



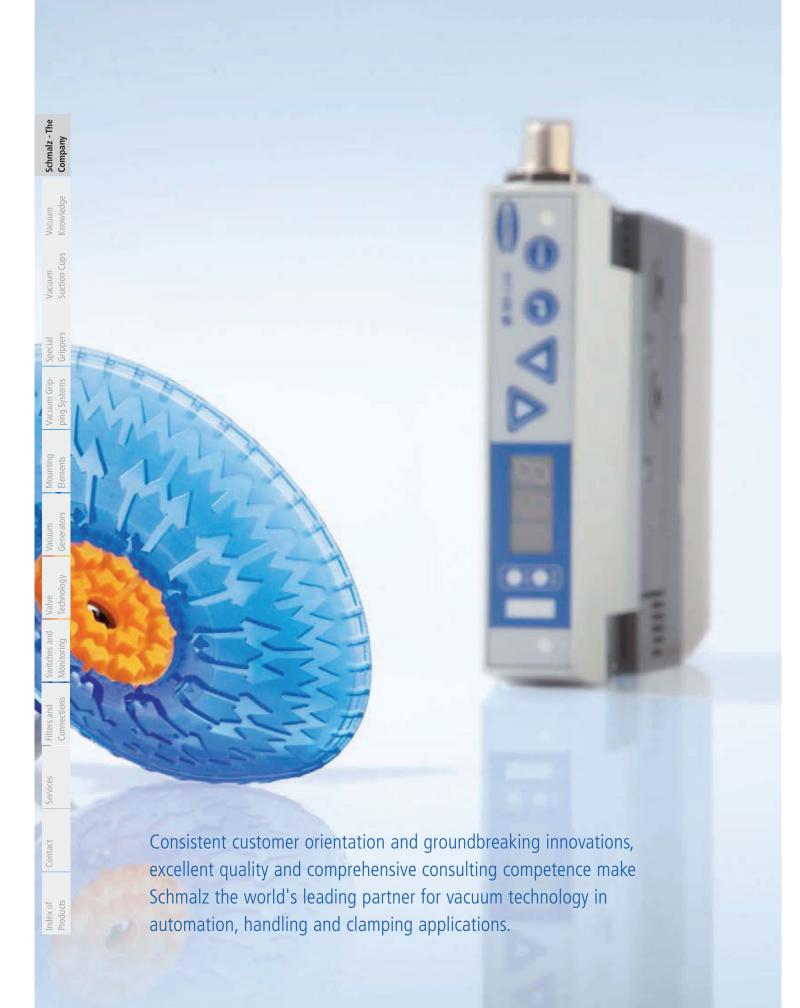
Vacuum Components
Catalog 2016 / 2017



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Dr. Dipl.-Ing. Kurt Schmalz

Dipl.-Ing. Wolfgang Schmalz

## **Our Purpose**

We are committed to maintaining a fair partnership with our customers and suppliers – one that is beneficial for all parties.

As a family-run company, all our actions and decisions are formed by the principle of sustainability. We are able to retain our freedom to manage the company as an independent entity, by combining economic success with environmental and social commitment.

As our customers and suppliers, you can therefore rest assured that we are the right choice for a long-term partnership. Our customers associate Schmalz with energy-efficient solutions and services, advanced technology, and premium quality. As pioneers in vacuum technology, we continue to push the boundaries of possibility in this area. We identify trends, come up with marketdriven innovations and set the standards. That lets us give our customers active support on route to Industry 4.0, for instance: we offer a variety of intelligent vacuum solutions which make processes more productive, efficient and flexible.

Our company is driven by the innovative spirit of our employees coupled with the expertise we have gained from more than 30 years' experience in the field of vacuum technology. Actively helping our company to be ready for change is therefore a matter close to our heart. We invest in technologies of the future and have also positioned ourselves successfully with our own branches in the most important international growth markets. Our employees derive their dedication and loyalty as well as their motivation for outstanding performance from a modern corporate culture and the opportunity to share in our economic success.

You also can engage in a partnership that brings real competitive advantages in the long term - place your trust in Schmalz vacuum technology.

Dr. Dipl.-Ing. Kurt Schmalz Managing Director

Dipl.-Ing. Wolfgang Schmalz Managing Director

Vacuum Grip- Special ping Systems Grippers

Filters and Switches and Valve Vacuum Mounting Connections Monitoring Technology Generators Elements



## **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**

1910 by Johannes Schmalz Founded:

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

More than 1,000 worldwide; 13% of staff in Germany are trainees Employees:

Innovation figures: Around 450 industrial rights registered and granted

8.5% (of revenue) invested in research and development

In 17 countries worldwide Branches:

Sales partners: In over 60 countries worldwide

Certifications: DIN ISO 9001 (quality management) since 1994

DIN ISO 14001 (environmental management) since 1997 DIN ISO 50001 (energy management) since 2012

AEO C (authorized economic operator, customs simplifications) since 2012

## **International Sales Network**

## On-site Expertise in Over 80 Countries



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#### Schmalz Sales Partners

You can find the Schmalz sales partner in your country at www.schmalz.com/salesnetwork

Company headquarters and main production facilities in Glatten (in the Black Forest) Germany

## **Efficiency and Sustainability**

You can see Sustainability in Practice in our Products



Schmalz sees sustainability as a holistic system of economic success, ecological responsibility and social engagement. Numerous sustainability measures have been combined to develop the Schmalz ecoSYSTEM. This ecoSYSTEM encompasses long-term stability, resource-efficient products and processes, and fairness towards customers, employees, suppliers and society.

Schmalz goals and cornerstones of sustainable management are:

#### **Economy**

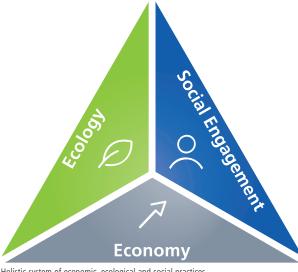
• A solid financial base is important to Schmalz because it allows the family business to retain its independence and freedom in the long term.

#### **Ecology and Conservation of Resources**

- Schmalz is a positive energy company that generates more electricity and heat from renewable sources than it uses.
- Schmalz's production is CO<sub>2</sub>-neutral to help the environment with an overall reduction of CO<sub>2</sub> emissions.
- Schmalz develops, produces and sells products with significantly lower CO<sub>2</sub> emissions over the entire product life than comparable products on the market.
- Schmalz takes numerous environmental protection measures and uses targeted communication to inspire others to follow its example.

#### **Social Commitment**

- Schmalz offers excellent working conditions and comprehensive benefits to attract and retain skilled workers.
- Schmalz supports the region it's based in and is actively involved in networks.



Holistic system of economic, ecological and social practices

Schmalz - The

#### **Sustainable Product Creation**

Design features play an important role in today's sustainable product creation. For example, the materials and production techniques used and the energy that is later required are already determined during the development phase of a product. That allows us to determine the major factors that impact our product carbon footprint before the production phase begins. Schmalz places a special emphasis on using low engery materials and productions processes. Furthermore, clearly defined environmental targets are included in our functional specifications for new product developments.

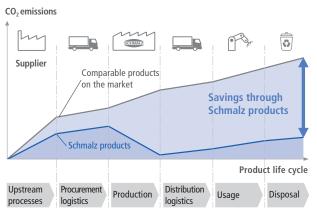
Schmalz views the manufacturing of a product as all of the processes that can be attributed to the value-creation process, including upstream processes. With this in mind, Schmalz audits its suppliers and integrates its most important partners directly into its own production process. This makes it possible to purchase parts that already have a low CO<sub>2</sub> impact. On the procurement side, Schmalz increasingly relies on regional suppliers. This eliminates unnecessary CO<sub>2</sub> production through shortest possible delivery distance. Schmalz uses CO<sub>2</sub>-neutral shipping methods such as GoGreen shipping from DHL to transport the product to the customer.



The design of the recyclable SAOXM automotive suction cup

# Example: Vacuum Generator with Automatic Air-Saving Function

A minimum vacuum level is needed to ensure that a vacuum can reliably handle workpieces. Vacuum generators with an integrated automatic air-saving function automatically switch off their suction function as soon as this level is reached. Vacuum generation is not reactivated until the next handling cycle or until the vacuum drops below the defined minimum vacuum level. Using this type of vacuum generator reduces energy consumption by up to 80 %. Using a gripper equipped with this function for the automated handling of metal sheets reduces CO<sub>2</sub> emissions by around 730 kg per year.



Development of CO<sub>2</sub> emissions during the product life cycle (Product Carbon Footprint)

#### **Efficiency in Product Operation**

When operating products in the field of vacuum technology, it is especially important to use the resources of compressed air and electricity in an efficient manner. For example, Schmalz designs its compact ejectors in a way that only the amount of compressed air is consumed that is needed for the actual handing operation. This way energy consumption during downtime is prevented.

#### Using the Product after the Utilization Phase

To complete the product life cycle in an efficient way, Schmalz focuses on a modular system when the product is first created. For instance, the elastomer part on special suction cups can easily be separated from the aluminum connecting part. Since the elastomer is a part that is subject to wear and tear, it can be replaced without having to purchase a completely new suction cup.



Ejector core with eco nozzle technology and integrated automatic air-saving function

Knowledge

action Cups

Suction

Grippers

vacuum Gripping Systems

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Vacuum Generators

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Switches an

Filters and

Services

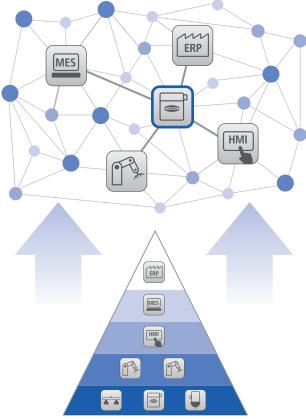
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## **Vacuum Solutions for Industry 4.0**

Intelligent Process Communication for Transparent and Efficient Production



In the future, the strict hierarchical structure of automation pyramids will increasingly become replaced by a fully networked automation cloud

#### **Intelligent Communication within Production**

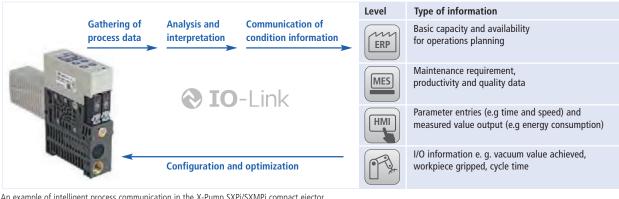
Networking in production means the gradual break up of hierarchical information structures. An automation cloud is formed in which intelligent devices and services interact with one another and organize themselves via an IO-Link. Intelligent products allow for communication with the user's control systems in order to adjust all process parameters for energy efficient operation.

#### **Our Smart Field Devices Understand Industry 4.0**

Vacuum generators like the SXPi/SXMPi compact ejector are becoming central to such a cloud. With the aid of their diagnostic and forecasting functions, they derive information regarding the condition of the unit and detect subtle changes or imminent malfunctions. This helps to prevent machine downtime and increase system availability.

Vacuum Generators

Filters and Switches and Valve Connections Monitoring Technology



An example of intelligent process communication in the X-Pump SXPi/SXMPi compact ejector

#### Energy and Process Control Data as the Basis of Industry 4.0

The basis for intelligent functions is that all of the relevant process data is available in real time. Schmalz provides an entire range of so-called smart field devices for this purpose: They are fitted with comprehensive energy and process control functions, they gather and interpret data and make it available to the network. This allows Schmalz to support its customers to gear up for Industry 4.0 – the switch to the intelligent factory.

#### The Visibility and Added Benefit of Intelligence in Schmalz Vacuum Ejectors

The in-built intelligence in the Schmalz compact ejectors allows for both efficient product operation and efficient control of the whole process. All of the parameters that are relevant to energy and performance throughout the vacuum system are recorded,

monitored, aggregated and analyzed via IO-Link here. Compatible systems and services connected through IO-Link, such as intra clouds or cloud services, are used to make the information visible in the different integration stages and output channels.

This enables a higher degree of transparency and productivity in automated processes. The energy monitoring function guarantees optimal energy consumption throughout the system. The system status is monitored using condition monitoring, which increases system availability sustantially. Finally the predictive maintenance module improves the performance of the gripper system.





Data aggregation / status communication

Integration / preparation for a variety of channels

Output in customer interfaces and systems



## **Vacuum Components**

Nowadays, vacuum components perform much more than just one basic function. Suction cups and vacuum generators, for example are the key to boosting efficiency: not only in the product itself thanks to the high level of energy efficiency, but also in the process. This is achieved by intelligent ejectors that calculate system states and data, communicate across networks and contribute to the monitoring and control of the entire process. Schmalz vacuum components enable major increases in productivity in automated

processes. In all areas of automation technology, Schmalz customers benefit from expert systems consulting and groundbreaking innovative solutions.

Our specialists' expertise guarantees efficient and economical solutions for the automation of a process; from the individual components to the complex gripping system, all the way through to the particular customer-specific application.

#### Vacuum Suction Cups

Filters and Switches and Valve Connections Monitoring Technology

#### **Special Grippers**

## Area Gripping Systems and End Effectors

#### **Mounting Elements**



Vacuum Generators



Valve Technology



Switches and Monitoring

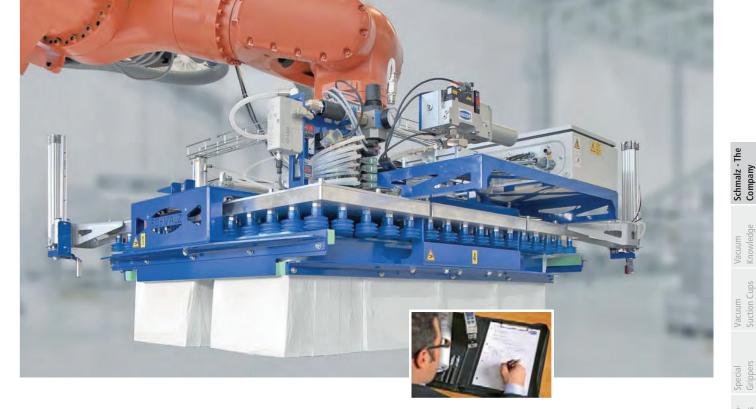


**Filters and Connections** 









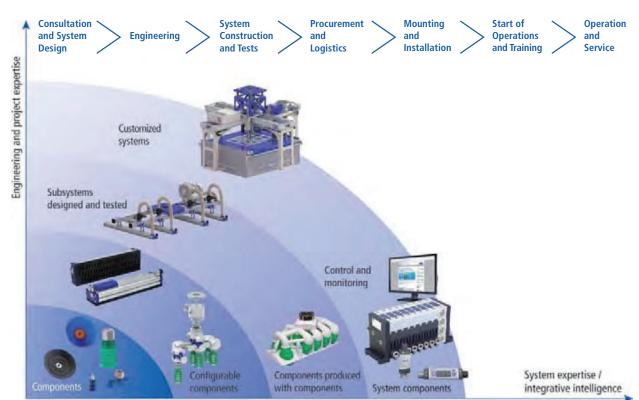
## **Vacuum Gripping Systems**

Our system consultants and designers have comprehensive expertise in the field of vacuum technology, as well as decades of experience in international mechanical and plant engineering.

Service with Added Value Throughout the Entire Life Cycle

Schmalz is an expert and experienced partner for system solutions in the vacuum automation field. Whether you utilize Schmalz for the efficient procurement of individual components or for project management for the creation of turn-key solutions:

First-class products, extensive experience and tailor-made services ensure you get the added value of a Schmalz system. This will allow you to minimize costs throughout the entire life cycle of your system.



# **Vacuum Handling Systems**

In many production, assembly and logistics processes people play a vital role thanks to the intuitive and flexible way in which they work. Schmalz vacuum lifting devices help to ensure an ergonomic workplace. They help prevent health problems caused by lifting and moving heavy loads.

Schmalz offers vacuum lifting devices with perfectly tailored aluminum crane systems. This means the crane systems are particularly responsive and support ergonomic work with the vacuum lifting device. Schmalz vacuum handling systems simplify production processes through easy and efficient handling.

Schmalz - The

Vacuum Vacuum Suction Cups Knowledge

#### Vacuum Tube Lifters Jumbo



For frequent and rapid lifting and movement of workpieces up to 300 kg. For handling workpieces like cardboard boxes, crates, sacks, barrels or buckets.

#### Vacuum Lifting Devices VacuMaster



Move loads of several tons safely and ergonomically, for instance, when loading and unloading CNC machining centers in sheet metal, wood, plastic or glass processing.

#### **Crane System**



Perfectly coordinated and customized light crane systems and jib cranes optimize the internal material flow.

#### **Workshop Equipment**



Damage-free and space-saving storage and manual clamping systems — all kinds of solutions, from transport trolleys to workbenches for mobile use.



## **Vacuum Clamping Systems**

Schmalz vacuum clamping systems increase efficiency in production processes with CNC machining centers. Innovative ideas, numerous national and international industrial rights, system variety and proximity to customers make Schmalz the leading provider of vacuum clamping technology worldwide. We are the system supplier for leading international manufacturers.

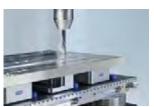
These manufacturers equip their CNC machining centers in their production facilities with Schmalz clamping systems as standard to achieve maximum productivity. Whether you need initial equipment, retrofit solutions or spare parts – Schmalz offers a large selection of high-quality clamping equipment for your application.

#### Clamping Technology for Wood Working



High-quality clamping equipment for wood working increases flexibility and reduces set-up times – from original equipment to retrofitting.

#### Clamping Technology for Metal and Plastics



Clamping solutions for precise, reliable and damage-free setup and assembly processes in CNC production.

#### Clamping Technology for Glass Working



Efficient clamping systems for positioning and securing objects quickly and safely in (partially) automated glass processing.

## 3D Clamping Systems



3D clamping systems and vacuum clamping devices for partially automated processing of 3D free-form surfaces with complex geometry.

i www.schmalz.com/clamping-systems

Vacuum Grip- Special ping Systems Grippers

Filters and Switches and Valve Vacuum Mounting Connections Monitoring Technology Generators Elements

# **Industry Solutions**

At Home in Many Industries Worldwide

Schmalz customers benefit from expert systems consulting and groundbreaking, innovative solutions in all areas of automation technology. The Schmalz vacuum components include everything you need to develop a fully operational vacuum system. The wide product range of vacuum components corresponds to the specific requirements of a wide variety of industry sectors. We focus on the industries below:

In the catalog, the industry-specific suitability of each product is indicated using symbols. The index at the end of the catalog can assist you in finding appropriate items for your relevant industry sector.







## Sheet Metal / Automotive

#### Fast Cycle Times and High Operational Reliability

- Special suction cups for highly dynamic sheet metal handling, even with oiled metal sheets
- Vacuum generators with integrated energy and process control: energy monitoring for optimized energy consumption, condition monitoring for maximum system availability, predictive maintenance for enhanced gripping system performance and quality
- Optimized mounting elements for the requirements of the automotive industry

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vacuum Suction Cup

Special Grippers

Vacuum Gripping Systems

Nounting lements

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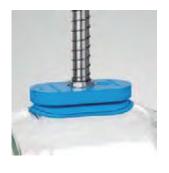
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#### **Mark-Free and Secure Handling**

- Suction cups especially for handling flat, smooth or hot and thin workpieces
- Suction plates made from special materials for use in areas with high UV and ozone levels







## **Plastics**

#### **Removal of Hot Plastics Leaving Few Marks**

- Special suction cup tools for requirements such as temperature resistance, workpiece painting and mark-free workpieces
- Vacuum generator minimized in size for highly dynamic handling







#### **Extremely Fast, Accurate and Gentle Handling**

- Wafer grippers for careful, fast and accurate handling of photovoltaic components
- Suction cups in various materials and shapes
- · Special grippers for low-contact and gentle handling







## Packaging

#### **Packaging and Handling Products with Minimal Cycle Times**

- Specialized range of suction cups with a large variety of materials and shapes for a wide range of packaging and products
- Wide variety of vacuum generators for various process requirements
- Modular system for quick and cost-effective design of vacuum end effectors
- Vacuum layer gripping systems for palletizing and commissioning packaged products

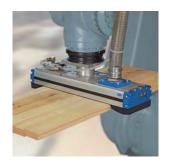






#### **Handling of Permeable Composite Materials**

- Special grippers with integrated vacuum generation and a high flow rate for secure gripping of porous materials such as carbon composites
- Needle grippers for handling non-rigid and unstable materials and materials that are difficult to grip using suction
- Suction cups in various shapes and materials for handling prepregs, dry materials and hardened components







#### Handling of Workpieces with a Variety of Surfaces under **Difficult Operating Conditions**

- Suction cups for handling and separating permeable workpieces
- Filters for protecting vacuum systems from contamination
- Vacuum gripping systems for moving wooden boards, furniture parts, pallets or entire layers of boards







## **Flectronics**

#### Clean and Flexible Handling

- Suction cup range in a wide variety of materials and diametersfor every processing step in the production of electronics
- · Vacuum generator with integrated system monitoring for increasing process reliability
- Small vacuum components minimized in size for highly dynamic handling







## Battery

#### Handling of Electrodes, Separators and Battery Cells without Causing any Damage

- Special grippers for lithium ion batteries
- Ideal marking behavior confirmed in contamination tests of the FRAUNHOFER IPA
- Careful, fast and accurate handling of battery components and cells

## **Overview of Section 2**





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#### Seminars and training

Schmalz offers customized training, seminars and courses at the Schmalz Academy. Customers benefit from our comprehensive expertise and all our years of experience as vacuum specialists. You will find more details in the chapter "Services".



