS 60 SF G1/8-IG	10.01.01.12593	-
SBS 60 HF G1/8-IG	10.01.01.12593	-
SBS 60 SF G1/8-IG CS	10.01.01.12593	10.01.01.12780
SBS 100 SF G1/8-IG	10.01.01.12593	-
SBS 100 HF G1/8-IG	10.01.01.12593	-
SBS 120 SF G1/8-IG	10.01.01.12593	-
SBS 120 HF G1/8-IG	10.01.01.12593	-

Special Grippers for Handling Glass

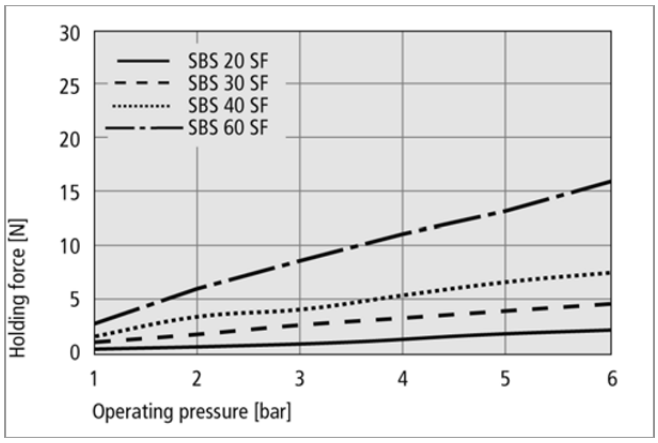
Floating Suction Cups SBS

Diameter (Ø) from 20 mm to 120 mm

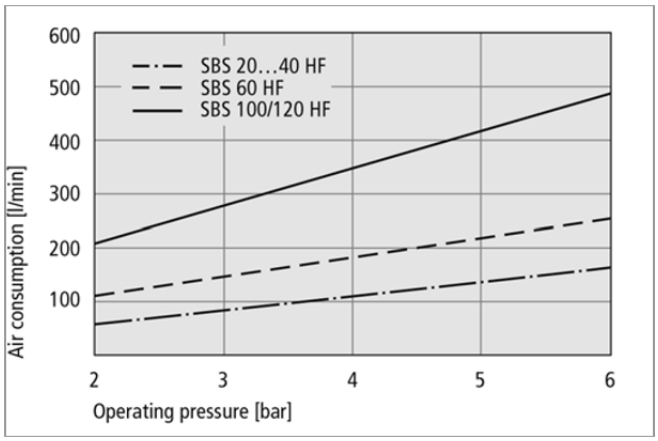
Performance Data Floating Suction Cups SBS



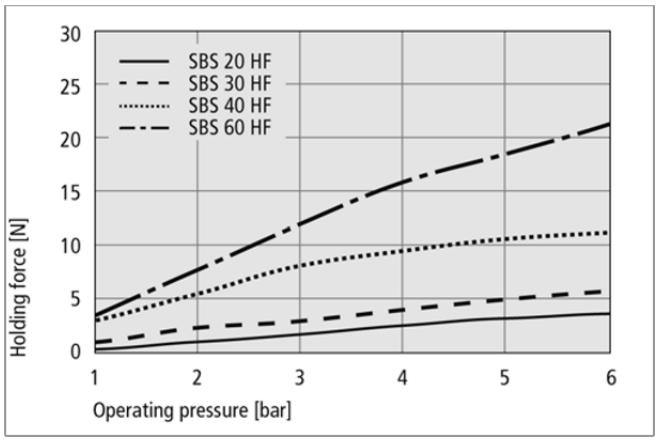
Air consumption SBS 20…120 SF



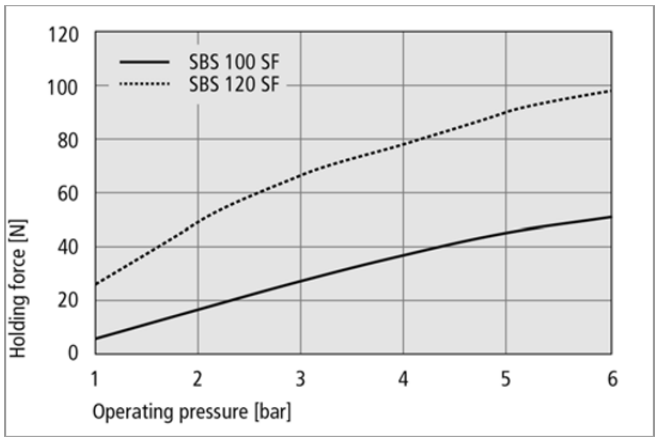
Holding force SBS 20…60 SF



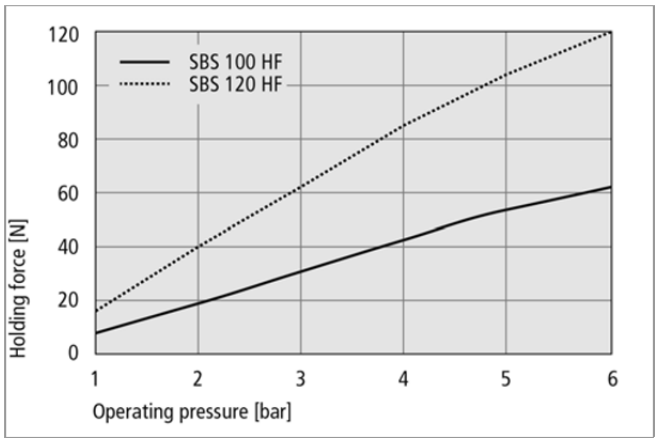
Air consumption SBS 20…120 HF



Holding force SBS 20…60 HF



Holding force SBS 100 and 120 SF



Holding force SBS 100 and 120 HF

Special Grippers for Handling Glass

Floating Suction Cups SBS

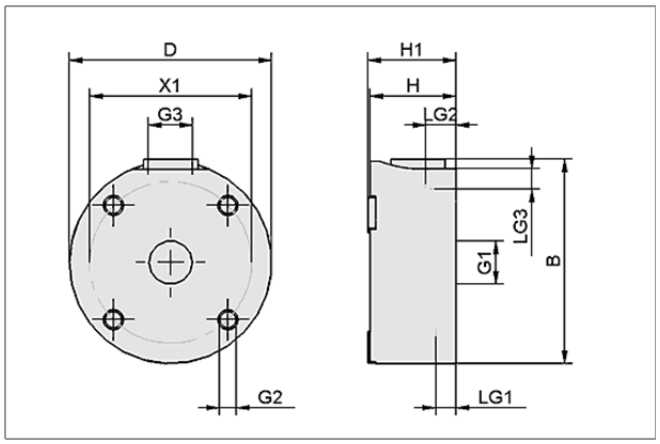
Diameter (Ø) from 20 mm to 120 mm

Technical Data Floating Suction Cups SBS

Type	Holding force [N]*	Air consumption [l/min]*	Operating pressure [bar]	Operating temperature [°C]	Weight [g]
SBS 20 SF M5-IG	2.0	100	1…6	0…80	12
SBS 20 HF M5-IG	3.0	140	1…6	0…80	12
SBS 30 SF M5-IG	4.0	100	1…6	0…80	31
SBS 30 HF M5-IG	5.0	140	1…6	0…80	31
SBS 40 SF G1/8-IG	6.5	100	1…6	0…80	51
SBS 40 HF G1/8-IG	10.5	190	1…6	0…80	51
SBS 40 SF G1/8-IG CS	6.5	100	1…6	0…80	53
SBS 60 SF G1/8-IG	13.0	150	1…6	0…80	118
SBS 60 HF G1/8-IG	18.5	225	1…6	0…80	118
SBS 60 SF G1/8-IG CS	13.0	150	1…6	0…80	120
SBS 100 SF G1/8-IG	46.0	225	1…6	0…80	295
SBS 100 HF G1/8-IG	55.5	420	1…6	0…80	295
SBS 120 SF G1/8-IG	89.0	225	1…6	0…80	390
SBS 120 HF G1/8-IG	104.0	420	1…6	0…80	390

* The specified values are valid for a operating pressure of 5 bar, measured on a air-tight workpiece with smooth surface.

Design Data Floating Suction Cups SBS



SBS 20 to 120

Type	Dimensions in mm										
	B	D	G1	G2	G3	H	H1	LG1	LG2	LG3	X1
SBS 20 SF M5-IG	22.2	20	M5-F	M3-F	M5-F	17	17.4	5	6	6	15
SBS 20 HF M5-IG	22.2	20	M5-F	M3-F	M5-F	17	17.4	5	6	6	15
SBS 30 SF M5-IG	32.0	30	M5-F	M4-F	M5-F	17	17.4	5	6	6	22
SBS 30 HF M5-IG	32.0	30	M5-F	M4-F	M5-F	17	17.4	5	6	6	22
SBS 40 SF G1/8-IG	41.0	40	G1/8“-F	M4-F	G1/8“-F	17	17.4	5	6	6	32
SBS 40 HF G1/8-IG	41.0	40	G1/8“-F	M4-F	G1/8“-F	17	17.4	5	6	6	32
SBS 40 SF G1/8-IG CS	41.0	40	G1/8“-F	M4-F	G1/8“-F	17	17.4	5	6	6	32
SBS 60 SF G1/8-IG	61.6	60	G1/8“-F	M4-F	G1/8“-F	17	17.4	5	6	6	45
SBS 60 HF G1/8-IG	61.6	60	G1/8“-F	M4-F	G1/8“-F	17	17.4	5	6	6	45
SBS 60 SF G1/8-IG CS	61.6	60	G1/8“-F	M4-F	G1/8“-F	17	17.4	5	6	6	45
SBS 100 SF G1/8-IG	101.0	100	G1/8“-F	M4-F	G1/8“-F	17	17.4	5	6	6	75
SBS 100 HF G1/8-IG	101.0	100	G1/8“-F	M4-F	G1/8“-F	17	17.4	5	6	6	75
SBS 120 SF G1/8-IG	121.5	120	G1/8“-F	M4-F	G1/8“-F	17	17.4	5	10	6	105
SBS 120 HF G1/8-IG	121.5	120	G1/8“-F	M4-F	G1/8“-F	17	17.4	5	10	6	105

Overview of Section 3

Vacuum Generators

Information

Vacuum Generators for Handling Glass

Compact Ejectors X-Pump SXPi / SXMPi with IO-Link

- Suction rate up to 220 l/min
- Max. vacuum 85%
- IO-Link

Robust and efficient compact ejector with Condition Monitoring, air-saving regulation and high blow-off capacity.

Compact Ejectors SCPi / SMPi with IO-Link

- Suction rate up to 195 l/min
- Max. vacuum 85%
- IO-Link

Lightweight and small compact ejector with system monitoring, air-saving function and high blow-off capacity.

Ejectors with Blow-off System SEAC-RP

- Suction rate up to 36 l/min
- Max. vacuum 85%
- Pneumatic air-saving function

Small ejectors with pneumactic air-saving function and blow-off for decentralized vacuum generation.

Dry-Running Vacuum Pumps EVE-TR-X

- Suction rate up to 129 m³/h
- Max. vacuum 92%
- Longevity improved rotary vanes

Low-maintenance, oil-free vacuum pump with integrated fan, permanently lubricated bearing and special rotary vanes for increased service life.

Energy and Process Control

Minimum Energy Consumption
Maximum System Availability and Performance

Energy-Efficient Solutions from Schmalz

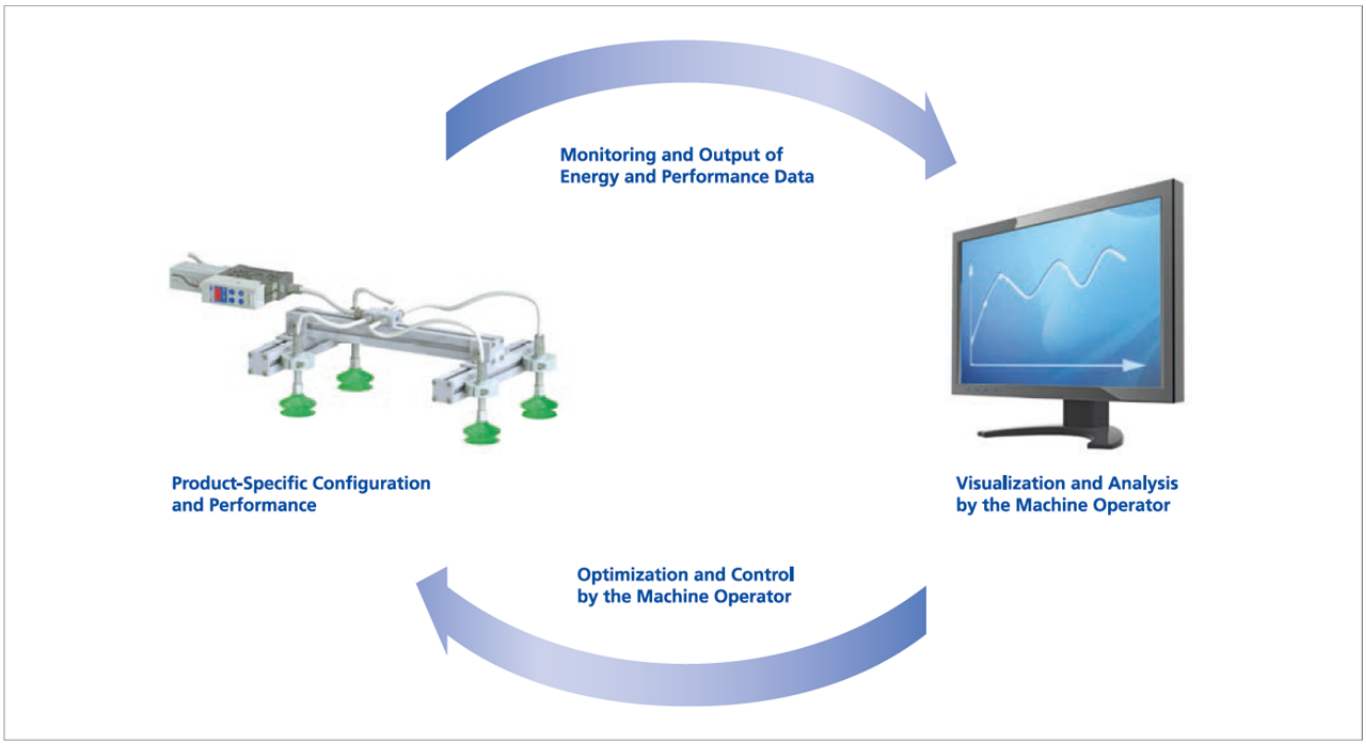
Rising energy prices and corporate responsibility promote the awareness of energy use. In automation technology, Schmalz supports you with efficient and sustainable vacuum solutions. In developing our products, we take into account both the energy consumption of the products themselves and their effect on the overall energy consumption of the entire process.

Compact Ejectors X-Pump with Energy and Process Control

From Product Efficiency to Process Efficiency

With the new energy and process control, Schmalz is building a bridge between efficient products and efficient processes. With this technology, all parameters relevant to energy consumption and performance of vacuum systems can be measured, monitored and optimized. Automated processes can therefore be improved to ensure maximum productivity. The energy and process control makes its debut in the compact ejectors XPump SXPi-PC and SXMPi-PC models, which are used as vacuum generators in many industries from glass to automotive.

Optimum Interplay between Product and Process



Energy and Process Control

Function Modules of the Compact Ejectors X-Pump

The energy and process control is a new function in Schmalz' compact ejectors X-Pump. For the first time, vacuum generators provide the machine operator with all information relevant to energy consumption and performance. The operator can import this data into his system controller and optimize the process. The technology is based on three function modules integrated into the X-Pump SXPi/SXMPi and SXPi-PC/SXMPi-PC models:

Energy Monitoring EM

For the optimization of energy consumption in vacuum systems

Condition Monitoring CM

For increasing system availability

Predictive Maintenance PM

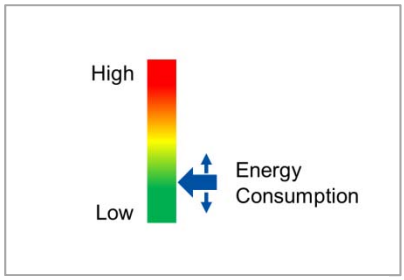
For increasing performance and quality of gripping systems

Energy Monitoring EM

Energy Monitoring for the Optimization of Energy Consumption in Vacuum Systems

The EM function determines a real value for the energy consumption of compact ejectors in vacuum systems. This allows the energy efficiency of a vacuum system to be optimized even before the start of operations. The energy consumption of the system in this state is saved in the system controller as the optimum value.

During operation, the EM function measures the actual energy consumption, recognizes any changes and reports these to the system controller. By making a visual representation of these values the machine operator can monitor, compare and optimize all parameters relevant to energy consumption.



Example for idication of energy consumption

Output parameters	Unit
Absolute energy consumption per cycle	Nl, W
Length of switch-on/suction times	s, %

Your Benefits

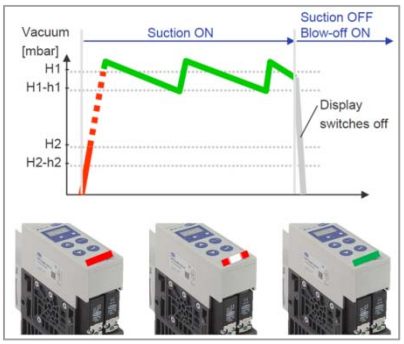
- Measurement of the current energy consumption of both individual system parts and the entire system
- Trend analysis per component, per production cycle and per shift
- Identification of disproportionate energy consumption
- Optimization of the energy consumption for the entire vacuum system

Condition Monitoring CM

Condition Monitoring for Increasing System Availability

The CM function measures the leak-tightness of the vacuum system during operation as well as the operating pressure. It continuously monitors the condition of the system during the process. If a leak arises in the system, this is displayed on the ejector and reported to the system controller. If the operating pressure falls below a critical value, this is reported immediately.

The CM function simultaneously monitors the valve switching frequency and, if necessary, switches off the vacuum generator's regulation or prevents the control frequency from rising too high in order to safeguard the process errors are identified early and the system availability is improved.



Example for idication of system status

Output parameters	Unit
Vacuum level	mbar
Operating pressure	bar
Leakage rate	mbar/s
Evacuation time	ms

Your Benefits

- Monitoring of all relevant process data by the ejector
- Maximum system availability due to detailed analysis of the condition of the vacuum system
- Fast and efficient rectification of critical errors in individual system parts or in the overall system
- Cost savings due to minimization of downtimes

Energy and Process Control

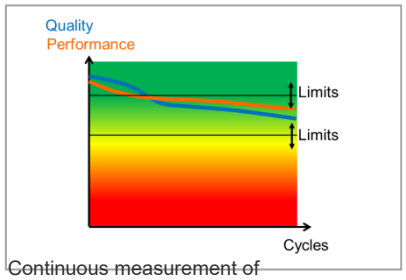
Function Modules of the Compact Ejectors X-Pump

Predictive Maintenance PM

Predictive Maintenance for Increasing Performance and Quality of Gripping Systems

The PM function determines the condition of the vacuum gripping system and allows the performance and quality of different gripping systems to be compared (e.g. in processes with changing components). The system measures the flow resistance and the leak-tightness of a particular gripper. This allows the operator to configure the gripper to ensure that the vacuum is provided with optimum speed and reliability.

With the PM function, the system can be set up for maximum performance even before the start of operations. During operation, the system recognizes any decline in the process e. g. by contaminations and allows this to be visualized. The operator can react before errors occur and recover the system performance (predictive maintenance).



Continuous measurement of Performce and Quality

Output parameters	Unit
Pressure during free suction, caused by the flow resistance of the gripping system (performance)	bar, %
Leak-tightness of the gripping system (quality)	mbar/s, %

Your Benefits

- Quick and easy system optimization by evaluating the performance of gripping systems
- Identification and prevention of faulty configurations
- Monitoring of performance-relevant process data and early recognition of changes in system condition (e.g. leakage or contamination)

Conclusion

Through the optimum interaction of these three function modules, compact ejectors X-Pump with energy and process control reduce energy consumption, enable early detection and rectification of errors and allow the system to be configured to maximum performance.

IO-Link

The future of process communication

IO-Link is the new standard in process communication. The interface between sensors and actuators transmits signals from the field level to higher-level controllers and bus systems. In comparison to the currently typical I/O mode, IO-Link offers crucial advantages over the entire life cycle of a system.

System life cycle with IO-Link

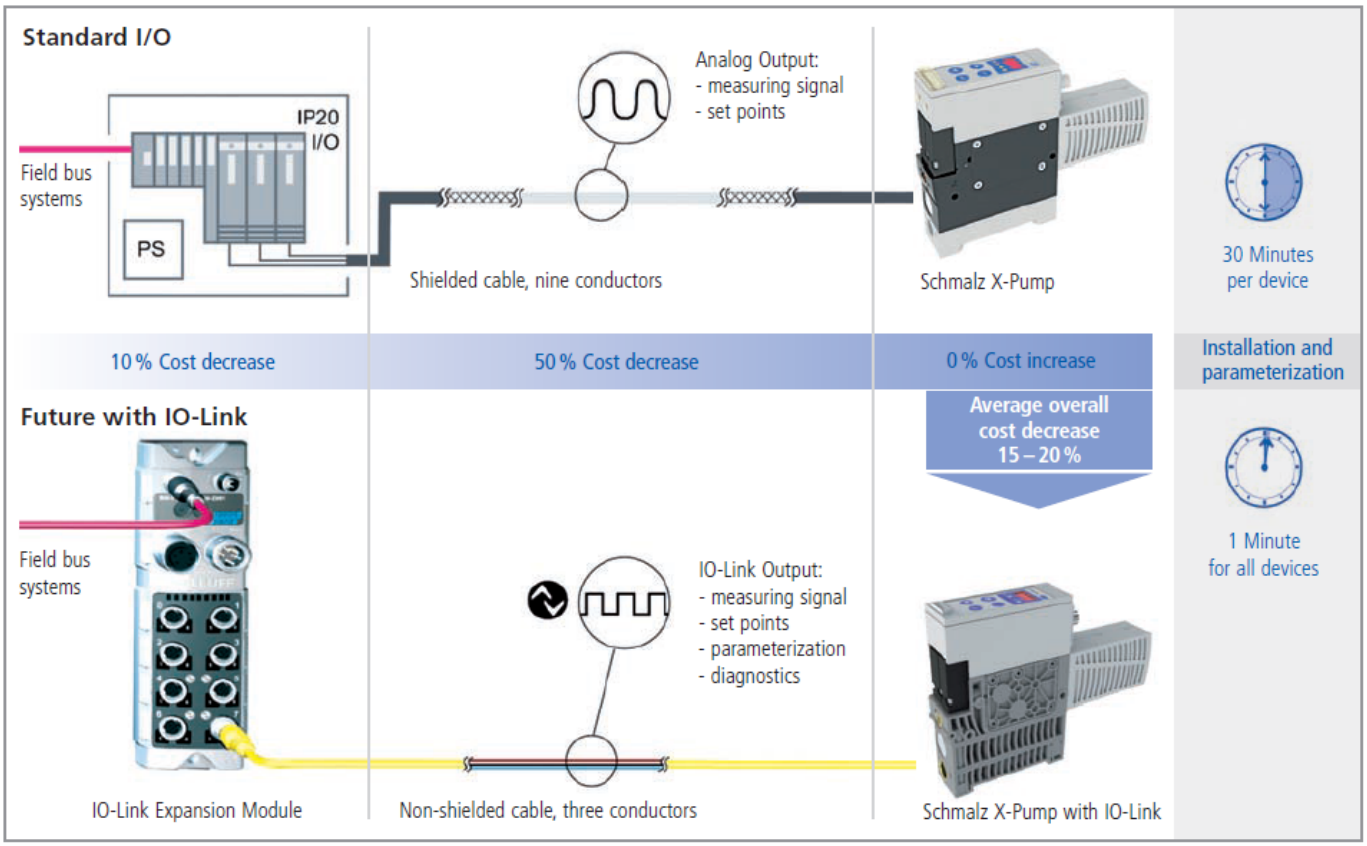
Market and demand	Development and design	Assembly and start of operations	Operation	Maintenance and repair
⬇ Set-up times	⬆ Standardization	⬇ Time	⬇ Downtime	⬆ Remote access
⬇ Downtime	⬇ Components	⬇ Components	⬆ Productivity	
⬆ Productivity	⬇ Design expense	⬇ Errors	⬆ Access	

IO-Link

Advantages of IO-Link

- Reduced wiring expense by using non-shielded 3-pole standard cables
- Transparent process data for a wide variety of bus systems
- Simplified uploading, downloading and management of parameters
- Reduced start-up times for fastest possible tool changings
- Central monitoring of the entire system
- Minimized downtime due to early fault recognition and localization
- Significant cost savings

Standard I/O in comparison with IO-Link

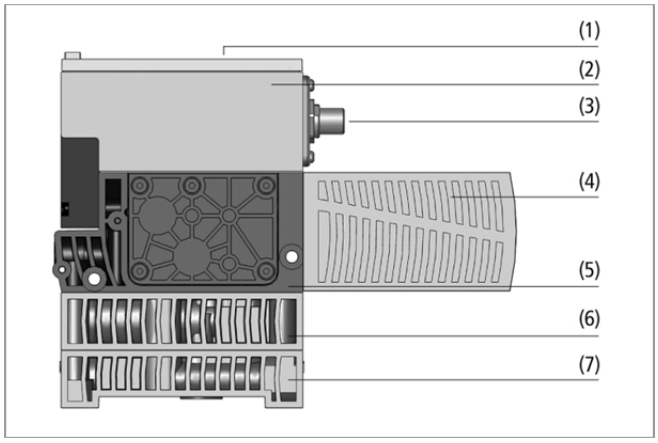


Vacuum Generators for Handling Glass

Compact Ejectors X-Pump SXPi / SXMPi with IO-Link

Suction rate from 185 l/min to 220 l/min

Compact ejectors X-Pump SXPi / SXMPi with IO-Link



System design compact ejectors X-Pump SXPi /SXMPi with IO-Link

Compact ejector X-Pump used for loading of a bending line

Suitability for Process-Specific Applications

Applications

- High performance vacuum generator for glass handling in different applications
- High suction and blow-off capacity for short cycle times and dynamic processes in the automotive glass industry
- Used in stacker applications with different glass sizes and vacuum circuits to monitor every circuit independently and reduce energy consumption with the integrated air-saving function
- Handling of glass with separation powder on the surface

Design

- Display (1) with large-scale operating and display elements
- Control unit (2) with advanced monitoring functions optional pressure sensor (PC type)
- Electrical connection (3) for M12 plug
- Removable silencer (4)
- Basic body (5) made of extremely robust plastic
- Type SXMPi with additional module (6) for power blow-off (adjustable)
- Connection plate (7): SX(M)Pi…H with horizontal connection and SX(M)Pi with quick-change connection
- With integrated pressure sensor (option)

Our Highlights...	Your Benefits...
• Integrated valves and system monitoring	> Ready-to-use unit without need for additional components
• Special valve technology	> Dirt resistance for the use with separation powder
• Integrated air-saving function	> Reduced running costs of the vacuum system
• Blow-off strength can be throttled and precisely adjusted	> Ejector suitable for different glass workpieces, cleaning of the vacuum circuit (e.g. powder) possible
• Suction valve as impulse (bistable) version available	> No undesired air consumption in case of power loss
• Condition Monitoring functions with internal and external evaluation options	> Process and system monitoring to avoid downtimes

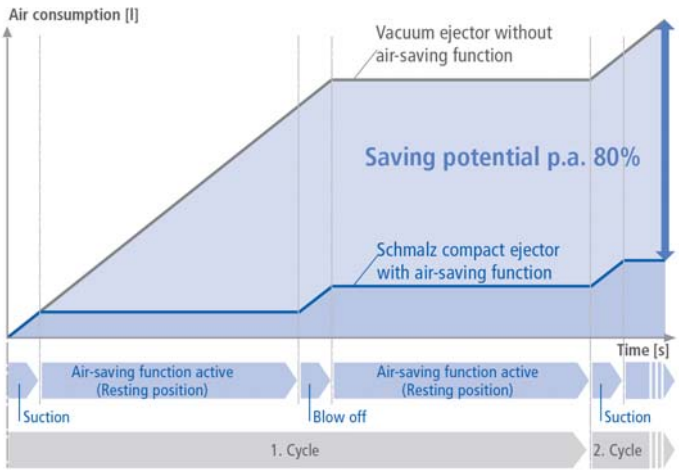
Vacuum Generators for Handling Glass

Compact Ejectors X-Pump SXPi / SXMPi with IO-Link

Suction rate from 185 l/min to 220 l/min

Schmalz X-Pump with IO-Link: New standards for vacuum generators

The new generation of Schmalz X-Pumps with IO-Link technology is strengthening its leading position among compact vacuum generators. It makes the various diagnostic functions visible and usable on the control level. That increases system availability and makes automation processes even more capable.