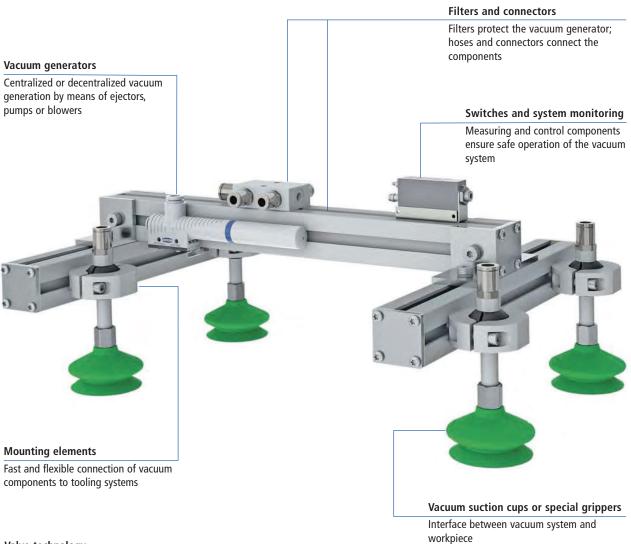
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## The Vacuum System and its Components



### Overview of a Vacuum System

Vacuum systems are used as grippers in automated applications. Customers benefit from the comprehensive component program of Schmalz, the vacuum specialist, when designing a vacuum system.



#### Valve technology

Valves are used to control the vacuum as well as the compressed air (decentralized or centralized)

## The Vacuum System and its Components

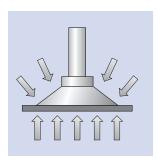


Vacuum Knowledge

#### **Vacuum Suction Cups**



Vacuum suction cups are the link between the workpiece and the handling system. They consist of the suction cup (elastomer part) and a connecting element.



Suction cups are used to grip and move workpieces in a plant or on a robot. A suction cup does not attach itself to the surface of a workpiece. Instead, the ambient air pressure (atmospheric pressure) presses the suction cup against the workpiece as soon as the ambient pressure is greater than cup and the workpiece.

This pressure difference is achieved by connecting the suction cup to a vacuum generator, which evacuates the air from the space between the cup and the workpiece. If the suction cup is in contact with the surface of the workpiece, no air can enter it from the sides and a vacuum is generated.

The holding force of the suction cups increases proportionally with the difference between the ambient pressure and the pressure inside the cup.

The holding force of a suction cup is calculated with the formula:

#### $F = \Delta p \times A$

= Holding force

 $\Delta p = Difference$  between ambient pressure and pressure of the system

= Effective suction area (the effective area of a suction cup under vacuum)

the pressure between the suction This means the holding force is proportional to the pressure difference and the suction area. The greater the difference between ambient pressure and pressure in the suction cup or the larger the effective suction area, the greater the holding force. The force can vary depending on a change of the pressure difference and area parameters.

#### **Suction Cup Shapes**

Suction cups from Schmalz can be divided into universal suction cups and suction cups for special applications. Universal suction cups cover a wide range of requirements. Suction cups for special applications were developed to meet the requirements of individual industries. They may be characterized by special properties, such as the handling of thin-walled and greasy body panels in the sheet metal industry or of porous and structured workpieces in the wood industry.

## The Vacuum System and its Components



The following shapes are generally distinguished:

- Flat suction cups
- Bellows suction cups

Each suction cup shape offers advantages that are reinforced and optimized by the combination with a suitable material. The available suction cup materials are described in detail in the section "Suction Cup Materials".

#### **Flat Suction Cups**

Flat suction cups are particularly suited for handling workpieces with flatly or slightly curved surfaces. Flat suction cups can be evacuated quickly due to their flat shape and low inner volume, therefore they can grip the workpiece in a very short time and can withstand the forces which result from fast movement of the object during handling.

#### Advantages of flat suction cups

- Large variety of different suction cup materials and shapes (round, oval, steep or flat leveling sealing lip)
- Flat shape and low inner volume result in minimum evacuation times
- Good stability of the suction cup allows high shear forces and positioning accuracy while workpieces are picked up

#### Typical areas of application

- Handling of smooth to lightly rough workpieces, such as sheet metal plates, cardboard, glass plates, plastic parts and wooden boards
- In automated processes with short cycle times



#### **Bellows Suction Cups**

Bellows suction cups are used when it is necessary to compensate for varying workpiece heights, to handle parts with uneven surfaces or fragile parts. The bellows make this suction cup especially flexible and adaptable.

#### Advantages of bellows suction cups

- Good adaptation to uneven surfaces
- Lift effect while picking up
- Compensation of differences in height
- Fragile workpieces are picked up gently

#### Typical areas of application

- Handling of curved or uneven workpieces, such as body panels, tubes, cardboard, etc.
- Handling of fragile workpieces, such as electronic components, injection molded plastic parts, etc.
- Handling of non-rigid or flexible workpieces, such as packaged or shrink wrapped products



#### **Suction Cup Materials**

Application and ambient conditions are important for the selection of the right suction cup and the appropriate material. Abrasion resistance, oil resistance and food safety are often required of a suction cup. These requirements can be met by selecting the appropriate material.

Schmalz develops its suction cup materials in-house with new materials being developed, tested and optimized in our own Plastics Competence Center. To help you find your suction cups for the proper use and environmental condition quickly, offers in the chapter "Vacuum Suction Cups" a selection aid, which is sorted according to specific materials and application areas. This gives you a quick and simple overview.

# Knowledge

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elements

vacuum Generator

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## The Vacuum System and its Components



#### Storage and Cleaning of Suction Cups

Observe the following information regarding storage and cleaning for the sensitive elastomer part of the suction cup: Store suction cups in a cool place (between 0°C and 15°C, max. 25°C) that is dark, dry, low in dust and offers protection from the weather, ozone and drafts, as well as stress. The effects of ozone, light (especially UV), heat, oxygen, humidity, as well as mechanical influences, can reduce the service life of the suction cup.

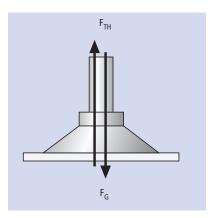
Clean suction cups with soap and warm water, and dry them at room temperature.

#### **Technical Data of Suction Cups**

Certain calculations are required for the selection of individual components when designing a vacuum system. The specified values are based on a vacuum level of -0.6 bar as well as a dry or lubricated workpiece surface. They are given without a safety factor. Depending on the operating conditions, one should keep in mind reductions that may occur due to friction or if a vacuum level is not reached (e.g. due to porous workpieces).

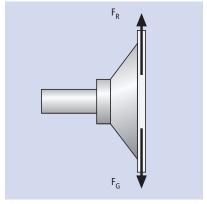
The most important technical data of the suction cups are explained below.

#### Theoretical suction force



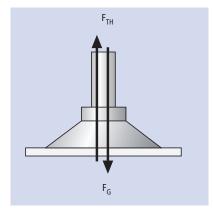
The theoretical suction force is the force acting perpendicular to the surface. The specifications in the catalog are calculated values in newtons.

#### **Shear force**



The shear force is the force acting tangentially to the surface. The specifications in the catalog are measured values in newtons.

#### Tearing force

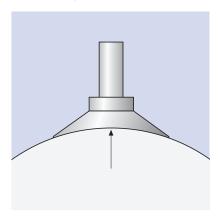


The tearing force is the maximum suction power with the suction cup is torn by an airtight, flat, smooth workpiece. The data are measured values without safety factor and serve as a clue to the max. possible load.

## The Vacuum System and its Components

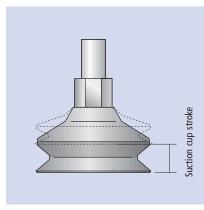


#### Minimum radius of curvature of the workpiece



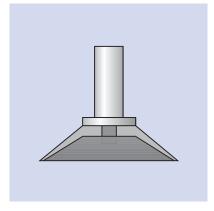
Indicates the radius up to which the workpiece can be gripped securely with the respective suction cup.

#### Suction cup stroke



Refers to the suction cup's stroke (z) that occurs during evacuation of the suction cup.

#### Inner volume



The inner volume indicates the volume of a body that has to be evacuated to pick up a workpiece. It is used to determine the total volume of the gripper system and is included when calculating evacuation times.

#### Design of the Suction Cup

The design of the suction cup always depends on the actual application For this reason, various physical values must be calculated and determined before the correct suction cup can be selected.

Later in this chapter the design of a vacuum system is described in more detail based on a calculation example.

#### Friction coefficient

The friction coefficient "µ" describes the relationship between friction force and normal force. It is not possible to specify generally valid values of the friction coefficient between the suction cup and the workpiece. It has to be determined correctly through trials with the condition of the workpiece surface (rough/dry/moist/oily) or the properties of the suction cup (shape/sealing lip/sealing edge/suction cup material/Shore hardness) having a major influence.

#### Calculation of the holding forces

The calculation of holding forces can only be about theoretical values. In practical applications, many factors, such as the size and shape of the suction cup, the surface finish and the rigidity of the workpiece (deformation) play a decisive role. That is the reason why we recommend a safety factor (S) of at least 2. The German accident prevention regulation, UVV, prescribes a binding safety factor of 1.5. When swiveling workpieces during the handling task, a safety factor of 2.5 or higher has to be used, in order to cope with the resulting turning forces.

The holding force of a suction cup is the product of:

#### $F = \Delta p \times A$

F = Holding force (without safety factor, purely static)

 $\Delta p = Difference$  between ambient pressure and pressure of the system

A = Effective suction area (the effective area of a suction cup under vacuum)

Filters and Switches and Connections Monitoring

## The Vacuum System and its Components



Vacuum Knowledge

#### Diameter of the suction cup

The holding force of a suction cup depends on its effective diameter. The condition of the workpiece and the number of suction cups are also crucial for the holding force that a vacuum system can generate.

The required diameter can be determined with the aid of the following formula:

#### For horizontal pick-up:

$$d = 1.12 x \sqrt{\frac{m x S}{P_U x n}}$$

d = Suction cup diameter in cm (with double lip ≈ internal diameter, with bellows suction cup = inner diameter of sealing lip)



For vertical pick-up:

$$d = 1.12 \text{ x} \sqrt{\frac{\text{m x S}}{P_{\text{U}} \text{ x n x } \mu}}$$

m = Weight of the workpiece in kg

PU = Vacuum in bar

n = Number of suction cups

 $\mu = Friction coefficient$ S = Safety factor

Calculation example for horizontal pick-up:

$$d = 1.12 \text{ x} \sqrt{\frac{50 \text{ kg x 2}}{0.4 \text{ bar x 4}}}$$

d = 8.85 cm

m = 50 kgPlastic sheet: Vacuum:

 $P_U = -0.4 \text{ bar}$  n = 4Number of suction cups:  $\mu\ =\ 0.5$ Measured friction coefficient: Safety factor:

A sensible selection is the suction cup PFYN 95 with a nominal diameter of 95 mm.

#### Calculation example for vertical pick-up:

$$d = 1.12 \text{ x} \sqrt{\frac{50 \text{ kg x 2}}{0.4 \text{ bar x 4 x 0.5}}}$$

d = 12.5 cm

Plastic sheet: m = 50 kg $P_{U} = -0.4 \text{ bar}$ n = 4 Vacuum: Number of suction cups: Measured friction coefficient:  $\mu\ =\ 0.5$ Safety factor: S = 2

A sensible selection is the suction cup PFYN 150 with a nominal diameter of 150 mm.

#### Suction rate or required volume flow [\*]

The volume flow that generates the vacuum is important for the suction force. The workpiece material is the principal factor for the required volume flow.

The table shows typical values for the volume flow or suction rate depending on the diameter of the suction cup with smooth and air-tight surface.

Typical value (with smooth, air-tight surfaces)									
Suction cup Ø	Suction area A	Volume flow	*						
	[cm <sup>2</sup> ]	[m <sup>3</sup> /h]	[l/min]						
up to 60 mm	28	0.5	8.3						
up to 120 mm	113	1.0	16.6						
up to 215 mm	363	2.0	33.3						
up to 450 mm	1,540	4.0	66.6						

#### Important:

Conduct suction trials for porous parts.

## The Vacuum System and its Components



#### **Special Grippers**



Special grippers are used in applications in which regular suction cups cannot be used. Special grippers are used to handle wafers, films, paper, fragile workpieces or textile fiber composites. They serve as a connection element between the workpiece and the handling system just like the suction cup.

Schmalz separates special grippers into the following series:

- Floating suction cups
- Magnetic grippers
- Needle grippers

- Wafer grippers
- Composite grippers
- Thin glass grippers

#### **Floating Suction Cups**

Floating suction cups are pneumatically operated special grippers with integrated vacuum generation. They operate on the Bernoulli principle and work as a low-contact system. The workpiece "floats" on an air cushion at the gripper surface. This makes the floating suction cup ideally suited for the handling of very sensitive

products. The high volume flow can compensate for leakage, when handling porous workpieces.

#### Advantages of floating suction cups:

- Low-contact handling
- High volume flow
- Safe separation of thin, porous workpieces
- Integrated vacuum generation

#### Typical areas of application:

- Handling of fiber composites, paper, film, wood veneer, printed circuit boards, wafers and solar cells
- Separation of thin, porous workpieces



Vacuum Mounting Generators Elements

Switches and Monitoring



## The Vacuum System and its Components

#### **Magnetic Grippers**

Magnetic grippers provide safe gripping of ferromagnetic workpieces by using the magnetic field of an integrated permanent magnet. The magnet is moved with compressed air to activate and deactivate gripping. Magnetic grippers are operated with pneumatic valves. The gripper does not require a voltage source for this purpose.

#### Advantages of magnetic grippers:

- Safe gripping with a permanent magnet is possible without voltage source
- Control of permanent magnet with compressed air and vacuum

#### Typical areas of application:

- Handling of ferromagnetic workpieces
- Handling of blanks and perforated plates as well as sheet metal parts with drilled holes/breakouts or complex shapes
- Support of vacuum gripping system in highly dynamic handling of sheet metal parts



#### **Needle Grippers**

The needles are pressed into the workpiece and herewith the gripping process is realized. The needles are ejected pneumatically. The needles are extended at an angle to ensure reliable gripping of the workpieces. Once the gripping process is complete, the needles are retracted either through spring force or pneumatically.

#### Advantages of needle grippers:

- Safe handling of non-rigid materials or materials with an unstable shape
- Different shapes for unique operating conditions
- Selectable needle diameters and adjustable strokes

#### Typical areas of application:

• Handling of porous and/or non-rigid workpieces, such as textiles, insulating and foam materials, fiber composites such as carbon and glass fiber, fleece or felts, carpets, filters, fabric, styrofoam as well as metal foams



#### Thin glass gripper

The thin glass gripper is a special gripper for the extremely dynamic and gentle handling of sensitive workpieces in automated or semi-automated processes. It reduces the dynamic and static forces on workpiece through the optimized dimensioning and distribution of suction positions.

#### Benefits of thin glass grippers:

- Significant reduction in damage rate for the thinnest workpieces (less than
- Full-surface gripping with low vacuum level
- Suction area made from mark-free PEEK to avoid glass surface contamination

#### Typical areas of application:

• Thin glass grippers are used in the manufacture of TFT displays, smartphones or tablets. The special gripper is also suitable for contamination-free handling without compromising downstream processes such as coating.



## The Vacuum System and its Components



#### Wafer Grippers

Wafer grippers are ideally suited for the handling of sensitive parts, especially photovoltaic components such as wafers and cells. The wafer gripper is equipped with an integrated vacuum generator. The high volume flow and the moderate vacuum level allows gentle handling of workpieces.

#### Advantages of wafer grippers:

- Extremely fast and accurate handling; implements cycle times of less than one second
- High volume flow with low air consumption
- Integrated vacuum generation, including blow-off function
- Many accessories for perfect matching to different process steps in photovoltaics industry

#### Typical areas of application:

- Handling of photovoltaics components also under cleanroom conditions
- Handling of fragile workpieces
- Handling of porous, permeable workpieces



#### **Composite Grippers**

Composite grippers are mainly used for handling fragile workpieces. They are operated pneumatically and have an integrated vacuum generator.

Due to their high volume flow and the moderate vacuum level, composite grippers are ideally suited for handling fragile components.

#### Advantages of composite grippers

- Secure gripping, also for porous materials or workpiece that only partially cover the suction surface
- Short cycle times and accurate positioning
- Integrated vacuum generation, including blow-off function
- High volume flow

#### Typical areas of application

- Handling of fiber composites, such as carbon fiber reinforced composites
- Handling of electrodes, separators and battery cells
- Handling of extremely thin, sensitive components
- Handling of porous, permeable workpieces
- Handling of blank circuit boards



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## The Vacuum System and its Components



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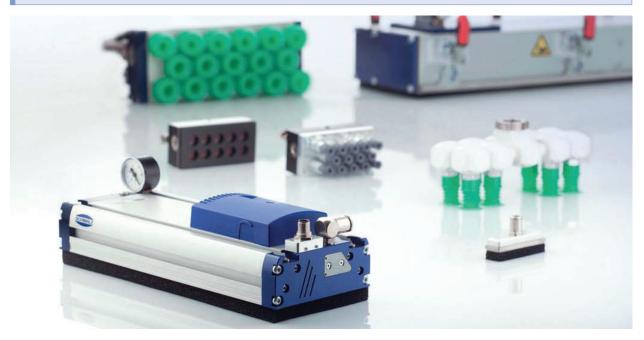
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## Area grippers and Vacuum End Effectors



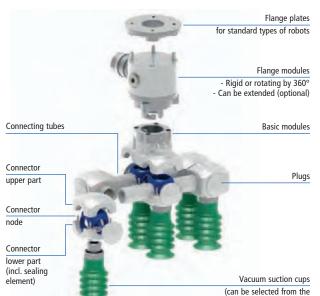
The Schmalz area grippers are used in various robot applications due to their lightweight design.

The area grippers have a modular design that allows them to be adapted and constructed quickly and easily to meet different customer requirements.

The universal grippers are suitable for a wide range of applications in handling workpieces:

- With different geometries and surfaces
- With porous properties and gaps

- Independent from their size and weight
- With an undefined pick-up position



#### **Vacuum End Effectors**

The Schmalz modular system for vacuum end effectors (VEE) allows fast, flexible configuration of end effectors for different processes.

A wide selection of combinations of vacuum feed and zones, connection elements and suction cup connections is available to create the matching end effector.

The VEE online configurator helps you to create an tailored made Vacuum End Effector solution in just a few mouse clicks.

Schmalz product range)

## The Vacuum System and its Components



#### **Mounting Elements**



Schmalz offers a broad product range of mounting elements to integrate grippers (suction cups or special grippers) into gripping systems.

The following mounting elements can basically be distinguished:

- Spring plunger
- Sections, crossbeams and connectors
- Jointed mountings
- Holders and adapters

Products from Schmalz are listed in the chapter "Mounting Elements".

#### Sections, crossbeams and connectors

These elements are used to build the basic structure of a vacuum gripping system. To reduce the number of hoses, you can build the sections as vacuum distributors with end covers and sealing frames.

#### **Holders and adapters**

The suction cups are attached to the basic structure or the traverse with holders and adapters. Different types of aluminium sections or square and round tubes are available.

#### Spring plunger

Spring plungers are used to compensate height differences of workpieces. They also cushion the impact of the suction cup and allow handling of fragile workpieces.

#### Jointed mountings

Jointed mountings provide a better adaption of the suction cup to the workpiece due to the design of Flexolink FLK and ball joint KGL that can be swiveled in all directions.







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## The Vacuum System and its Components



Filters and Switches and Valve Connections Monitoring Technology

#### Vacuum Generators



Vacuum generators provide the vacuum level that is required for the handling task. The vacuum is created either pneumatically or electrically.

Pneumatic vacuum generators implement short cycle times and can be integrated directly into the system due to their compact and lightweight design.

Electrical vacuum generators are used in applications when compressed air is not available or if very high suction capacities are required.

#### Pneumatic vacuum generators

Ejectors

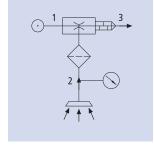
#### **Electrical vacuum generators**

- Pumps
- Vacuum Blowers

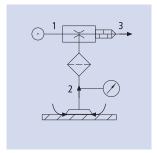
#### Important:

The nominal suction rate of all vacuum generators is given in l/min or m<sup>3</sup>/h. The values are based on an ambient pressure of 1,013 mbar (sea level) and an ambient temperature of 20 °C.

The maximum suction rate therefore indicates the volume flow that the vacuum generator evacuates from the environment (free flow).



Free pick flow



Additional suction while workpiece is

## The Vacuum System and its Components



#### Vacuum Ejectors

Ejectors work on the Venturi principle; they are divided into singlestage ejectors and ejectors featuring eco-nozzle technology. The compressed air is supplied through connection (A) to ejectors. It flows through the venturi nozzle (B). The air is accelerated and compressed during this process. After passing through the nozzle, the accelerated air slows down once again and a vacuum is created. Air is drawn in this way through the vacuum connection (D). The aspirated air and the compressed air escape through the silencer (C).

With ejectors featuring eco-nozzle technology, the vacuum passes through several venturi nozzles arranged in a row. The volumes of the individual nozzles add up to form a total suction rate.

#### Advantages of ejectors

- Compact shape
- Low weight
- Fast vacuum generation
- · No flexible parts, resulting in low maintenance and low wear
- Choose an installation position
- No heat generation

#### Typical areas of application

• Industrial robot applications in all industries, such as feeder applications in the automotive industry

We distinguish between three basic types of ejectors:

#### **Ejector modules**



- Ejector modules featuring eco-nozzle technology for efficient vacuum generation and high suction rate with minimal air consumption
- For use in the packaging industry, e.g. in carton erectors for direct installation without separate housing

#### **Basic ejectors**



- Vacuum generators without valve control and system monitoring with high maximum vacuum level
- Used mainly to handle air-tight workpieces

# Principle of operation of a single-stage ejector

#### Compact ejectors



- Vacuum generator with integrated valve technology. System monitoring and IO-Link technology are available as selected variants
- Control of pick-up and blow-off feasible without external valves
- Optional with integrated air-saving regulation
- Used in fully automatic handling systems (e.g. sheet metal processing, automotive industry, robot applications)

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## The Vacuum System and its Components



#### Vacuum Pumps

Vacuum pumps include an eccentrically mounted impeller with lamellas (A) which are pressed against the walls of the housing by centrifugal force and thus provide a seal. As the impeller rotates, the size of each chamber (B) varies. As the chamber becomes larger, the air in it expands and the pressure drops, resulting in a partial vacuum. The air is drawn in through the inlet (C), compressed, and ejected through the outlet (D).

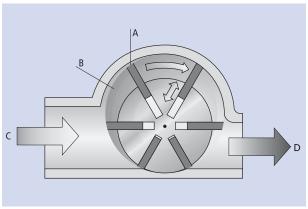
Due to their high compression factor, pumps generate a very high vacuum and, according to the type, have a very high suction capacity.

#### Advantages of vacuum pumps

- High vacuum with high evacuation volume
- Central vacuum generation

#### Typical areas of application

- As central vacuum generation in gantry handling systems
- In manual vacuum handling systems
- In packaging machines



Functional principle vacuum pump

We distinguish between three basic types of vacuum pumps:

#### **Dry-running pumps**

- Universal vacuum pumps requiring little maintenance
- · Used mainly as central vacuum generator in large gripping systems for handling air-tight workpieces

#### Oil-lubricated pumps



- Vacuum pump with extremely high vacuum level (up to 95% vacuum)
- Used in handling systems with an emphasis on low noise and low maintenance as well as high vacuum, for handling air-tight workpieces

#### Water-ring pumps



- Vacuum pump requiring little maintenance with internal water cooling for handling air-tight workpieces
- Used especially in areas with high demands on ambient air (e.g. packaging in the food industry)

## The Vacuum System and its Components



#### Vacuum Blowers

The blades (A) transport, accelerate and compress the air on the momentum principle. The air is dragged by the blades in this case. A vacuum is created at the suction end (B) this way. The compressed air (exhaust air) escapes through the outlet opening (C).

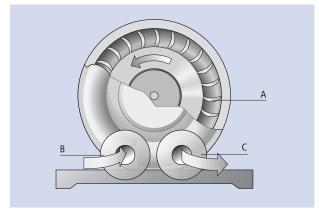
Blowers provide a very high suction rate due to the large air channel volume and specially shaped blades.

#### Advantages of vacuum blowers

- Enormous suction rate
- High leakage compensation
- · Evacuation of large volumes in a short time

#### Typical areas of application

 Handling of porous workpieces, such as cardboard, insulation material, chipboards or bags



Functional principle vacuum blower

We distinguish between two basic types of vacuum blowers:

#### Vacuum blowers

- Vacuum blowers are either directly driven or frequency-regulated
- Used especially for handling porous workpieces (chipboards, bags, etc.)
- Frequency-controlled blowers can be customized by controlling the motor speed and respectively the suction rate

#### Vacuum blowers with reversing



- Vacuum blower with electro-pneumatic reversing for control of suction, blowing and neutral position
- Used for handling air-tight workpieces that are picked up and deposited quickly

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## The Vacuum System and its Components



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## Valve Technology



Valves are used to control vacuum as well as compressed air. They can increase process safety in vacuum gripping systems.

The following functional principles can be distinguished:

- Solenoid valves for vacuum and compressed air
- Check valves and flow restrictors; touch valves
- Manual valves for vacuum and compressed air

#### Solenoid Valves

Solenoid valves are used to control the flow of vacuum and compressed air. The valves themselves are controlled with the aid of electrical signals. Solenoid valves are available in various nominal sizes, permitting selection of a valve which precisely matches the customer-specific requirements. They are available with direct control as well as with pneumatic pilot operation.



# The Vacuum System and its Components



## **Check Valves, Flow Restrictors and Touch Valves**

Check valves and flow restrictors, as well as touch valves, increase the process safety and efficiency in a vacuum system.

**Check valves** interrupt the flow as soon as a certain volume flow has been reached. This will turn off any suction cups in the gripper system that may not be covered completely. The system vacuum will remain intact.

**Flow restrictors** reduce the flow cross-section in the vacuum system and are mainly used in gripper systems for handling porous workpieces. By reducing the flow cross-section, the system vacuum remains intact even if the suction cups are not covered.

**Touch valves** open the suction channel with a spring-mounted plunger when a workpiece is present at the suction cup. When the suction cup is occupied (= workpiece present), the line for the vacuum is opened. Touch valves do not protect the system from partially occupied suction cups.



#### **Non-Return Valves**

Non-return valves seal the vacuum system against leakage, for example, in the event of a vacuum failure caused by a power outage. Thus, gripped workpieces are prevented from falling off the gripping system.



#### **Manual Valves**

Manual valves are used for manual activation or deactivation of vacuum or compressed air circuits or of individual suction cups in lifting equipment. The valves are available as 2/2-way or 3/2-way valves.



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# The Vacuum System and its Components



Filters and Switches and Valve Connections Monitoring Technology

## **Switches and System Monitoring**



Devices for system monitoring are important for the safe operation of a vacuum system. Schmalz offers measuring as well as control components for this purpose.

We distinguish between the following components for system monitoring and control:

- Mechanical vacuum switches
- Vacuum and pressure sensor
- Electronic vacuum and pressure switches
- Measuring and control components

Components for system monitoring are used in all areas of automated handling applications, for example, in feeder systems in the automotive industry, in the plastics industry, as well as in other applications in order to increase process safety.

#### **Mechanical Vacuum Switches**

Vacuum switches are available in mechanical and electronic types. In the mechanical versions, the existing vacuum is measured by using a membrane and a microswitch (electromechanical design), or a valve (pneumatic design) is activated. In the electronic version, the vacuum is measured by a piezoresistive sensor and a switching signal (analog or digital) is output. In the pneumatic version no electrical connections are required.



# The Vacuum System and its Components



#### Vacuum and Pressure Sensor

Analog vacuum and pressure sensors are characterized by their compact design. They serve the nearby query directly in the process with the suction cup. They are ideal for the output of part-presence signals. With analog switching outputs, the output voltage is proportional to the applied pressure or vacuum.



#### **Electronic Vacuum and Pressure Switches**

With electronic vacuum and pressure switches, the vacuum is measured by a piezoresistive sensor and a (digital) switching signal is output.

Electronic vacuum and pressure switches are operated in the measuring range from -1 to 10 bar. The switches with a digital display offer a user friendly operation process. The switching points and hysteresis are fully programmable by a foil keypad. They are used under high requirements on switching- and repeatability accuracy and to realize short switching times. Vacuum and pressure switches with a teach button are ideal for quick and easy programming of switching points.



#### **Measuring and Control Components**

**Vacuum regulators** can be adjusted mechanically. They guarantee a precise setting with high repeatability. Vacuum regulators compensate for pressure differences of vacuum generators caused by their design.

**Pressure-reduction** valves are used to set a specific output pressure when the pressure on the input end (input pressure) is higher than necessary.

**Manometers** The manometers measure provide the vacuum value in an analog or digital way. They can be used for all vacuum applications because of their standardized dimensions and connections.



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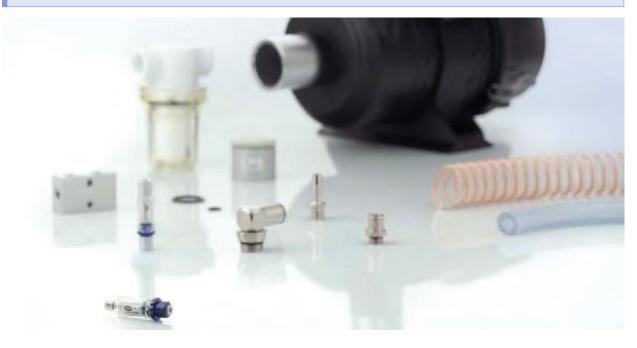
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## Filters and Connectors



Vacuum systems are protected by the use of filters. The filters protect the vacuum generator from contamination. Suction cups and vacuum generators are connected with each other by hoses and connectors.

Schmalz offers the following products:

- Vacuum filters
- Vacuum distributors
- Hoses and connectors

## Vacuum Filters

Filters are used to protect the vacuum generator or the valve in dusty environments. The filters are installed in the system between the suction cup and the vacuum generator or the valve.

**Vacuum filters** are often installed as central filter in the system. The vacuum filters have a degree of separation of almost 100%.

**Vacuum cup filters** are installed as decentralized filters directly in the vacuum line at the suction cup. Vacuum cup filters are used with light to medium contamination.

**Inline filters** are installed as decentralized filters directly in the vacuum line at the suction cup. Inline filters are used with small flows and light contamination.



# The Vacuum System and its Components



## Vacuum Distributor

The vacuum distributors can be used with centralized or decentralized vacuum generation. In systems with decentralized vacuum generation, compressed air is distributed to the individual ejectors by the distributor. In systems with centralized vacuum generation, the vacuum is distributed from the vacuum generator to the individual suction cups by the distributor.



#### **Hoses and Connectors**

Schmalz offers all hoses and connections that are needed to set up a functioning vacuum system. The products range from vacuum hoses to plug-in screw unions and sealing rings, all the way to hose clamps.



# Basic Vacuum Knowledge and Vacuum Terminology



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## **Definition of Vacuum**

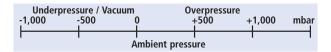
Vacuum is the term for air pressures which lie below normal atmospheric pressure. The ambient pressure is 1,013 mbar at sea level and decreases with elevation.

The form of the vacuum depends on the application in vacuum technology. A relatively small vacuum, the low vacuum, is sufficient for vacuum handling.

The pressure of the low vacuum ranges from 1 mbar to 1,013 mbar (ambient pressure at sea level).

## Specification as relative value

In vacuum technology, the vacuum is specified as a relative value which means the vacuum is specified in relation to the ambient pressure. Such vacuum values always have a negative sign, because the ambient pressure is used as the reference point, which is defined as 0 mbar.



#### Specification as absolute value

In science, a vacuum is specified as an absolute value. The reference point is absolute zero, which means space void of air (e.g. outer space). This means the vacuum value is always positive.



The following table shows the comparison values between absolute and relative pressure.

Vacuum/pressure conversion table								
Absolute pressure	Relative	bar	N/cm <sup>2</sup>	kPa	atm, kp/cm <sup>2</sup>	mm H <sub>2</sub> O	Torr; mm Hg	in Hg
[mbar]	vacuum							
900	10%	-0.101	-1.01	-10.1	-0.103	-1,030	-76	-3
800	20%	-0.203	-2.03	-20.3	-0.207	-2,070	-152	-6
700	30%	-0.304	-3.04	-30,4	-0.310	-3,100	-228	-9
600	40%	-0.405	-4.05	-40.5	-0.413	-4,130	-304	-12
500	50%	-0.507	-5.07	-50.7	-0.517	-5,170	-380	-15
400	60%	-0.608	-6.08	-60.8	-0.620	-6,200	-456	-18
300	70%	-0.709	-7.09	-70.9	-0.723	-7,230	-532	-21
200	80%	-0.811	-8.11	-81.1	-0.827	-8,270	-608	-24
100	90%	-0.912	-9.12	-91.2	-0.930	-9,300	-684	-27

At the end of this chapter you will find additional conversion and unit tables.



# Basic Vacuum Knowledge and Vacuum Terminology

#### **Measurement Units for Vacuum Data**

The units pascal [Pa], kilopascal [kPa], bar [bar] and millibar [mbar] are most widely used in vacuum technology as units for pressure. The units are converted as follows:

#### 0.001 bar = 0.1 kPa = 1 mbar = 100 Pa

In this catalog, all absolute pressure values are given in bar or mbar, all relative values in %. The % value is typical for a relative indication of the efficiency of a vacuum generator. Other units are used internationally. Some of them are included in the following table.

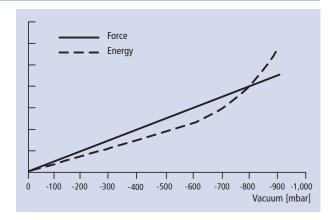
Vacuum/pressure conversion table							
	bar	N/cm <sup>2</sup>	kPa	atm, kp/cm <sup>2</sup>	mm H <sub>2</sub> O	Torr; mm Hg	in Hg
bar	1.00000	10.00000	100.0000	1.01970	10,197.00	750.0600	29.5400
N/cm <sup>2</sup>	0.10000	1.00000	10.0000	0.10190	1,019.70	75.0060	2.9540
kPa	0.01000	0.10000	1.0000	0.01020	101.97	7.5006	0.2954
atm, kp/cm <sup>2</sup>	0.98070	9.80700	98.0700	1.00000	10,332.00	735.5600	28.9700
mm H <sub>2</sub> O	0.00010	0.00100	0.0100	0.00000	1.00	0.0740	0.0030
Torr; mm Hg	0.00133	0.01333	0.1333	0.00136	13.60	1.0000	0.0394
in Hg	0.03380	0.33850	3.8850	0.03446	345.40	25.2500	1.0000

At the end of this chapter you will find additional conversion and unit tables.

#### **Energy Required for Vacuum Generation**

The energy required for vacuum generation increases disproportionately to the attained vacuum. Increasing the vacuum from -600 mbar to -900 mbar, for example, increases the holding force by a factor of 1.5, but the evacuation time and the energy needed to achieve this vacuum value increases by a factor of 3.

This means that only the vacuum required should be generated in the working area to keep the energy expenditure and the operating costs at a minimum.



#### Common working areas

- for air-tight surface (e.g. metal, plastics, etc.): -600 to -800 mbar vacuum
- for porous materials (e.g. cardboard boxes, particle boards, MDF sheets, etc.): -200 to -400 mbar vacuum; in this range the necessary holding force is generated by increasing the suction rate and the suction area.

#### Important:

In this catalog, the holding forces of the suction cups are always specified at an efficient vacuum level of -600 mbar.

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# Basic Vacuum Knowledge and Vacuum Terminology



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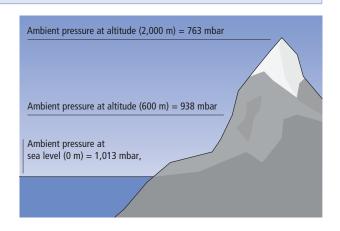
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## The Atmosphere and its Effects on Vacuum Technology

The air pressure (ambient pressure) depends on the elevation of the location as well as the temperature at that site. As shown in the diagram, the air pressure at sea level is 1,013 mbar. At an elevation of 600 m (location of the J. Schmalz GmbH in Glatten, Germany) air pressure is reduced to 938 mbar. At a height of 2,000 m, the air pressure is only 763 mbar.

This pressure loss also has an effect on working with a vacuum. The pressure drop with increasing height also reduces the maximum pressure difference that can be attained and therefore the maximum holding force. Per 100 m increase in elevation, the air pressure drops by about 12.5 mbar.

A vacuum generator that generates an 80% vacuum, achieves a vacuum value of -810 mbar at sea level (ambient pressure = 1,013 mbar); at 2,000 m (ambient pressure = 763 mbar) a vacuum generator only achieves -610 mbar. The possible holding force of a vacuum suction cup drops proportionally to the vacuum value that can be attained. This means the application at sea level presents the best case scenario.



#### Important:

All data in this catalog refer to an ambient pressure of 1,013 mbar and an ambient temperature of 20 °C.

# System Design – Calculation Example



## Approach to System Design

The implementation from theory to practice is shown with a system design based on an example. The Schmalz Calculator offers helpful support during the system design and is available for free download at www.schmalz.com/calculator

All relevant to a calculation values can be found on the product pages under the "Specifications".

Calculation of forces	Suction cups	Mounting elements	Vacuum hoses	Distributors	Vacuum generators	Solenoid valves	Vacuum switches
1	2	3	4	5	6	7	8

Flowchart for system design

#### The following calculations are based on this application:

#### Workpiece

Material: Steel sheets, stacked on a pallet

Surface: Smooth, level, dry

**Dimensions:** Length: max. 2,500 mm

Width: max. 1,250 mm Thickness: max. 2.5 mm Weight: approx. 60 kg

#### Handling system

Used system: Gantry handling system

Existing compressed air: 8 bar Control voltage: DC 24 V

Working sequence: Horizontal Pick & Place

A steel sheet is picked up from a pallet, lifted, transported horizontally and deposited in a

machining center.

Max. acceleration: X, Y axis: 5 m/s<sup>2</sup>

Z axis: 5 m/s<sup>2</sup>

Cycle time: 30 s

Scheduled time: for pick-up: < 1s

for releasing: < 1s

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# System Design – Calculation Example



Vacuum Grip- Special ping Systems Grippers

## Weight Calculation of a Workpiece

It is important to determine the weight (m) of the workpiece to continue with additional calculations. It is calculated based on the following formula:

 $m = L x B x H x \rho$ = Weight [kg] = Length [m] L В = Width [m] Н = Height [m] = Density [kg/m<sup>3</sup>]

Our example:

 $m = 2.5 \text{ m x } 1.25 \text{ m x } 0.0025 \text{ m x } 7,850 \text{ kg/m}^3$ = 61.33 kg

### Theoretical Holding Force of a Suction Cup

To calculate the theoretical holding force, we show and describe the three most important and most frequently occurring load cases (handling sequences).

For the following, simplified representations of the load cases the calculation must be based on the worst load case with the highest, theoretical holding force. This is the only way to ensure that the suction cup grips the workpiece safely during the entire handling process.

#### Safety factor S:

The safety factor S must be adjusted in accordance with the condition of workpiece surface. The safety factor has a minimum value of 1.5 for smooth and dense workpieces. A safety factor of 2.0 or greater must be used for critical, heterogeneous, porous, rough or oiled workpieces.

#### Friction coefficient µ:

The friction coefficient  $\mu$  describes the relationship between friction force and normal force. We cannot issue generally valid specifications for the friction coefficient between suction cup and workpiece. The friction coefficient  $\mu$  therefore has to be determined correctly through tests.

The following can be used as reference values.

 $= 0.2 \dots 0.3$ for wet surfaces = 0.5for wood, metal, glass, stone, etc. = 0.6for rough surfaces

#### Calculation for oiled surfaces:

For standard suction cups without specified lateral force, the recommended reference value is  $\mu = 0.1$  to 0.3. To obtain a more precise value, tests must be completed on the original workpiece.

For suction cups that have an explicitly specified lateral force on a dry or oiled surface, the friction coefficient  $\mu$  can be calculated using the following formula:

 $\mu = F_R / F_N$ 

Lateral force on a dry or oiled surface/suction force

The calculated  $\mu$  value can then be used in the formula of the respective load case (I to III).

# System Design – Calculation Example



#### Load case I - Suction cup horizontal, direction of force horizontal

The workpiece (in this case the steel sheet with the dimensions  $2.5 \times 1.25 \text{ m}$ ) is lifted up vertically and transported horizontally. The acceleration is  $5 \text{ m/s}^2$ .