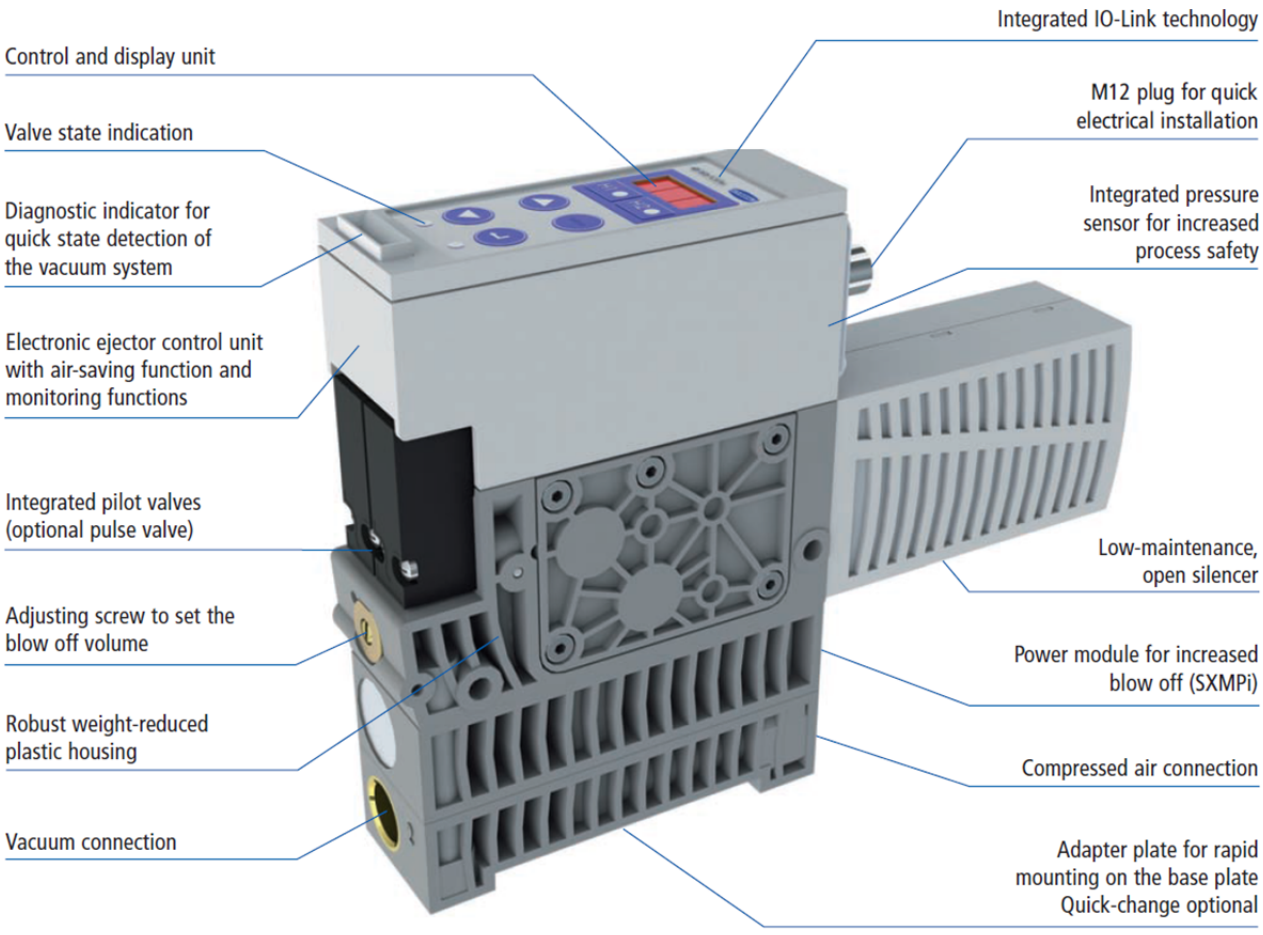


Air-saving function:
Reduction of the energy consumption to a minimum

- Self-regulating system with individual setting points for the specific handling process
- Minimum vacuum level can be set to provide 100% process safety
- In glass handling applications the energy consumption can be reduced by more than 80%
- Minimum active time for function “vacuum active” offer lower energy costs than electrical pump systems
- Less air-flow in the system to reduce the risk of contamination of the connection elements

Result: Reduced energy costs with maximum availability of the system

Compactly and robustly designed



Vacuum Generators for Handling Glass

Compact Ejectors X-Pump SXPi / SXMPi with IO-Link

Suction rate from 185 l/min to 220 l/min

Designation Code Compact Ejectors X-Pump SXPi / SXMPi with IO-Link

Abbreviated designation	Nozzle size	Idle position suction valve	Connection pneumatical	Additional function	Connection electrical
Example SXPi 25 NO H M12-8:					
SXPi	**25**	**NO**	**H**	**-**	**M12-8**
SXPi without power blow-off	25 = 2.5 mm	IMP bistable switched	H horizontal	PC pressure	M12-8 M12,
SXMPi with power blow-off	30 = 3.0 mm	with pulse	Q quick-	monitoring	8-pole
		NC normally closed	change		2xM12- 5 2xM12-
		NO normally opened			5-pole

Ordering Data Compact Ejectors X-Pump SXPi / SXMPi with IO-Link

Compact ejector SXPi / SXMPi is delivered as a ready to use connect product (without connection cable).

Available spare parts: connection cable, base plate, ejector tester

Compact Ejectors X-Pump SXPi / SXMPi with IO-Link

SXPi 25*		SXPi 30*	
Type	**Part Number**	**Type**	**Part Number**
SXPi 25 NO H M12-8	10.02.02.03776	**SXPi 30 NO H M12-8**	10.02.02.03780
SXPi 25 NO Q M12-8	10.02.02.03777	**SXPi 30 NO Q M12-8**	10.02.02.03781
SXPi 25 NO H 2xM12-5	10.02.02.03778	**SXPi 30 NO H 2xM12-5**	10.02.02.03782
SXPi 25 NO Q 2xM12-5	10.02.02.03779	**SXPi 30 NO Q 2xM12-5**	10.02.02.03783
SXPi 25 NC H M12-8	10.02.02.03784	**SXPi 30 NC H M12-8**	10.02.02.03788
SXPi 25 NC Q M12-8	10.02.02.03785	**SXPi 30 NC Q M12-8**	10.02.02.03789
SXPi 25 NC H 2xM12-5	10.02.02.03786	**SXPi 30 NC H 2xM12-5**	10.02.02.03790
SXPi 25 NC Q 2xM12-5	10.02.02.03787	**SXPi 30 NC Q 2xM12-5**	10.02.02.03791
SXPi 25 IMP H M12-8	10.02.02.03792	**SXPi 30 IMP H M12-8**	10.02.02.03796
SXPi 25 IMP Q M12-8	10.02.02.03793	**SXPi 30 IMP Q M12-8**	10.02.02.03797
SXPi 25 IMP H 2xM12-5	10.02.02.03794	**SXPi 30 IMP H 2xM12-5**	10.02.02.03798
SXPi 25 IMP Q 2xM12-5	10.02.02.03795	**SXPi 30 IMP Q 2xM12-5**	10.02.02.03799

SXMPi 25*		SXMPi 30*	
Type	**Part Number**	**Type**	**Part Number**
SXMPi 25 NO H M12-8	10.02.02.03800	**SXMPi 30 NO H M12-8**	10.02.02.03804
SXMPi 25 NO Q M12-8	10.02.02.03801	**SXMPi 30 NO Q M12-8**	10.02.02.03805
SXMPi 25 NO H 2xM12-5	10.02.02.03802	**SXMPi 30 NO H 2xM12-5**	10.02.02.03806
SXMPi 25 NO Q 2xM12-5	10.02.02.03803	**SXMPi 30 NO Q 2xM12-5**	10.02.02.03807
SXMPi 25 NC H M12-8	10.02.02.03808	**SXMPi 30 NC H M12-8**	10.02.02.03812
SXMPi 25 NC Q M12-8	10.02.02.03809	**SXMPi 30 NC Q M12-8**	10.02.02.03813
SXMPi 25 NC H 2xM12-5	10.02.02.03810	**SXMPi 30 NC H 2xM12-5**	10.02.02.03814
SXMPi 25 NC Q 2xM12-5	10.02.02.03811	**SXMPi 30 NC Q 2xM12-5**	10.02.02.03815
SXMPi 25 IMP H M12-8	10.02.02.03816	**SXMPi 30 IMP H M12-8**	10.02.02.03820
SXMPi 25 IMP Q M12-8	10.02.02.03817	**SXMPi 30 IMP Q M12-8**	10.02.02.03821
SXMPi 25 IMP H 2xM12-5	10.02.02.03818	**SXMPi 30 IMP H 2xM12-5**	10.02.02.03822
SXMPi 25 IMP Q 2xM12-5	10.02.02.03819	**SXMPi 30 IMP Q 2xM12-5**	10.02.02.03823

* Note: Additional nozzle sizes on request

Vacuum Generators for Handling Glass

Compact Ejectors X-Pump SXPi / SXMPi with IO-Link

Suction rate from 185 l/min to 220 l/min

Compact Ejectors SXPi / SXMPi X-Pump with IO-Link Technology and Pressure Monitoring – “PC”

Type*	Part Number
SXMPi 25 IMP H PC 2xM12-5	10.02.02.04022
SXMPi 25 IMP Q PC 2xM12-5	10.02.02.04563
SXMPi 25 NC H PC 2xM12-5 1	10.02.02.04021
SXMPi 25 NC H PC M12-8	10.02.02.04189
SXMPi 25 NC Q PC 2xM12-5	10.02.02.04024
SXMPi 25 NC Q PC M12-8	10.02.02.04025
SXMPi 25 NO H PC 2xM12-5	10.02.02.04023
SXMPi 30 IMP H PC 2xM12-5	10.02.02.04097
SXMPi 30 IMP H PC M12-8	10.02.02.04561

* Note: All versions listed above can also be optionally configured as "PC" version

Ordering Data Accessories Compact Ejectors X-Pump SXPi / SXMPi with IO-Link

Type	Part Number	Weight [kg]
Connecting cable M12, 8-pole	21.04.05.00079	0.28
Connecting cable M12, 5-pole	21.04.05.00080	0.24
Connecting cable M12, 8-pole to 5-pole*	21.04.05.00167	0.35
Single base plate with quick-change connections – GPQ1**	10.02.02.02473	0.18
Double base plate with quick-change connections – GPQ2**	10.02.02.02154	0.47
Ejector tester	10.02.02.03588	0.75

* For IO-Link
** For use with SX(M)Pi…Q – version with quick-change system

Technical Data Compact Ejectors X-Pump SXPi / SXMPi with IO-Link

Type	Nozzle-Ø [mm]	Degree of evacuation [%]	Max. suction rate [l/min]	Max. suction rate [m³/h]	Air consumpt. during evac. [l/min]*	Air consumpt. during evac. [m³/h]*	Max air consumpt. blow-off [l/min]
SXPi 25	2.5	85	185	11.1	290	17.4	200
SXPi 30	3.0	85	220	13.2	380	22.8	200
SXMPi 25	2.5	85	185	11.1	290	17.4	320
SXMPi 30	3.0	85	220	13.2	380	22.8	320

Type	Noise level [dB]	Operating pressure [bar]	Recomm. int. hose-Ø vacuum [mm]**	Recomm. int. hose-Ø compressed-air [mm]**	Weight [kg]	Operating temperature [°C]
SXPi 25	67	3…6	9	8	0.77	0…50
SXPi 30	72	3…6	9	8	0.77	0…50
SXMPi 25	67	3…6	9	8	0.91	0…50
SXMPi 30	72	3…6	9	8	0.91	0…50

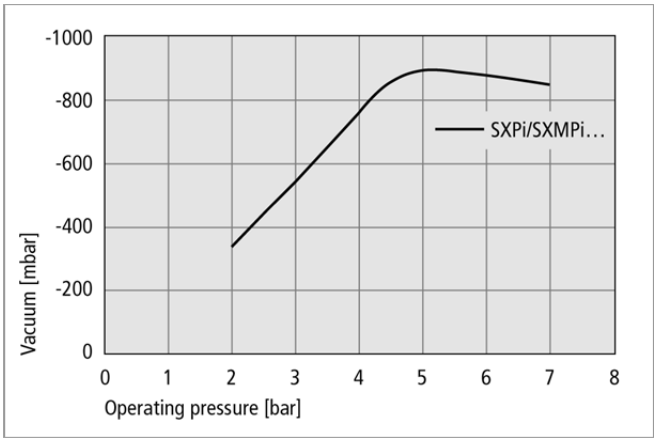
!The supply voltage is 24V DC
* At optimal operating pressure (4.5 bar)
** For max. length 2 m

Vacuum Generators for Handling Glass

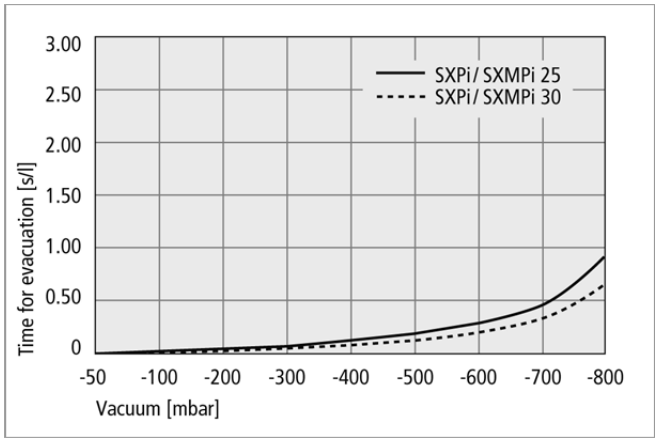
Compact Ejectors X-Pump SXPi / SXMPi with IO-Link

Suction rate from 185 l/min to 220 l/min

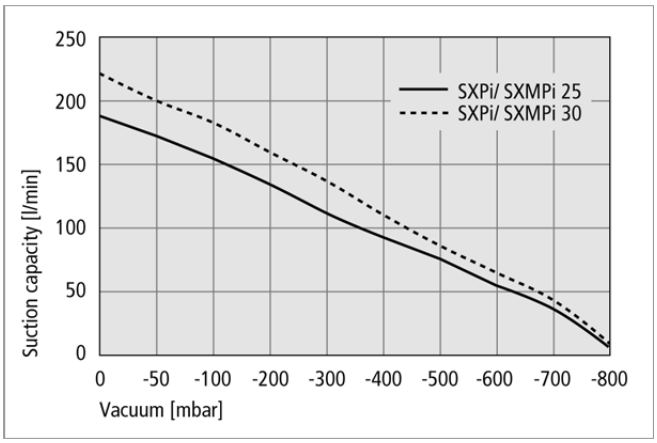
Performance Data Compact Ejectors X-Pump SXPi / SXMPi with IO-Link



Vacuum level at different operating pressures



Evacuation times for various degrees of evacuation



Suction capacity at various degrees of evacuation

Suction Capacity in l/min at Various Degrees of Evacuation

Type	Degree of evacuation in mbar									
	0	-50	-100	-200	-300	-400	-500	-600	-700	-800
SXPi/SXMPi 25	185	170	158	135	114	95	76	56	33	10
SXPi/SXMPi 30	220	199	184	160	138	115	91	63	39	15

Evacuation Time in s/l for Various Vacuum Ranges

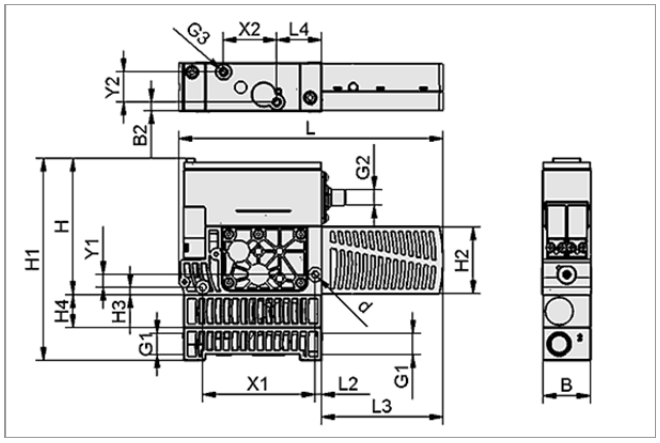
Type	Degree of evacuation in mbar								
	-50	-100	-200	-300	-400	-500	-600	-700	-800
SXPi/SXMPi 25	0.02	0.03	0.06	0.10	0.15	0.18	0.26	0.46	0.87
SXPi/SXMPi 30	0.01	0.02	0.05	0.08	0.11	0.15	0.22	0.37	0.69

Vacuum Generators for Handling Glass

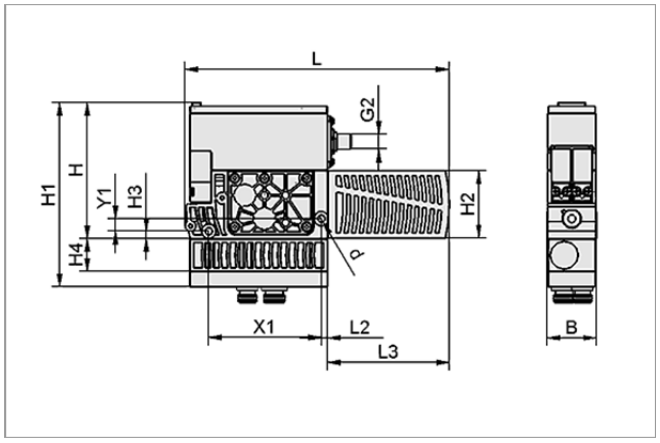
Compact Ejectors X-Pump SXPi / SXMPi with IO-Link

Suction rate from 185 l/min to 220 l/min

Design Data Compact Ejectors X-Pump SXPi / SXMPi with IO-Link



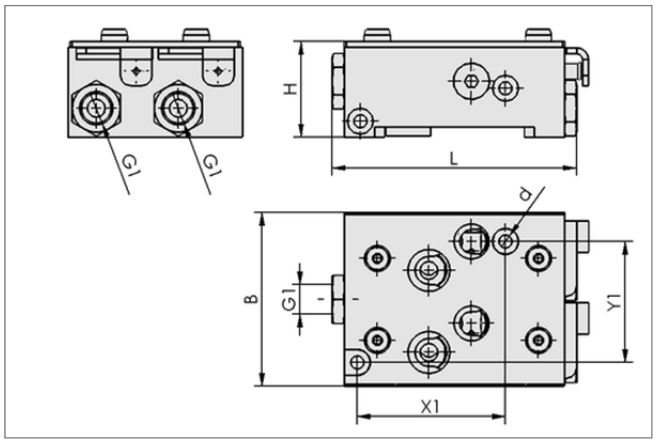
SXMPi H



SXMPi Q

Type	Dimensions in mm																	
	B	B2	d	G1	G2	H	H1	H2	H3	H4	L	L2	L3	L4	X1	X2	Y1	Y2
SXPi…H…	39	6.8	5.5	G3/8“-F	M12-M	108	134	54	6	-	210	5	97	35.5	89	42	10	24
SXPi…Q…	39	-	5.5	-	M12-M	108	120	54	6	-	210	5	97	-	89		10	-
SXMPi…H…	39	6.8	5.5	G3/8“-F	M12-M	108	160	54	6	26	210	5	97	35.5	89	42	10	24
SXMPi…Q…	39	-	5.5	-	M12-M	108	146	54	6	26	210	5	97	-	89		10	-

Design Data Accessories Compact Ejectors X-Pump SXPi / SXMPi with IO-Link



Base Plate with Quick-Change Connections GPQ 1…2

Type	Dimensions in mm						
	B	d	G1	H	L	X1	Y2
GPQ 1	46	6.6	G3/8“-F	43	122	74	19.5
GPQ 2	87	6.6	G3/8“-F	48	122	74	60.5

Vacuum Generators for Handling Glass

Compact Ejectors SCPi / SMPi with IO-Link

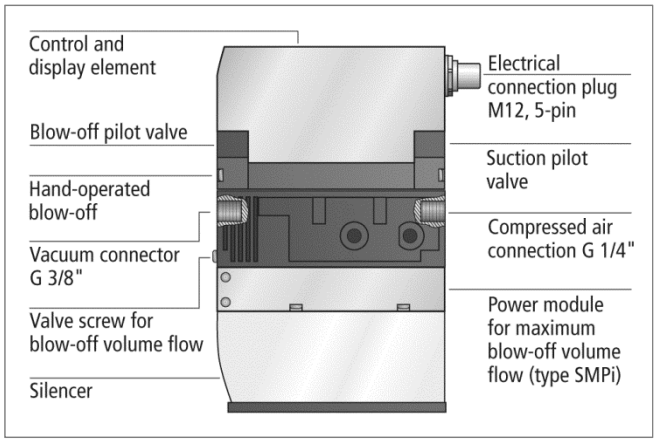
Suction rate from 75 l/min to 195 l/min

Suitability for Industry-Specific Applications

Compact ejectors SCPi / SMPi

Applications

- Handling of glass in pick&place applications
- Handling of glass in the hot end of the automotive glass production such as trimming or injection moulding
- Handling of solar glass along the module production process such as the framing or flashing station
- Fast handling applications of display glass with short cycles times using the integrated power blow-off function



System design compact ejectors SCPi / SMPi

Design

- Main body made of high-strength plastic
- User display with seven segments, operating keyboard and luminous display that indicates system status
- Electrical connection via standard M12 plug, optional with potential separation of sensor and actor power supply
- Integrated pneumatic valves for NO, NC or IMP (pulse switch functions)
- Power blow-off piston for type SMPi provides extremely high blow-off capacity for reduced cycle times. Adjusting screw to adjust the blow-off capacity (also for SCPi)
- Pneumatic connections (G3/8" and G1/4") with protective filters

Centralized vacuum generation by means of compact ejectors SMPi

Our Highlights...	Your Benefits...
• IO-Link function with remote parameterization	> Connection to bus systems and fast data synchronization
• Clearly structured user display with setting buttons	> Easy to enter and read vacuum parameters
• Integrated air-saving function	> Reduced energy costs
• Compact disk design	> Minimal space requirements
• Weight-optimized housing	> Minimal stress during high accelerations
• Suction function as bistable version is available	> No undesired air consumption in case the machine is stopped

Vacuum Generators for Handling Glass

Compact Ejectors SCPi / SMPi with IO-Link

Suction rate from 75 l/min to 195 l/min

Designation Code Compact Ejectors SCPi / SMPi with IO-Link

Abbreviated designation	Nozzle size	Idle position suction valve	System monitoring	Connection electrical
Example SMPi 15 NO VD M12-5:				
SMPi	**15**	**NO**	**VD**	**M12-5**
SCPi without power blow-off **SMPi** with power blow-off	15 = 1.5 mm 20 = 2.0 mm 25 = 2.5 mm	IMP bistable switched with pulse NC normally closed NO normally open	RD air-saving function with digital vacuum switch VD digital vacuum switch	M12-5 M12, 5 pole

Ordering Data Compact Ejectors SCPi / SMPi with IO-Link

Compact ejector SCPi / SMPi is delivered as a ready to connect product (without connection cable).

Available accessories: connection cable, compressed-air connection plate, ejector blanking plate, quick change connection, ejector tester

Compact Ejectors SCPi / SMPi with IO-Link

SCPi 15…		SCPi 20…		SCPi 25…	
Type	**Part Number.**	**Type**	**Part Number**	**Type**	**Part Number**
SCPi 15 NO VD M12-5	10.02.02.03342	**SCPi 20 NO VD M12-5**	10.02.02.03354	**SCPI 25 NO VD M12-5**	10.02.02.03366
SCPI 15 NC VD M12-5	10.02.02.03343	**SCPi 20 NC VD M12-5**	10.02.02.03355	**SCPi 25 NC VD M12-5**	10.02.02.03367
SCPi 15 IMP VD M12-5	10.02.02.03344	**SCPi 20 IMP VD M12-5**	10.02.02.03356	**SCPi 25 IMP VD M12-5**	10.02.02.03368
SCPi 15 NO RD M12-5	10.02.02.03345	**SCPi 20 NO RD M12-5**	10.02.02.03357	**SCPi 25 NO RD M12-5**	10.02.02.03369
SCPI 15 NC RD M 12-5	10.02.02.03346	**SCPi 20 IMP RD M12-5**	10.02.02.03358	**SCPi 25 NC RD M12-5**	10.02.02.03370
SCPi 15 IMP RD M12-5	10.02.02.03347	**SCPi 20 IMP RD M12-5**	10.02.02.03359	**SCPi 25 IMP RD M12-5**	10.02.02.03371

SMPi 15…		SMPi 20…		SMPi 25…	
Type	**Part Number**	**Type**	**Part Number**	**Type**	**Part Number**
SMPI 15 NOI VD M12-5	10.02.02.03336	**SMPi 20 NO VD M12-5**	10.02.02.03348	**SMPI 25 NO VD M12-5**	10.02.02.03360
SMPi 15 NC VD M12-5	10.02.02.03337	**SMPi 20 NC VD M12-5**	10.02.02.03349	**SMPi 25 NC VD M12-5**	10.02.02.03361
SMPi 15 IMP VD M12-5	10.02.02.03338	**SMPi 20 IMP VD M12-5**	10.02.02.03350	**SMPi 25 IMP VD M12-5**	10.02.02.03362
SMPI 15 NO RD M12-5	10.02.02.03339	**SMPi 20 NO RD M12-5**	10.02.02.03351	**SMPI 25 NO RD M12-5**	10.02.02.03363
SMPi 15 NC RD M12-5	10.02.02.03340	**SMPi 20 NC RD M12-5**	10.02.02.03352	**SMPi 25 NC RD M12-5**	10.02.02.03364
SMPi 15 IMP RD M12-5	10.02.02.03341	**SMPi 20 IMP RD M12-5**	10.02.02.03353	**SMPi 25 IMP RD M12-5**	10.02.02.03365

Ordering Data Accessories Compact Ejectors SCPi / SMPi with IO-Link

Accessories	Part Number	Weight [kg]
Connecting cable M12, 5-pole	21.04.05.00080	0.240
Connection distributor 3xM12, 4-pole	10.02.02.03372	0.170
Connection distributor 2xM12, 4-pole	10.02.02.03490	0.100
Compressed-air connection plate GP 2	10.02.02.00917	0.375
Compressed-air connection plate GP 3	10.02.02.00918	0.481
Compressed-air connection plate GP 4	10.02.02.00919	0.595
Compressed-air connection plate GP 5	10.02.02.00920	0.700
Compressed-air connection plate GP 6	10.02.02.00921	0.807
Ejector blanking plate*	10.02.02.00728	0.017
Quick Change connection**	10.02.02.03463	0.163
Ejector tester	10.02.02.03588	0.755

* Plate for covering unused connections when using compressed air-connection plates
** For additional quick-mounting function (tool-free change of ejectors). When using with compressed air-connection plates, order 1x per ejector.

Vacuum Generators for Handling Glass

Compact Ejectors SCPi / SMPi with IO-Link

Suction rate from 75 l/min to 195 l/min

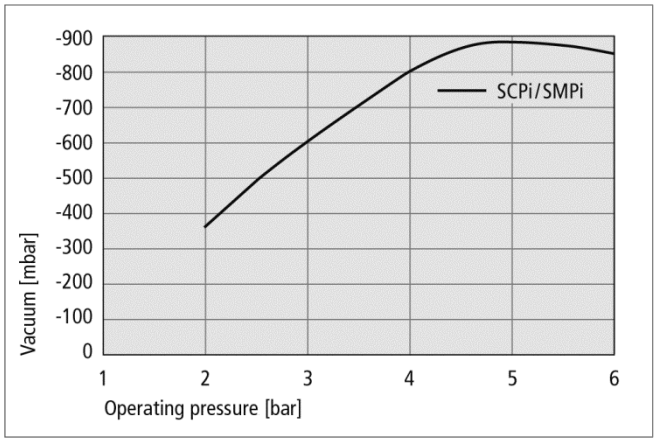
Technical Data Compact Ejectors SCPi / SMPi with IO-Link

Type	Nozzle -Ø [mm]	Degree of evacuation [%]	Max. suction rate [L/min]	Max. suction rate [m³/h]	Air consumpt. during evac. [l/min]*	Air consumpt. during evac. [m³/h]*	Max. air consumption blow-off [l/min]
SMPi 15…	1.5	85	75	4.5	115	7.2	200
SMPi 20…	2.0	85	135	8.1	180	10.8	200
SMPi 25…	2.5	85	185	11.1	290	17.4	200
SCPi 15…	1.5	85	75	4.5	115	7.2	200
SCPi 20…	2.0	85	140	8.4	180	11.7	200
SCPi 25…	2.5	85	195	11.7	290	17.4	200

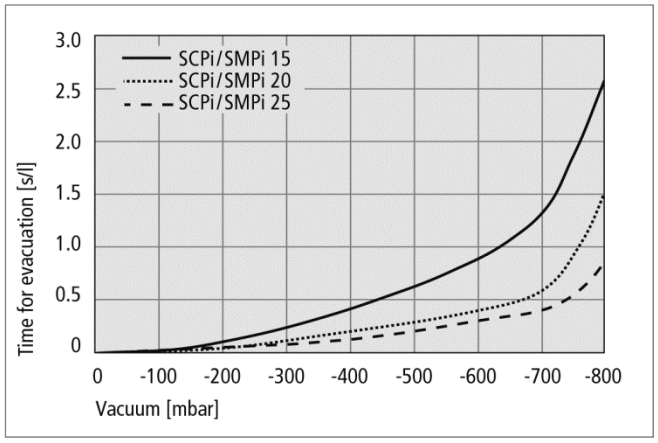
Type	Noise level free [dB]	Noise level workp. gripped [dB]	Operating pressure [bar]	Recomm. int. hose diameter compr. air [mm]**	Recomm. int. hose diameter vacuum [mm]**	Weight [kg]	Operating temperature [°C]
SMPi 15…	75	74	4…7	6	6	0.56	0…50
SMPi 20…	75	70	4…7	6	8	0.56	0…50
SMPi 25…	78	77	4…7	8	9	0.56	0…50
SCPi 15…	75	70	4…7	6	6	0.56	0…50
SCPi 20…	75	65	4…7	6	8	0.56	0…50
SCPi 25…	78	75	4…7	8	9	0.56	0…50

! The supply voltage is 24V DC
* At optimal operating pressure
** For max. length 2 m

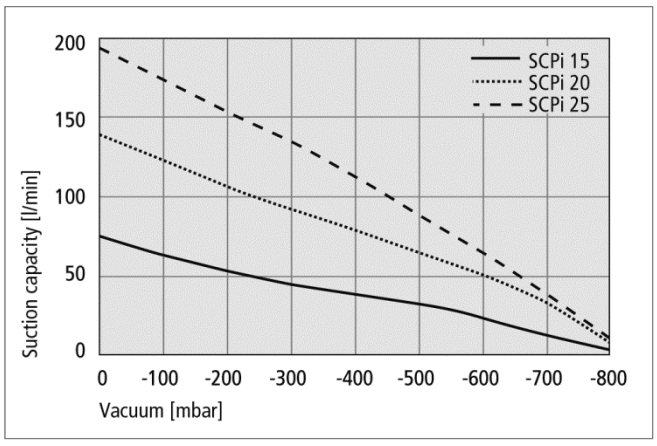
Performance Data Compact Ejectors SCPi / SMPi



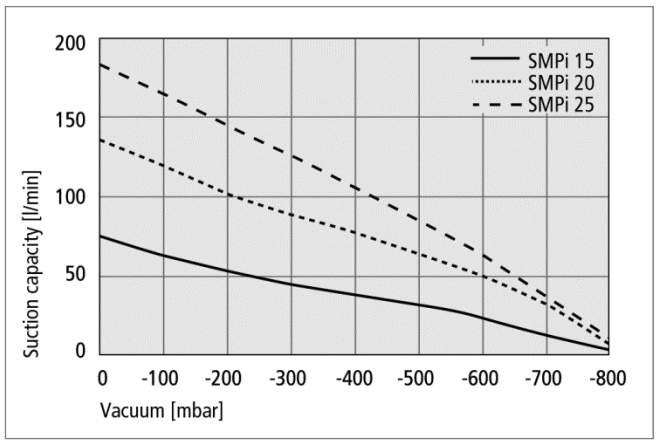
Achievable vacuum at various operating pressures



Evacuation times for various vacuum ranges



Suction capacity SCPi... at various degrees of evacuation



Suction capacity SMPi... at various degrees of evacuation

Vacuum Generators for Handling Glass

Compact Ejectors SCPi / SMPi with IO-Link

Suction rate from 75 l/min to 195 l/min

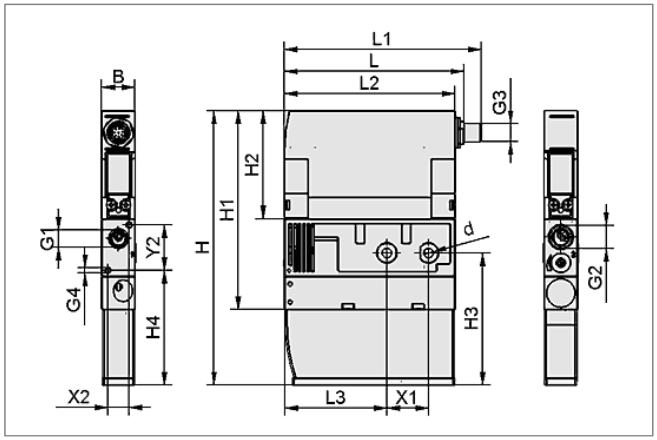
Suction Capacity in l/min at Various Degrees of Evacuation

Type	Degree of evacuation in mbar									
	0	-50	-100	-200	-300	-400	-500	-600	-700	-800
SMPi 15	75.0	70.3	65.4	55.2	46.3	38.3	31.2	23.9	13.5	3.4
SMPi 20	135.0	127.5	119.5	103.7	89.8	77.0	63.3	50.4	31.1	8.2
SMPi 25	185.0	178.6	167.8	145.8	126.7	106.2	84.7	64.0	37.6	11.1
SCPi 15	75.0	70.3	65.4	55.2	46.3	38.3	31.2	23.9	13.5	3.4
SCPi 20	139.0	131.3	123.1	106.8	92.5	79.3	65.2	51.9	32.1	8.5
SCPi 25	195.0	188.2	176.8	153.6	133.6	112.0	89.3	67.4	39.7	11.7

Evacuation Time in s/l for Various Vacuum Ranges

Type	Degree of evacuation in mbar								
	-50	-100	-200	-300	-400	-500	-600	-700	-800
SCPi / SMPi 15	0.03	0.07	0.16	0.27	0.42	0.63	0.91	1.37	2.60
SCPi / SMPi 20	0.02	0.04	0.08	0.14	0.22	0.31	0.44	0.66	1.54
SCPi / SMPi 25	0.01	0.02	0.05	0.09	0.14	0.20	0.28	0.42	0.86

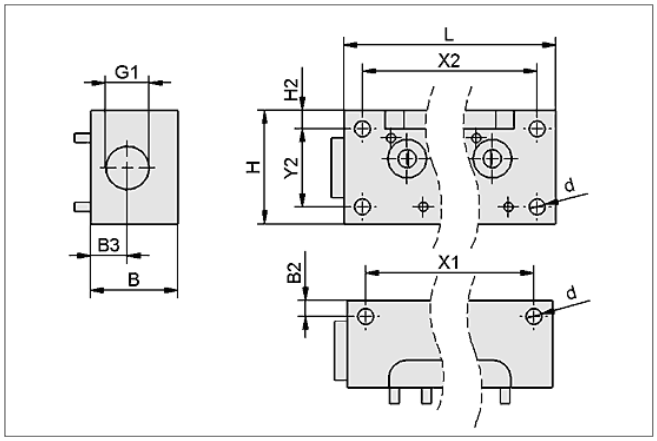
Design Data Compact Ejectors SCPi / SMPi with IO-Link



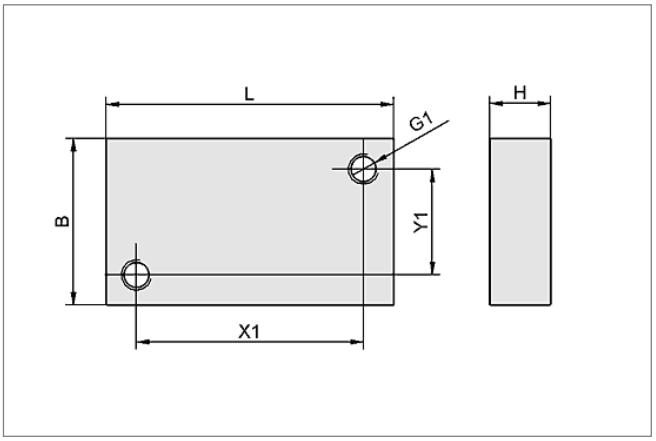
SCPi…/SMPi…

Type	Dimensions in mm																	
	B	d	G1	G2	G3	G4	H	H1	H2	H3	H4	L	L1	L2	L3	X1	X2	Y2
SMPi 15	22	6.6	G1/4“-F	G3/8“-F	M12x1-M	M4-F	181.5	131.5	71.5	87.5	76	118.5	129.7	112.5	67.5	27.5	14	30
SMPi 20	22	6.6	G1/4“-F	G3/8“-F	M12x1-M	M4-F	181.5	131.5	71.5	87.5	76	118.5	129.7	112.5	67.5	27.5	14	30
SMPi 25	22	6.6	G1/4“-F	G3/8“-F	M12x1-M	M4-F	181.5	131.5	71.5	87.5	76	118.5	129.7	112.5	67.5	27.5	14	30
SCPi 15	22	6.6	G1/4“-F	G3/8“-F	M12x1-M	M4-F	181.5	131.5	71.5	87.5	76	118.5	129.7	112.5	67.5	27.5	14	30
SCPi 20	22	6.6	G1/4“-F	G3/8“-F	M12x1-M	M4-F	181.5	131.5	71.5	87.5	76	118.5	129.7	112.5	67.5	27.5	14	30
SCPi 25	22	6.6	G1/4“-F	G3/8“-F	M12x1-M	M4-F	181.5	131.5	71.5	87.5	76	118.5	129.7	112.5	67.5	27.5	14	30

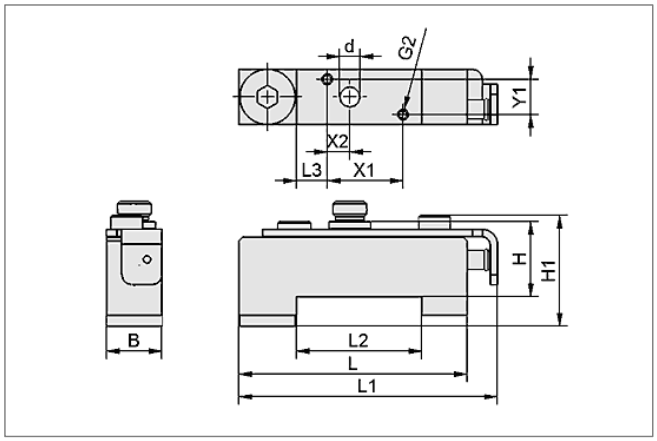
Design Data Accessories Compact Ejectors SCPi / SMPi with IO-Link



Compressed-air connection plate GP...



Ejector blanking plate EJEK-PL...



Quick Change Connection ADP-Q1...

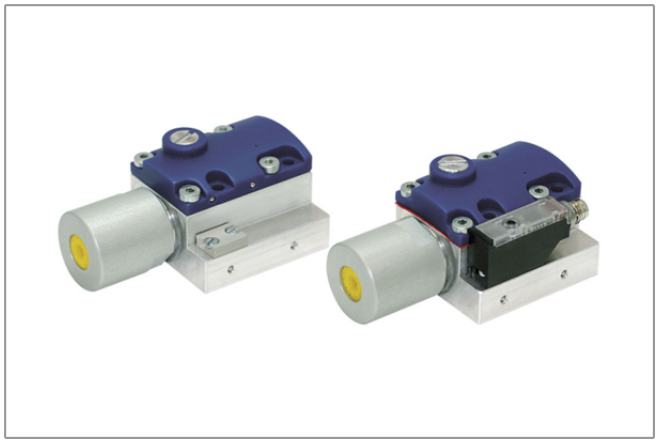
Type	Dimensions in mm								
	B	B2	B3	d	G1	G2	H	H1	H2
GP 2 SMP(i)15..30/SCP(i)15..30	38	7	16	7	G1/2“-F	-	49.5	-	8
GP 3 SMP(i)15..25/SCP(i)15..25	38	7	16	7	G1/2“-F	-	49.5	-	8
GP4 SMP(i)15…20/SCP(i)15..20	38	7	16	7	G1/2“-F	-	49.5	-	8
GP5 SMP(i)15/SCP(i)15	38	7	16	7	G1/2“-F	-	49.5	-	8
GP6 SMP(i)15/SCP(i)15	38	7	16	7	G1/2“-F	-	49.5	-	8
EJEK-PL SMP(i)/SCP(i)20..30	22	-	-	-	M4-F	-	8.0	-	-
ADP-Q1 90.5x22x29.7 SMPi/SCPi	22	-	-	8	-	M5-F	29.7	43.9	-

Type	Dimensions in mm								
	X1	X2	Y1	Y2	L	L1	L2	L3	Number of outputs
GP 2 SMP(i)15..30/SCP(i)15..30	62	62	-	34	78.0	-	-		2
GP 3 SMP(i)15..25/SCP(i)15..25	85	85	-	34	101.0	-	-		3
GP4 SMP(i)15…20/SCP(i)15..20	108	108	-	34	124.0	-	-		4
GP5 SMP(i)15/SCP(i)15	131	131	-	34	147.0	-	-		5
GP6 SMP(i)15/SCP(i)15	154	154	-	34	170.0	-	-		6
EJEK-PL SMP(i)/SCP(i)20..30	30	-	14	-	38.0	-	-		-
ADP-Q1 90.5x22x29.7 SMPi/SCPi	30	9	14	-	90.5	102.5	49.6	12.1	1

Vacuum Generators for Handling Glass

Ejectors with Blow-Off System SEAC RP

Suction rate 36 l/min

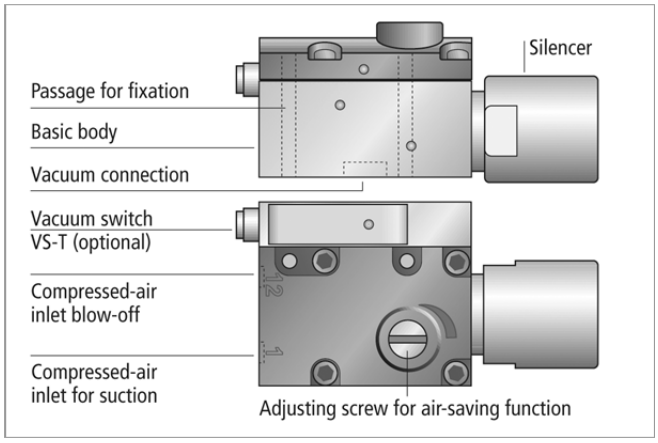


Ejectors with blow-off system SEAC RP

Suitability for Process-Specific Applications

Applications

- Ejector for vacuum generation in many different applications with short cycle times, such as handling of automotive glass
- Use on stacker units for decentral vacuum generation for individual vacuum circuits to handle different glass sizes
- Use in combination with suction plates – direct assembly on suction plates possible by means of adapter plate



System design ejectors with blow-off system SEAC RP

Design

- Body made of anodized aluminum
- Air-saving function controlled by integrated pneumatic vacuum switch with adjustable setting point
- Integrated blow-off function with additional compressed-air port
- Optional vacuum switch VS-V-AH-T-PNP-S with adjustable switching point (connection cable not included in delivery)
- Two mounting screws included in delivery

Vacuum generator SEAC RP directly mounted to a spring plunger

Our Highlights...	Your Benefits...
• Integrated pneumatical air-saving function	> Minimum compressed-air consumption, minimal requiring of fittings
• Short gripping and blow-off times	> Very short cycle times in automated operations
• Minimum size and low weight	> Particularly suitable for highly dynamic systems
• Use in combination with different holder systems	> Direct mounting to suction plates, spring plungers or profiles
• With silencer	> Reduced noise level
• Optionally available with vacuum switch	> System monitoring function for optimization of cycle times

Vacuum Generators for Handling Glass

Ejectors with Blow-Off System SEAC RP

Suction rate 36 l/min

Designation Code Ejectors with Blow-Off System SEAC RP

Abbreviated designation	Nozzle size	Additional function	Product addition	Mounting orientation
Example SEAC 10 RP VS-T R:				
SEAC	**10**	**RP**	**VS-T**	**R**
SEAC	10 = 1.0 mm	PR pneumatic air-saving regulation	VS-T vacuum switch	L left R right

Ordering Data Ejectors with Blow-Off System SEAC RP

Ejector SEAC RP is delivered as ready to connect product.