 $F_{TH} = m x (g + a) x S$ 

 $F_{TH}$  = theoretical holding force [N]

m = Weight [kg]

 $q = Gravity [9.81 \text{ m/s}^2]$ 

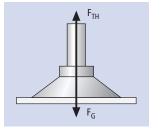
a = Acceleration [m/s<sup>2</sup>] of the system

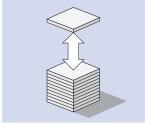
S = Safety factor

Our example:

 $F_{TH} = 61.33 \text{ kg x } (9.81 \text{ m/s}^2 + 5 \text{ m/s}^2 / 0.5) \text{ x } 1.5$ 

 $F_{TH} = 1,363 \text{ N}$ 





The suction cups land on a workpiece vertically that is to be lifted up.

#### Load case II - Suction cup horizontal, direction of force horizontal

The workpiece (in this case the steel sheet with the dimensions  $2.5 \times 1.25 \text{ m}$ ) is lifted up vertically and transported horizontally. The acceleration is  $5 \text{ m/s}^2$ .

 $F_{TH} = m x (g + a/\mu) x S$ 

 $F_{TH} = \text{theoretical holding force [N]}$  $F_{a} = \text{Acceleration force} = \text{m x a}$ 

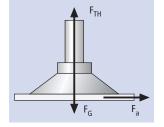
m = Weight [kg]

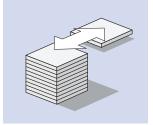
 $g = Gravity [9.81 m/s^2]$ 

 $a = Acceleration [m/s^2] of the system$ 

μ = Friction coefficient

S = Safety factor





Our example:

 $F_{TH} = 61.33 \text{ kg x } (9.81 \text{ m/s}^2 + 5 \text{ m/s}^2 / 0.5) \text{ x } 1.5$ 

 $F_{TH}^{n} = 1,822 \text{ N}$ 

The suction cups land on a workpiece horizontally that is to be moved to the side.

#### Load case III - Suction cup vertical, direction of force vertical

Description of load case: The workpiece (in this case the steel sheet with the dimensions  $2.5 \times 1.25 \text{ m}$ ) is picked up from a pallet and moved with a rotary motion at an acceleration of  $5 \text{ m/s}^2$ .

 $F_{TH} = (m/\mu) \times (g + a) \times S$ 

 $F_{TH}$  = theoretical holding force [N]

m = Weight [kg]

 $g = Gravity [9.81 \text{ m/s}^2]$ 

a = Acceleration [m/s<sup>2</sup>] of the plant

μ = Friction coefficient

S = Safety factor

Our example:

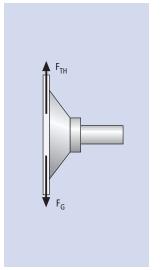
 $F_{TH} = (61.33 \text{ kg}/0.5) \text{ x } (9.81 \text{ m/s}^2 + 5 \text{ m/s}^2) \text{ x } 2$ 

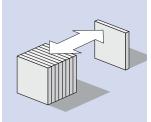
 $F_{TH} = 3,633 \text{ N}$ 

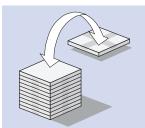
#### Comparison:

For our scenario, the workpiece is lifted off a pallet, moved to the side and placed on a machining center. The rotary motion from load case III is not needed in this application, therefore one only needs to consider the result from load case II.

The result in this case is a maximum theoretical holding force (F<sub>TH</sub>) of 1,822 N. This theoretical holding force acts on the suction cup during horizontal transport of the workpiece.







The following calculations are based on this value to safely solve the task.

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# System Design – Calculation Example



## **Suction Cup Selection**

The calculated theoretical holding force corresponds to the force that the suction cups must create to handle the workpiece safely. To select the suction cups, one must also take the ambient conditions and the application into consideration. The selection of the suction cups usually takes place based on the following criteria:

Application: Multi-shift operation, service life, chemically aggressive environment, temperature, etc.

Material: Suction cups made of different materials are available to meet the requirements, such as those particularly suited for smooth or rough surfaces, oily or very fragile workpieces, anti-static suction cups for electronic components, suction cups leaving few marks for fragile plastic parts, etc.

Surface: Depending on the condition of the surface, we recommend suction cups in specific shapes. You can select from flat or bellows suction cups with different sealing lips and sealing edges in different shapes and geometries.



#### For this example we choose:

## Flat suction cup of the type PFYN made of Perbunan NBR

This suction cup is a cost-efficient solution for handling smooth, level workpieces.

To solve the example, the calculated theoretical holding force can be applied by one suction cup or distributed among several suction cups. The number of suction cups used depends on the respective application.

For the steel sheet (2,500 x 1,250 mm) from the present case, one would usually use six or eight suction cups. The most important criterion for the number of suction cups in this example, is the flexing of the steel sheet during transport. Depending on the number of used suction cups, the required diameter of these suction cups changes.

#### Calculation of suction force FS [N] for individual suction cup

 $F_S = F_{TH}/n$ 

 $F_S$  = Suction force  $F_{TH}$  = Theoretical holding force n = Number of suction cups

 $F_S = 1.822 \text{ N/6}$  $F_S = 304 \text{ N}$ Our example:

According to the technical data for the suction cup PFYN, one needs 6 x PFYN 95 NBR with a diameter of 95 mm and a suction force of 350 N each.

 $F_S = 1.822 \text{ N/8}$   $F_S = 228 \text{ N}$ 

According to the technical data for the suction cup PFYN, one needs 8 x PFYN 80 NBR with a diameter of 80 mm and a suction force of 260 N each.

# For this example we choose:

Six suction cups of type PFYN 95 NBR

With a sheet thickness of 2.5 mm, six suction cups ensure a secure sheet pick.

# System Design – Calculation Example



## **Mounting Element Selection**

The mounting of the suction cups is usually selected according to customer requirements. But there may be compelling reasons for a particular type of mounting:

#### Uneven or inclined surfaces

The suction cup must be able to adapt to the incline:

> Joint mounting

#### Different heights/thicknesses

To compensate for height difference, one needs a spring-supported mounting:

> Spring plunger

In this case, the steel sheets are stacked on a pallet. If the sheets are larger than the pallet, one must assume that the ends of the sheets are hanging down. This means the suction cups must be able to compensate for height differences and inclines.



#### For this example we choose:

Joint Flexolink FLK 1/4" - 1/4" female thread

Optimum flexibility of suction cups for inclined workpiece surfaces.

#### Spring plunger FSTE 1/4" – 75 stroke

Greatest stroke because of sheets hanging down from pallet, 1/4" thread for connection to selected joint mounting Flexolink FLK.

#### Note:

Make sure when you select the mounting elements that these can be screwed onto the suction cups, which means the threads have to match. This also ensures maintaining the carrying capacities. The different mounting options and technical data are listed in the chapter "Mounting Elements".

#### Vacuum Hose Selection

The vacuum hoses are selected to match the size of the volume flows as well as the size of the suction cups. The table "Technical data" includes a recommendation for a hose cross section on the respective page of the suction cup and the ejector. The different hoses are listed in the chapter "Filters and Connectors".

#### For this example we choose:

**Vacuum hose VSL 8/6** with an internal diameter of 6 mm See table "Technical data" for the suction cup of type PFYN 95 NBR used in this example.



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# System Design – Calculation Example



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## **Distributor Selection**

The distributor has to match the used hose diameter and the number of suction cups.

#### Example:

The hose VSL 8/6 has an outside diameter of 8 mm and an internal diameter of 6 mm. Six suction cups are used.

#### For this example we choose:

**Plug-in screw unions STV-GE G1/4-AG 8** for the hose VSL 8/6 with outside diameter 8 mm and internal diameter 6 mm as well as 1/4" thread matching the female thread of the distributor.

Plug-in screw union STV-GE G3/8-AG 8 fits the spring plunger.

**Distributor VTR G3/8-IG 9xG1/4** with one input (3/8" thread) and nine outputs (1/4" thread).

Three sealing screws VRS-SB G1/4-AG to close the three open outputs.



#### Vacuum Generator Selection

The selection of the matching vacuum generator (ejector, pump or blower) is determined by several factors:

Type of workpieces: porous, air-tight a lower case electricity, compressed air

• Restrictions for size and weight

• Maintaining cycle times

short cycle times: Ejector

Long transport distances: Pump or blower



#### For this example we choose:

Ejector to generate vacuum.

Because the workpiece in this case is air-tight, you can create a simple and lightweight structure while implementing short pick-up and release times.

# System Design – Calculation Example



#### Suction rate of vacuum generator

The diameter of the suction cup determines the suction rate that a vacuum generator has to apply to evacuate the suction cup. Based on experience and measurements with system designs, we recommend a selection based on the following table:

Suction capacity as a function of suction cup diameter Suction cup Ø Suction capacity V <sub>c</sub>					
Up to 60 mm	0.5 m <sup>3</sup> /h	8.3 l/min			
Up to 120 mm	1.0 m <sup>3</sup> /h	16.6 l/min			
Up to 215 mm	2.0 m <sup>3</sup> /h	33.3 l/min			
Up to 450 mm	4.0 m <sup>3</sup> /h	66.6 l/min			

#### Note:

The specified values apply regardless of the type of vacuum generation. The recommended suction ratio applies per suction cup and only for smooth, air-tight surfaces. For porous, permeable workpieces we recommend conducting a corresponding suction trial with the original workpiece.

#### Calculation of the suction rate V [m³/h, l/min], that the vacuum generator has to apply

 $V = n \times V_s$ 

= Number of suction cups

Required suction rate for an individual suction cup

Example:  $V = 6 \times 16.6 \text{ l/min}$ 

V = 99.6 l/min

#### For this example we choose:

Compact ejector SCPi 20 with a suction rate of 140 l/min.

The compact ejector offers valves for control of the "suction" and "blow off" functions as well as system monitoring for ensuring process safety during handling. The compact ejector SCPi is also equipped with IO-Link Technology. It makes the various diagnostic functions visible and usable on the control level. This increases system availability and makes automation processes even more efficient.

#### Valve Technology Selection

In this case we are using a compact ejector with integrated valve technology. In other cases we need solenoid valves to switch the function "Vacuum on/off". They are usually used when pumps or blowers are used as vacuum generators.

The selection of the valves is based on the following criteria:

- Suction rate of vacuum generator
- Control voltage
- Operating principle of the valve (NO/NC)

The nominal flow of the solenoid valve may not be less than the suction ratio of the vacuum generator.



Vacuum Vacuum Suction Cups Knowledge

# System Design – Calculation Example



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#### Calculation of the nominal size of the valve:

 $V_V = V_{VE}$ 

 $V_V = Nominal flow of valve [m<sup>3</sup>/h, l/min]$ 

 $V_{VF}$  = Existing suction rate of vacuum generator [m<sup>3</sup>/h, l/min]

**Example:**  $V_V = 140 \text{ l/min} = 8.4 \text{ m}^3/\text{h}$ 

#### For this example we choose:

The used compact ejector of type SCPi 20 is equipped with solenoid valves which eliminates the need for separate valves. A solenoid valve of type EMV-10 with a nominal flow of 20 m<sup>3</sup>/h would also be sufficient for the function Suction ON/OFF.

#### Vacuum Switch Selection

Vacuum switches and manometers are usually selected based on the existing requirements regarding functionality and switching frequency.

The following functions are available:

- Adjustable switching point
- Hysteresis fixed or adjustable
- Signal output digital and/or analog
- Function LED
- Display with input keyboard
- Vacuum connection M5-IG, M8-AG, flange or tube insert
- Supply and signal connection with cable or M8 plug

The available versions with their respective technical data are explained in the chapter "Switches and System Monitoring".



## For this example we choose:

The used compact ejector of the type SCPi 20 is equipped with an integrated system monitoring (digital output signals). There is no need for an additional vacuum switch.

# System Design – Calculation Example



#### Calculation of Evacuation Times

The entire volume that has to be evacuated is required to calculate the efficiency of the vacuum system.

$$V_G = V_1 + V_2 + V_3 + V_4 + V_5 + \dots$$

 $V_G$  = Volume to be evacuated [m<sup>3</sup>]

= Volume of suction cups [m<sup>3</sup>]

= Volume of mounting elements [m<sup>3</sup>]

= Volume of vacuum hoses [m<sup>3</sup>]

= Volume of distributor [m<sup>3</sup>]

= Volume of prefilter (if necessary) [m<sup>3</sup>]

= Volume of solenoid valve (if necessary) [m<sup>3</sup>]

 $V_G = 6 \times 35 \text{ cm}^3 + 6 \times 9.5 \text{ cm}^3 + 6 \times 43 \text{ cm}^3 + 1 \times 38.5 \text{ cm}^3$  $V_G = 564 \text{ cm}^3 = 0.000564 \text{ m}^3$ 

#### Calculation of evacuation time t [h]

$$t = (V_G x In (P_a/P_e) x 1.3)/V$$

 $V_G = Volume to be evacuated [m<sup>3</sup>]$ 

In = Natural logarithm

 $P_a = Absolute start pressure [1,013 mbar]$ 

P<sub>e</sub> = Absolute final pressure [mbar] V = Suction rate of vacuum genera

Suction rate of vacuum generator [m<sup>3</sup>/h]

#### **Example:**

60% = 400 mbar absolute

 $t = (0.000564 \text{ m}^3 \text{ x In } (1,013 \text{ mbar} / 400 \text{ mbar}) \text{ x } 1.3) / 8.4 \text{ m}^3$ 

t = 0.0000811 h = 0.29 s

#### **Test with Original Parts**

A complete and energy-efficient vacuum system has been assembled from the Schmalz vacuum components. You should still conduct tests with original sample workpieces. The theoretical system design gives you a feeling for the size of the system. Schmalz has its own test center in which we conduct practical tests.

We will be glad to assist you with our expertise and many years of experience, from planning all the way to commissioning of your vacuum system. A comprehensive range of trainings and seminars rounds off our program.

# Symbols in Vacuum Technology



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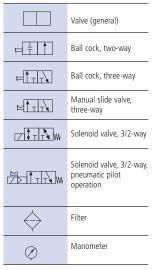
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#### **Symbols in Vacuum Technology**

Circuit diagrams and function charts are used in vacuum technology to visualize vacuum systems. These diagrams/charts include symbols for certain components or modules. The following overview represents the most important and common symbols of vacuum components from Schmalz.

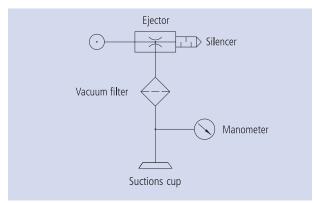


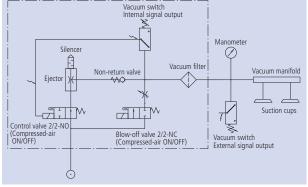
	Vacuum/pressure switch
	Check valve
	Pressure-limiter valve
	Non-return valve
⊂ <del>↑</del>	Touch valve
	Flow restrictor

Special suction cup
Flat suction cup with single lip
Flat suction cup with double lip
Flat suction cup with sealing profile
Bellows suction cup
Spring plunger
Flexolink, ball joint
Sealing cord
Adapter nipple

7	Ejector, single-stage
	Ejector, multi-stage
	Silencer
M=\$	Vacuum blower
M=\$	Vacuum pump
	Vacuum regulator
$\sim$	Hose
-	Reservoir

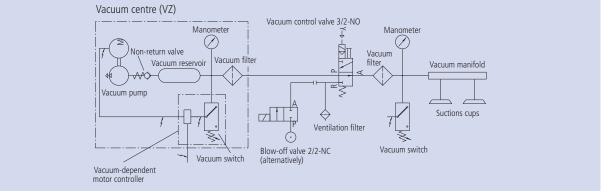
Circuit diagrams for all relevant vacuum components are available in the operating instructions online at www.schmalz.com/operating-instructions. Examples of vacuum circuit diagrams:





Example: Vacuum circuit with basic ejector

Example: Vacuum circuit with controlled compact ejector



Example: Vacuum circuit with vacuum center and vacuum-controlled motor circuit

# Units and Conversion Tables



## **Units and Symbols**

## **Dimensions and volume**

Parameter	Symbol	Unit in Schmalz catalog
Length	L	mm, m
Width	W	mm, m
Height	Н	mm, m
Diameter	d	mm, m
Volume	V	m³, l

## Weight

Parameter	Symbol	Unit in Schmalz catalog
Mass	m	g, kg
Density	ρ	kg/m <sup>3</sup>

## Force

Parameter	Symbol	Unit in Schmalz catalog
Force	F	N, kg x m/s <sup>2</sup>
Theoretical holding force	F <sub>TH</sub>	N
Acceleration	Fa	N
Tear-off force	FA	N
Weight	G	N
Friction coefficient	μ	-

#### Time

Parameter	Symbol	Unit in Schmalz catalog
Duration, evacuation time	t	ms, s, min, h
Speed	V	m/s
Acceleration	a, g	m/s <sup>2</sup> , g

## Temperature

Parameter	Symbol	Unit in
		Schmalz catalog
Temperature	t	°C

## **Electrical and magnetic values**

Parameter	Symbol	Unit in Schmalz catalog
Voltage	U	V
Strength of current	I	A

## Vacuum values

Parameter	Symbol	Unit in Schmalz catalog
Pressure, absolute	p	mbar, bar
Pressure difference	Δр	mbar, bar
Initial pressure	P <sub>a</sub>	mbar, bar
Final pressure	P <sub>e</sub>	mbar, bar
Negative pressure / vacuum	P <sub>u</sub>	mbar, bar
Suction rate	V	l/min, m³/h
Required suction rate	V <sub>s</sub>	l/min, m <sup>3</sup> /h
Nominal flow of solenoid valve	V <sub>V</sub>	l/min, m³/h
Present suction rate of vacuum generator	V <sub>VE</sub>	l/min, m³/h
Total volume to be evacuated	$V_{G}$	m <sup>3</sup> , l

#### Other information

Parameter	Symbol	Unit in Schmalz catalog
Safety factor	S	-
Quantity of suction cups	n	-
Natural logarithm	In	-
Noise level / sound pressure level	L <sub>p</sub>	dB

# Units and Conversion Tables



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Vacuum Knowledge

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## **Conversion tables**

## Length

	m	ft	in
1 m	1.000	3.281	39.370
1 ft (foot)	0.305	1.000	12.000
1 in (inch)	0.025	0.083	1.000

#### Mass

	kg	lb	oz
1 kg	1	2.20	35.27
1 lb (pound)	0.45	1	16
1 oz (ounce)	0.03	0.06	1

## **Temperature**

	K	°C	°F
1 Kelvin	1	-272.15	-457.87
1 °Celsius	274.15	1	33.8
1 °Fahrenheit	255.93	-17.22	1

## **Suction rate**

	m³/s	I/s	m³/h	I/min
m <sup>3</sup> /s	1	1,000	3,600	60,000
l/s	10 <sup>-3</sup>	1	3.6	60
m³/h	2.78 x 10 <sup>-4</sup>	0.278	1	16.67
l/min	1.67 x 10 <sup>-5</sup>	1.67 x 10 <sup>-2</sup>	0.06	1

#### Pressure

	bar	N/cm <sup>2</sup>	kPa	mbar
1 bar	1	10	100	10³
1 N/cm <sup>2</sup>	0.1	1	10	100
1 kPa	0.01	0.1	1	10
1 mbar	10 <sup>-3</sup>	0.01	0.1	1

## Volume

	m <sup>3</sup>	cm <sup>3</sup>	I
m <sup>3</sup>	1		1,000
cm <sup>3</sup>	1 x 10 <sup>-6</sup>	1	1 x 10 <sup>-3</sup>
I	1 x 10 <sup>-3</sup>	1,000	1

## Vacuum ranges

	Absolute pressure in mbar	Mean free path of atoms*
Low vacuum	1,000 – 1	68 nm – 0,1 mm
Medium vacuum	1 – 10 <sup>-3</sup>	0.1 mm – 100 mm
High vacuum	$10^{-3} - 10^{-7}$	100 mm – 1 km
Ultra high vacuum	< 10 <sup>-7</sup>	> 1 km

<sup>\*</sup>The number density of molecules for a temperature of 20 °C

#### **Thread**

Thread designation	External diameter in mm	Bead wire diameter in mm	Pitch in mm
Metric ISO thread			
M3	3.00	2.5	0.50
M4	4.00	3.2	0.70
M5	5.00	4.1	0.80
M6	6.00	4.9	1.00
M8	8.00	6.6	1.25
M10	10.00	8.4	1.50
M12	12.00	10.1	1.75
Metric ISO fine thread		12.5	1.50
M14x1.5	14.00	14.9	1.00
M16x1	16.00	18.4	1.50
M20x1.5	20.00	28.4	1.50
M30x1.5	30.00		
Pipe thread			
<b>G</b> 1/8	9.73	8.5	0.91
G1/4	13.16	11.4	1.34
<b>G</b> %	16.66	14.9	1.34
<b>G</b> ½	21,00	18.6	1.81
G¾	26.44	24.1	1.81
G1	33.25	30.3	2.31
G11/4	41.91	39.0	2.31
G1½	47.80	44.8	2.31
G2	59.61	56.6	2.31
<b>G2</b> ½	75.18	72.2	2.31

# Vacuum Glossary



#### Abrasion resistance

The abrasion resistance refers to the resistance of suction cups (elastomer part) against mechanical stress, especially friction. It is determined by the material properties of the suction cup as well as its shape.