Available accessories: Mounting adapters and connection cable for vacuum switch

Ejectors with Blow-Off System SEAC RP

Type	Part Number
SEAC 10 RP R	10.02.02.03289
SEAC 10 RP VS-T R	10.02.02.03290
SEAC 10 RP L	10.02.02.03296
SEAC 10 RP VS-T L	10.02.02.03297

Ordering Data Accessories Ejectors with Blow-Off System SEAC RP

Type	Part Number
ADP-EJ 45.5x21x44 SEAC S	10.02.02.03484
ADP-EJ 45.5x21x44 SEAC L	10.02.02.03483
ADP-EJ 38x20x11-G1/8-IG SEAC	10.02.02.04068
ADP-EJ 38x20x11-G1/4-IG SEAC	10.02.02.04067
Connection cable for vacuum switch	10.06.02.00031

Technical Data Ejectors with Blow-Off System SEAC RP

Type	Nozzle-Ø [mm]	Degree of Evacuation [%]	Max. suction rate [l/min]	Max. suction Rate [m³/h]	Air con-sumpt. during Evac. [l/min]*	Air consumpt. during evac. [m³/h]*	Max. air consumtion Blow-off [l/min]	Operating Pressure [bar]	Weight [g]
SEAC 10 RP...	1.0	85	36	2.1	65	3.9	92	4...6	180

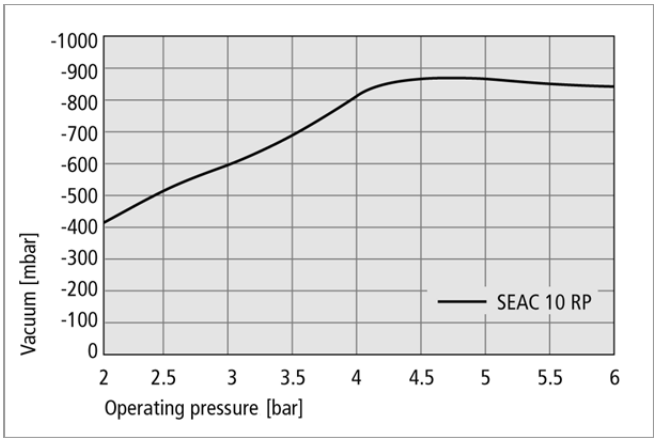
* At optimal operating pressure

Vacuum Generators for Handling Glass

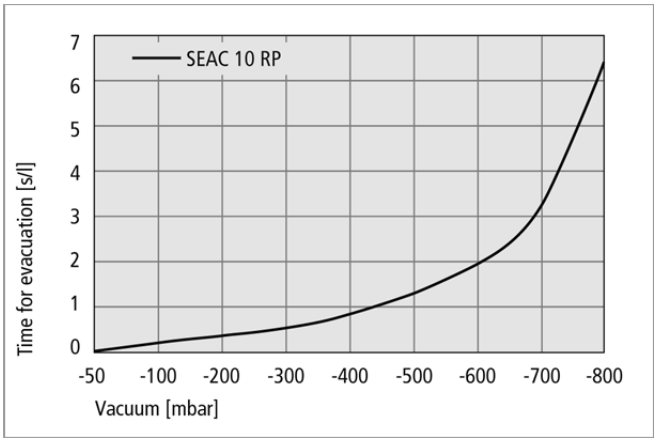
Ejectors with Blow-Off System SEAC RP

Suction rate 36 l/min

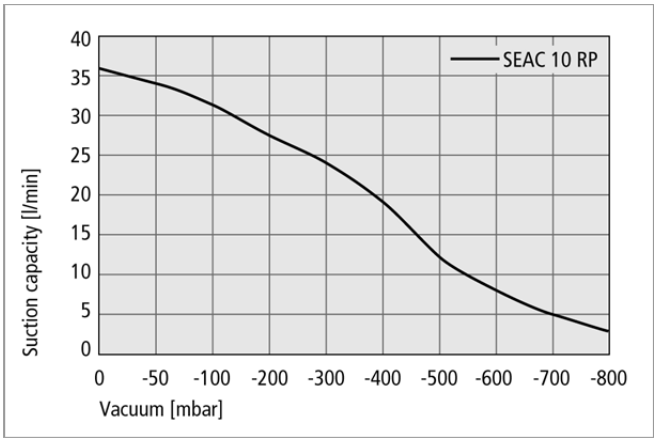
Performance Data Ejectors with Blow-Off System SEAC RP



Vacuum level at different operating pressures



Evacuation times for various degrees of evacuation



Suction capacity at various degrees of evacuation

Suction Capacity in l/min at Various Degrees of Evacuation

Type	Degree of evacuation in mbar									
	0	-50	-100	-200	-300	-400	-500	-600	-700	-800
SEAC 10 RP	36.0	34.0	32.0	27.5	24.0	19.5	12.0	8.0	5.0	3.0

Evacuation Time in s/l for Various Vacuum Ranges

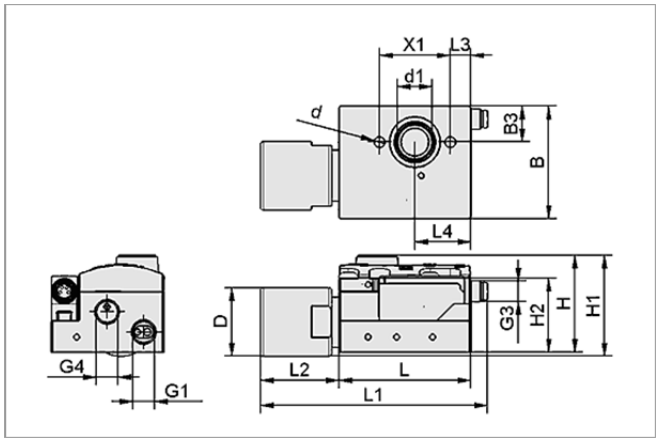
Type	Degree of evacuation in mbar								
	-50	-100	-200	-300	-400	-500	-600	-700	-800
SEAC 10 RP	0.12	0.20	0.39	0.62	0.93	1.35	1.98	3.26	6.50

Vacuum Generators for Handling Glass

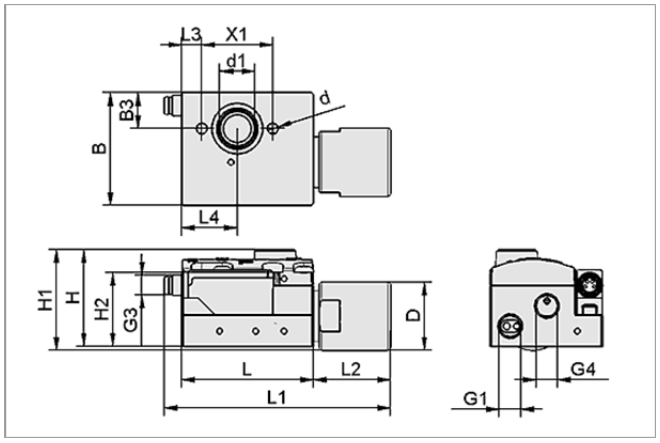
Ejectors with Blow-Off System SEAC RP

Suction rate 36 l/min

Design Data Ejectors with Blow-Off System SEAC RP



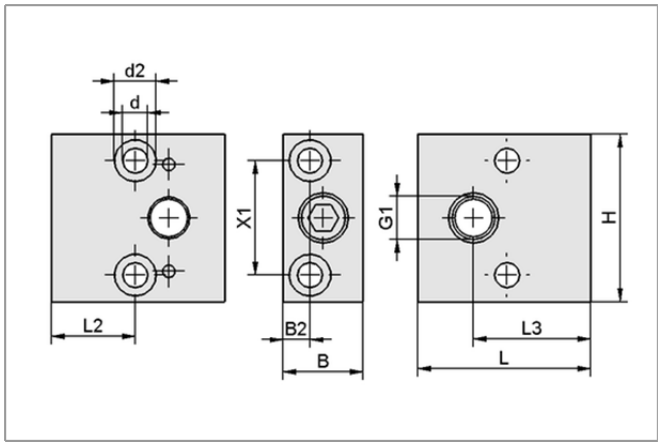
SEAC 10 RP (VS-T) R



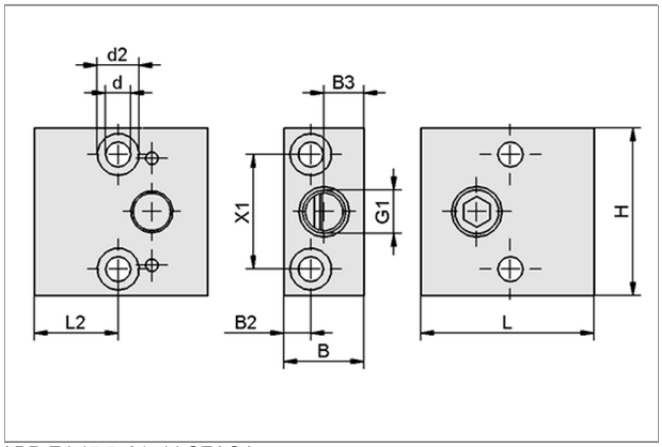
SEAC 10 RP (VS-T) L

Type	Dimensions in mm																
	B	B3	d	d1	D	G1	G3	G4	H	H1	H2	L	L1	L2	L3	L4	X1
SEAC 10 RP...	44.5	14.2	4.3	13.8	27	G1/8"-F	-	G1/8"-F	38.3	39.8	29.3	52	-	29.5	8	22	28
SEAC 10 RP VS-T...	44.5	14.2	4.3	13.8	27	G1/8"-F	M8-M	G1/8"-F	38.3	39.8	29.3	52	88.1	29.5	8	22	28

Design Data Holders for Profile Mouting of Ejectors SEAC-RP



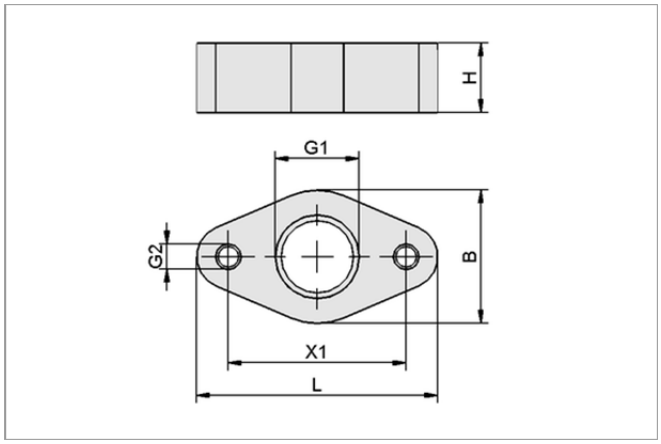
ADP-EJ 45.5x21x44 SEAC S



ADP-EJ 45.5x21x44 SEAC L

Type	Dimensions in mm									
	B	B2	B3	d	d2	G1	H	L	L2	L3	X1
ADP-EJ 45.5x21x44 SEAC S	21	7	-	6.6	11	G1/4-F	44	46	22	31	30
ADP-EJ 45.5x21x44 SEAC L	21	7	10.5	6.5	11	G1/4-F	44	46	22	-	30

Design Data Holders for Direct Suction Pad Mouting of Ejectors SEAC-RP



ADP-EJ 38x20x11-G…-IG SEAC

Type	Dimensions in mm					
	B	G1	G2	H	L	X1
ADP-EJ 38x20x11-G1/8-IG SEAC	20	G1/8-F	M4-F	11	38	28
ADP-EJ 38x20x11-G1/4-IG SEAC	20	G1/4-F	M4-F	11	38	28

Vacuum Generators for Handling Glass

Dry-Running Vacuum Pumps EVE-TR-X

Suction rate from 10 m³/h to 129 m³/h

Dry-running vacuum pumps EVE-TR-X

Suitability for Process-Specific Applications

Applications

- Vacuum pump with longevity improved carbon vanes for applications with continuous operation / vacuum supply, e.g. glass grinding applications
- Central vacuum generation to supply vacuum to several circuits, e.g. stacking of various glass sizes in float lines
- Vacuum supply for manual handling devices, e.g. tube lifter Jumbo
- Vacuum generator for the handling of glass with separation powder with the integrated and easy access vacuum filter

Design

- Dry-running vacuum pump, with (-F) or without additional filter
- Three-phase AC power supply
- Multi-cell rotary vane pump with very constant suction capacity
- Synthetic resin based carbon vanes
- Compact design with integrated cooling fan and permanently lubricated bearings
- Damping elements integrated into the mounting holes
- Should preferably be mounted with the motor shaft horizontal
- Coating RAL 7035

Our Highlights...	Your Benefits...
• Wear resistant vanes and honed vane housing	> Increased longevity for reduced service intervals
• Multi-cell compression principle	> Constant suction flow and vibration-free operation
• Permanently lubricated bearings and powerful cooling fan	> Excellent heat dissipation for long service life
• Wide range of different suction capacities	> Perfectly matching flow rates for every application
• Dry-running rotary vane pump with excellent efficiency	> Low energy consumption, economical continuous operation
• Type with filter (-F) with easy access filter cartridge	> Fast and easy cleaning of the filter

Designation Code Dry-Running Vacuum Pumps EVE-TR-X

Abbreviated designation	Pump type	Suction capacity in m³/h	Supply voltage	Product addition
Example EVE-TR-X 40 AC3 F:				
EVE	**TR-X**	**40**	**AC3**	**F**
EVE	TR-X dry-running	10 to 140	AC3 three-phase	F additional filter

Vacuum Generators for Handling Glass

Dry-Running Vacuum Pumps EVE-TR-X

Suction rate from 10 m³/h to 129 m³/h

Ordering Data Dry-Running Vacuum Pumps EVE-TR-X

Vacuum pump EVE-TR-X is delivered as a ready to connect product. Different types according to IE2 classification available.

Available accessories: Vacuum regulation valve
Available spare parts: Filter insert, set of wear parts

Dry-Running Vacuum Pumps EVE-TR-X

Type	Vacuum pump	Vacuum pump with additional filter
EVE-TR-X 10	10.03.01.00209	10.03.01.00210
EVE-TR-X 16	10.03.01.00212	10.03.01.00213
EVE-TR-X 25	10.03.01.00215	10.03.01.00216
EVE-TR-X 40	10.03.01.00218	10.03.01.00219

Type	Vacuum pump (Type 1)*	Vacuum pump (Type 2)**	Vacuum pump (Type 3)***	Vacuum pump with additional filter (Type 1)*	Vacuum pump with additional filter (Type 2)**	Vacuum pump with additional filter (Type 3)***
EVE-TR-X 80	10.03.01.00221	10.03.01.00273	10.03.01.00274	10.03.01.00222	10.03.01.00275	10.03.01.00276
EVE-TR-X 100	10.03.01.00239	10.03.01.00277	10.03.01.00278	10.03.01.00240	10.03.01.00279	10.03.01.00280
EVE-TR-X 140	10.03.01.00241	10.03.01.00281	10.03.01.00282	10.03.01.00242	10.03.01.00283	10.03.01.00284

* Type 1: S064/S065/S072 (IE2) – Europe, China, India
** Type 2: S067/S068 (IE2) – US, Canada
*** Type 3: S070/S069/S070 (IE2) – Japan, Korea, Brazil

Ordering Data Spare Parts Dry-Running Vacuum Pumps EVE-TR-X

Type	Set of wear parts	Filter insert
EVE-TR-X 10	10.03.01.00223	10.03.01.00228
EVE-TR-X 16	10.03.01.00224	10.03.01.00229
EVE-TR-X 25	10.03.01.00225	10.03.01.00230
EVE-TR-X 40	10.03.01.00226	10.03.01.00230
EVE-TR-X 80	10.03.01.00227	10.03.01.00231
EVE-TR-X 100	10.03.01.00233	10.03.01.00235
EVE-TR-X 140	10.03.01.00234	10.03.01.00235

Ordering Data Accessories Dry-Running Vacuum Pumps EVE-TR-X

Type	Vacuum regulation valve
EVE-TR-X 10	10.03.01.00136
EVE-TR-X 16	10.03.01.00136
EVE-TR-X 25	10.03.01.00136
EVE-TR-X 40	10.03.01.00136
EVE-TR-X 80	10.03.01.00153
EVE-TR-X 100	10.03.01.00153
EVE-TR-X 140	10.03.01.00153

Vacuum Generators for Handling Glass

Dry-Running Vacuum Pumps EVE-TR-X

Suction rate from 10 m³/h to 129 m³/h

Technical Data Dry-Running Vacuum Pumps EVE-TR-X

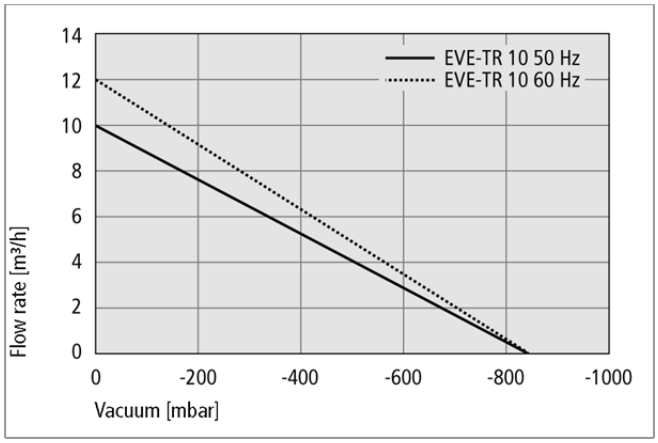
Type	Max. vacuum [mbar]	Suction rate at 50 Hz [m³/h]	Suction rate at 60 Hz [m³/h]]	Protection IP	Weight [kg]	Noise level at 50Hz [dB]
EVE-TR-X 10	850	10.0	12.0	IP 54	16.0	60
EVE-TR-X 16	850	16.0	19.0	IP 54	22.5	61
EVE-TR-X 25	850	25.0	30.0	IP 54	26.0	62
EVE-TR-X 40	850	40.0	48.0	IP 54	38.5	67
EVE-TR-X 80	900	67.0	78.5	IP 55	76.0	71
EVE-TR-X 100	900	98.0	112.0	IP 55	100.0	75
EVE-TR-X 140	900	129.0	154.0	IP 55	111.0	76

* Specified for 230V / 230V or 400V

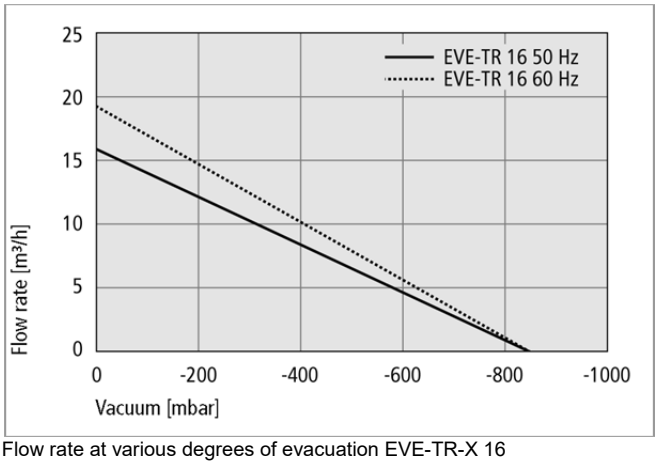
Type	Type 1: Europe, China, India	Type 2: US, Canada	Type 3: Japan, Korea, Brazil
EVE-TR-X 80	S064/S065/S072 (IE2)	S067/S068 (IE2)	S070/S069/S070 (IE2)
EVE-TR-X 100	S064/S065/S072 (IE2)	S067/S068 (IE2)	S070/S069/S070 (IE2)
EVE-TR-X 140	S064/S065/S072 (IE2)	S067/S068 (IE2)	S070/S069/S070 (IE2)

Type	Type 1: Europe, China, India	Type 2: US, Canada	Type 3: Japan, Korea, Brazil
50 Hz with IE2	230V / Y400V (+/- 10%)	-	220V / Y380-400V (+/- 10%)
50 Hz without IE2	-	-	200V / Y350V (+/- 10%)
60 Hz with IE2	265V / Y460V (+/- 10%)	230V / Y460V (+/- 10%)	-
60 Hz without IE2	230V / Y400V (+/- 10%)	YY208V (+/-10%)	200V / Y350V (+/- 10%)

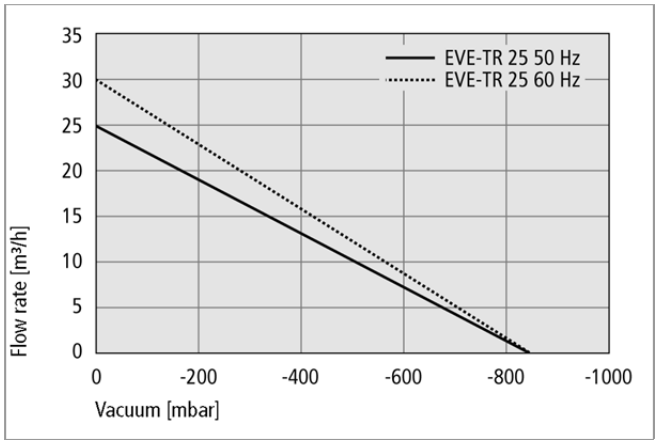
Performance Data Dry-Running Vacuum Pumps EVE-TR-X



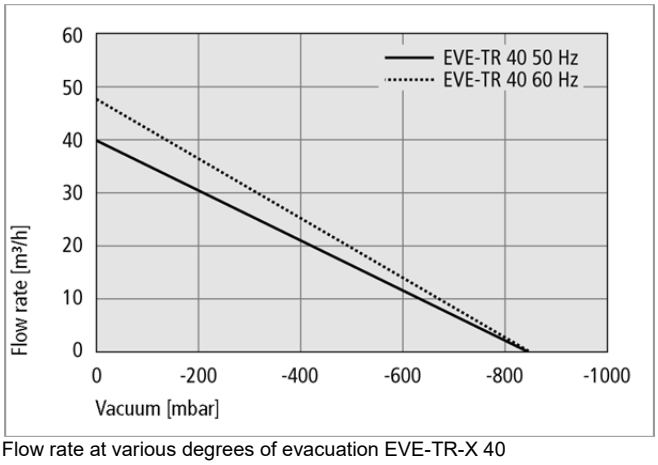
Flow rate at various degrees of evacuation EVE-TR-X 10



Flow rate at various degrees of evacuation EVE-TR-X 16

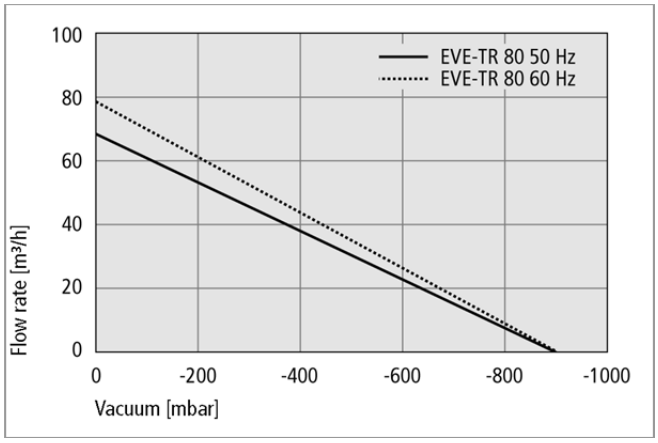


Flow rate at various degrees of evacuation EVE-TR-X 25

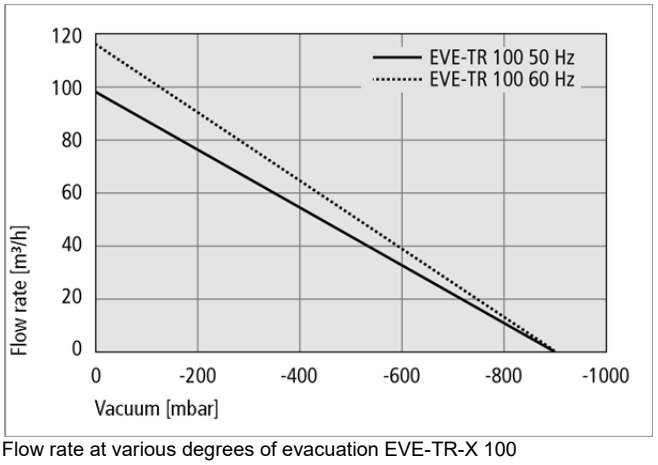


Flow rate at various degrees of evacuation EVE-TR-X 40

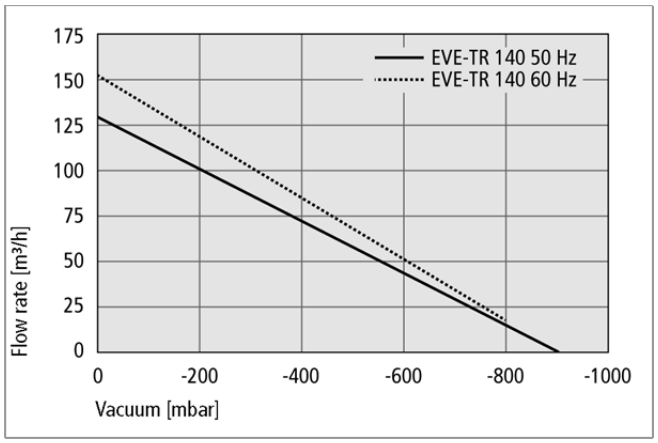
Performance Data Dry-Running Vacuum Pumps EVE-TR-X



Flow rate at various degrees of evacuation EVE-TR-X 80



Flow rate at various degrees of evacuation EVE-TR-X 100



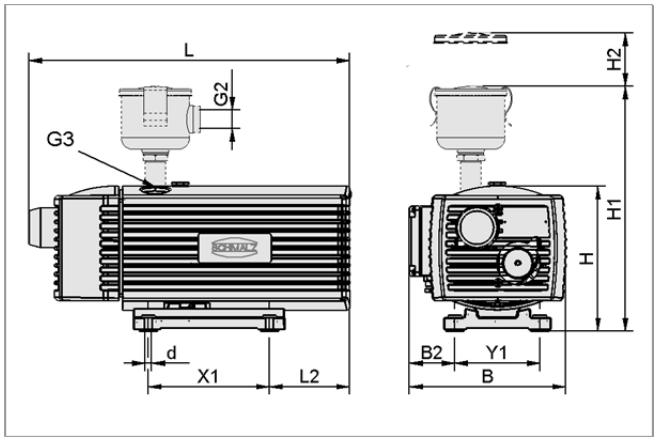
Flow rate at various degrees of evacuation EVE-TR-X 140

Vacuum Generators for Handling Glass

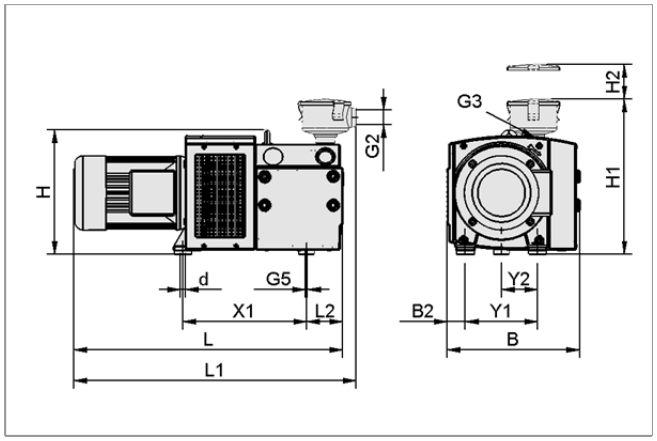
Dry-Running Vacuum Pumps EVE-TR-X

Suction rate from 10 m³/h to 129 m³/h

Design Data Dry-Running Vacuum Pumps EVE-TR-X



EVE-TR-X 10 to 40 (F)



EVE-TR-X 80 to 140 (F)

Type	Dimensions in mm														
	B	B2	d	G2	G3	G5	H	H1	H2	L	L1	L2	X1	Y1	Y2
EVE-TR-X 10	206	60	7	-	G1/2“-F	-	189	-	-	429	-	106	160	112	-
EVE-TR-X 10 F	206	60	7	G3/4”-F	G1/2“-F	-	189	325	70	429	-	106	160	112	-
EVE-TR-X 16	231	66	7	-	G1/2“-F	-	205	-	-	452	-	73	202	125	-
EVE-TR-X 16 F	231	66	7	G3/4”-F	G1/2“-F	-	205	345	70	452	-	73	202	125	-
EVE-TR-X 25	260	40	7	-	G3/4“-F	-	290	-	-	505	-	96	220	199	-
EVE-TR-X 25 F	260	40	7	G3/4”-F	G3/4“-F	-	290	380	70	505	-	96	220	199	-
EVE-TR-X 40	280	51	7		G3/4“-F	-	290	-	-	572	-	131	220	199	-
EVE-TR-X 40 F	280	51	7	G1-1/4”-F	G3/4“-F	-	290	425	70	572	-	131	220	199	-
EVE-TR-X 80	353	48	12	-	G1“-F	M8-F	328	-	-	709	-	96	328	190	95
EVE-TR-X 80 F	353	48	12	G1-1/4”-F	G1“-F	M8-F	328	420	75	709	745	96	328	190	95
EVE-TR-X 100	470	108	12	-	G1-1/2“-F	M8-F	336	-	-	835	-	140	398	245	123
EVE-TR-X 100 F	470	108	12	G1-1/4”-F	G1-1/2“-F	M8-F	336	466	75	835	890	140	398	245	123
EVE-TR-X 140	470	108	12	-	G1-1/2“-F	M8-F	336	-	-	873	-	140	398	245	123
EVE-TR-X 140 F	470	108	12	G1-1/4”-F	G1-1/2“-F	M8-F	336	437	75	873	851	140	398	245	123

Overview of Section 4

Switches and System Monitoring

Switches and System Monitoring for Handling Glass

Vacuum and Pressure Switches VSi

- Electronic vacuum and pressure switch with and without display
- Measuring range: -1 to 10 bar
- Switching function: PNP, NPN

Smart vacuum and pressure switch with condition monitoring function. IO-Link interface and communication via NFC technology.