#### Absolute pressure

The absolute pressure refers to the absolute zero point, or a space completely empty of molecules. In an absolute vacuum there is a pressure of 0 bar. A relative vacuum of -600 mbar corresponds to an absolute pressure of 400 mbar.

#### Air-saving function

Air-saving function refers to the ejector's air-saving function during the handling procedure. Once the ejector reaches a particular vacuum value, the evacuation process is interrupted. If the vacuum drops below a defined value, the ejector starts evacuating again. The air-saving function can therefore increase the energy and economic efficiency of a vacuum system.

#### Ambient pressure (atmospheric pressure)

Ambient pressure refers to the hydrostatic pressure that exists at any given point. Ambient pressure is also known as atmospheric pressure. The standard atmospheric pressure at sea level is 1,013 mbar. The ambient pressure drops with increasing altitude. At an altitude of 600 m (the location of J. Schmalz GmbH in Glatten, Germany) the ambient pressure is reduced to 938 mbar. The ambient pressure has a direct influence on the maximum vacuum value that can be reached.

#### Bernoulli's principle

Bernoulli's principle describes the drop in pressure of a fluid when it passes from a narrow section to a much wider section. In practice, this happens in the form of a direct transition into an open space. To prevent the vacuum collapsing, the fluid is diverted to the side.

#### Centralized vacuum system

In a centralized vacuum system, the vacuum is generated with a central vacuum source for more than one suction cups.

#### Check valve

The check valve is the valve that automatically monitors volume flow. If the volume flow exceeds a defined value, the valve closes automatically; for example, when suction cups are not being used.

#### Control pressure range

The control pressure range is the range between the lowest and highest permissible control pressures.

#### Cycle time

The cycle time refers to the time taken for a repetitive process to complete one cycle.

#### **Decentralized vacuum system**

In a decentralized vacuum system, a vacuum is generated directly at each individual vacuum suction cup. Positioning vacuum generation directly at the suction cup allows for short pick-up and depositing times.

#### **Evacuation time**

The evacuation time refers to the time it takes to evacuate a certain volume to reach a required vacuum value.

#### Flow resistance

Flow resistance refers to a reduced flow cross-section in a vacuum line. The resistance reduces the volume flow that can pass through a line.

#### **Friction coefficient**

The friction coefficient  $[\boldsymbol{\mu}]$  refers to the relationship between friction force and normal force (contact force between suction cup and workpiece). The friction coefficient is not specified by an unit.

#### High vacuum

A high vacuum describes any vacuum in which there is an absolute pressure of 10<sup>-7</sup> to 10<sup>-3</sup> mbar. High vacuums are used, for example, in electron tubes and particle accelerators.

#### **Holding force**

Holding force refers to the force that can be exerted by a suction cup to grip a workpiece. It is calculated by multiplying the pressure difference by the effective suction area of the suction cup (F =  $\Delta p \times A$ ). The holding force of a suction cup is thus influenced by underpressure and the suction area. It is a theoretical value, specified without safety factors. It is usual to state the holding force of a suction cup with a relative vacuum of 60%.

#### **Hysteresis**

Hysteresis refers to a pressure difference between two switching points, and thus defines the state of the output signal. The respective output signal changes when either the upper or lower limit value of the hysteresis is reached. Using the example of a vacuum switch: When the vacuum reaches a specified value, the signal changes to "ON". If the vacuum drops below a defined value, the signal switches to "OFF". Hysteresis is mainly used to control the air-saving function of ejectors.

#### Idle position of NC valve

The idle position of an NC valve refers to the position of the valve when it is not actuated, i.e. "closed" (normally closed). VacuumSchmalz - TheKnowledgeCompany

# Vacuum Glossary



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#### Idle position of NO valve

The idle position of an NO valve refers to the position of the valve when it is not actuated, i.e. "open" (normally open).

#### Inner volume

The inner volume indicates the volume of the body that has to be evacuated during a suction procedure. For example, the inner volume of a suction cup has an effect on the evacuation time.

#### Leakage

Leakage refers to a leak within the vacuum system. This can be caused by missing or faulty sealing elements, or by the porosity of the workpiece being processed.

#### Load case

Load case refers to the handling task, or the process of handling a workpiece.

Load case I – Suction cup horizontal, direction of force vertical Load case II – Suction cup horizontal, direction of force horizontal Load case III – Suction cup vertical, direction of force vertical

#### Low vacuum

A low vacuum describes any vacuum in which there is an absolute pressure of 1 mbar up to atmospheric pressure (1,013 mbar). Examples of applications for a low vacuum include light bulbs and vacuum cleaners. Vacuum handling technology also uses values in the low vacuum range because these can be generated economically to create high suction power and short cycle times.

#### Medium vacuum

A medium vacuum describes any vacuum in which there is an absolute pressure between 0.001 mbar and 1 mbar. Medium vacuums are used, for example, in low-pressure gas-filled lights.

#### Nominal flow

Nominal flow refers to the maximum flow through a certain diameter (nominal diameter). The nominal flow is given in I/min or m<sup>3</sup>/h.

#### Normal force

Normal force is the force component acting perpendicular to a surface. Every force acting on a surface can be divided into normal force and shear force (see "Shear force"). Based on the normal force, the friction force can be calculated using the friction coefficient for a material pairing. The result indicates the friction force between two surfaces, for example between a suction cup and a workpiece. Normal force is measured in Newton [N].

#### NPN – Switching output

NPN switching output refers to the configuration of a switching output in cases where the load is connected to the positive pole of the operating voltage source. The output transistor of the vacuum switch connects the active device through to the operating voltage, allowing current to flow through the consuming device.

#### Minimum radius of curvature

The minimum radius of curvature refers to the smallest radius that a suction cup can securely grip. For round suction cups, this refers to a sphere, while for oval suction cups it refers to a cylinder.

#### **Operating temperature**

The operating temperature is the temperature range in which a product can be deployed or run.

#### Overpressure resistance

Overpressure resistance refers to the maximum pressure that a body (for example, a reservoir or vacuum filter) can resist.

#### **PNP Switching output**

PNP switching output refers to the configuration of a switching output in cases where the load has a permanent connection to the operating voltage source. The output transistor of the vacuum switch connects the active device to the positive pole, allowing current to flow through the consuming device.

#### Recovery time

The recovery time is the period in which the product is not being used or is not subject to significant work loads. The product can recover during this time.

#### Reference pressure

Reference pressure is the pressure referred to by a sensor. Vacuum switches, for example, have a connection for reference air.

#### Relative pressure

Relative pressure refers to the value of pressure in relation to the prevalent ambient pressure. The vacuum is given using negative values. Relative pressure has a pressure of 0 mbar as a reference point. An absolute pressure of 400 mbar corresponds to a relative pressure of -600 mbar. In the field of vacuum handling, it is also common to state the values in percentages: -600 mbar corresponds to a vacuum of 60%.

#### Reversing valve

A reversing valve is a type of changeover valve used in a blower. The valve supplies the system alternately with overpressure and underpressure. The valve thus controls the suction, blow-off and neutral setting in the vacuum system.

#### **Shear force**

Shear force is the force acting tangentially to a surface and indicates how much friction can be transferred between the suction cup and workpiece. Shear force is given in Newton [N].

#### **Shore hardness**

Shore hardness refers to the hardness of elastomers and plastics. It is a standardized material property for the hardness of materials.

# Vacuum Glossary



#### Standard liter

A standard liter is the measurement of a gas occupying a liter at 20 °C and 1,013 mbar (standard state).

#### Standard pressure

Standard pressure is the pressure in the atmosphere under standard conditions. In both technology and the natural sciences, this is 1,013 mbar at  $0\,^{\circ}\text{C}$ . The values in the Schmalz catalog refer to a temperature of  $20\,^{\circ}\text{C}$ 

#### Standard temperature

Standard temperature is the temperature under standard conditions. The values in the Schmalz catalog refer to a temperature of 20 °C.

#### Suction force

See "Holding force"

#### Suction cup stroke

The suction cup stroke refers to the stroke effect that is created by the suction cup when picking up a workpiece. The stroke value indicates the maximum contraction of the suction cup.

#### Suction power

See "Suction rate"

#### **Suction rate**

Suction rate refers to the suction power of a vacuum generator. This value indicates the volume that can be evacuated by a vacuum generator in a certain time. The suction rate is given in  $l/min \ or \ m^3/h$ .

#### Switching point

The switching point refers to a point at which a switch changes the state of the output signal. If, for example, a programmed vacuum value is reached on a vacuum switch, the output signal switches to "ON" and there is voltage at the switch output. The initial position of the signal can be set to either NC (opener) or NO (closer).

#### Vacuum

A vacuum is a pressure range lower than that of the ambient pressure. The vacuum value is divided into various classes; refer to "High Vacuum", "Medium Vacuum" and "Low Vacuum".

#### Ventilation time

The ventilation time refers to the time it takes to dissipate vacuum in a system. This defines the time it takes to release a workpiece. The ventilation of a suction cup can take place either atmospherically or actively by a compressed air pulse (active blow off).

#### Venturi principle

The Venturi principle describes the correlation between dynamic

and static air pressure when air flows through a tube. At the narrowest section, the dynamic pressure is at a maximum, while the static pressure is at a minimum. Since the same volume is flowing through the tube, the velocity increases in proportion to the cross sections. Because of this differential pressure, a vacuum can be created and air can be drawn in by using Venturi nozzles with a side inlet port. Vacuum generators based on this principle are called ejectors.

#### Volume flow

Volume flow refers to the volume of a medium that flows through a cross section within a certain amount of time. Volume flow is given in I/min or m³/h.

#### Workpiece temperature

The workpiece temperature is the temperature of a processed workpiece. This temperature can influence the selection of a suitable suction cup material.

# **Vacuum Suction Cups** Schmalz - The Company Vacuum Suction Cups Knowledge Vacuum Grip-ping Systems Mounting Elements Vacuum Generators Switches and Valve Monitoring Technology Filters and Connections Services Index of Contact Products

# Vacuum Suction Cups

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Selection Aid



Selection	Guide	bv	field	of	application

Material of the Suction Cup

Suction Cups

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# **Vacuum Suction Cups (Universal)**

#### Flat Suction Cups (Round)



#### Flat Suction Cups PFYN



• Diameter: 1 to 200 mm • Material: FPM, HT1, NBR, PU, SI

• Antistatic and non-marking variants

• Connect. nipple plugged into elastomer part

Round universal suction cup available in various materials for a wide range of requirements; especially for workpieces with even, smooth surfaces.



#### Flat Suction Cups PFYN VU1







- Diameter: 15 to 95 mm
- Material: VU1
- · Connection nipple plugged into elastomer part

Extremely wear-resistant Vulkollan suction cup for high loads and a long service life in multi-shift operation.



## Flat Suction Cups SGAN



- Diameter: 7 to 16 mm
- Material: SI, PU
- · Connection nipple plugged into elastomer part

Suction cup with soft sealing lip for handling fragile workpieces such as CDs, veneers, wafers and solar cells even in multi-shift operation with short cycle times.



#### **Suction Plates SPU**

• Diameter: 100 to 400 mm

• Support plate made of aluminum

Material: NBR, SI



Round suction plate for smooth and slightly rough workpieces; optionally with peeling insert for separation





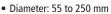




of sheets, with touch valve or with steep sealing lip.

Round suction plate with adaptable sealing edge for rough and textured workpieces.

#### **Suction Plates SPK**



- Material sealing lip: EPDM
- Support plate made of aluminum

Vacuum

Suction Cups Knowledge

## Vacuum Suction Cups

At a Glance

#### Flat Suction Cups (Oval)



#### Flat Suction Cups SGON



- Dimensions: 4 x 2 to 90 x 30 mm
- Material: HT1, NBR, SI
- Cups of the size 24 x 8 and larger are additionally secured with a two-ear clamp to prevent rotation

Oval flat suction cup with maximum suction force particularly on narrow, elongated workpieces such as sections and pipes, for example.



#### **Suction Plates SPLO**

· Material: NBR





Oval flat suction cup with aluminum support plate for narrow, elongated workpieces such as sections and pipes, for example.

# **Bellows Suction Cups (Round)**



#### **Bellows Suction Cups FSGA** (1.5 Folds)

• Dimensions: 60 x 20 to 370 x 80 mm

Support plate vulcanized to elastomer



110

99

106

- Diameter: 6 to 78 mm
- Material: HT1, NBR, NK, SI
- Connection nipple plugged into elastomer part

Round universal suction cup with 1.5 folds, available in various materials for a wide range of requirements.



#### **Bellows Suction Cups FSGA VU1** (1.5 Folds)







116

- Diameter: 30 to 110 mm
- Material: VU1
- Connection nipple plugged into elastomer part

Extremely wear-resistant Vulkollan bellows suction cup with 1.5 folds for high loads and long service life in multishift operation.



#### **Bellows Suction Cups FSGA** (1.5 Folds) from Ø110 mm







121

- Diameter: 110 and 150 mm
- Material: NBR, SI
- Support plate screwed to elastomer part

Round suction cup with 1.5 folds and large diameter for large, heavy, but fragile workpieces; with attached connection plate.



#### **Bellows Suction Cups FSGPL** (1.5 Folds)







124

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

Round suction cup with 1.5 folds, large diameter, very soft sealing lip and supports on the underside; with vulcanizebonded steel support plate.

# Vacuum Suction Cups

At a Glance





#### **Bellows Suction Cups FSG** (2.5 Folds)

• Connection nipple plugged into

• Diameter: 3 to 88 mm

• Diameter: 30 to 85 mm

• Material: VU1

elastomer part

• Diameter: 25 mm Material: NBR, SI

elastomer part

Material: VU1

part

elastomer part



Round universal suction cup with 2.5 folds, available in various materials for a wide range of requirements.



#### **Bellows Suction Cups FSG VU1** (2.5 Folds)

• Material: HT1, NBR, NBR-AS, NK, SI, SI-AS







Extremely wear-resistant Vulkollan suction cup with 2.5 folds for high loads and long service life in multi-shift operation; with optional oil groove.



#### **Bellows Suction Cups FSGB** (3.5 Folds)

• Connection nipple plugged into

• Connection nipple plugged into







Round universal suction cup with 3.5 folds for optimal damping effect and the highest suction cup stroke for fragile workpieces.

#### **Bellows Suction Cups (Oval)**



#### **Bellows Suction Cups FSGAO** (1.5 Folds)

• Dimensions: 95 x 40 and 140 x 65 mm

• Connection plate screwed to elastomer







Extremely wear-resistant Vulkollan bellows suction cup with 2.5 folds for high loads and long service life in multishift operation.

#### Vacuum Suction Cups for Special Applications

#### Suction Cups for Handling Sheet Metal



#### **Bell-Shaped Suction Cups SAXM**



High-speed bell-shaped suction cup with highest absorption of lateral and holding forces thanks to its optimal

#### **Bell-Shaped Suction Cups SAOXM** (Oval)



internal structure and high suction cup stroke.



## • Dimensions: 60 x 20 to 100 x 40 mm

• Material: ED

Material: ED

• Connection nipple modular

Diameter: 20 to 115 mm

· Connection element modular

Oval high speed suction cup with an innovative inner structure and high suction cup stroke for narrow and long sheet metal such as sections, pipes or ribbing.

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Suction Cups

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# Vacuum Suction Cups



#### Flat Suction Cups SAF

• Diameter: 30 to 125 mm

• Material: NBR



Round flat suction cup with low internal volume and very high horizontal and vertical holding forces even with oiled workpieces.



#### **Bellows Suction Cups SAB** (1.5 Folds)

Connection nipple vulcanized to elasto-



• Diameter: 22 to 125 mm • Material: NBR

• Connection nipple vulcanized to elastomer part

Round suction cup with 1.5 folds for extremely curved and thin-walled sheet metal; very high horizontal and vertical holding forces and high suction cup stroke.



#### Flat Suction Cups SAOF (Oval)



167

159

163

- Dimensions: 50 x 16 to 140 x 70 mm
- · Material: NBR
- · Connection nipple vulcanized to elastomer part

Oval suction cup with low inner volume for elongated sheet metal such as sections, pipes or ribbing; very high horizontal and vertical holding forces.



#### **Bellows Suction Cups SAOB** (Oval, 1.5 Folds)



171

175

179

182

- Dimensions: 60 x 30 to 140 x 70 mm
- Material: NBR
- · Connection nipple vulcanized to elastomer part

Oval suction cup with 1.5 folds for elongated, curved, thin-walled sheet metal such as pipes or ribbing; very high horizontal and vertical holding forces and high suction cup stroke.



# **Bell-Shaped Suction Cups SAOG**





## • Dimensions: 60 x 20 to 95 x 40 mm

- Material: NBR
- · Connection nipple vulcanized to elastomer part

Oval bell-shaped suction cup for elongated, thin-walled sheet metal; very good adjustment to convex curves.



#### **Bellows Suction Cups SAB2 P** (2.5 Folds)



Diameter: 20 mm

Round bellows suction cup with 2.5 folds for strongly curved or thin-walled sheet metal parts. Push-in suction cup neck for direct mounting.

#### **Suction Cups for Handling Wood**



#### Flat Suction Cups SHFN



• Diameter: 50 to 85 mm

Material: NBR, HT1

· Push-in function

- Material: NK
- Connection nipple plugged into elastomer part or support plate vulcanized to elastomer part

Round suction cup with internal sealing edge for sealing on rough, slightly textured surfaces.

# Vacuum Suction Cups

At a Glance





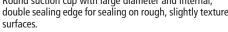
#### **Suction Plates SHF**



Round suction cup with large diameter and internal, double sealing edge for sealing on rough, slightly textured

 Supporting plate securely clipped to elastomer part

• Supporting plate securely clipped to





#### **Suction Plates SPC**

• Diameter: 160 to 400 mm

Material: NK

Material: NBR

elastomer part



Round suction cup with double sealing edge and compressed air connection for handling and separation of workpieces that are porous and subject to through-suction.

## **Suction Cups for Packaging**



#### Flat Suction Cups SPF



Round flat suction cup with support ribs, reinforced basic body, low internal volume and flexible sealing lip for handling rigid packaging.

• Diameter: 10 to 60 mm Material: ED Connection element modular

# **Bellows Suction Cups SPB1**



(1.5 Folds)

• Diameter: 10 to 80 mm

Material: ED

· Connection element modular

Round bellows suction cup with 1.5 folds, reinforced basic body, large suction cup stroke and damping effect for handling semi-rigid packaging.



#### **Bellows Suction Cups SPOB1** (Oval, 1.5 Folds)



• Dimensions: 60x20 and 100x40 mm

• Material: ED

· Connection element modular

Oval bellows suction cup with 1.5 folds, reinforced basic body, damping effect and large suction stroke for handling rigid packaging.



#### **Bellows Suction Cups SPB2** (2.5 Folds)



• Diameter: 20 to 50 mm

• Material: ED

• Connection nipple modular

Round bellows suction cup with 2.5 folds and reinforced basic body, damping effect as well as large suction stroke for use in carton and tray erectors.



#### **Bellows Suction Cups SPB2 P** (2.5 Folds)



• Diameter: 20 and 40 mm • Material: SI (use in the food and beverage

industry)

Push-in function

Round, push-in bellows suction cup with 2.5 folds and a soft fold geometry, flexible sealing lip and a large suction cup stroke for handling curved, non-rigid packaging.

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## Vacuum Suction Cups

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#### **Bellows Suction Cups SPB4** (4.5 Folds)

• Diameter: 20 to 50 mm

• Material: SI, SI-HD (suitable for applications in the food industry)



Round bellows suction cup with 4.5 folds with reinforced basic body and soft sealing lip for handling unstable packaging; FDA-compliant silicone.

217

225

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#### **Bellows Suction Cups SPOB1f** (Oval, 1.5 Folds)

• Dimensions: 35 x 15 to 80 x 35 mm

· Material: SI (suitable for applications in the food industry)



Oval bellows suction cup with 1.5 folds for dynamically handling bags and film packaging products in flow-wrap packaging processes.



#### **Bellows Suction Cups SPB2f** (2.5 Folds)

• Diameter: 30 to 50 mm

 Material: SI (use in the food and beverage industry)



Round bellows suction cup with 2.5 folds for dynamically handling bags that have an extremely large number of folds and are not very full or packaging filled with liquid. Integrated stabilizer ensures additional bag stabilization.



#### **Bellows Suction Cups SPB4f** (4.5 Folds)

• Diameter: 30 to 50 mm

Diameter: 13 to 22 mm

• Diameter: 18 to 50 mm

the food industry)

the food industry)

· Material: SI, SI-HD (suitable for applications in the food industry)

Modular connection nipple or push-in



Round bellows suction cup with 4.5 folds for handling of bags with extreme wrinkling, low filling level or liquid filled packaging. Integrated stabilizer ensures additional stabilization of the bag.