98

Vacuum and Pressure Switches VSi

Modular. Visible. Easy to integrated

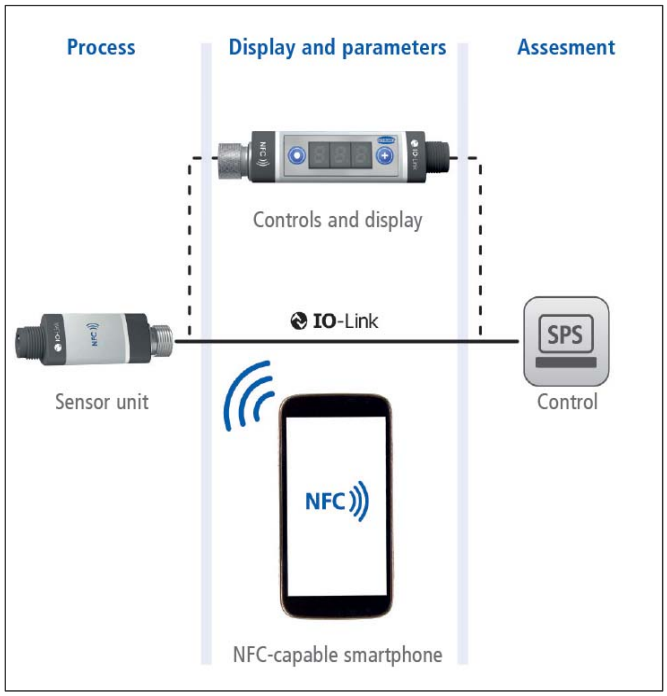
Measuring range from -1 to 10 bar

Keep everything at your fingertips with the new VSi vacuum and pressure switches from Schmalz: The electronic switches are modular in design, simple to integrate in the automation environment and trackable throughout the entire process thanks to the use of innovative communication technology.

Switch without display, 2 switching outputs, IO-Link interface

Switch for data reading during the process, digital switching outputs with external display (SDI) to indicated the status directly at the PLC / operator area, IO-link interface

Switch with integrated display, 2 digital switching outputs, IO-link interface



IO-Link and NFC technology provide innovative communication methods

Modular

- Switch in three versions: without a display, with an integrated display or an external display
- Compact sensor unit for installation directly on the suction cup, for measurement without measuring errors due to hose connections (e.g. delay time)
- External control and indicator display for integration in the user interface

Visible

- Device and process information available in real time because the switch performs measurements directly in the process and communicates to any controls via IO-link
- Device and process information can be parameterized and exported via NFC on a smartphone
- Current vacuum or pressure level visible on the display

Easy to integrate

- Switch can be integrated into a system quickly and easily via IO-link
- Process and device parameters can be configured quickly via IO-link, NFC or an external display

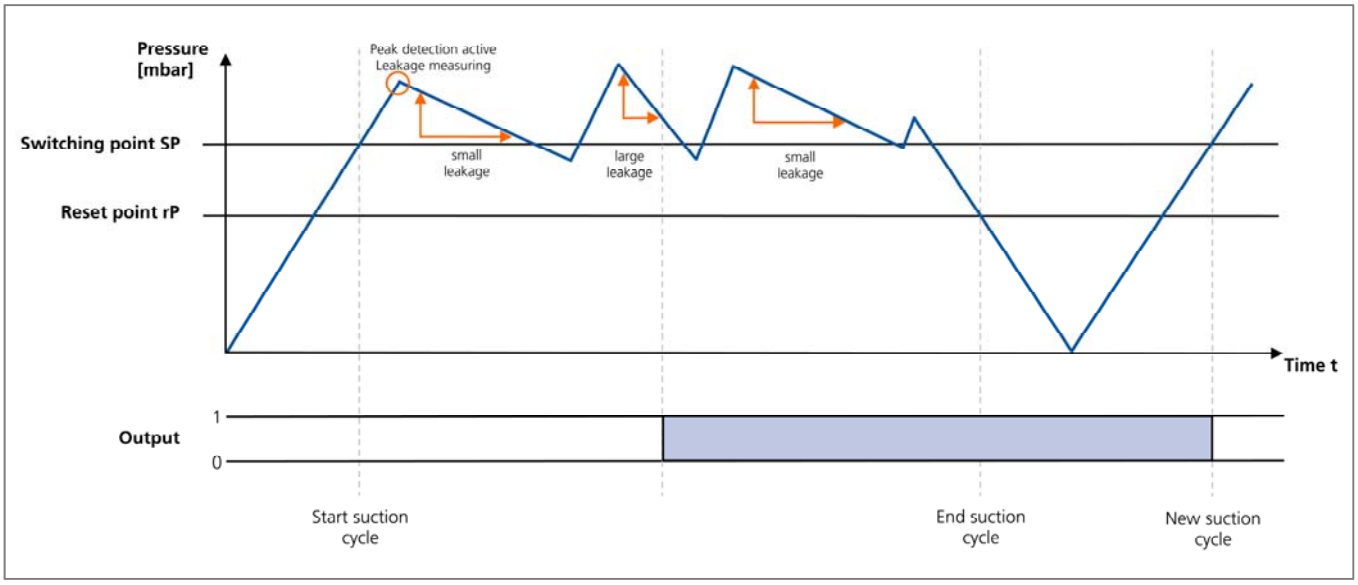
Vacuum and Pressure Switches VSi

Modular. Visible. Easy to integrated

Measuring range from -1 to 10 bar

Condition Monitoring – Increase of system availability

The vacuum and pressure switches VSi are equipped with an integrated Condition Monitoring function. By continuous monitoring of the system (leakage) in case of a critical status of the system the switches are able to provide a signal (via SIO / IO-Link) to the PLC and indicated the status of the system by the integrated LED. The max. permissible leakage of the system can be adjusted directly at the switch or via IO-Link / NFC. This allows to establish a condition monitoring of e.g. vacuum systems with electrical pumps.



Condition Monitoring cycle

Overview available types

Step 1 Select type	Step 2 Decide on measurement point	Step 3 Select display options	Step 4 Select electrical connection	Article no. / Illustration V = vacuum P = pressure VP = vacuum / pressure
Digital vacuum and pressure switches with IO-Link VSi Outputs 2x standard IO (SIO) 1x IO-Link (IO)	**Measurement directly in the process** Compact sensor unit for installation directly on the suction cup. Version with external control and indicator display for installation in the user interface available as an option	**No display** ✓PLC (via SIO/IO) ✓Smartphone (via NFC)	M8-4	**VSi-V-M8-4** 10.06.02.00567
				VSi-P-M8-4 10.06.02.00568
				VSi-VP-M8-4 10.06.02.00569
			M12-4	**VSi-V-M12-4** 10.06.02.00570
				VSi-P-M12-4 10.06.02.00571
				VSi-VP-M12-4 10.06.02.00572
		With external display ✓PLC (via SIO/IO) ✓Smartphone (via NFC) ✓External display	M12-4	**VSi-V-M12-4-SDI** 10.06.02.00587
				VSi-P-M12-4-SDI 10.06.02.00588
				VSi-VP-M12-4-SDI 10.06.02.00589
	Measurement on the user interface Sensor unit with integrated control and indicator display for integration in the user interface	**With integrated display** ✓PLC (via SIO/IO) ✓Smartphone (via NFC) ✓Integrated display	M8-4	**VSi-V-D-M8-4** 10.06.02.00577
				VSi-P-D-M8-4 10.06.02.00578
				VSi-VP-D-M8-4 10.06.02.00579
			M12-4	**VSi-V-D-M12-4** 10.06.02.00580
				VSi-P-D-M12-4 10.06.02.00581
				VSi-VP-D-M12-4 10.06.02.00582

Switches for Handling Glass

Vacuum and Pressure Switches VSi

Measuring range from -1 to 10 bar

Vacuum and Pressure Switches VSi

Suitability for Process-Specific Applications

Applications

- Electronic vacuum and pressure switch with IO-Link interface for measuring vacuum and overpressure in automation and handling systems
- Compact switch VSi can be positioned directly at the suction cups to avoid delay times due to vacuum connection, external display (SDI) can be used to teach the switch (e.g. copy function) or read data
- Condition Monitoring in handling systems with electrical vacuum generators (e.g. pumps), such as stacker systems or destacking applications in the Automotive Glass production
- Output of device data such as type or operating instructions via smartphone using NFC, even with types without display

Design

- Switch with compact sensor unit in three designs: without display, with integrated or external control and indicator display
- Robust fiberglass reinforced plastic housing
- Installation via stainless steel vacuum/compressed air connection and with optional additional mounting bracket
- M8-4 pin or M12-4 pin connection plug
- Mode and switching point display using LEDs that are visible from all sides

Our Highlights...	Your Benefits...
• Electronic vacuum and pressure switch, available with and without display	> Precise measurement and output of digital signals; visualization of vacuum and pressure values
• Version with external control and indicator display (SDI) with copy function	> Precise measurement directly in the process; installation of the display in the user's field of view; settings such as switching points can be transferred to other switches
• Communication in all standard field bus systems via IO-Link interface, Standard IO (SIO) with 24VDC signals as standard integrated	> Input and output of all relevant process data via the controller; minimum installation and set-up effort required
• Output and configuration via smartphone using NFC technology	> Simple access to service and maintenance information; mobile display of detailed error messages
• Switch can be rotated once installed	> Display is easy to read in any installation position

Designation Code Vacuum and Pressure Switches VSi

Abbreviated designation	Measuring range in bar	Display	Electrical connection	Additional function
Example VSi-V-D-M8-4:				
VSi	V	D	M8-4	
VSi	V -1 to 0 VP8 -1 to 8 P10 0 to 10	D with integrated display	M8-4 male connect. M8, 4 pole M12-4 male connect. M12, 4 pole	SDI with external display

Switches for Handling Glass

Vacuum and Pressure Switches VSi

Measuring range from -1 to 10 bar

Ordering Data Vacuum and Pressure Switches VSi

Vacuum and pressure switch VSi is delivered as a ready to connect product (without connection cable). The product consists of:
• Vacuum and pressure switch of type VSi - available as vacuum version, pressure version or combined version without display, with integrated display or with external display

Available accessories: External display (smart device interface), connection cable, mounting bracket

Vacuum and Pressure Switches VSi

Type	Vacuum switch	Vac./Press. switch	Pressure switch
VSi…M8-4	10.06.02.00567	10.06.02.00569	10.06.02.00568
VSi…M12-4	10.06.02.00570	10.06.02.00572	10.06.02.00571
VSi…D…M8-4	10.06.02.00577	10.06.02.00579	10.06.02.00578
VSi…D…M12-4	10.06.02.00580	10.06.02.00582	10.06.02.00581
VSi…SDI	10.06.02.00587	10.06.02.00589	10.06.02.00588
SDI-D M12-5 (Smart Device Interface)	10.06.02.00594 (used in combination with VSi (external display) or with VSi / VSi…D as copy device		

Ordering Data Accessories Vacuum and Pressure Switches VSi

Type	Designation	Part Number	Description
Connection cable VSi...	ASK B-M8-4 5000 K-4P PUR	10.06.02.00031	M8-4 socket, open cable end
Connection cable VSi...	ASK B-M12-4 5000 K-4P PUR	21.04.05.00263	M12-4 socket, open cable end
Connection cable VSi...SDI	ASK B-M8-4 5000 S-M12-4 PUR	21.04.05.00264	M8-4 socket to M12-4 connector
Connection cable VSi...SDI	ASK B-M12-4 5000 S-M12-4 PUR	21.04.05.00265	M12-4 socket to M12-4 connector
Connection cable SDI-D	ASK B-M12-5 5000 PUR GE	21.04.05.00080	M12-5 socket, open cable end
Connection cable SDI-D	ASK B-M12-5 2000 S-M12-5 PUR	21.04.05.00211	M12-5 socket to M12-5 connector
Mounting bracket	BEF-WIN 21x34.5x59 1.5	10.06.02.00061	Mounting bracket for VSi / VSi…D

Technical Data Vacuum and Pressure Switches VSi

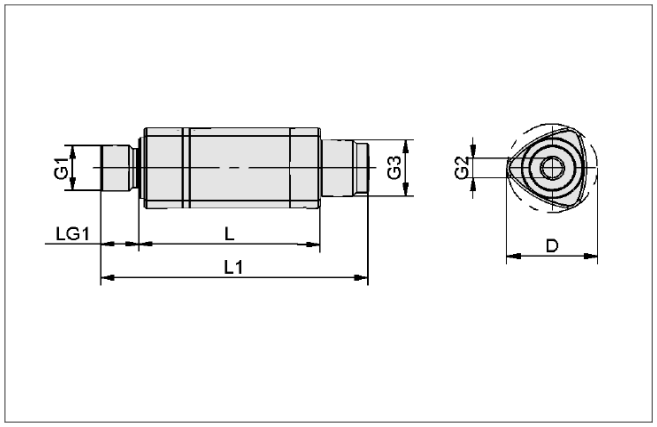
Type	VSi…V	VSi…VP8	VSi…P10
Measured medium	Non-aggressive gases; dry, oil-free air	Non-aggressive gases; dry, oil-free air	Non-aggressive gases; dry, oil-free air
Measuring range [bar]	-1.0 ... 0.0	0.0 ... 10.0	-1.0 ... 8.0
Max. overpressure resistance	8	15	12
Repeatability	± 3% of full-scale value	± 3% of full-scale value	± 3% of full-scale value
Hysteresis	Adjustable	Adjustable	Adjustable
Output signal	SIO (2 digital) / IO-Link	SIO (2 digital) / IO-Link	SIO (2 digital) / IO-Link
Switching capacity [mA]	2 x 100	2 x 100	2 x 100
Indication	VSi = LED VSi…D = LED + Display (3 digit)	VSi = LED VSi…D = LED + Display (3 digit)	VSi = LED VSi…D = LED + Display (3 digit)
Electrical connection	Male connect M8, 4 pole	Male connect M8, 4 pole	Male connect M8, 4 pole
Connection	G1/8"-M + M5-F	G1/8"-M + M5-F	G1/8"-M + M5-F
Voltage	10-30V DC	10-30V DC	10-30V DC
Current consumption [mA]	< 35 mA	< 35 mA	< 35 mA
Protection IP	IP 65 (cable connected)	IP 65 (cable connected)	IP 65 (cable connected)
Temperature influence	± 3% of full-scale value	± 3% of full-scale value	± 3% of full-scale value
Operating temperature [°C]	0 ... 60	0 ... 60	0 ... 60
Weight [g]	VSi = 12 VSi…D = 16	VSi = 12 VSi…D = 16	VSi = 12 VSi…D = 16

Switches for Handling Glass

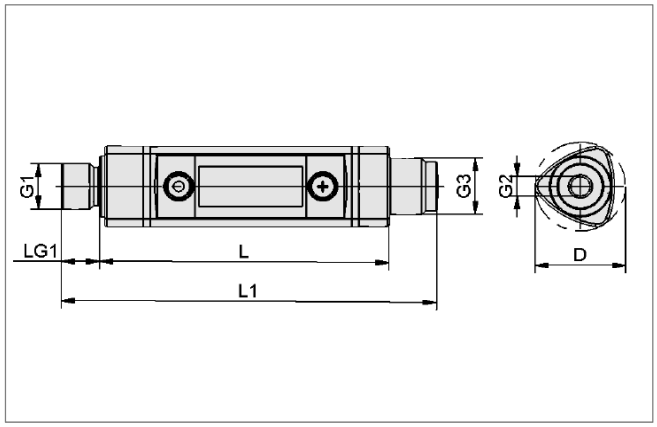
Vacuum and Pressure Switches VSi

Measuring range from -1 to 10 bar

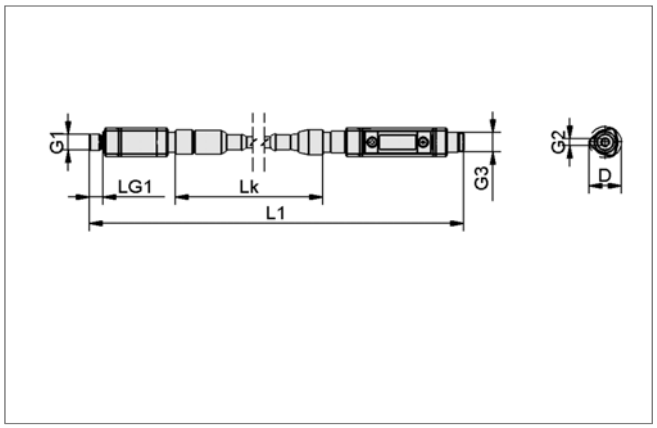
Design Data Vacuum and Pressure Switches VSi



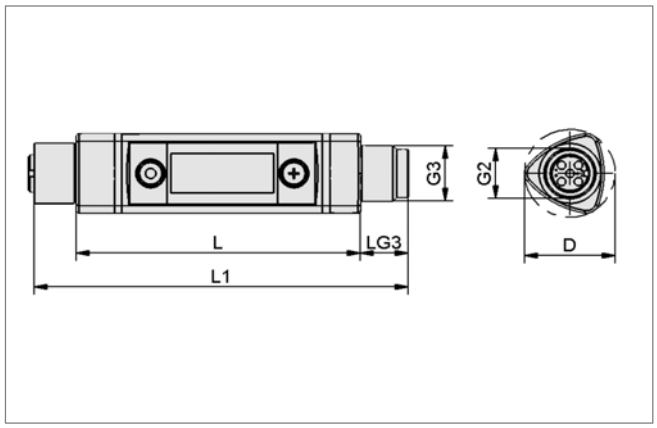
VSi…



VSi...D



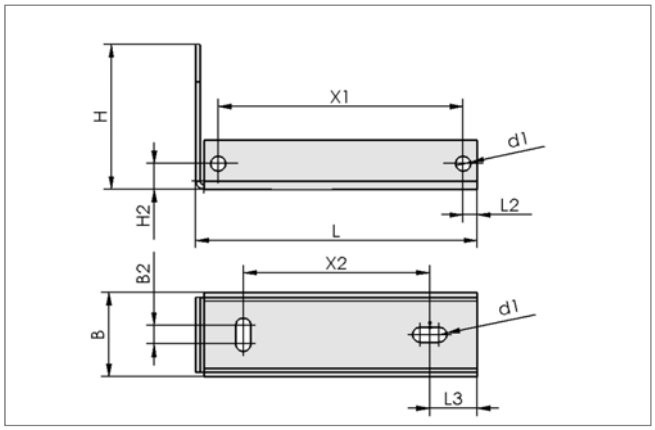
VSi...SDI



SDI

Type	Dimensions in mm								
	D	G1	G2	G3	L	L1	LG1	LG3	Lk
VSi…M8-4	19	G1/8”-M	M5-F	M8x1-M	38.0	56.0	8		-
VSi…M12-4	19	G1/8”-M	M5-F	M12x1-M	38.0	56.0	8		-
VSi…D….M8-4	19	G1/8”-M	M5-F	M8x1-M	60.5	78.5	8		-
VSi…D….M12-4	19	G1/8”-M	M5-F	M12x1-M	60.5	78.5	8		-
VSi…SDI	19	G1/8”-M	M5-F	M12x1-M	-	5200.0	8		5000
SDI D M12-5	19	-	M12x1-F	M12x1-M	59.5	78.5	-	10	-

Design Data Accessories Vacuum and Pressure Switches VSi



BEF-WIN

Type	Dimensions in mm									
	B	B2	d1	H	H2	L	L2	L3	X1	X2
BEF-WIN	21	4	3.2	34.5	5.5	59	3	10	52	39

Overview of Section 5

Vacuum Gripping Systems

Vacuum Gripping Systems for Handling Glass

Vacuum Area Gripping Systems FXP / FMP

104

- With integrated ejector (FXP), for external generator (FMP)
- Modular design
- Sealing element: foam

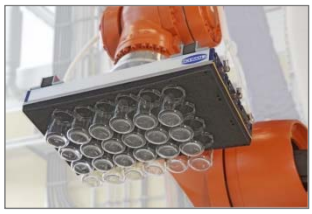
Flexible Vacuum Area Gripping Systems with very soft foam sealing element for gentle handling of glass with low surface pressure.

Vacuum Area Gripping Systems FXP/FMP with Foam SU

109

- Special foam with protection cover (SU)
- With integrated ejector (FXP), for external generator (FMP)

Vacuum Area Gripping Systems for very gentle handling of sensitive workpieces without leaving marks due to special protection cover on the foam. Low surface pressure due to large contact area, flexible & soft foam.



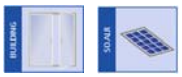
Vacuum Layer Gripping Systems SPZ

113

- Layer handling
- Modular design
- Special sealing foam: Coned-foam

Vacuum Layer Gripping System for packing and palletizing/depalletizing applications of container glass.

Vacuum Suction Spiders SSP



114

- Modular system consisting of different vacuum components
- Design according to the application

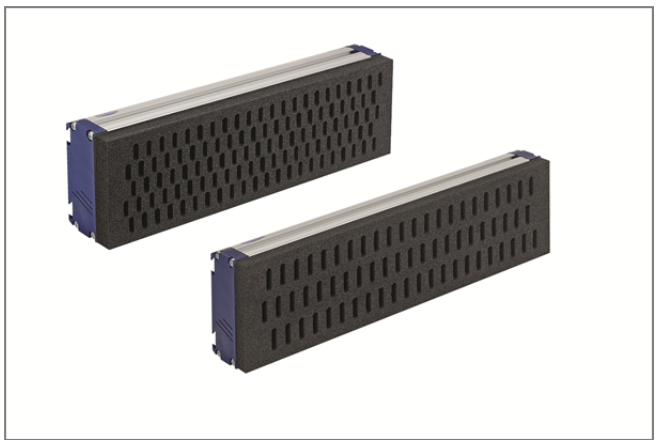
Vacuum Suction Spiders are designed according to the specific applications using the wide range of different vacuum components to build the optimum solution.

Vacuum Gripping Systems

Vacuum Area Gripping Systems FXP / FMP

Flexible and Powerful

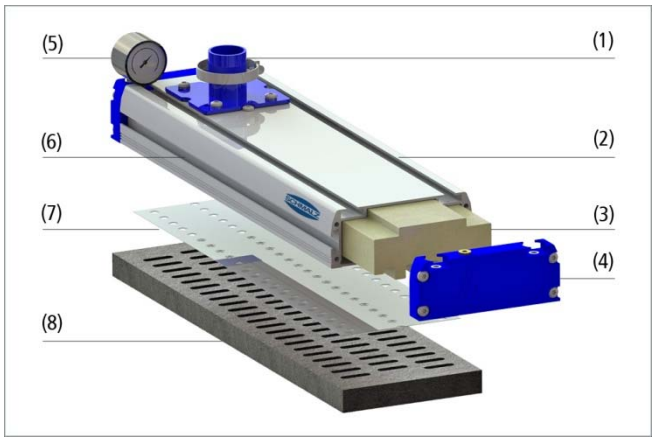
Suitability for Process-Specific Applications



Vacuum area gripping systems FXP / FMP

Applications

- Universal gripper for handling of glass regardless of size, shape and surface
- Handling of glass with different sizes using the integrated valve technology of the gripper
- Handling of sensitive coated glass with soft foam material and no relative movement on the glass surface
- Handling of thin glass with high force and low local surface pressure due to large gripping area
- Handling of glass with undefined pick-up position
- Ideal for use on robots due to its low weight



System design vacuum area gripping systems FMP with foam

Design

- FMP with vacuum connector (1) for external vacuum generation, FXP with integrated pneumatic vacuum generator
- Basic body (2) made from anodized aluminum
- Vacuum booster (3) for low evacuation times
- End cover (4) with connections for blow-off and separation functions as well as attachment point for the vacuum switch and vacuum gauge (5)
- T-groove (6) on the side to mount proximity sensors for workpiece recognition and cycle time optimization
- Valve film (7) with self-cleaning effect
- Durable sealing foam (8) with outstanding sealing properties and low reset force and with optimized adhesive film for simple and fast foam replacement

Vacuum area gripping systems FXP used for automotive glass handling

Our Highlights...	Your Benefits...
• Integrated valve technology (available as either flow resistors or check valves)	> Flexible gripping system to adapt to different workpiece shapes and sizes
• FXP with integrated ejector and additional functions	> Minimization of system costs and installation times
• Soft sealing foam with individual suction cells	> Gentle handling of coated and thin glass
• Sealing foam available with filter	> Protection of the gripper used with separation powder
• Sealing foam with Quick-Change Adhesive Film	> Fast and easy replacement of spare foam
• Low weight	> High accelerations and low cycle times

Vacuum Gripping Systems

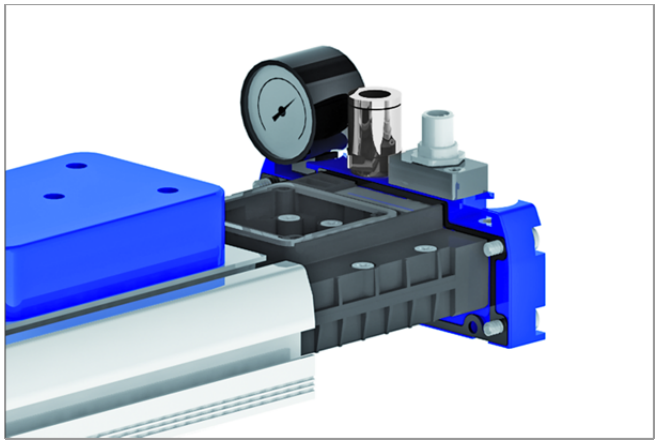
Vacuum Area Gripping Systems FXP / FMP

Flexible and Powerful

Selection Aid: Vacuum generator

FXP: Integrated Vacuum Generation

As a unit that is ready for connection, the area gripping system FXP is equipped with a plug-in ejector for vacuum generation. It can be individually configured and quickly retooled in case of changing application conditions. The modular design ensures easy maintenance and enables the integration of additional functions for energy and process optimization directly in the gripper.