#### **Bellows Suction Cups FGA PVC** (1.5 Folds)

• Material: PVC (suitable for applications in



Round bellows suction cup with 1.5 folds for non-rigid and unstable outer packaging.



#### **Bellows Suction Cups FG PVC** (2.5 Folds)





Round bellows suction cup with 2.5 folds with high suction cup stroke and damping effect for non-rigid and unstable outer packaging.



## **Bellows Suction Cups FSGB-R** (Rectangular)

• Material: PVC (suitable for applications in



 Dimensions: 52 x 25 to 80 x 50 mm Material: NBR, SI

Connection plate screwed to elastomer

Rectangular bellows suction cup with 2.5 and 3.5 folds for square, non-rigid and unstable outer packaging.





# Vacuum Suction Cups

At a Glance





#### **Chocolate Suction Cups SPG**

Material: SI, SI-HD (suitable for

applications in the food industry)



Bell-shaped chocolate suction cup for handling round, oval or even square chocolate candies in conjunction with picker robots; FDA-compliant silicone.

#### Suction Cups for Plastic Films and Paper



#### Flat Suction Cups SGPN

Connection nipple plugged into

• Diameter: 33 mm











256

253

Round suction cup with flat, elongated sealing lip and inner support for handling of films, paper or wafers without sucking in or damaging the workpiece.

#### **Suction Cups for Handling Glass**



#### **Suction Plates SGF**

Material: EPDM, HT1

• Diameter: 15 to 40 mm Material: FPM, HT1, NK, SI

elastomer part





261

 Diameter: 125 to 400 mm Round suction plate for handling of flat, smooth workpieces, such as glass and plastic sheets. Also used for the handling of plate glass (float glass) and solar modules.



#### **Bellows Suction Cups SAB HT1** (1.5 Folds)



264

268

271

- Diameter: 22 to 125 mm Material: HT1
- Connection nipple vulcanized to elastomer part

Round bellows suction cup with 1.5 folds made of mark-free material for handling glass. High lateral and vertical holding forces and big stroke.



#### **Bellows Suction Cups SAOB HT1** (Oval, 1.5 Folds)



- Dimensions: 60 x 30 to 140 x 70 mm
- Material: HT1
- · Connection nipple glued to elastomer part

Oval bellows suction cup with 1.5 folds made of mark-free material for handling elongated glass. High lateral and vertical holding forces and big stroke.

#### **Suction Cups for High-Temperature Applications**



## Flat Suction Cups SAF HT2



Round flat suction cup with low internal volume and very

 Connection nipple vulcanized to elastomer part

Diameter: 30 to 60 mm

Material: HT2

high horizontal and vertical holding forces for use in high temperature areas.

## Vacuum Suction Cups

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Vacuum Vacuum Suction Cups Knowledge

# **Bellows Suction Cups SAB HT2**



• Diameter: 22 to 80 mm

Material: HT2

(1.5 Folds)

 Connection nipple vulcanized to elastomer part

Round suction cup with 1.5 folds for extremely curved and thin-walled sheet metal in high temperature areas; very high horizontal and vertical holding forces and high suction cup stroke.



#### Flat Suction Cups SAOF HT2 (Oval)



277

283

286

288

274

• Dimensions: 60 x 23 to 100 x 50 mm

• Material: HT2

· Connection nipple glued to elastomer

Oval suction cup with low inner volume for elongated sheet metal such as sections, pipes or ribbing in high temperature areas; very high horizontal and vertical holding forces.



#### **Bellows Suction Cups SAOB HT2** (Oval, 1.5 Folds)



280

• Dimensions: 60 x 30 and 80 x 40 mm

Material: HT2

· Connection nipple glued to elastomer

Oval suction cup with 1.5 folds for elongated, curved, thin-walled sheet metal such as pipes or ribbing in high temperature areas; very high horizontal and vertical holding forces and high suction cup stroke.

Suction cup with felt coating for temperature resistance



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





• Material: FPM, coated with felt

• Diameter: 90 to 190 mm

• Diameter: 35 to 140 mm

• Withstands temperatures up to 400 °C

and no marks on the workpiece.



#### Suction Plates for High-Temperature SPL-HT





Suction cup with replaceable seal and stainless steel basic

#### • Material: Special woven silicate material Withstands temperatures up to 600 °C

# body for high temperature resistance.





#### **Suction Plates SPL POM-NBR**



- Diameter: 40 to 115 mm
- · Material sealing ring: NBR
- Support plate made of aluminum

Round suction plate with adaptable sealing ring for handling flexible materials such as prepreg or semi-finished products of fiber composite material.

# Vacuum Suction Cups

At a Glance



## Suction Cups for Handling CDs/DVDs



#### Suction Cups SGR and SGH



Ring shaped suction cup with maximum suction force with minimal space requirements on common optical storage media such as CDs, DVDs or Blu-ray DVDs.

290

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## **Sealing Profiles**



#### Sealing Cords DI-SCHN

• Diameter: 17 to 36 mm

• Different sizes and shapes

Material: SI



Sealing profiles with various dimensions for producing individual suction plates.

• Diameter: 6 to 12 mm Cross-sections: 8 x 1 to 25 x 20 mm



## **Sealing Profiles DI-PROF**



• Cross-sections: 21 x 11 to 53 x 32 mm production of suction plates for extremely rough and

Sealing profiles made from two components for individual textured surfaces.

#### **Accessories Vacuum Suction Cups**



#### Filter Discs FD

• Material: PE

• Diameter: 16 to 55 mm

• Diameter: 6 to 32 mm

• Material: PEEK

• For suction cup type: FGA, FG







The filter plate stops the tool from being sucked in to the suction cup.

#### **Suction Cup Inserts SPI PEEK**



Cup inserts SPI made of PEEK for bellows suction cups FGA and FG for gentle and mark free gripping and depositing of smooth workpieces.

300

297



#### **Suction Cup Covers SU**

• Diameter: 30 to 360 mm • For suction cups and suction plates

• For suction cup type: FGA, FG





Suction cup cover for handling delicate, flat and smooth

303

workpieces (non-marking).

Suction Cups

# Vacuum Suction Cups

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## At a Glance



#### **Protection Covers PC**



• Diameter: 125 to 400 mm

• Protection of suction cups and suction

Protection cover PC to protect the suction plates from environmental influences and aging during storage or when suction plates are not in use.



306







• Diameter: 20/10 x 2 to 88/64 x 5 mm

• For suction cup type: FGA, FG

Material: SI

Sealing ring made from special foam for optimally sealing structured surfaces.

308

# **Vacuum Suction Cups**

# Selection by Applications



# UNIVERSAL

## **Universal Suction Cup**

Snape		ramily	Suction area	Page
Round		PFYN	Ø 1 mm – 200 mm	74
		PFYN VU1	Ø 15 mm – 95 mm	84
		SGAN	Ø 7 mm – 16 mm	88
		SPU	Ø 100 mm – 400 mm	92
		SPK	Ø 55 mm – 250 mm	96
	<b>=</b> 1,5	FSGA	Ø 6 mm – 78 mm	110
		FSGA VU1	Ø 30 mm – 110 mm	116
		FSGA 110	Ø 110 mm – 150 mm	121
		FSGPL	Ø 100 mm – 250 mm	124
	<b>=</b> 2,5	FSG	Ø 3 mm – 88 mm	127
		FSG VU1	Ø 30 mm – 85 mm	134
		FSGB	Ø 25 mm	137
Oval		SGON	4 x 2 – 90 x 30	99
		SPLO	60 x 20 – 370 x 80	106
	<b>=</b> 1,5	FSGAO	95 x 40 – 140 x 65	140

# ACKAGING

## **Suction Cups for Packaging**

Shape		Family	Suction area	Page
Round		SPF	Ø 10 mm – 60 mm	193
		SPG	Ø 33 mm	253
	<b>==</b> 1,5	SPB1	Ø 10 mm – 80 mm	199
		FGA PVC	Ø 13 mm – 22 mm	241
	<b>==</b> 2,5	SPB2	Ø 20 mm – 50 mm	209
		SPB2 P	Ø 20 mm – 40 mm	214
		SPB2f	Ø 30 mm – 50 mm	229
		FG PVC	Ø 18 mm – 50 mm	245
	<b>=</b> 4,5	SPB4	Ø 20 mm – 50 mm	217
		SPB4f	Ø 30 mm – 50 mm	235
Oval	<b>==</b> 1,5	SPOB1	60 x 20 – 100 x 40	205
		SPOB1f	35 x 15 – 80 x 35	225
Rectangular	<b>==</b> 2,5	FSGB-R	52 x 25 – 80 x 50	249
	<b>==</b> 3,5	FSGB-R	52 x 25 – 80 x 50	249



## **Suction Cups for Handling Sheet Metal**

Shape		Family	Suction area	Page
Round		SAF	Ø 30 mm – 125 mm	159
		SAXM	Ø 20 mm – 115 mm	143
	<b>==1,5</b>	SAB	Ø 22 mm – 125 mm	163
	<b>=</b> 2,5	SAB2 P	Ø 20 mm	179
Oval		SAOF	50 x 16 – 140 x 70	167
		SAOXM	60 x 20 – 100 x 40	151
		SAOG	60 x 20 - 95 x 40	175
	<b>==</b> 1,5	SAOB	60 x 30 - 140 x 70	171



## **Suction Cups for High-Temperature Applications**

Shape		Family	Suction area	Page
Round		SAF HT2	Ø 30 mm – 60 mm	271
		SPL-HT FMP-F	Ø 90 mm – 190 mm	283
		SPL-HT	Ø 35 mm – 140 mm	286
	<b>=</b> 1,5	SAB HT2	Ø 22 mm – 80 mm	274
Oval		SAOF HT2	60 x 23 – 100 x 50	277
	<b>=</b> 1,5	SAOB HT2	60 x 30 - 80 x 40	280



## **Suction Cups for Handling Wood**

Shape	Family	Suction area	Page
Round	SHFN	Ø 50 mm – 85 mm	182
	SHF	Ø 125 mm – 210 mm	187
	SPC	Ø 160 mm – 250 mm	190



## **Suction Cups for Handling CDs/DVDs**

Shape	Family	Suction area	Page
Round/Half-round	SGR/SGH	Ø 17 mm – 36 mm	290



## Suction Cups for Plastic Films and Paper

Shape		Family	Suction area	Page
Round		SGPN	Ø 15 mm – 40 mm	256



## Composite Grippers

Shape	Family	Suction area	Page
Round	SPL-POM NBR	Ø 40 mm – 115 mm	288



## **Suction Cups for Handling Glass**

Shape		Family	Suction area	Page
Round		SGF	Ø 125 mm – 400 mm	261
	<b>==1,5</b>	SAB HT1	Ø 22 mm – 125 mm	164
Oval	<b>==</b> 1,5	SAOB HT1	60 x 30 – 140 x 70	268

Flat



# **Vacuum Suction Cups**

# Material of the Suction Cup



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Contact Services Filters and Switches and Valve Vacuum Mounting Vacuum Grip- Special Connections Monitoring Technology Generators Elements ping Systems Grippers

**Material Overview** 

	Abbreviation	NBR	NBR-AS	SI (SI-HD)	SI-AS	NK	HT1
Description	Chemical designation / trade name	Nitrile caoutchu (AS = antistatic)	ıc	Silicone caoutchuc (AS = antistatic)		Natural rubber	High temperature material
_	Color / coding	black, gray, blue, light blue	black with blue dot	nature (trans- lucid), green	black with red dot	gray, light brown	blue
	General weathering resistance	••	••	•••	•••	••	•••
	Ozone resistance	•	•	••••	••••	•	••••
	Oil resistance	••••	••••	••	••	•	••••
ance	Fuel resistance	••	••	•	•	•	••
Chemical resistance	Alcohol resistance, ethanol 96%	••••	•••	••••	•••	••••	••••
Chemic	Solvents resistance	••	••	••	••	•	••
	General resistance to acids	•	•	••	••	••	•
	Bases resistance	•	•	••	••	•	•
	Steam resistance	••	••	••	••	•	•••
<u>:S</u>	Wear resistance	••	••	• (•)	•	••	•••
acterist	Resistance to permanent deformation	••	••	••	••	•••	••
l chai	Tensile strength	••	••	•	•	••	••
Mechanical characteristics	Specific resistance in $[\Omega \times cm]$	_	10 <sup>3</sup> to 10 <sup>6</sup> 1)	_	10 <sup>3</sup> to 10 <sup>6</sup>	-	-
	Shore hardness to DIN ISO 7619	40 to 80 ± 5	55 ± 5	40 to 70 ± 5 <sup>2)</sup> (65 ± 5)	55 ± 5	35 to 55 ± 5	60 ± 5
oera- resis- ce <sup>3)</sup>	Short-term in °C (< 30 sec.)	-30° to +120°	-30° to +120°	-40° to +220°	-35° to +220°	-35° to +120°	-25° to +170°
Tempera- ture resis- tance <sup>3)</sup>	Longer-term in °C	-10° to +70°	-10° to +70°	-30° to +180°	-20° to +180°	-25° to +80°	-10° to +140°
	Target industry	Universal	(Universal), Electronics	Packaging	Packaging, Electronics	Wood, Packaging	Plastics, Glass
Further characteristics	Food grade according to CFR 21 §177.2600 FDA			✓			
er ch	Leaving few marks						✓
Furth	Absence of PWIS (paint-wetting impairment substances)	NBR-60, NBR-45					✓
	Cleanroom suitability	on request	on request	ullet $ullet$ $ullet$ $ullet$ $ullet$	on request	on request	•••

 $<sup>^{1)}</sup>_{\ \ Depending \ on \ size \ and \ geometry}$   $^{2)}_{\ \ After-bake \ of \ silicone \ 4 \ h/200 \ ^{\circ}C = \sim +5 \ Shore \ A}$   $^{3)}_{\ \ Approximate \ value: \ depends \ on \ ambient \ temperature, \ application \ force, \ recovery \ time \ and \ wall \ thickness \ of \ suction \ cup}$ 

# **Vacuum Suction Cups**

# Material of the Suction Cup



HT2	ED	PU	VU1	PVC	FPM	EPDM	EPDM-MOS
High- temperature material	Elastodur	Polyurethane	Vulkollan <sup>® 4)</sup>	Polyvinyl- chloride	Fluor- caoutchuc	Ethylene- propylene- caoutchuc	Foam rubber made of Ethy- lene-propy- lene-caoutchuc
black	green, blue	blue	dark green	blue (translucid)	black with white dot	grey	black
•••	•••	•••	•••	••	••••	••••	••••
••••	•••	•••	•••	•••	•••	••••	••••
••••	•••	•••	•••	•••	••••	● ● 5)	<b>● ●</b> <sup>5)</sup>
••••	••	••	••	•	••••	•	••
••	•••	••••	••••	•	••	••••	••••
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•	● ● ● (●)	••••	••••	•••	•	••	•
••	•	•	••	•	••	••	••
••	● ● ● (●)	•••	••••	••	••	••	•
_	_	_	_	_	_	-	_
65 ± 5	60 to 85 ± 5	55 ± 5	72 ± 5	50 ± 5	65 ± 5	55 ± 5	~15 <sup>6)</sup>
-10° to +250°	-40° to +100°	-40° to +130°	-40° to +100°	-30° to +65°	-10° to +250°	-35° to +130°	-35° to +100°
-5° to +200°	-25° to +80°	-30° to +100°	-30° to +80°	-15° to +50°	-5° to +200°	-25° to +100°	-25° to +70°
Glass, Solar, Metal	Packaging, Metal	Packaging	Metal, Packaging, Glass, Wood	Packaging	Glass, Solar, Metal	Glass	Metal, Wood
				✓			
	$\checkmark$				✓		

on request

on request

on request

on request

<sup>&</sup>lt;sup>4)</sup>Vulkollan<sup>®</sup> is a registered trademark of Bayer AG
<sup>5)</sup>With slight oil wetting
<sup>6)</sup>Varies, for technical reasons, for foam rubber

## Flat Suction Cups PFYN

Suction area (Ø) from 1 mm to 200 mm





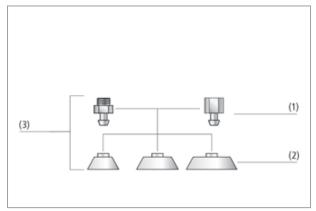
### Suitable for Industry Specific Applications



Flat suction cups PFYN

# **Applications**

- Round, flat suction cup for handling of flat workpieces with smooth or slightly rough surfaces
- Handling of hot workpieces (HT1, SI)
- Low-marking and antistatic handling of sensitive workpieces (HT1 and AS versions)



System design flat suction cups PFYN

### Design

- Robust, wear-resistant suction cup PFYN (3) with single sealing lip, consisting of suction cup PFG (2) and connection nipple (1)
- Nipple plugged in on cups up to 50 mm in diameter
- Nipple screwed into a metal inlay (vulcanized to the cup) on cups with a diameter of 60 mm or more
- Within each nipple family, the replacement cups and nipples can be combined as desired



Flat suction cups PFYN being used for handling plastic boards

### Our Highlights...

- Different materials
- Wide range of diameters
- Optimum shape
- · Low internal volume
- Supports on the bottom

### Your Benefits...

- > Suction cups for a wide range of applications (high temperatures, antistatic, low-marking, resistance to chemicals)
- > Wide range of versions for different sizes and types of workpieces
- > High suction forces with small dimensions
- > For very short cycle times
- > No permanent deformation of thin-walled workpieces

## Flat Suction Cups PFYN

Suction area (Ø) from 1 mm to 200 mm





### **Designation Code Flat Suction Cups PFYN**

Abbreviated designation	Suction area Ø	Material and	Connection thread
	in mm	Shore hardness	
Example PFYN 20 NBR-55 G1/8-AG:			
PFYN	20	NBR-55	G1/8-AG
PFYN	1	FPM-65 (mark-free)	M3-AG (AG = male (M))
	to	HT1-60	M5-AG
	200	NBR-55	M5-IG (IG = female (F))
		NBR-AS-55 (antistatic)	G1/8-AG
		PU-55	G1/8-IG
		SI-55	G1/4-AG
		SI-AS-55 (antistatic)	G1/4-IG
			G1/2-IG



### **Ordering Data Flat Suction Cups PFYN**

Suction cup PFYN (elastomer part + connection nipple) is delivered unassembled (diameters of 120 mm and more are assembled). The delivery consists of:

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

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

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# Flat Suction Cups PFYN

Suction area (Ø) from 1 mm to 200 mm



Vacuum
Suction Cups Knowledge

### **Flat Suction Cups PFYN**

Туре	Suction cup mate	erial * / hardness i	n Shore A				
	FPM-65	HT1-60	NBR-55	NBR-AS-55	PU-55	SI-55	SI-AS-55
PFYN 1 M3-AG	-	-	10.01.01.00274	10.01.01.10375	-	10.01.01.00280	-
PFYN 1.5 M3-AG	-	-	10.01.01.00275	10.01.01.10376	-	10.01.01.00281	-
PFYN 2 M3-AG	-	10.01.01.13000	10.01.01.00276	10.01.01.10377	-	10.01.01.00282	10.01.01.10391
PFYN 3.5 M3-AG	10.01.01.00295	10.01.01.12982	10.01.01.00277	10.01.01.10378	-	10.01.01.00283	10.01.01.10392
PFYN 5 M5-AG	10.01.01.00179	10.01.01.11130	10.01.01.00137	10.01.01.10379	-	10.01.01.00151	10.01.01.10393
PFYN 5 M5-IG	10.01.01.00123	10.01.01.11144	10.01.01.00081	10.01.01.10345	-	10.01.01.00095	10.01.01.10357
PFYN 6 M5-AG	10.01.01.00180	10.01.01.11131	10.01.01.00138	10.01.01.10380	-	10.01.01.00152	10.01.01.10394
PFYN 6 M5-IG	10.01.01.00124	10.01.01.11145	10.01.01.00082	10.01.01.10346	-	10.01.01.00096	10.01.01.10358
PFYN 8 M5-AG	10.01.01.00181	10.01.01.11132	10.01.01.00139	10.01.01.10381	10.01.01.00167	10.01.01.00153	10.01.01.10395
PFYN 8 M5-IG	10.01.01.00125	10.01.01.11146	10.01.01.00083	10.01.01.10347	10.01.01.00111	10.01.01.00097	10.01.01.10359
PFYN 10 M5-AG	10.01.01.00182	10.01.01.11133	10.01.01.00140	10.01.01.10382	10.01.01.00168	10.01.01.00154	10.01.01.10396
PFYN 10 M5-IG	10.01.01.00126	10.01.01.11147	10.01.01.00084	10.01.01.10348	10.01.01.00112	10.01.01.00098	10.01.01.10360
PFYN 10 G1/8-AG	10.01.01.00297	10.01.01.11134	10.01.01.00279	10.01.01.10383	10.01.01.00291	10.01.01.00285	10.01.01.10397
PFYN 10 G1/8-IG	10.01.01.00273	10.01.01.11148	10.01.01.00255	10.01.01.10349	10.01.01.00267	10.01.01.00261	10.01.01.10361
PFYN 15 G1/8-AG	10.01.01.00183	10.01.01.11135	10.01.01.00141	10.01.01.10384	10.01.01.00169	10.01.01.00155	10.01.01.10398
PFYN 15 G1/8-IG	10.01.01.00127	10.01.01.11149	10.01.01.00085	10.01.01.10350	10.01.01.00113	10.01.01.00099	10.01.01.10362
PFYN 20 G1/8-AG	10.01.01.00184	10.01.01.11136	10.01.01.00142	10.01.01.10385	10.01.01.00170	10.01.01.00156	-
PFYN 20 G1/8-IG	10.01.01.00128	10.01.01.11150	10.01.01.00086	10.01.01.10351	10.01.01.00114	10.01.01.00100	-
PFYN 25 G1/8-AG	10.01.01.00185	10.01.01.11137	10.01.01.00143	10.01.01.10386	10.01.01.00171	10.01.01.00157	-
PFYN 25 G1/8-IG	10.01.01.00129	10.01.01.11151	10.01.01.00087	10.01.01.10352	10.01.01.00115	10.01.01.00101	-
PFYN 30 G1/8-AG	10.01.01.00186	10.01.01.11138	10.01.01.00144	10.01.01.10387	10.01.01.00172	10.01.01.00158	-
PFYN 30 G1/8-IG	10.01.01.00130	10.01.01.11152	10.01.01.00088	10.01.01.10353	10.01.01.00116	10.01.01.00102	-
PFYN 35 G1/8-AG	10.01.01.00187	10.01.01.11139	10.01.01.00145	10.01.01.10388	10.01.01.00173	10.01.01.00159	-
PFYN 35 G1/8-IG	10.01.01.00131	10.01.01.11153	10.01.01.00089	10.01.01.10354	10.01.01.00117	10.01.01.00103	-
PFYN 40 G1/8-AG	10.01.01.00188	10.01.01.11140	10.01.01.00146	10.01.01.10389	10.01.01.00174	10.01.01.00160	-
PFYN 40 G1/8-IG	10.01.01.00132	10.01.01.11154	10.01.01.00090	10.01.01.10355	10.01.01.00118	10.01.01.00104	-
PFYN 50 G1/8-AG	10.01.01.00189	10.01.01.11141	10.01.01.00147	10.01.01.10390	10.01.01.00175	10.01.01.00161	-
PFYN 50 G1/8-IG	10.01.01.00133	10.01.01.11155	10.01.01.00091	10.01.01.10356	10.01.01.00119	10.01.01.00105	-
PFYN 60 G1/4-AG	10.01.01.00190	10.01.01.11142	10.01.01.00148	-	10.01.01.00176	10.01.01.00162	-
PFYN 60 G1/4-IG	10.01.01.00134	10.01.01.11156	10.01.01.00092	-	10.01.01.00120	10.01.01.00106	-
PFYN 80 G1/4-AG	10.01.01.00191	10.01.01.11143	10.01.01.00149	-	10.01.01.00177	10.01.01.00163	-
PFYN 80 G1/4-IG	10.01.01.00135	10.01.01.11157	10.01.01.00093	-	10.01.01.00121	10.01.01.00107	-
PFYN 95 G1/4-AG	10.01.01.00192	-	10.01.01.00150	-	10.01.01.00178	10.01.01.00164	-
PFYN 95 G1/4-IG	10.01.01.00136	-	10.01.01.00094	-	10.01.01.00122	10.01.01.00108	-
PFYN 120 G1/2-IG	10.01.01.12052	-	10.01.01.00337	-	-	10.01.01.00338	-
PFYN 150 G1/2-IG	-	-	10.01.01.00339	-	-	10.01.01.00340	-
PFYN 200 G1/2-IG	-	-	10.01.01.00341	-	-	10.01.01.00342	-

<sup>\*</sup>Additional material specifications at beginning of the section "Vacuum Suction Cups"

# Flat Suction Cups PFYN

Suction area (Ø) from 1 mm to 200 mm



### Ordering Data Spare Parts Flat Suction Cups

Туре	Suction cup mater	Suction cup material * / hardness in Shore A						
	FPM-65	HT1-60	NBR-55	NBR-AS-55	PU-55	SI-55	SI-AS-55	
PFG 1	-	-	10.01.01.00001	10.01.01.10335	-	10.01.01.00021	-	
PFG 1.5	-	-	10.01.01.00002	10.01.01.10336	-	10.01.01.00022	-	
PFG 2	-	10.01.01.12967	10.01.01.00003	10.01.01.10063	-	10.01.01.00023	10.01.01.10050	
PFG 3.5	10.01.01.00064	10.01.01.12981	10.01.01.00004	10.01.01.10042	-	10.01.01.00024	10.01.01.00752	
PFG 5	10.01.01.00067	10.01.01.11158	10.01.01.00007	10.01.01.10064	-	10.01.01.00027	10.01.01.10051	
PFG 6	10.01.01.00068	10.01.01.11159	10.01.01.00008	10.01.01.10065	-	10.01.01.00028	10.01.01.00626	
PFG 8	10.01.01.00069	10.01.01.11160	10.01.01.00009	10.01.01.10043	10.01.01.00049	10.01.01.00029	10.01.01.00647	
PFG 10	10.01.01.00070	10.01.01.11161	10.01.01.00010	10.01.01.10066	10.01.01.00050	10.01.01.00030	10.01.01.00701	
PFG 15	10.01.01.00071	10.01.01.11162	10.01.01.00011	10.01.01.10067	10.01.01.00051	10.01.01.00031	10.01.01.00627	
PFG 20	10.01.01.00072	10.01.01.11163	10.01.01.00012	10.01.01.10337	10.01.01.00052	10.01.01.00032	-	
PFG 25	10.01.01.00073	10.01.01.11164	10.01.01.00013	10.01.01.10338	10.01.01.00053	10.01.01.00033	-	
PFG 30	10.01.01.00074	10.01.01.11165	10.01.01.00014	10.01.01.10339	10.01.01.00054	10.01.01.00034	-	
PFG 35	10.01.01.00075	10.01.01.11166	10.01.01.00015	10.01.01.10340	10.01.01.00055	10.01.01.00035	-	
PFG 40	10.01.01.00076	10.01.01.11167	10.01.01.00016	10.01.01.10341	10.01.01.00056	10.01.01.00036	-	
PFG 50	10.01.01.00077	10.01.01.11168	10.01.01.00017	10.01.01.10342	10.01.01.00057	10.01.01.00037	-	
PFG 60	10.01.01.00078	10.01.01.11169	10.01.01.00018	-	10.01.01.00058	10.01.01.00038	-	
PFG 80	10.01.01.00079	10.01.01.11170	10.01.01.00019	-	10.01.01.00059	10.01.01.00039	-	
PFG 95	10.01.01.00080	10.01.01.13160	10.01.01.00020	-	10.01.01.00060	10.01.01.00040	-	
PFG 120	10.01.01.00389	-	10.01.01.00331	-	-	10.01.01.00332	-	
PFG 150	-	10.01.01.13445	10.01.01.00333	-	-	10.01.01.00334	-	
PFG 200	-	-	10.01.01.00335	-	-	10.01.01.00336	-	

<sup>\*</sup>Additional material specifications at beginning of the section "Vacuum Suction Cups"

### **Ordering Data Spare Parts Connection Nipples**

Туре	Connection nipples [AG]		Connection nipples [IG]	
PFYN 1 M3	SA-NIP N001 M3-AG	10.01.01.00315	-	-
PFYN 1.5 M3	SA-NIP N002 M3-AG	10.01.01.00314	-	-
PFYN 2 M3	SA-NIP N003 M3-AG	10.01.01.00316	-	-
PFYN 3.5 M3	SA-NIP N003 M3-AG	10.01.01.00316	-	-
PFYN 5 M5	SA-NIP N004 M5-AG	10.01.01.03526	SA-NIP N004 M5-IG	10.01.01.03518
PFYN 6 M5	SA-NIP N004 M5-AG	10.01.01.03526	SA-NIP N004 M5-IG	10.01.01.03518
PFYN 8 M5	SA-NIP N004 M5-AG	10.01.01.03526	SA-NIP N004 M5-IG	10.01.01.03518
PFYN 10 M5	SA-NIP N004 M5-AG	10.01.01.03526	SA-NIP N004 M5-IG	10.01.01.03518
PFYN 10 G1/8	SA-NIP N004 G1/8-AG	10.01.01.03528	SA-NIP N004 G1/8-IG	10.01.01.03520
PFYN 15 G1/8	SA-NIP N005 G1/8-AG	10.01.01.03529	SA-NIP N005 G1/8-IG	10.01.01.03521
PFYN 20 G1/8	SA-NIP N006 G1/8-AG	10.01.01.03530	SA-NIP N006 G1/8-IG	10.01.01.03522
PFYN 25 G1/8	SA-NIP N007 G1/8-AG	10.01.01.03531	SA-NIP N007 G1/8-IG	10.01.01.03523
PFYN 30 G1/8	SA-NIP N007 G1/8-AG	10.01.01.03531	SA-NIP N007 G1/8-IG	10.01.01.03523
PFYN 35 G1/8	SA-NIP N007 G1/8-AG	10.01.01.03531	SA-NIP N007 G1/8-IG	10.01.01.03523
PFYN 40 G1/8	SA-NIP N007 G1/8-AG	10.01.01.03531	SA-NIP N007 G1/8-IG	10.01.01.03523
PFYN 50 G1/8	SA-NIP N008 G1/8-AG	10.01.01.03532	SA-NIP N008 G1/8-IG	10.01.01.03524
PFYN 60 G1/4	SA-NIP N009 G1/4-AG	10.01.01.10097	SA-NIP N009 G1/4-IG	10.01.01.10096
PFYN 80 G1/4	SA-NIP N009 G1/4-AG	10.01.01.10097	SA-NIP N009 G1/4-IG	10.01.01.10096
PFYN 95 G1/4	SA-NIP N009 G1/4-AG	10.01.01.10097	SA-NIP N009 G1/4-IG	10.01.01.10096
PFYN 120 G1/2	-	-	SA-NIP N010 G1/2-IG	10.01.01.00796
PFYN 150 G1/2	-	-	SA-NIP N010 G1/2-IG	10.01.01.00796
PFYN 200 G1/2	-	-	SA-NIP N010 G1/2-IG	10.01.01.00796

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# Flat Suction Cups PFYN

Suction area (Ø) from 1 mm to 200 mm



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### **Technical Data Flat Suction Cups PFYN**

Туре	Suction force [N]*	Volume [cm³]	Min. curve radius [mm] (convex)	Recommended internal hose diameter d [mm]**	Nipple family
PFYN 1	0.03	0.001	2	2	N 001
PFYN 1.5	0.06	0.001	2	2	N 002
PFYN 2	0.12	0.001	2	2	N 003
PFYN 3.5	0.42	0.002	8	2	N 003
PFYN 5	0.75	0.005	8	2	N 004
PFYN 6	1.20	0.008	8	2	N 004
PFYN 8	2.30	0.030	10	2	N 004
PFYN 10	4.00	0.070	13	2	N 004
PFYN 15	9.00	0.400	13	4	N 005
PFYN 20	15.50	0.800	20	4	N 006
PFYN 25	26.50	1.300	25	4	N 007
PFYN 30	34.00	1.300	40	4	N 007
PFYN 35	44.00	2.700	50	4	N 007
PFYN 40	57.70	3.800	50	4	N 007
PFYN 50	91.00	7.000	75	4	N 008
PFYN 60	125.00	10.000	100	6	N 009
PFYN 80	260.00	25.000	150	6	N 009
PFYN 95	350.00	35.000	200	6	N 009
PFYN 120	540.00	77.800	300	9	N 010
PFYN 150	842.00	176.300	300	9	N 010
PFYN 200	1498.00	427.000	400	9	N 010

<sup>\*</sup>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

<sup>\*\*</sup>The recommended hose diameter refers to a hose length of approx. 2 m

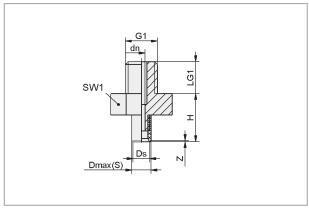
# Flat Suction Cups PFYN

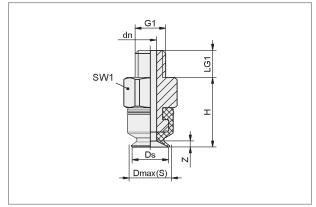
Suction area (Ø) from 1 mm to 200 mm





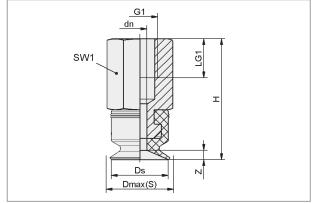
### **Design Data Flat Suction Cups PFYN**

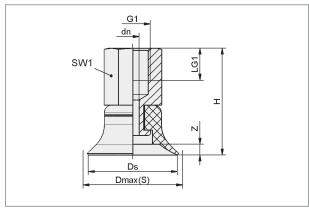




PFYN 1 to 1.5 AG

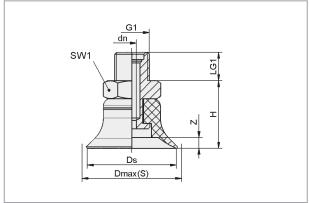


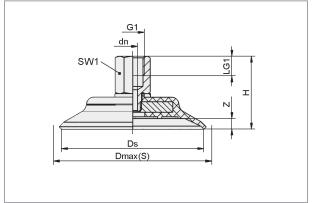




PFYN 5 to 10 IG







PFYN 15 to 50 AG

PFYN 60 to 95 IG

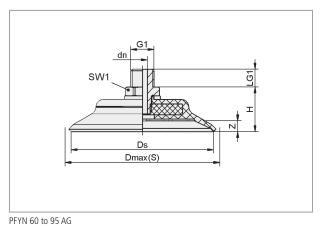
# Flat Suction Cups PFYN

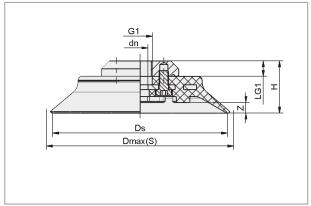
Suction area (Ø) from 1 mm to 200 mm



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PFYN 120 to 200 IG

# Flat Suction Cups PFYN

Suction area (Ø) from 1 mm to 200 mm



### **Design Data Flat Suction Cups PFYN**

Туре	Dimensions in	mm*						
	dn	Dmax(S)**	Ds	G1	Н	LG1	SW1	Z (Stroke)
PFYN 1 M3-AG	0.4	1.2	1.0	M3-M	3.6	3.0	5	0.1
PFYN 1.5 M3-AG	0.7	1.8	1.5	M3-M	4.5	3.0	5	0.1
PFYN 2 M3-AG	1.0	2.5	2.0	M3-M	6.0	3.0	5	0.5
PFYN 3.5 M3-AG	1.0	4.0	3.5	M3-M	6.0	3.0	5	0.5
PFYN 5 M5-AG	1.5	5.5	5.0	M5-M	11.5	4.5	8	0.9
PFYN 5 M5-IG	1.5	5.5	5.0	M5-F	16.5	5.5	8	0.9
PFYN 6 M5-AG	2.0	6.5	6.0	M5-M	11.5	4.5	8	1.0
PFYN 6 M5-IG	2.0	6.5	6.0	M5-F	16.5	5.5	8	1.0
PFYN 8 M5-AG	2.0	9.0	8.0	M5-M	12.0	4.5	8	1.3
PFYN 8 M5-IG	2.0	9.0	8.0	M5-F	17.0	5.5	8	1.3
PFYN 10 M5-AG	2.0	11.5	10.0	M5-M	12.5	4.5	8	1.4
PFYN 10 M5-IG	2.0	11.5	10.0	M5-F	17.5	5.5	8	1.4
PFYN 10 G1/8-AG	2.0	11.5	10.0	G1/8"-M	12.5	8.0	14	1.4
PFYN 10 G1/8-IG	2.0	11.5	10.0	G1/8"-F	23.5	9.0	14	1.4
PFYN 15 G1/8-AG	2.0	17.5	15.0	G1/8"-M	13.0	8.0	14	1.9
PFYN 15 G1/8-IG	2.0	17.5	15.0	G1/8"-F	24.0	9.0	14	1.9
PFYN 20 G1/8-AG	2.0	23.0	20.0	G1/8"-M	15.0	8.0	14	2.2
PFYN 20 G1/8-IG	2.0	23.0	20.0	G1/8"-F	26.0	9.0	14	2.2
PFYN 25 G1/8-AG	2.4	27.5	25.0	G1/8"-M	19.0	8.0	14	3.0
PFYN 25 G1/8-IG	3.5	27.5	25.0	G1/8"-F	30.0	9.0	14	3.0
PFYN 30 G1/8-AG	2.4	31.5	28.8	G1/8"-M	17.0	8.0	14	2.0
PFYN 30 G1/8-IG	3.5	31.5	28.8	G1/8"-F	28.0	9.0	14	2.0
PFYN 35 G1/8-AG	2.4	38.0	35.0	G1/8"-M	19.0	8.0	14	3.0
PFYN 35 G1/8-IG	3.5	38.0	35.0	G1/8"-F	30.0	9.0	14	3.0
PFYN 40 G1/8-AG	2.4	43.0	40.0	G1/8"-M	19.0	8.0	14	3.5
PFYN 40 G1/8-IG	3.5	43.0	40.0	G1/8"-F	30.0	9.0	14	3.5
PFYN 50 G1/8-AG	2.4	53.5	50.0	G1/8"-M	20.0	8.0	14	4.0
PFYN 50 G1/8-IG	3.5	53.5	50.0	G1/8"-F	31.0	9.0	14	4.0
PFYN 60 G1/4-AG	5.5	64.0	60.0	G1/4"-M	23.0	10.0	17	4.7
PFYN 60 G1/4-IG	5.5	64.0	60.0	G1/4"-F	39.0	11.0	17	4.7
PFYN 80 G1/4-AG	5.5	86.0	80.0	G1/4"-M	25.0	10.0	17	6.0
PFYN 80 G1/4-IG	5.5	86.0	80.0	G1/4"-F	41.0	11.0	17	6.0
PFYN 95 G1/4-AG	5.5	102.0	95.0	G1/4"-M	25.5	10.0	17	6.0
PFYN 95 G1/4-IG	5.5	102.0	95.0	G1/4"-F	41.5	11.0	17	6.0
PFYN 120 G1/2-IG	13.5	124.0	120.0	G1/2"-F	36.5	13.0	-	6.0
PFYN 150 G1/2-IG	13.5	158.0	147.5	G1/2"-F	45.5	13.0	-	9.0
PFYN 200 G1/2-IG	13.5	222.0	193.0	G1/2"-F	50.5	13.0	-	13.0

<sup>\*</sup>Acceptable dimensional tolerances for rubber parts concerning to DIN ISO 3302-1 M3

 $<sup>\</sup>ensuremath{^{\star\star}}\xspace$  External dimension of the suction cup when it is pressed against the workpiece by the vacuum

# Flat Suction Cups PFYN

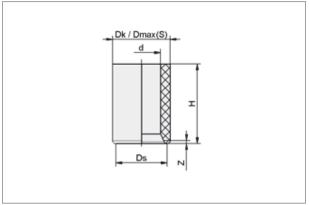
Suction area (Ø) from 1 mm to 200 mm

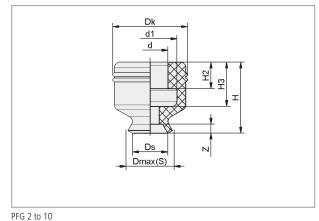


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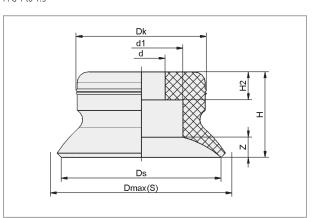
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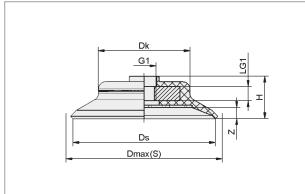
## Design Data Flat Suction Cups PFG - Spare Parts for PFYN