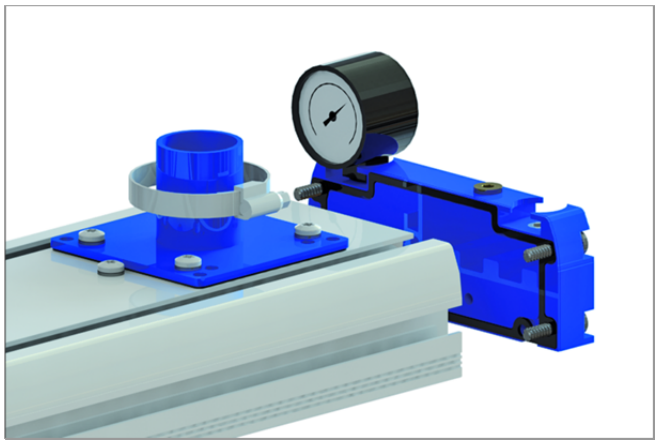


Integrated Plug-in Ejector

- Optimized characteristic curve for gentle handling of sensitive workpieces
- Fast evacuation and high suction flow even at high vacuum values
- Control valves integrated into the end cover for controlling the suction and blow-off functions (optional)
- Silencer for reducing the sound level to 74 dB(A)
- Ready to connect unit, easy to clean

FMP: External Vacuum Generation

The area gripping system FMP has the same modular design as the type FXP, but is equipped with a connection piece for external vacuum generators. It is therefore suitable for use in combination with powerful pumps and blowers.



Connection Piece for External Vacuum Generation

- Allows use of an electrical vacuum generator (blower or pump)
- Suitable for handling of higher loads due to higher vacuum level (pumps) or gentle handling with lower vacuum level (blower)

Selection Aid

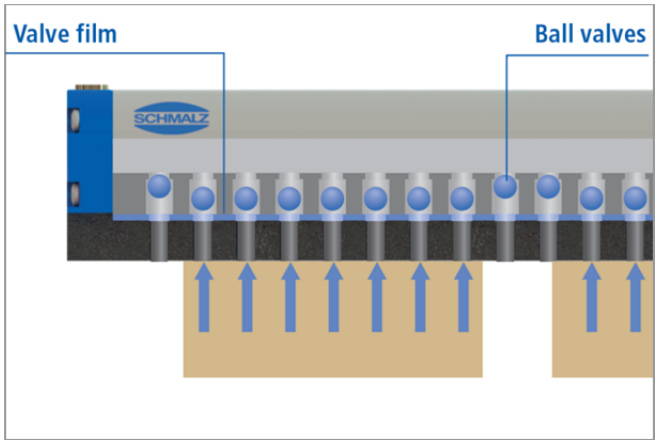
Application features	FXP	FMP
Minimization of interfering edges caused by hoses and attached vacuum generator (integration of functions)	✓	
Easy mounting and quick connection of the gripper	✓	
Minimal system costs (investment costs for vacuum generation including hoses and controller)	✓	
Minimal operating costs (because of the option of electrical vacuum generation), especially for applications with multiple grippers		✓
Handling of very sensitive workpieces with low vacuum levels (external blower)		✓

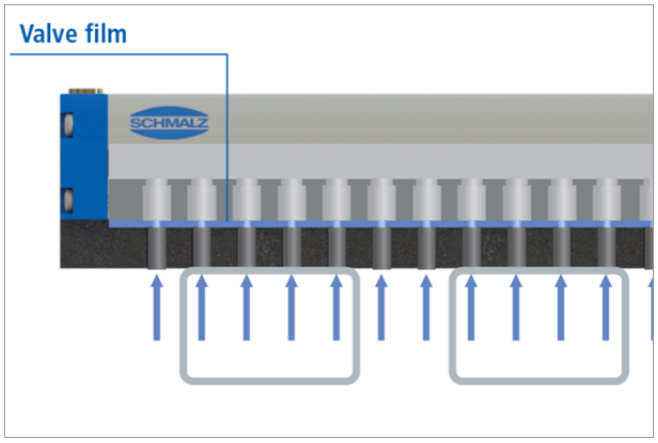
Vacuum Gripping Systems

Vacuum Area Gripping Systems FXP / FMP

Flexible and Powerful

Selection Aid: Valve Technology





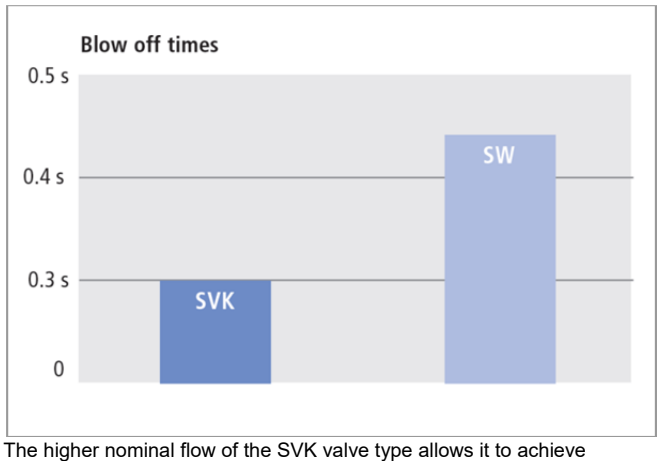
Check valves SVK

- Ball valves integrated in the base section for closing off uncovered suction cells
- Leak-free integrated, resulting in a higher vacuum as well as improved energy efficiency and holding force
- Valve film with clover shaped for high flow rate and fast pick and release of the workpiece
- Proper functioning ensured even with uneven surfaces

Flow restrictors SW

- Valve film with integrated flow restrictors to minimize leakage losses due to uncovered suctions cells
- Suitable for swiveling operations and high accelerations
- Different flow diameters available (optional)

Selection Aid



The higher nominal flow of the SVK valve type allows it to achieve significantly shorter blow-off times than the SW type can (measured at a gripper length of 442 mm)

Application features	SVK	SW
Workpieces with low of gripper coverage		✓
Minimum cycle times (active blow-off)	✓	
Optimization of energy efficiency	✓	
Swiveling movements > 45°		✓

Designation Code Vacuum Area Gripping Systems FXP / FMP

Abbreviated designation	Version*	Valve technology	Length	Number of suction rows	Suction cell grid	Sealing element
Example FXP-SVK 442 3R18 O20						**O20**
FXP	**-**	**SVK**	**442**	**3R**	**18**	
FXP (Integrated vacuum generation) FMP (External vacuum generation)	S Control valves	SVK Check valves SW Flow restrictors	442 mm to 1,432 mm	3R 3 rows (standard) 5R 5 rows (on request)	18 mm	Sealing foam Height 20 mm

* On request: Integrated Control Valves - vacuum on/off (24V DC, NO) and blow-off on/off (24V DC, NC); M12 plug (4-pole)

Accessories and additional versions can be found in the catalogue “Vacuum Gripping Systems”

Ordering Data Vacuum Area Gripping Systems FXP / FMP

Type*	Part number	
	Without filter	With filter
FXP-SVK 442 3R18	10.01.38.00675	10.01.38.00680
FXP-SVK 640 3R18	10.01.38.00676	10.01.38.00681
FXP-SVK 838 3R18	10.01.38.00677	10.01.38.00682
FXP-SVK 1234 3R18	10.01.38.00678	10.01.38.00683
FXP-SVK 1432 3R18	10.01.38.00679	10.01.38.00684
FXP-SW 442 3R18	10.01.38.00685	10.01.38.00690
FXP-SW 640 3R18	10.01.38.00686	10.01.38.00691
FXP-SW 838 3R18	10.01.38.00687	10.01.38.00692
FXP-SW 1234 3R18	10.01.38.00688	10.01.38.00693
FXP-SW 1432 3R18	10.01.38.00689	10.01.38.00694

Type*	Part number	
	Without filter	With filter
FMP-SVK 442 3R18	10.01.38.00303	10.01.38.00415
FMP-SVK 640 3R18	10.01.38.00411	10.01.38.00416
FMP-SVK 838 3R18	10.01.38.00412	10.01.38.00417
FMP-SVK 1234 3R18	10.01.38.00413	10.01.38.00418
FMP-SVK 1432 3R18	10.01.38.00414	10.01.38.00419
FMP-SW 442 3R18	10.01.38.00433	10.01.38.00428
FMP-SW 640 3R18	10.01.38.00434	10.01.38.00429
FMP-SW 838 3R18	10.01.38.00435	10.01.38.00430
FMP-SW 1234 3R18	10.01.38.00436	10.01.38.00431
FMP-SW 1432 3R18	10.01.38.00437	10.01.38.00432

* Customer-specific gripper dimensions (length) on request

Ordering Data Spare Parts Vacuum Area Gripping Systems FXP / FMP – Sealing Foam

Type	Part number	
	Without filter	With filter
DI-PL 442x128 3R18	10.01.38.00113	10.01.38.00192
DI-PL 640x128 3R18	10.01.38.00405	10.01.38.00408
DI-PL 838x128 3R18	10.01.38.00140	10.01.38.00409
DI-PL 1234x128 3R18	10.01.38.00193	10.01.38.00196
DI-PL 1432128 3R18	10.01.38.00406	10.01.38.00410

Technical Data Vacuum Area Gripping Systems FXP / FMP

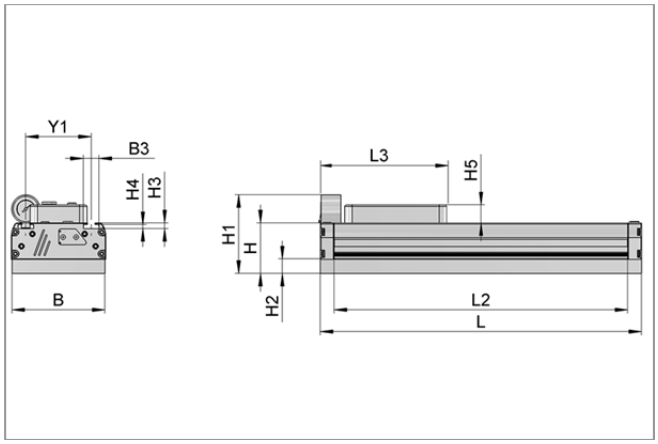
Type	Number of suction cells	Air consumption* [l/min]	Max. suction flow [l/min]	Max. degree of evacuation [%]	Suction force** [N]	Weight [kg]
FXP-SVK 442 3R18	66	250	1,050	55	550	2.6
FXP-SVK 640 3R18	99	375	1,350	55	820	3.4
FXP-SVK 838 3R18	132	500	1,600	55	1,090	4.2
FXP-SVK 1234 3R18	198	875	2,940	55	1,650	5.7
FXP-SVK 1432 3R18	231	1,000	3,180	55	1,910	6.3
FXP-SW 442 3R18	66	250	1,050	55	440	2.5
FXP-SW 640 3R18	99	375	1,350	55	660	3.3
FXP-SW 838 3R18	231	500	1,600	55	870	4.1
FXP-SW 1234 3R18	198	875	2,940	55	1,310	5.6
FXP-SW 1432 3R18	231	1,000	3,180	55	1,530	6.2

Noise level 74 dB(A)
* At an operating pressure of 5.5 bar
** At a vacuum level of -250 mbar with the gripper fully covered

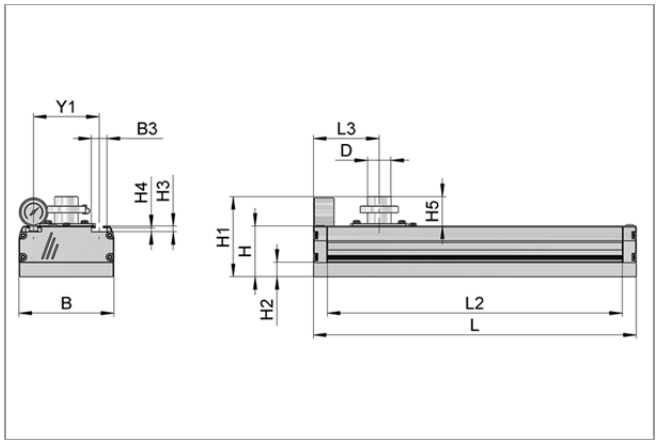
Type	Number of suction cells	Required suction flow*** [l/min]	Suction force** [N]	Weight [kg]
FMP-SVK 442 3R18	66	300	550	2.5
FMP-SVK 640 3R18	99	450	820	3.3
FMP-SVK 838 3R18	132	600	1,090	4.1
FMP-SVK 1234 3R18	198	900	1,650	5.5
FMP-SVK 1432 3R18	231	1,050	1,910	6.1
FMP-SW 442 3R18	66	300	440	2.4
FMP-SW 640 3R18	99	450	660	3.2
FMP-SW 838 3R18	231	600	870	4.0
FMP-SW 1234 3R18	198	900	1,310	5.4
FMP-SW 1432 3R18	231	1,050	1,530	6.0

** At a vacuum level of -250 mbar with the gripper fully covered
*** The external vacuum generator must supply at least the specified suction flow (at the vacuum port of the FMP) at -250 mbar but max. 135% of the specified value

Design Data Vacuum Area Gripping Systems FXP / FMP



FXP



FMP

Type*	Dimensions in mm											
	B	B3	H	H1	H2	H3	H4	H5	L	L2	L3	Y1
FXP-SVK 442 3R18	130	21.6	70	109	20	7.7	5.5	29	442	402	154	90
FXP-SVK 640 3R18	130	21.6	70	109	20	7.7	5.5	29	640	600	154	90
FXP-SVK 838 3R18	130	21.6	70	109	20	7.7	5.5	29	838	798	154	90
FXP-SVK 1234 3R18	130	21.6	70	109	20	7.7	5.5	29	1,234	1,194	154	90
FXP-SVK 1432 3R18	130	21.6	70	109	20	7.7	5.5	29	1,432	1,392	154	90
FXP-SW 442 3R18	130	21.6	70	109	20	7.7	5.5	29	442	402	154	90
FXP-SW 640 3R18	130	21.6	70	109	20	7.7	5.5	29	640	600	154	90
FXP-SW 838 3R18	130	21.6	70	109	20	7.7	5.5	29	838	798	154	90
FXP-SW 1234 3R18	130	21.6	70	109	20	7.7	5.5	29	1,234	1,194	154	90
FXP-SW 1432 3R18	130	21.6	70	109	20	7.7	5.5	29	1,432	1,392	154	90

* Two ejectors/silencer box covers are used for the 1,234 mm and 1,432 mm lengths. Type FXP requires a compressed-air hose connection 12/9 mm.

Type	Dimensions in mm												
	B	B3	D*	H	H1	H2	H3	H4	H5	L	L2	L3	Y1
FMP-SVK 442 3R18	130	21.6	32	70	111	20	7.7	5.5	41	442	402	90	90
FMP-SVK 640 3R18	130	21.6	32	70	111	20	7.7	5.5	41	640	600	90	90
FMP-SVK 838 3R18	130	21.6	60	70	116	20	7.7	5.5	46	838	798	90	90
FMP-SVK 1234 3R18	130	21.6	60	70	116	20	7.7	5.5	46	1,234	1,194	90	90
FMP-SVK 1432 3R18	130	21.6	60	70	116	20	7.7	5.5	46	1,432	1,392	90	90
FMP-SW 442 3R18	130	21.6	32	70	111	20	7.7	5.5	41	442	402	90	90
FMP-SW 640 3R18	130	21.6	32	70	111	20	7.7	5.5	41	640	600	90	90
FMP-SW 838 3R18	130	21.6	60	70	116	20	7.7	5.5	46	838	798	90	90
FMP-SW 1234 3R18	130	21.6	60	70	116	20	7.7	5.5	46	1,234	1,194	90	90
FMP-SW 1432 3R18	130	21.6	60	70	116	20	7.7	5.5	46	1,432	1,392	90	90

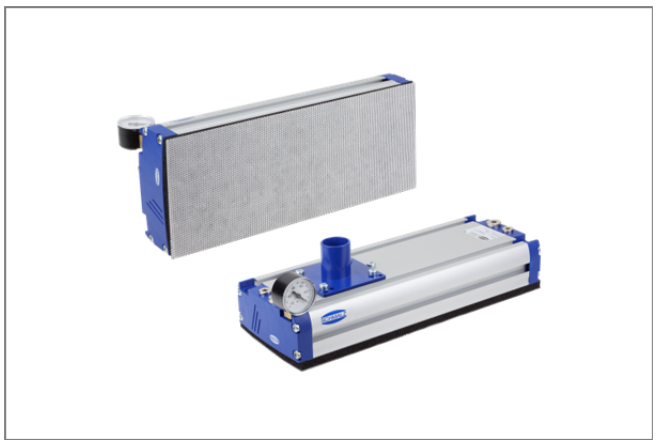
* Vacuum hose with internal diameter of dimension D required

Vacuum Area Gripping Systems

Vacuum Area Gripping Systems FXP / FMP with Foam SU

Gentle and Non-Marking

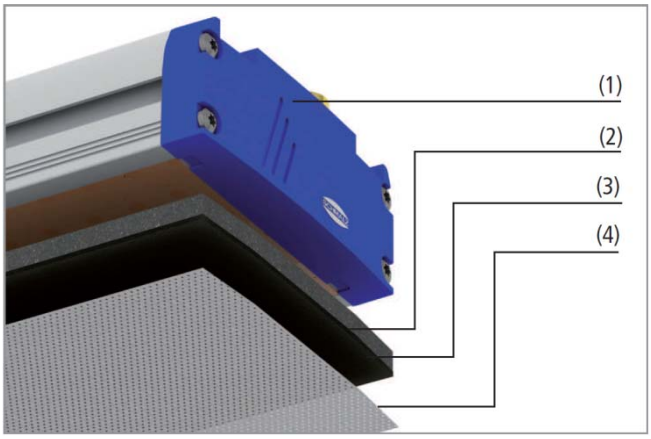
Suitability for Process-Specific Applications



Vacuum area gripping systems FXP / FMP with foam SU

Applications

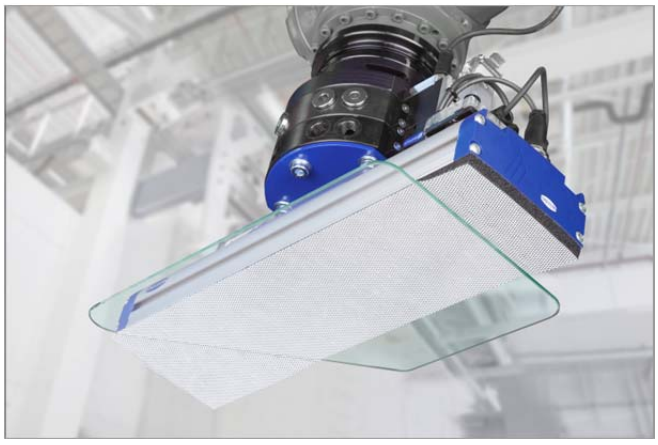
- Handling of thin and flexible display glass along in the entire display production line
- Handling of coated glass with very sensitive coating types
- Use in the production of low-E glass in the field of building and automotive
- Handling of sensitive workpiece surfaces such as coated or polished surfaces
- Use in clean room applications (e. g. display production)



System design vacuum area gripping systems FXP/FMP with foam SU

Design

- Gripper available with integrated vacuum generator (FXP) or for the use with external vacuum generator (FMP)
- Base section (1) with integrated vacuum distribution and valve technology – available in different lengths
- Flexible foam layer (2) for height compensation of the work-pieces and gentle gripping
- Special silicone-free adhesion layer (3) for easy replacement of protection covers SU
- Replaceable protection cover (4) for the non-marking han-dling of sensitive workpieces.



Vacuum area gripping systems used for handling of sidelites

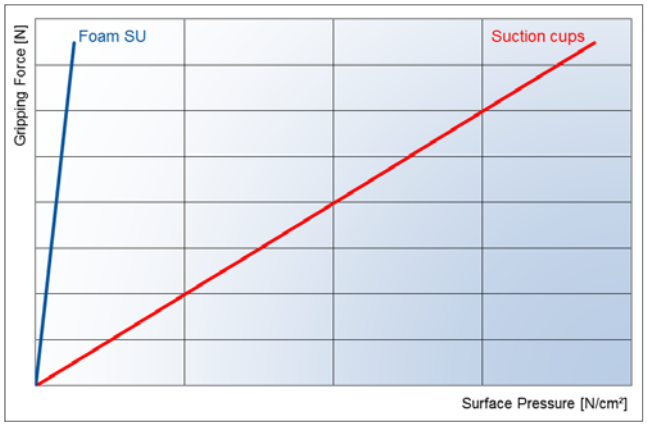
Our Highlights...	Your Benefits...
• Gripper with integrated valve technology	> Flexible system to adapt to different workpiece shapes and sizes
• Soft and adaptable sealing foam with individual suction cells	> Gentle handling and mini-mum surface pressure during gripping
• No relative movement of the foam on the workpiece surface	> No risk of scratches on the sensitive glass surface
• Protection cover SU on the entire gripping area	> No contamination of the workpiece surface
• Perforated fabric layer with quick-change adhesive film	> Cost saving – Fast and easy replacement of spare part

Vacuum Area Gripping Systems

Vacuum Area Gripping Systems FXP / FMP with Foam SU

Gentle and Non-Marking

Gentle Handling



- Reduces dynamic and static forces on the glass with optimal dimensioning and distribution of suction cells
- Large contact area for the handling of thin glass by providing excellent support during handling
- Lower surface pressure compared to other gripping principles, such as elastomer suction cups or grippers based on the Bernoulli principle, and therefore considerably gentler handling

  → **Significant decrease in breakage rates and damage of coatings**

FXP: Integrated Vacuum Generation

- Integrated Plug-in Ejector
- Optimized performance characteristics for gentle handling of sensitive workpieces
- Fast evacuation and high suction flow even at high vacuum values
- Control valves integrated into the end cover for controlling the suction and blow-off functions (Version “S”)
- Silencer for reducing the sound level to 74 dB(A)
- Ready to connect unit, easy to clean

FMP: External Vacuum Generation

- Connection for external Vacuum Generation
- Allows use of an electrical vacuum generator (blower or pump)
- Suitable for handling of higher loads due to higher vacuum level (pumps) or gentle handling with lower vacuum level (blower)

Vacuum Area Gripping Systems

Vacuum Area Gripping Systems FXP / FMP with Foam SU

Gentle and Non-Marking

Designation Code Vacuum Area Gripping Systems FXP / FMP with Foam SU

Abbreviated designation		Version*		Valve-technology **		Length	Number of suction rows	Suction cell grid	Sealing element
Beispiel: FXP-SVK 442 5R18 N10SU									
FXP		**-**		**SVK**		**442**	**5 Reihen**	**18 mm**	**N10 SU**
FMP	Integrated vacuum generation	S	Control-valves	SVK	Check-valves	442 mm to 1,432 mm	5 rows (on request)	18 mm	Sealing foam height 10mm with SU
FXP	External vacuum generation			SW	Flow-restrictors				

* Integrated Control Valves - vacuum on/off (24V DC, NO) and blow-off on/off (24V DC, NC); M12 plug (4-pole)
** Additional information on the valve technology please see “Vacuum Area Gripping Systems FXP / FMP”

Accessories and additional versions can be found in the catalogue “Vacuum Gripping Systems”

Ordering Data Vacuum Area Gripping Systems FXP / FMP with Foam SU

Type*	Part number
FMP-SW 442 5R18 N10SU	10.01.38.02967
FMP-SW 640 5R18 N10SU	10.01.38.02968
FMP-SW 838 5R18 N10SU	10.01.38.02969
FMP-SW 1234 5R18 N10SU	10.01.38.02970
FMP-SW 1432 5R18 N10SU	10.01.38.02971
FXP-SW 442 5R18 N10SU	10.01.38.02947
FXP-SW 640 5R18 N10SU	10.01.38.02948
FXP-SW 838 5R18 N10SU	10.01.38.02949
FXP-SW 1234 5R18 N10SU	10.01.38.02950
FXP-SW 1432 5R18 N10SU	10.01.38.02951
FXP-S-SW 442 5R18 N10SU	10.01.38.02957
FXP-S-SW 640 5R18 N10SU	10.01.38.02958
FXP-S-SW 838 5R18 N10SU	10.01.38.02959
FXP-S-SW 1234 5R18 N10SU	10.01.38.02960
FXP-S-SW 1432 5R18 N10SU	10.01.38.02961

Type*	Part number
FMP-SVK 442 5R18 N10SU	10.01.38.02972
FMP-SVK 640 5R18 N10SU	10.01.38.02973
FMP-SVK 838 5R18 N10SU	10.01.38.02974
FMP-SVK 1234 5R18 N10SU	10.01.38.02975
FMP-SVK 1432 5R18 N10SU	10.01.38.02976
FXP-SVK 442 5R18 N10SU	10.01.38.02952
FXP-SVK 640 5R18 N10SU	10.01.38.02953
FXP-SVK 838 5R18 N10SU	10.01.38.02954
FXP-SVK 1234 5R18 N10SU	10.01.38.02955
FXP-SVK 1432 5R18 N10SU	10.01.38.02956
FXP-S-SVK 442 5R18 N10SU	10.01.38.02962
FXP-S-SVK 640 5R18 N10SU	10.01.38.02963
FXP-S-SVK 838 5R18 N10SU	10.01.38.02964
FXP-S-SVK 1234 5R18 N10SU	10.01.38.02965
FXP-S-SVK 1432 5R18 N10SU	10.01.38.02966

* Customer-specific gripper dimensions (length) on request

Ordering Data Spare Parts Vacuum Area Gripping Systems FXP / FMP Foam SU

Type	Part number	
	Foam N10SU	Protection Cover SU
FXP/FMP 442	10.01.38.02863	10.01.38.02858
FXP/FMP 640	10.01.38.02864	10.01.38.02859
FXP/FMP 838	10.01.38.02865	10.01.38.02860
FXP/FMP 1234	10.01.38.02866	10.01.38.02861
FXP/FMP 1432	10.01.38.02867	10.01.38.02862

Technical Data Vacuum Area Gripping Systems FXP / FMP with Foam SU

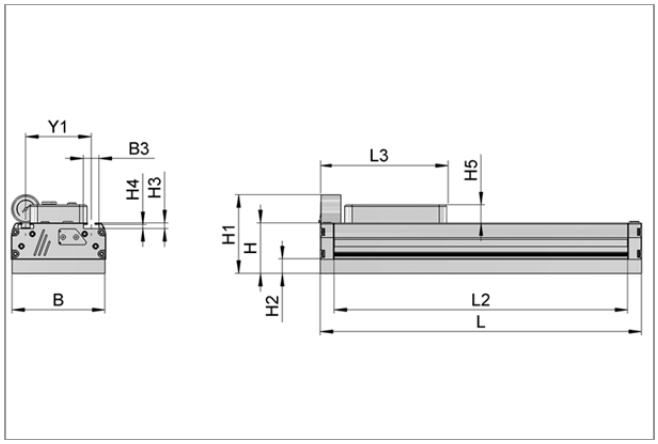
For technical data please see in our catalogue “Vacuum Components” page 382 or www.schmalz.com.

Vacuum Area Gripping Systems

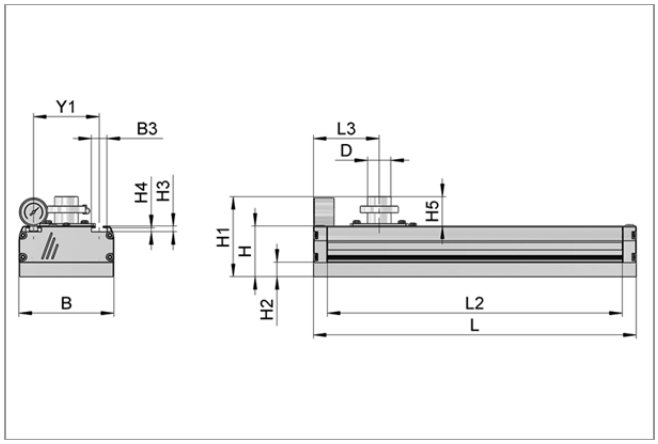
Vacuum Area Gripping Systems FXP / FMP with Foam SU

Gentle and Non-Marking

Design Data Vacuum Area Gripping Systems FXP / FMP with Foam SU



FXP



FMP

Type*	Dimensions in mm											
	B	B3	H	H1	H2	H3	H4	H5	L	L2	L3	Y1
FXP-SVK 442 5R18	130	21.6	60	99	10	7.7	5.5	29	442	402	154	90
FXP-SVK 640 5R18	130	21.6	60	99	10	7.7	5.5	29	640	600	154	90
FXP-SVK 838 5R18	130	21.6	60	99	10	7.7	5.5	29	838	798	154	90
FXP-SVK 1234 5R18	130	21.6	60	99	10	7.7	5.5	29	1,234	1,194	154	90
FXP-SVK 1432 5R18	130	21.6	60	99	10	7.7	5.5	29	1,432	1,392	154	90
FXP-SW 442 5R18	130	21.6	60	99	10	7.7	5.5	29	442	402	154	90
FXP-SW 640 5R18	130	21.6	60	99	10	7.7	5.5	29	640	600	154	90
FXP-SW 838 5R18	130	21.6	60	99	10	7.7	5.5	29	838	798	154	90
FXP-SW 1234 5R18	130	21.6	60	99	10	7.7	5.5	29	1,234	1,194	154	90
FXP-SW 1432 5R18	130	21.6	60	99	10	7.7	5.5	29	1,432	1,392	154	90

* Two ejectors/silencer box covers are used for the 1,234 mm and 1,432 mm lengths. Type FXP requires a compressed-air hose connection 12/9 mm.

Type	Dimensions in mm												
	B	B3	D*	H	H1	H2	H3	H4	H5	L	L2	L3	Y1
FMP-SVK 442 5R18	130	21.6	32	60	101	10	7.7	5.5	41	442	402	90	90
FMP-SVK 640 5R18	130	21.6	32	60	101	10	7.7	5.5	41	640	600	90	90
FMP-SVK 838 5R18	130	21.6	60	60	106	10	7.7	5.5	46	838	798	90	90
FMP-SVK 1234 5R18	130	21.6	60	60	106	10	7.7	5.5	46	1,234	1,194	90	90
FMP-SVK 1432 5R18	130	21.6	60	60	106	10	7.7	5.5	46	1,432	1,392	90	90
FMP-SW 442 5R18	130	21.6	32	60	101	10	7.7	5.5	41	442	402	90	90
FMP-SW 640 5R18	130	21.6	32	60	101	10	7.7	5.5	41	640	600	90	90
FMP-SW 838 5R18	130	21.6	60	60	106	10	7.7	5.5	46	838	798	90	90
FMP-SW 1234 5R18	130	21.6	60	60	106	10	7.7	5.5	46	1,234	1,194	90	90
FMP-SW 1432 5R18	130	21.6	60	60	106	10	7.7	5.5	46	1,432	1,392	90	90

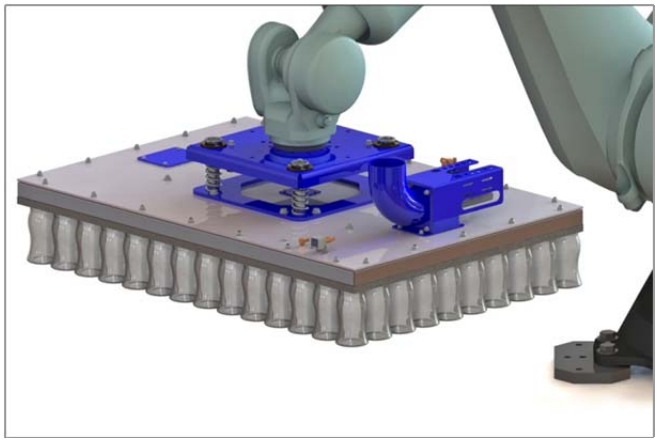
* Vacuum hose with internal diameter of dimension D required

Vacuum Gripping Systems

Vacuum Layer Gripping Systems SPZ

Efficient Palletizing and Depalletizing of Container Glass

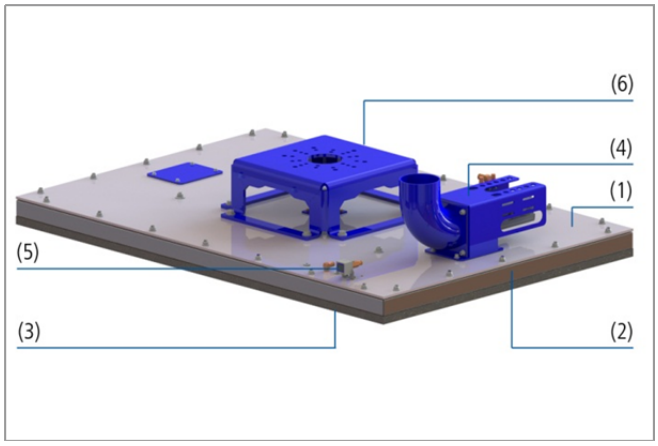
Suitability for Process-Specific Applications



Vacuum layer gripping systems SPZ

Applications

- Complete gripping system for process-safe layered palletizing and depalletizing of container glass (depalletizing only in combination with the optional spring-mounted flange module)
- For use in automated preparing, filling, packaging and commissioning processes
- Also suitable for handling layers with gaps, mixed layers, intermediate layers and pallets
- High accelerations with low cycle times



System design vacuum layer gripping systems SPZ

Design

- Main body with various mounting holes (1)
- Suction box made of folded and welded stainless steel (2)
- Sealing plate made of coned foam (3), can be replaced quickly due to quick-change adhesive film
- Valve technology (4)
- Vacuum switch for monitoring the vacuum values (using the two-color display screen) and additional control functions (5)
- Standard flange module (6) (spring-mounted flange module optional)
- External vacuum generation (not shown in the picture)

Vacuum layer gripping systems SPZ for handling of container glass

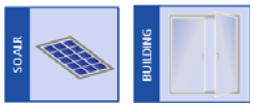
Our Highlights...	Your Benefits...
• Sealing plate made of flexible coned foam	> Optimal adjustment to the shapes of the workpiece
• Modular design	> Flexible system build to the specific application
• Standardized grid pattern designed for common container glass opening diameters larger than 50 mm	> Tested, perfectly matched overall system including blower and hose connections
• Other grids for additional opening diameters are available (optional)	> Customer-specific dimensions and adaptation possible upon request

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 Gripping Systems

Vacuum Suction Spiders SSP

Modular System for Every Application

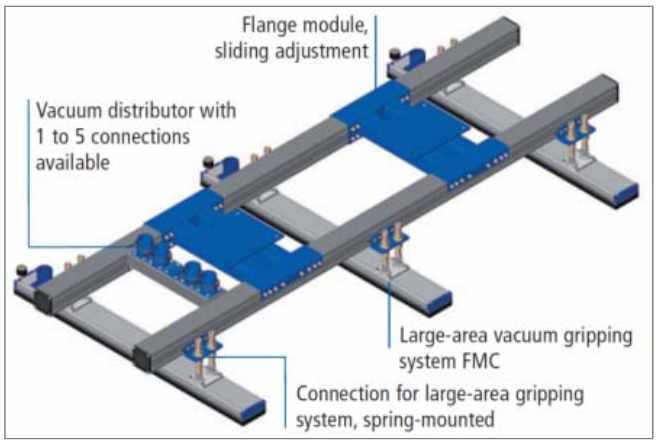


Suitability for Process-Specific Applications

Vacuum suction spiders SSP

Applications

- Vacuum suction spiders are providing automated handling solutions for various process steps in the PV module production
- Used for handling of glass for the loading and unloading of production lines in the glass industry
- Handling of glass and slip sheets (paper) in destacking processes



Example for system design vacuum suction spiders SSP

Design

- Modular system enables the optimum selection of suction cups, large area gripping systems or special grippers in combination with mounting elements, valves and system monitoring
- Combination of different gripping technologies like suction cups and floating suction cups are 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 of PV modules

Our Highlights...	Your Benefits...
• Modular design with the high quality components of Schmalz	> The optimum solution for every application / process step
• High technology vacuum generation	> Minimum operation costs for economic solutions
• Combination of different gripping technologies in one gripper	> One gripper for different workpieces, e.g. glass and slip-sheet handling to reduce process costs
• Made from low weight components	> 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.

Overview of Section 6

Vacuum Clamping Systems

Vacuum Clamping Systems for Glass

Schmalz Quick-Change System SQC

- Flexible solution to update existing grinding tables
- Dimension: D80 / 80x80 mm
- Height: 80 mm / 120 mm

Schmalz Quick-Change System to reduce set-up times and increase availability and thus output capacity of production lines.

116

Vacuum Blocks Round VCBL-GL for Flat Tables

- For flat table systems
- Diameter: 120 mm
- Height: 81.5 mm / 93.5 mm / 120 mm

Round vacuum blocks for the safe and precise clamping of glass in the automotive and building glass production. Non-marking sealing ring made of HT1.

120

Customized Vacuum Blocks VCBL-GL for Flat Tables

- For flat table systems
- Customized dimensions

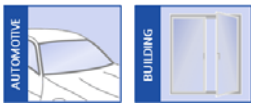
Customized vacuum blocks according to the workpiece design. Large effective vacuum area in combination with high friction surface for precise grinding of small size workpieces (e.g. sidelites).

122

Vacuum Clamping Systems for Glass

Schmalz Quick-Change SQC for Bystronic* Centers

Height 80 mm / 120 mm

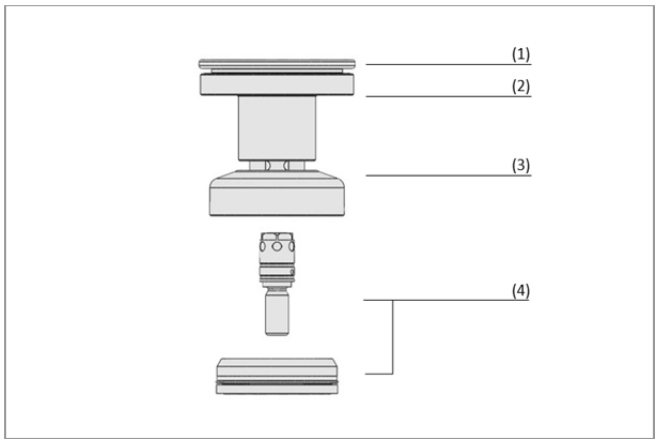


Schmalz Quick-Change SQC

Suitability for Process-Specific Applications

Applications

- Flexible vacuum clamping system for Bystronic* glass grinding machines with 100 mm grid and height of 80 and 120 mm
- Simple retrofitting on existing machine tables
- The Quick-Change Mono-Bases are firmly connected to the machine table and the Quick-Change Suction Cups and covers are positioned according to the glass layout
- Tool-free cup changing using the Quick-Change mechanism reduces set-up times and downtimes
- High precision due to friction plates specially optimized for use in the glass industry



System design Schmalz Quick-Change SQC

Design

- Sealing ring made of non-marking material HT1 or NBR; available as a spare part (1)
- The Quick-Change Suction Cups SQC-C are positioned on the base by means of the Quick-Change System (2)
- Aluminium housing (electrically conductive system) with rated break point (3)
- Base SQC-MB mounted permanently to the table by means of a M12 hollow-screw (4)
- Non-used suction positions on the table can be closed by using the cover ABDK

Schmalz Quick-Change SQC being used for glass grinding

Our Highlights...	Your Benefits...
• Modular Quick-Change System consisting of just 3 parts	> Fast and easy set-up of new machining layouts
• Cups and Covers can be changed without tools	> Minimum set-up times and maximum availability of the machine for increased output of the line
• Base SQC-MB remains permanently on the table	> Less cleaning efforts of the table during layout changes
• High friction surface of the cup	> High forces during the grinding process even in case of water coated cups
• Height tolerance +/- 0.05 mm	> Precise machining

* Bystronic is a registered and protected brand name. The items listed here are products of J. Schmalz GmbH that have been designed to fit Bystronic machining centers.

Vacuum Clamping Systems for Glass

Schmalz Quick-Change System SQC for Bystronic* Centers

Height 80 mm / 120 mm

Ordering Data Schmalz Quick-Change System SQC

- A complete clamping system consists of Quick-Change Bases (Step 1), Quick-Change Suction Cups (Step 2) and Covers
- Overall height available with 80 mm and 120 mm (Quick-Change Base + Quick-Change Suction Cup)

Step 1: Select Quick-Change Base SQC-MB

Quick-Change Base SQC-MB

- Fixture for the Quick-Change Suction Cups, keyed positioning with 30° steps. Mounted to the table by a hollow screw (included into the delivery of the base)
- Non-used bases to be closed by Covers (available as accessory)

Ordering Data Quick-Change Base SQC-MB

Type	Part Number
SQC-MB-62.9x18-M12-AG	10.01.18.01031

Ordering Data Accessories and Spare Parts Quick-Change Base SQC-MB

Type	Description	Part Number
SCHR-M12X52.9	Hollow screw	10.01.18.01030
DRUC-STK-2.4X14	Reset pin for 30° lock position	20.05.07.00137

Step 2: Select Quick-Change Suction Cup SQC-C and Cover ABDK

Quick-Change Suction Cup SQC-C

- Quick-Change Suction Cups the be mounted on Base SQC-MB by using the push- button
- Covers ABDK mounted on the base by a self-locking system (rotation)
- Spare Parts: Sealing ring

Ordering Data Quick-Change Suction Cup SQC-C

Type	Design	Height incl. base [mm]	Suction area [mm]	Part Number
SQC-C-RU-80x102-HT1	round	120	Ø 80	10.01.18.01090
SQC-C-RU-80x62-HT1	round	80	Ø 80	10.01.18.01091
SQC-C-RU-80x102-NBR	round	120	Ø 80	10.01.18.01037
SQC-C-RU-80x62-NBR	round	80	Ø 80	10.01.18.01033
SQC-C-VI-80x80x102-HT1	rectangular	120	80 x 80	10.01.18.01039
SQC-C-VI-80x80x62-HT1	rectangular	80	80 x 80	10.01.18.01038
SQC-C-VI-80x80x102-NBR	rectangular	120	80 x 80	10.01.18.01092
SQC-C-VI-80x80x62-NBR	rectangular	80	80 x 80	10.01.18.01093

Ordering Data Spare Parts Quick-Change Suction Cup SQC-C

Type	Spare part for	Part Number
ISDR 81x12 SQC HT1	SQC-C-RU-80x…-HT1	10.01.18.00842
ISDR 81x11 NBR	SQC-C-RU-80x…-NBR	10.07.08.00554
ISDR 81x81x12 Cup 1 HT1	SQC-C-VI-80x80x…-HT1	10.01.15.00962
ISDR 81x81x12 Cup 1 NBR-50	SQC-C-VI-80x80x…-NBR	10.01.15.00158

Cover ABDK

Ordering Data Cover

Type	Part Number
ABDK 68x12 SQC	10.01.18.01022

* Bystronic is a registered and protected brand name. The items listed here are products of J. Schmalz GmbH that have been designed to fit Bystronic machining centers.

Vacuum Clamping Systems for Glass

Schmalz Quick-Change System SQC for Bystronic* Centers

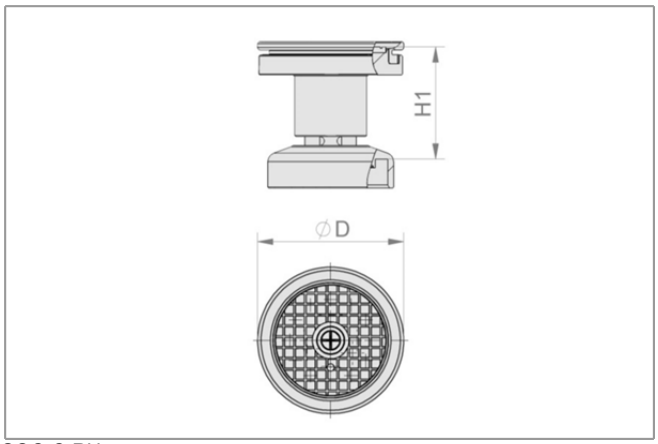
Height 80 mm / 120 mm

Technical Data Schmalz Quick-Change System SQC

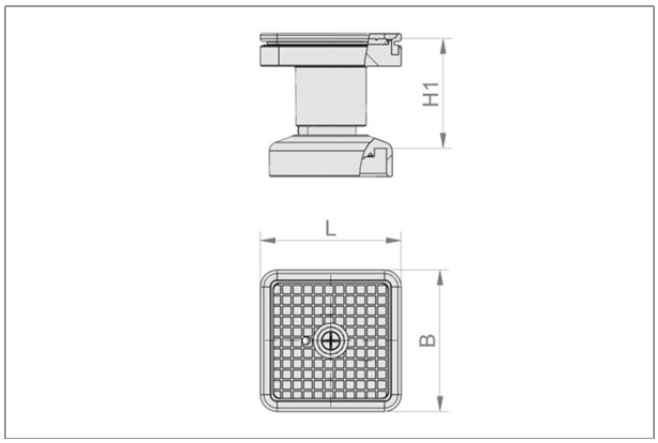
Type	Working height (incl. Base) [mm]	Suction force [N]	Sealing material	Friction plate material	Wrench size
SQC-C-RU-80x102-HT1	120	300	HT1	Elastodur	-
SQC-C-RU-80x62-HT1	80	300	HT1	Elastodur	-
SQC-C-RU-80x102-NBR	120	300	NBR	Elastodur	-
SQC-C-RU-80x62-NBR	80	300	NBR	Elastodur	-
SQC-C-VI-80x80x102-HT1	120	380	HT1	Elastodur	-
SQC-C-VI-80x80x62-HT1	80	380	HT1	Elastodur	-
SQC-C-VI-80x80x102-NBR	120	380	NBR	Elastodur	-
SQC-C-VI-80x80x62-NBR	80	380	NBR	Elastodur	-
SQC-MB-62.9x18-M12-AG	-	-	-	-	16
ABDK 68x12 SQC	30	-	-	-	-

*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

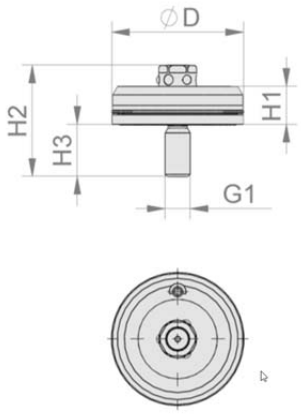
Design Data Schmalz Quick-Change System SQC



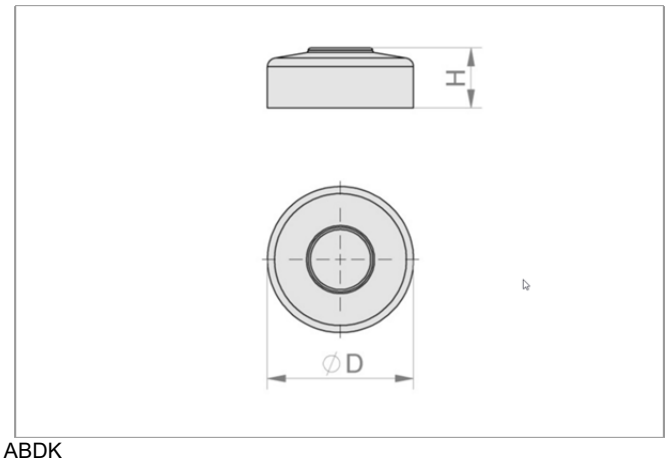
SQC-C-RU-…



SQC-C-VI-…



SQC-MB



ABDK

* Bystronic is a registered and protected brand name. The items listed here are products of J. Schmalz GmbH that have been designed to fit Bystronic machining centers.

Vacuum Clamping Systems for Glass

Schmalz Quick-Change System SQC for Bystronic* Centers

Height 80 mm / 120 mm

Design Data Schmalz Quick-Change System SQC

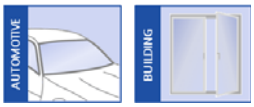
Type	Dimensions in mm							
	L	B	D	H	H1	H2	H3	G1
SQC-C-RU-80x102-HT1	-	-	80	-	102	-	-	-
SQC-C-RU-80x62-HT1	-	-	80	-	62	-	-	-
SQC-C-RU-80x102-NBR	-	-	80	-	102	-	-	-
SQC-C-RU-80x62-NBR	-	-	80	-	62	-	-	-
SQC-C-VI-80x80x102-HT1	80	80	-	-	102	-	-	-
SQC-C-VI-80x80x62-HT1	80	80	-	-	62	-	-	-
SQC-C-VI-80x80x102-NBR	80	80	-	-	102	-	-	-
SQC-C-VI-80x80x62-NBR	80	80	-	-	62	-	-	-
SQC-MB-62.9x18-M12-AG	-	-	62	-	18	52.8	25	M12-M
ABDK 68x12 SQC	-	-	68	18.65	-	-	-	-

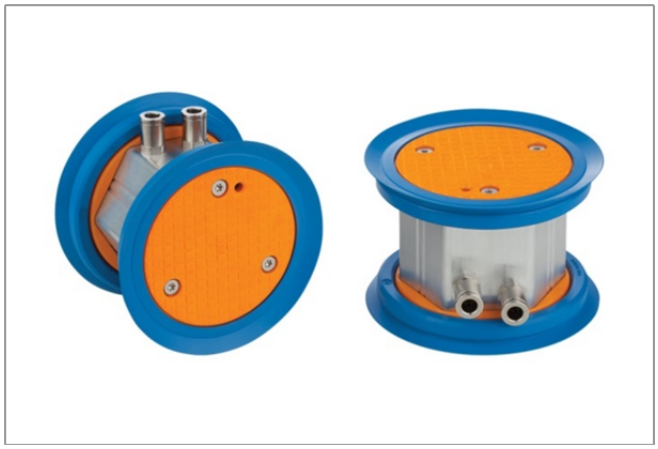
* Bystronic is a registered and protected brand name. The items listed here are products of J. Schmalz GmbH that have been designed to fit Bystronic machining centers.

Vacuum Clamping Systems for Glass

Vacuum Blocks Round VCBL-GL for Flat Tables

Suction area (Ø) 120 mm



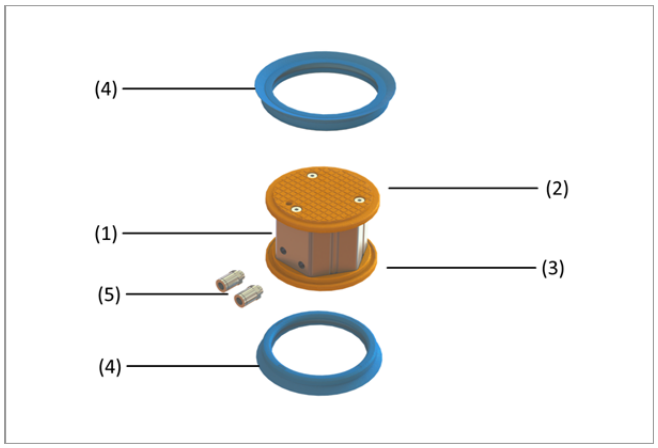


Vacuum Blocks round VCBL-GL D120 …

Suitability for Process-Specific Applications

Applications

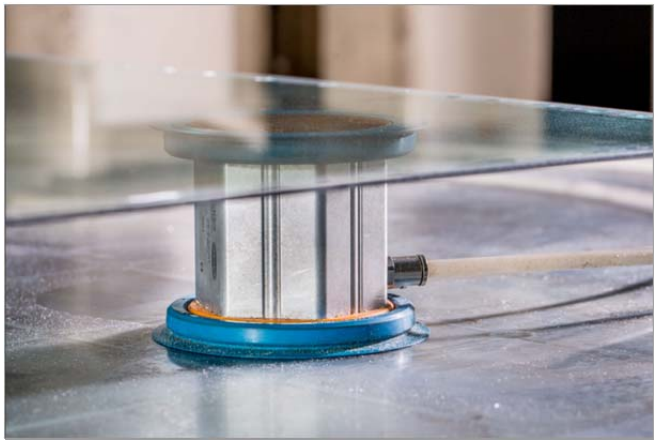
- Vacuum blocks for grinding of glass workpieces on flat table machines (e.g. Bando Kiko*)
- Grinding of automotive glass with high friction forces and flexible positioning of the vacuum blocks on the machining center
- Grinding of building glass or design glass with high requirements regarding grinding quality
- Use for grinding of sensitive surfaces and thin glass due to soft and non-marking sealing ring



System design Vacuum Blocks round VCBL-GL D120 …

Design

- Vacuum block with two circuit vacuum system – two vacuum connections by means of push-in fittings 8/6
- Aluminum body (1) with friction plates (2 + 3) made of special material Elastodur
- Sealing rings (4) made of non-marking material HT1 - replaceable without tools
- Vacuum supply via push-in fittings, optional with 3/2-way valve for the convenient positioning of the vacuum blocks on the machining center



Vacuum Blocks round VCBL-GL D120 for clamping of glass

Our Highlights...	Your Benefits...
• High friction forces	> Maximum holding forces on dry and wet glass surfaces
• Sealing ring made of non-marking material HT1, friction plate made of Elastodur	> Non-marking clamping of automotive glass
• Height tolerance of ± 0.05mm	> High precision during the manufacturing process
• Low reset force of the sealing ring	> No deformation of the workpiece when grinding thin glass
• Wear resistant friction plate on the top and bottom of the vacuum blocks	> High friction forces between glass and blocks as well as blocks and table

* Bando Kiko is a registered and protected brand name. The items listed here are products of J. Schmalz GmbH that have been designed to fit Bando Kiko machining centers

Vacuum Clamping Systems for Glass

Vacuum Blocks Round VCBL-GL for Flat Tables

Suction area (Ø) 120 mm

Designation Code Data Vacuum Blocks Round VCBL-GL DM120 for Flat Tables

Abbreviated designation	Suction area Ø in mm	Height [mm]*
Example VCBL-GL D120x81.5:		
VCBL-GL	**D120**	**81.5**
VCBL-GL	120	81.5
		93.5
		120

* Additional heights on request

Ordering Data Vacuum Blocks Round VCBL-GL DM120 for Flat Tables

Vacuum blocks available in different heights, are delivered assembled.

Available accessories: Push-in fittings, 3/2-way valves
Available spare parts: Sealing ring

Vacuum Blocks Round VCBL-GL DM120 for Flat Tables

Type	Part Number
VCBL-GL D120x81.5	10.01.18.00233
VCBL-GL D120x93.5	10.01.18.00587
VCBL-GL D120x120	10.01.18.00576

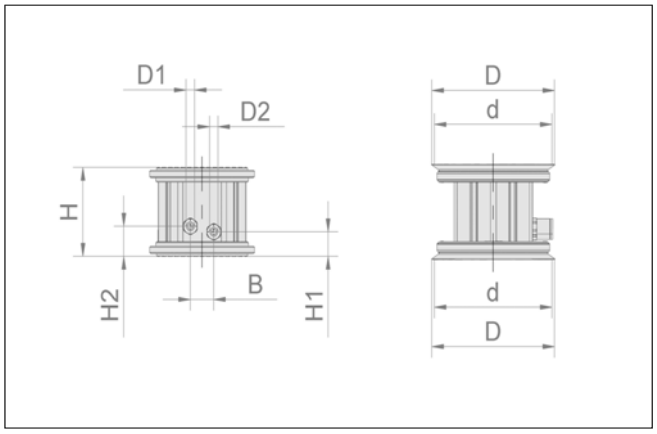
Ordering Data Spare Parts Vacuum Blocks Round VCBL-GL DM120 for Flat Tables

Type	Part Number
DR 120/88.5x16.5	10.01.18.00249

Ordering Data Accessories Vacuum Blocks Round VCBL-GL DM120 for Flat Tables

Type	Description	Part Number
VSL-8-6 PU	Vacuum hose	10.07.09.00003
ZUB-VCBL-GL	2 x Push-in 8/6 – 90° angle	10.01.18.00493
ZUB VCBL-GL	Manual 3/2-way valve	10.01.18.00492

Design Data Vacuum Blocks Round VCBL-GL DM120 for Flat Tables



VCBL-GL D120…

Type	Dimensions in mm			
	H	d*	D**	H1
VCBL-GL D120x81.5	81.5	120	126	22.5
VCBL-GL D120x93.5	93.5	120	126	22.5
VCBL-GL D120x120	120.0	120	126	22.5

Type	Dimensions in mm			
	H2	D1	D2	B
VCBL-GL D120x81.5	27.5	8	8	24
VCBL-GL D120x93.5	27.5	8	8	24
VCBL-GL D120x120	27.5	8	8	24

* Diameter sealing ring not assembled
** Diameter sealing ring assembled on vacuum block

Vacuum Clamping Systems for Glass

Customized Vacuum Blocks VCBL-GL for Flat Tables

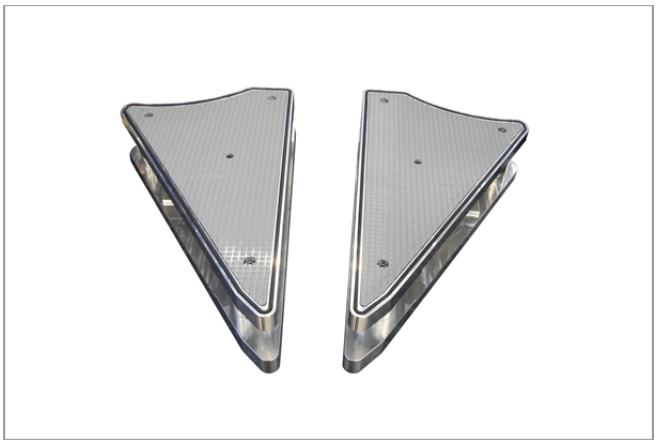
Customized suction area

Suitability for Process-Specific Applications

Vacuum block VCBL-GL – rectangular pedestal

Applications

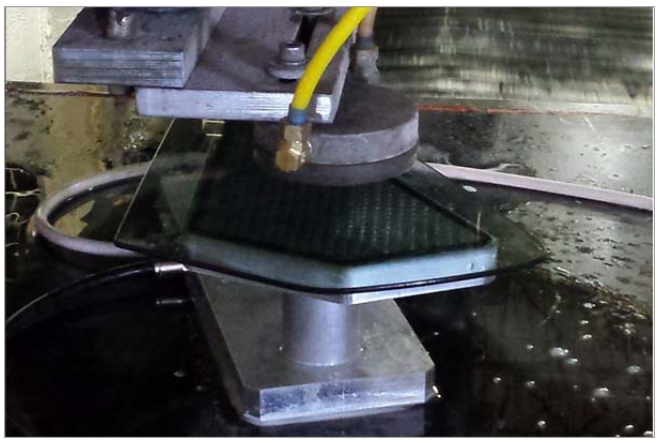
- Used on flat table grinding machines
- Grinding of small sidelites, e.g. vents or quarters where standard round suction cups can't provide sufficient clamping area
- Suction plate (top) adjusted to the design of the glass to enable maximum available vacuum area and therefore high friction force.
- High friction contact area of the cup with replaceable seal
- Mirrored pedestal (custom) can be flipped to enable a machining of left and right hand sidelites with one tool



Vacuum block VCBL-GL – Mirrored pedestal / Flipping (left & right hand)

Design

- Vacuum block with two circuit vacuum system – two vacuum connections by means of push-in fittings 8/6
- Circuit 1: Pre-fixation of the block on the machine table – vacuum can be active during several grinding processes
- Circuit 2: Clamping the workpiece – vacuum activated during the grinding process of the glass
- Size pedestal / suction plate (bottom) defines the maximum area of the top suction plate. Pedestal available in different shapes (quadratic, rectangular, custom)
- Different heights available
- Sealing frame clipped into suction plate and can be replaced separately



Customized vacuum blocks VCBL-GL being used for clamping of glass

Our Highlights...	Your Benefits...
• Customized suction plate according to the glass design	> Max. available gripping area for high friction forces
• Special friction material with high forces and low wear	> High precision and longevity of the blocks
• Height tolerance of ± 0.05mm	> Very precise grinding with very high accuracy
• Replaceable seal	> Increased longevity of the block, since wear parts separately replaceable
• Type with mirrored pedestal can be flipped	> Machining of left and right hand sidelites with the same tool (e.g. coated glass)

Vacuum Clamping Systems for Glass

Customized Vacuum Blocks VCBL-GL for Flat Tables

Customized suction area

Ordering Data Customized Vacuum Blocks VCBL-GL for Flat Tables

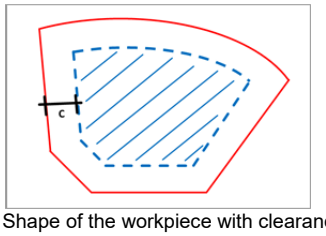
- To order a customized vacuum block please follow the steps below and contact our specialists / system consultants for detailed information

Step 1: Shape of the workpiece

Shape of the workpiece

- Provide data on the workpiece (dxf.) including scale (inch or mm); original data of the workpiece without modifications (such as clearance)
- Define / evaluate area of the workpiece

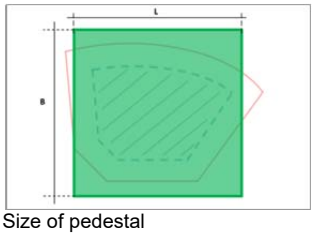
Step 2: Clearance



Shape of the workpiece with clearance

- Indicate required clearance (C) for the machining of the glass
- The remaining area (area of the glass) with clearance will define the effective vacuum / gripping area and therefore the minimum area of the pedestal

Step 3: Design of pedestal and height



Size of pedestal

- Select shape / size of pedestal based on:
  - Shape:
    Comparable to workpiece shape
  - Size:
    $A_{Pedestal} > A_{Suction\ Plate}$
- Size S / M / L will define the pricing of the block
- Indicate whether custom / mirrored pedestal is required:

Type pedestal	Square	Rectangular	Custom
Example			
Type S	L x B: 200 x 200 mm	L x B: 200 x 100 mm	A: < 200 cm²
Type M	L x B: 300 x 300 mm	L x B: 300 x 100 mm	A: < 300 cm²
Type L	L x B: 400 x 400 mm	L x B: 400 x 200 mm	A: < 800 cm²

- Specify required height (table top to suction area of the block), standard height is 81.5 mm

Ordering Data Spare Parts Customized Vacuum Blocks VCBL-G for Flat Tables

Type*	Description	Part Number
DI-PROF 4x6 MOS CR HR	Sealing profile	10.07.04.00130

* Length according to the design of the suction plate and pedestal

Overview of Section 7

Vacuum Handling Systems

Vacuum Handling Systems for Glass

Vacuum Tube Lifters JumboErgo

- Manual operation
- Lift capacity: 35 to 300 kg

JumboErgo for fast and flexible handling of glass in the building, automotive and solar sector, such as solar modules during the assembly process

126

Vacuum Tube Lifters JumboFlex

- Manual operation
- Lift capacity: up to 50 kg

JumboFlex for ergonomic handling in application with high cycle rates, such as automotive glass handling during the value add processes

127

Vacuum Lifting Device VacuMaster Window

- Manual operation
- Lift capacity: 200 and 300 kg

VacuMaster Window for safe and ergonomic handling of glass sheets and windows with frames and mullions in the entire production process of building glass.

128

Vacuum Lifting Device VacuMaster Glass

- Manual operation
- Lift capacity: 300 to 1000 kg

VacuMaster Glass for outdoor glass handling on construction sites. Installation of windows and facade elements.

129

Vacuum Handling Systems for Glass

Vacuum Tube Lifters JumboErgo

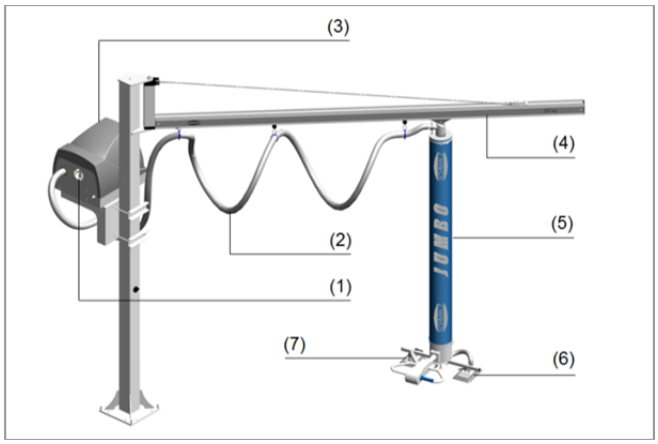
Lift Capacity from 35 to 300 kg

Suitability for Process-Specific Applications

Vacuum tube lifters JumboErgo

Applications

- High speed and flexible handling of glass sheets in the Automotive Glass production such loading and unloading of moulding machines or during the assembly process
- Used for handling of glass in logistic and commissioning processes along the production process of Automotive Glass
- The Vacuum tube lifter JumboErgo enables a safe and ergonomic manual handing of glass sheets and modules in various process steps in the PV module production
- With the pneumatic swiveling the glass/modules can be picked up vertically and placed horizontally or vice versa



System design vacuum tube lifters JumboErgo incl. crane system

Design

- Due to special function principle only one vacuum generator (1) for the lifting movement and the gripping of the glass is necessary
- (2) Vacuum feed hose
- (3) Accessories such as silencer box
- Optionally available with the pneumatic swiveling unit PSE and entire crane system (4) as a turnkey solution
- Vacuum operated lifting unit by special lifting tube (5)
- Gripper can be equipped with different suction cups (6)
- (7) Operating unit

Vacuum tube lifters JumboErgo being used panoramic roof handling

Our Highlights…	Your Benefits…
• Vacuum only operation	> Handling of glass and modules without any additional equipment such as chain hoist or manipulator
• Special rotary handle	> Fast, safe and ergonomic handling
• Pneumatic swiveling unit (optional)	> Swiveling of glass and modules at the touch of a button
• Optional available crane system build to your requirements	> 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.

Vacuum Handling Systems for Glass

Vacuum Tube Lifters JumboFlex

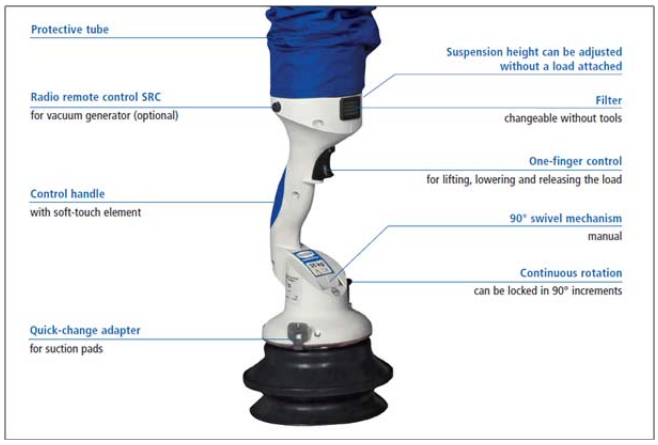
Lift Capacity up to 50 kg

Suitability for Process-Specific Applications

Vacuum tube lifters JumboFlex

Applications

- High speed and flexible handling of glass sheets in the Automotive Glass production such loading and unloading of moulding machines or during the assembly process
- Used for handling of glass in logistic and commissioning processes along the production process of Automotive Glass
- The Vacuum tube lifter JumboFlex enables a safe and ergonomic manual handing of glass
- Extremely fast pick and place handling in manual processes (with up to 300 picks per hour) without retooling efforts due to very flexible and adaptive suction cups



System design vacuum tube lifters JumboFlex - lifting unit

Design

- Lifting unit consisting of control handle and vacuum gripper
- One-finger control for lifting, lowering and releasing the load
- Rotation head with continuous rotation; can be locked in 90° increments
- 90° slewing mechanism for picking loads from the side and automatic slewing into horizontal position
- Quick-change adapter for a fast, tool-free change of the gripper
- Remote control for vacuum generator (optional)

Vacuum tube lifter JumboFlex being used for windshield handling

Our Highlights…	Your Benefits…
• Vacuum only operation	> Handling of glass and modules without any additional equipment such as chain hoist or manipulator
• One-hand operation for lifting, lowering and releasing the workpiece	> Fast, safe and ergonomic handling
• Continuous rotation (can be locked in 90° increments) of vacuum grippers	> Easy positioning / alignment of the workpiece
• 90° manual slewing function	> Handling of workpiece from vertical into horizontal position

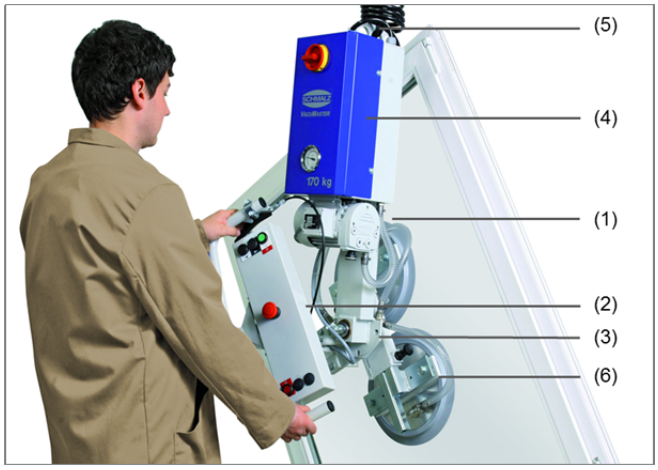
Please contact our specialists for detailed information. Our experienced system consultants are available to answer your questions in person. You can count on professional project planning and the expert realization of your vacuum solution.
Additional information can be found on www.schmalz.com.

Vacuum Handling Systems for Glass

Vacuum Lifting Device VacuMaster Window

Lift Capacity 200 kg and 300 kg

Vacuum Lifting Device VacuMaster Window



System design Vacuum Lifting Device VacuMaster Window

VacuMaster Window being used during the framing of windows

Suitability for Process-Specific Applications

Applications

- Safe and ergonomic handling of glass and finished windows during the entire window production process
- Handling of windows with frame parts and mullions with a max. protrusion of 45 mm
- Loading and unloading of vertical glass grinding machines by using the 90° rotation unit
- Max. lift capacity of 300 kg (vertical transport and rotation)

Design

- Manual Lifting device VacuMaster as ready to use solution with integrated vacuum pump (1) and ergonomic operating unit (2) for the control of the device (picture shows type VacuMaster Window Comfort)
- Integrated manual or electrical rotation (3) for clockwise and counter-clockwise rotation of the glass by 90°
- Audible warning device (4) and vacuum reservoir for safe work condition in case of power outage
- Mechanical connection (5) to a chain-hoist and crane system – turnkey solution of Schmalz available
- Suction plates (6) type SGF for high friction force and short gripping times (UV and Ozone resistant)

Our Highlights…	Your Benefits…
• Ergonomic handling of glass and finished products	> Increased productivity thanks to minimization of downtime due to employee injury
• Compact and user friendly control unit	> Fast and easy operation
• Energy saving function and audible warning device	> Reduced energy costs with maximum safety
• Electrically driven (option) rotation unit 90°	> Only one person for the handling process required
• High friction suction cups	> High forces and process safety

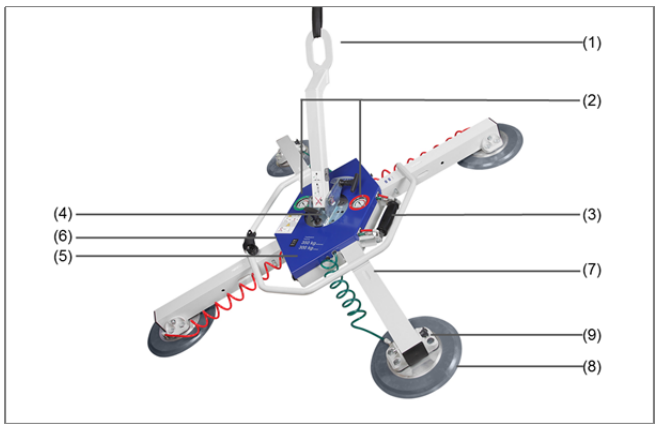
Please contact our specialists for detailed information. Our experienced system consultants are available to answer your questions in person. You can count on professional project planning and the expert realization of your vacuum solution.
Additional information can be found on www.schmalz.com.

Vacuum Handling Systems for Glass

Vacuum Lifting Device VacuMaster Glass

Lift Capacity 300 kg to 1000 kg

Vacuum Lifting Device VacuMaster Glass



System design VacuMaster Glass 350/300

VacuMaster Glass being used for outdoor glass handling

Suitability for Process-Specific Applications

Applications

- Handling of glass during glass installation
- Used attached to a crane system for the outdoor handling of glass on construction sites to install glass and windows
- Swiveling and rotation allows a perfectly aligned workpiece installation to facades
- Modular design for a fast and flexible adaption to varying glass sizes, e.g. by using the extension arms
- Mounting extensions for the suction cups for the handling of windows with frame parts and mullions up to 90 mm

Design

- Compact unit VacuMaster Glass is attached to a crane (1)
- Two redundant vacuum circuits (2) (according to DIN EN 13155). Vacuum activation by manual sliding valve (3)
- Manual (4) swiveling (90°) and rotation device (360°) with locking points
- Audible warning device (5) to indicate critical vacuum levels
- Status indicator LED (6) for battery level
- Removable extension arm (7)
- High friction and UV/Ozone resistant suction plates SGF (8) with Quick-Change adapter (9)

Our Highlights…	Your Benefits…
• Easy and ergonomic operation	> Careful and safe handling of sensitive glass workpieces
• Modular design with high flexibility	> Fast and easy adaption to varying glass sizes and loads
• Two redundant vacuum circuits with power failure monitor	> Safe operation for increased productivity
• Integrated battery with LED status indication	> 1-day operation without power supply
• 90° swiveling and 360° rotation	> High flexibility and perfect alignment of the workpiece
• Very flat design with low overall height	> Flexible operation in small spaces

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.

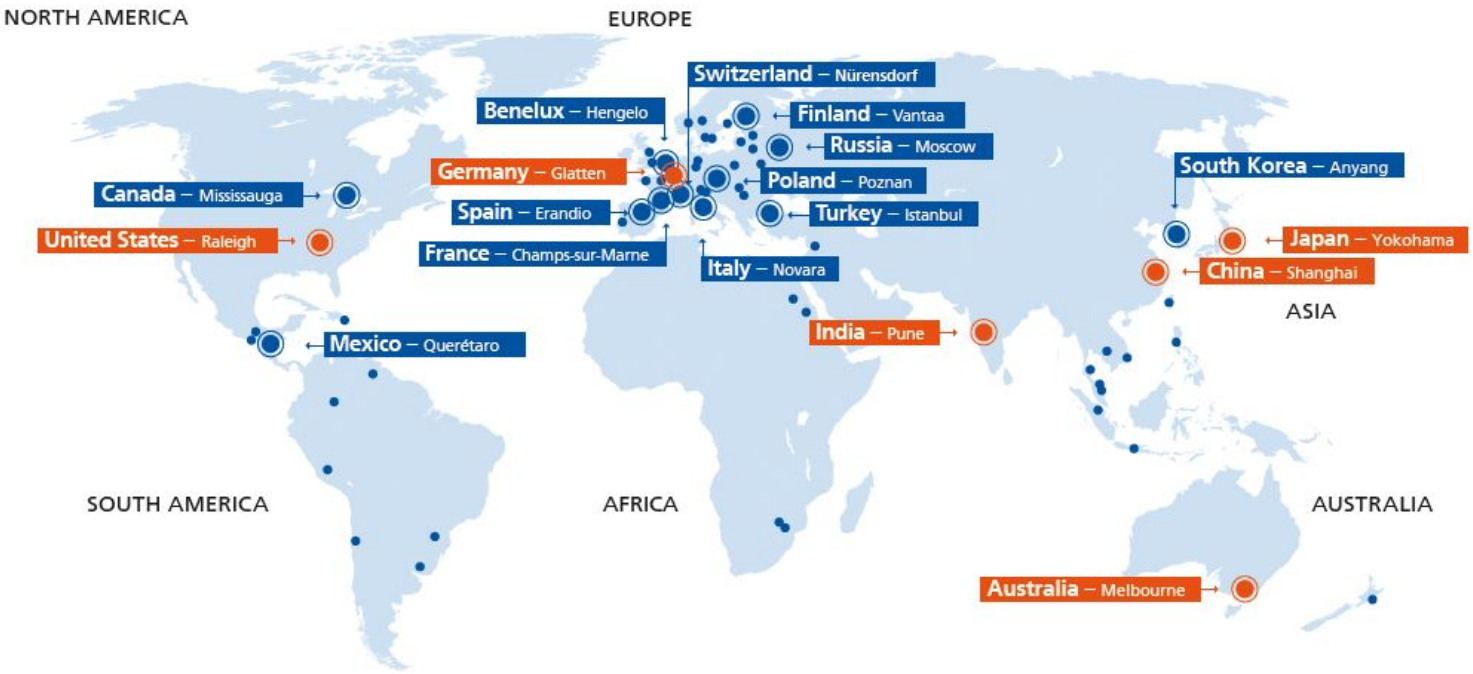
World of Vacuum Technology

Vacuum Components
Tel. +49 7443 2403-102

Vacuum Gripping Systems
Tel. +49 7443 2403-107

Vacuum Handling Systems
Tel. +49 7443 2403-108

Vacuum Clamping Systems
Tel. +49 7443 2403-109



Find your local sales partner by visiting www.schmalz.com/salesnetwork

J. Schmalz GmbH
Aacher Straße 29
D-72293 Glatten
Tel. +49 7443 2403-0
Fax +49 7443 2403-259
schmalz@schmalz.de
www.schmalz.com