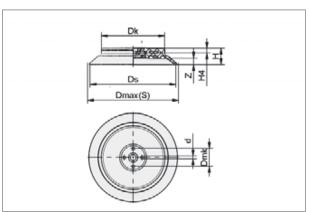


PFG 1 to 1.5





PFG 15 to PFG 50



PFG 120 to 200

PFG 60 to PFG 95

# Flat Suction Cups PFYN

Suction area (Ø) from 1 mm to 200 mm



### Design Data Flat Suction Cups PFG - Spare Parts for PFYN

Туре	Dimensio	ns in mm³	k										
	d	d1	Dk	Dmax(S)**	Dmk	Ds	G1	Н	H2	Н3	H4	LG1	Z (Stroke)
PFG 1	0.8	-	1.2	1.2	-	1.0	-	1.6	-	-	-	-	0.1
PFG 1.5	1.2	-	1.8	1.8	-	1.5	-	2.5	-	-	-	-	0.1
PFG 2	2.0	3.0	4.2	3.0	-	2.0	-	4.0	1.5	2.5	-	-	0.5
PFG 3.5	2.0	3.0	4.2	4.0	-	3.5	-	4.0	1.5	2.5	-	-	0.5
PFG 5	4.0	6.0	7.7	5.5	-	5.0	-	6.5	2.0	4.0	-	-	0.9
PFG 6	4.0	6.0	7.7	6.5	-	6.0	-	6.5	2.0	4.0	-	-	1.0
PFG 8	4.0	6.0	8.2	9.0	-	8.0	-	7.0	2.0	4.0	-	-	1.3
PFG 10	4.0	6.0	8.7	11.5	-	10.0	-	7.5	2.0	4.0	-	-	1.4
PFG 15	4.5	7.8	12.2	17.5	-	15.0	-	8.0	2.6	-	-	-	1.9
PFG 20	4.5	11.0	15.2	23.0	-	20.0	-	10.0	4.5	-	-	-	2.2
PFG 25	6.0	11.0	16.2	27.5	-	25.0	-	14.0	7.0	-	-	-	3.0
PFG 30	6.0	11.0	15.1	31.5	-	28.8	-	12.0	7.0	-	-	-	2.0
PFG 35	6.0	11.0	20.5	38.0	-	35.0	-	14.0	7.0	-	-	-	3.0
PFG 40	6.0	11.0	24.3	43.0	-	40.0	-	14.0	7.0	-	-	-	3.5
PFG 50	8.0	20.0	29.1	53.5	-	50.0	-	15.0	7.0	-	-	-	4.0
PFG 60	-	-	38.7	64.0	-	60.0	M10x1.25-F	18.0	-	-	-	6	4.7
PFG 80	-	-	52.3	86.0	-	80.0	M10x1.25-F	20.5	-	-	-	6	6.0
PFG 95	-	-	68.2	102.0	-	95.0	M10x1.25-F	19.0	-	-	-	6	6.0
PFG 120	7.3	-	89.5	124.0	40	120.0	-	23.5	-	-	8.5	-	6.0
PFG 150	7.0	-	104.5	158.0	40	147.5	-	31.0	-	-	11.0	-	9.0
PFG 200	7.0	-	142.5	222.0	40	193.0	-	37.0	-	-	11.0	-	13.0

<sup>\*</sup>Acceptable dimensional tolerances for rubber parts concerning to DIN ISO 3302-1 M3

<sup>\*\*</sup>External dimension of the suction cup when it is pressed against the workpiece by the vacuum

## Flat Suction Cups PFYN VU1

Suction area (Ø) from 15 mm to 95 mm



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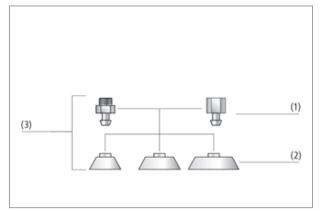
### Suitable for Industry Specific Applications



Flat suction cups PFYN VU1

### **Applications**

- Round, flat suction cup for applications in multi-shift operations with very shortcycle times
- Handling of oily metal sheets (automobile production), cardboard and sheets of wood
- Handling of extremely abrasive workpieces such as rough cardboard sheets



System design flat suction cups PFYN VU1

### Design

- Robust, wear-resistant suction cup PFYN (3) with single sealing lip, consisting of suction cup PFG (2), made of Vulkollan VU1, and connection nipple (1)
- Suction cup with positive connection to nipple which withstands even very high loading
- Within each nipple family, the replacement cups and nipples can be combined as desired



Flat suction cups PFYN VU1 being used for handling large sheet metal parts

### Our Highlights...

- Material Vulkollan VU1, very resistant to tearing
- Good resistance to chemicals
- Very low wear, about 10 - 12 mm<sup>3</sup> to DIN 53516
- Supports on the bottom
- Temperature resistance: -40  $^{\circ}$ C to +80  $^{\circ}$ C, short-term resistance up to +100 °C

### Your Benefits...

- > Extremely wear-resistant suction cup for very high loads and a long lifetime
- > Unaffected by oil (handling of sheet metal)
- > Lifetime up to 20 times higher, compared to standard NBR
- > No permanent deformation of thin-walled workpieces
- > Suitable for use at very low and high temperatures

## Flat Suction Cups PFYN VU1

Suction area (Ø) from 15 mm to 95 mm



### **Designation Code Flat Suction Cups PFYN VU1**

Abbreviated designation	Suction area Ø in mm	Material and Shore hardness	Connection thread
Example PFYN 80 VU1-72 G1/4-IG:			
PFYN	80	VU1-72	G1/4-IG
PFYN	15	VU1-72	G1/8-AG (AG = male (M))
	to		G1/8-IG (IG = female (F))
	95		G1/4-AG
			G1/4-IG



### Ordering data Flat Suction Cups PFYN VU1

Suction cup PFYN VU1 (elastomer part + connection nipple) is delivered assembled. The assembly consists of:

- Suction cup of type PFG VU 1 elastomer part, available in various diameters
- Connection nipple of type SA-NIP available with various threads

Available spare parts: suction cup PFG 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	-	-

<sup>\*</sup>Additional material specifications at beginning of the section "Vacuum Suction Cups"

### Ordering Data Spare Parts Flat Suction Cups

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

<sup>\*</sup>Additional material specifications at beginning of the section "Vacuum Suction Cups"

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# Flat Suction Cups PFYN VU1



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Suction area (Ø) from 15 mm to 95 mm

## **Ordering Data Spare Parts Connection Nipples**

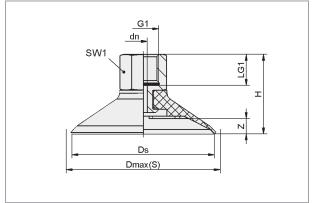
Туре	Connection nipple	
PFYN 15 VU1-72 G1/8-AG	SA-NIP N005 G1/8-AG DN200	10.01.01.03529
PFYN 15 VU1-72 G1/8-IG	SA-NIP N005 G1/8-IG DN200	10.01.01.03521
PFYN 30 VU1-72 G1/8-AG	SA-NIP N007 G1/8-AG DN240	10.01.01.03531
PFYN 30 VU1-72 G1/8-IG	SA-NIP N007 G1/8-IG DN350	10.01.01.03523
PFYN 50 VU1-72 G1/4-AG	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

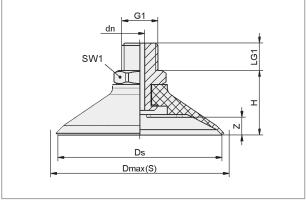
### **Technical Data Flat Suction Cups PFYN VU1**

Туре	Suction force [N]*	Volume [cm³]	Min. curve radius [mm] (convex)	Recommended 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

<sup>\*</sup>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 Flat Suction Cups PFYN VU1**





PFYN 15 to 95 VU1 IG

PFYN 15 to 95 VU1 AG

<sup>\*\*</sup>The recommended hose diameter refers to a hose length of approx. 2 m

# Flat Suction Cups PFYN VU1

Suction area (Ø) from 15 mm to 95 mm



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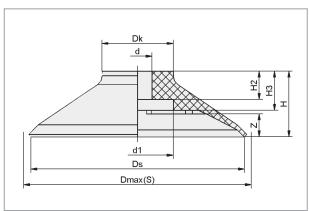
### **Design Data Flat Suction Cups PFYN VU1**

Туре	Dimensions in mm*							
	dn	Dmax(S)**	Ds	G1	Н	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

<sup>\*</sup>Acceptable dimensional tolerances for rubber parts concerning to DIN ISO 3302-1 M3

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### Design Data Flat Suction Cups PFG VU1 - Spare Parts for PFYN VU1



PFG VU1

Туре	Dimensions i	n mm*							
	d	d1	Dk	Dmax(S)**	Ds	Н	H2	Н3	Z (Stroke)
PFG 15 VU1-72	4.5	8.5	11.5	17.0	14.5	9.5	2.5	4.5	1.5
PFG 30 VU1-72	6.0	11.0	16.0	31.5	29.0	13.0	7.0	7.0	3.0
PFG 50 VU1-72	8.0	13.0	18.0	53.0	49.0	17.0	8.0	11.0	4.5
PFG 60 VU1-72	8.0	20.0	20.0	67.0	60.0	18.5	8.0	11.0	6.0
PFG 80 VU1-72	12.0	25.0	52.3	86.0	80.0	25.0	12.0	17.5	6.0
PFG 95 VU1-72	12.0	25.0	31.0	101.0	95.0	25.0	12.0	16.5	6.0

<sup>\*</sup>Acceptable dimensional tolerances for rubber parts concerning to DIN ISO 3302-1 M3

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<sup>\*\*</sup>External dimension of the suction cup when it is pressed against the workpiece by the vacuum

<sup>\*\*</sup>External dimension of the suction cup when it is pressed against the workpiece by the vacuum

## Flat Suction Cups SGAN

Suction area (Ø) from 7 mm to 16 mm





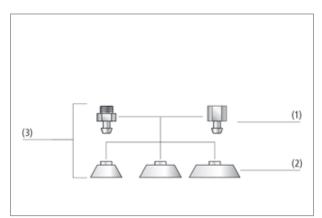
### Suitable for Industry Specific Applications



Flat suction cups SGAN

### **Applications**

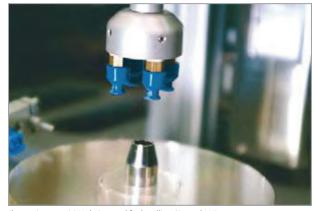
• Round and flat suction cup for handling of CDs and DVDs, wood veneers, wafers and solar cells



System design flat suction cups SGAN

# Design

- Robust and wear-resistant suction cup SGAN (3) with single sealing lip, consisting of suction cup SGA (2) and connection nipple (1)
- Connection nipple is plugged in on cups of all sizes
- With each nipple family, the replacement cups and nipples can be combined as desired



Flat suction cups SGAN being used for handling CDs and DVDs

### Our Highlights...

- Soft, flexible sealing lip
- Special material: silicone SI
- · Special material: polyurethane PU
- Optimum shape

### Your Benefits...

- > For sensitive workpieces, such as CDs
- > Very suitable for particularly high and low temperatures
- > Long lifetime, high resistance to wear
- > Particularly suitable for multishift operations with very short cycle times

## Flat Suction Cups SGAN

Suction area (Ø) from 7 mm to 16 mm



### **Designation Code Flat Suction Cups SGAN**

Abbreviated designation	Suction area Ø in mm	Material and Shore hardness	Connection thread
Example SGAN 13 PU-60 G1/8-IG:			
SGAN	13	PU-60	G1/8-IG
SGAN	7	PU-60	M5-AG (AG = male (M))
	9	SI-55	M5-IG (IG = female (F))
	13		G1/8-AG
	16		G1/8-IG



### **Ordering Data Flat Suction Cups SGAN**

Suction cup SGAN (elastomer part + connection nipple) is delivered unassembled. The delivery consists of:

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

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

### Flat Suction Cups SGAN

Туре	Suction cup material * / hardness in Shore A			
	PU-60	SI-55		
SGAN 7 M5-AG	10.01.01.00800	10.01.01.00798		
SGAN 7 M5-IG	10.01.01.00799	10.01.01.00797		
SGAN 9 M5-AG	10.01.01.00804	10.01.01.00802		
SGAN 9 M5-IG	10.01.01.00803	10.01.01.00801		
SGAN 13 G1/8-AG	10.01.01.00808	10.01.01.00806		
SGAN 13 G1/8-IG	10.01.01.00807	10.01.01.00805		
SGAN 16 G1/8-AG	10.01.01.00812	10.01.01.00810		
SGAN 16 G1/8-IG	10.01.01.00811	10.01.01.00809		

<sup>\*</sup>Additional material specifications at beginning of the section "Vacuum Suction Cups"

### Ordering Data Spare Parts Flat Suction Cups and Connection Nipples

Type*	Polyurethane PU	Silicone SI
SGA 7	10.01.01.00570	10.01.01.00347
SGA 9	10.01.01.00569	10.01.01.00348
SGA 13	10.01.01.00571	10.01.01.00349
SGA 16	10.01.01.00572	10.01.01.00452
		6.1

<sup>\*</sup>Additional material specifications at beginning of the section "Vacuum Suction Cuns"

Туре	Connection nipple	
SGAN 7 M5-AG	SA-NIP N028 M5-AG DN200	10.01.01.00753
SGAN 7 M5-IG	SA-NIP N028 M5-IG DN200	10.01.01.00813
SGAN 9 M5-AG	SA-NIP N028 M5-AG DN200	10.01.01.00753
SGAN 9 M5-IG	SA-NIP N028 M5-IG DN200	10.01.01.00813
SGAN 13 G1/8-AG	SA-NIP N029 G1/8-AG DN350	10.01.01.00816
SGAN 13 G1/8-IG	SA-NIP N029 G1/8-IG DN350	10.01.01.00815
SGAN 16 G1/8-AG	SA-NIP N029 G1/8-AG DN350	10.01.01.00816
SGAN 16 G1/8-IG	SA-NIP N029 G1/8-IG DN350	10.01.01.00815

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## Flat Suction Cups SGAN

Suction area (Ø) from 7 mm to 16 mm



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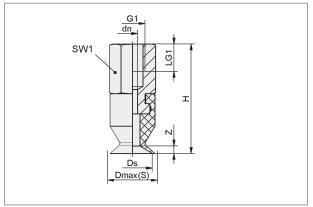
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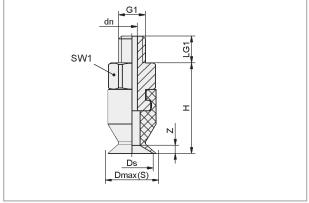
### **Technical Data Flat Suction Cups SGAN**

Туре	Suction force [N]*	Volume [cm³]	Min. curve radius [mm] (convex)	Recommended internal hose diameter d [mm]**	Nipple family
SGAN 7	1.6	0.186	8	2	N 028
SGAN 9	2.1	0.000	10	2	N 028
SGAN 13	4.7	0.441	13	4	N 029
SGAN 16	6.9	0.607	15	4	N 029

<sup>\*</sup>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 Flat Suction Cups SGAN**





SGAN 7 to 16 IG

SGAN 7 to 16 AG

Туре	Dimensions in I	mm*						
	dn	Dmax(S)**	Ds	G1	Н	LG1	SW1	Z Stroke
SGAN 7 M5-AG	2.0	8	7	M5-M	17	5.0	8	1.0
SGAN 7 M5-IG	2.0	8	7	M5-F	22	5.5	8	1.0
SGAN 9 M5-AG	2.0	9	8	M5-M	17	5.0	8	1.5
SGAN 9 M5-IG	2.0	9	8	M5-F	22	5.5	8	1.5
SGAN 13 G1/8-AG	3.0	14	12	G1/8"-M	17	8.0	14	2.0
SGAN 13 G1/8-IG	3.0	14	12	G1/8"-F	25	8.0	14	2.0
SGAN 16 G1/8-AG	3.0	18	15	G1/8"-M	17	8.0	14	2.0
SGAN 16 G1/8-IG	3.0	18	15	G1/8"-F	25	8.0	14	2.0

<sup>\*</sup>Acceptable dimensional tolerances for rubber parts concerning to DIN ISO 3302-1 M3

 $<sup>\</sup>ensuremath{^{\star\star}}\xspace$  The recommended hose diameter refers to a hose length of approx. 2 m

<sup>\*\*</sup>External dimension of the suction cup when it is pressed against the workpiece by the vacuum

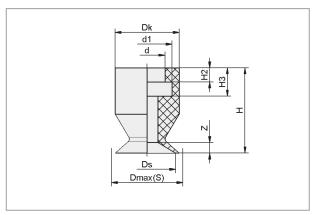
# Flat Suction Cups SGAN

Suction area (Ø) from 7 mm to 16 mm



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### Design Data Flat Suction Cups SGA - Spare Parts for SGAN



SGA 7 to 16

Туре	Dimensions i	n mm*							
	d	d1	Dk	Dmax(S)**	Ds	н	H2	Н3	Z (Stroke)
SGA 7	5	7	9	8	7	12.0	2.0	4.0	1.0
SGA 9	5	7	9	9	8	12.0	2.0	4.0	1.5
SGA 13	9	12	15	14	12	11.5	1.8	3.6	2.0
SGA 16	9	12	16	18	15	12.0	2.0	4.0	2.0

<sup>\*</sup>Acceptable dimensional tolerances for rubber parts concerning to DIN ISO 3302-1 M3

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 $<sup>{}^{\</sup>star\star}\textsc{External}$  dimension of the suction cup when it is pressed against the workpiece by the vacuum

Suction area (Ø) from 100 mm to 400 mm



### Suction Plates SPU



### Suitable for Industry Specific Applications

· Round suction plate for handling of smooth, flat workpieces • Series SPU B with thicker sealing lip: handling of workpieces with a slightly rough surface, such as wood or scaly metal sheets • Series SPU AE with integrated peeling insert: handling of thin metal sheets (approx. 1.0 - 2.5 mm); overcomes the self-adhesion

• Series SPU TV with touch valve: deactivation of unused suction

cups to prevent the entry of unwanted air



Suction plates SPU

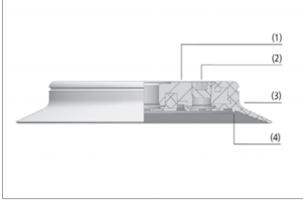


### Design

**Applications** 

between the sheets

- Suction cup SPU consisting of sealing ring (3) and aluminum support plate (1)
- Sealing ring clipped securely onto support plate with positive
- Internal sealing edge (4) for better sealing on slightly rough
- Side vacuum connector (2) normally sealed with a plug (glued into position for extra safety)
- Series SPU TV: touch valve already installed
- Series SPU AE: peeling insert on the bottom side already installed
- When worn, the seal can be replaced separately



System design suction plates SPU

Suction plates SPU being used for handling coated chipboards

### Our Highlights...

- Supports on the bottom
- Low internal volume
- Wide range of diameters
- Optimum shape

### Your Benefits...

- > No permanent deformation of thin-walled workpieces
- > Very short cycle times
- > Wide range of versions for many different workpieces
- > High suction force in spite of small dimensions

### Suction Plates SPU

Suction area (Ø) from 100 mm to 400 mm





### **Designation Code Suction Plates SPU**

Abbreviated designation	Suction area Ø in mm	Material and Shore hardness	Connection thread	Product addition
Example SPU 160 NBR-55 G1/2-IG TV:				
SPU	160	NBR-55	G1/2-IG	TV
SPU	100	NBR-55	G1/4-IG (IG = female (F))	AE peeling insert
	to	SI-60	G1/2-IG	B steep sealing lip
	400			TV touch valve



### **Ordering Data Suction Plates SPU**

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

- Sealing ring of type DR-SPU elastomer part, available in various diameters
- Aluminium support plate, available with various threads
- Optional product addition: touch valve, steep sealing lip, peeling insert

Available spare parts: sealing ring DR-SPU, touch valve

### **Suction Plates SPU**

Туре	Suction cup material * / hardness in Shore A			
	NBR-55	SI-60		
SPU 100 G1/4-IG	10.01.01.01107	10.01.01.01108		
SPU 125 G1/4-IG	10.01.01.01102	10.01.01.01103		
SPU 125 G1/4-IG TV	10.01.01.01157	10.01.01.01158		
SPU 125 G1/4-IG AE	10.01.01.01159	10.01.01.01160		
SPU 160 G1/2-IG	10.01.01.01116	10.01.01.01117		
SPU 160 G1/2-IG TV	10.01.01.01153	10.01.01.01154		
SPU 160 G1/2-IG AE	10.01.01.01155	10.01.01.01156		
SPU 210 G1/2-IG	10.01.01.01092	10.01.01.01093		
SPU 210 G1/2-IG B	10.01.01.10552	-		
SPU 210 G1/2-IG TV	10.01.01.01149	10.01.01.01150		
SPU 210 G1/2-IG AE	10.01.01.01151	10.01.01.01152		
SPU 250 G1/2-IG	10.01.01.01097	10.01.01.01098		
SPU 250 G1/2-IG B	10.01.01.10589	-		
SPU 250 G1/2-IG TV	10.01.01.01209	10.01.01.01210		
SPU 300 G1/2-IG	10.01.01.01134	10.01.01.01135		
SPU 360 G1/2-IG B	10.01.01.10588	-		
SPU 400 G1/2-IG	10.01.01.01138	-		
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<sup>\*</sup>Additional material specifications at beginning of the section "Vacuum Suction Cups"

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## Suction Plates SPU

Suction area (Ø) from 100 mm to 400 mm



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### **Ordering Data Spare Parts Suction Plates**

Туре	Suction cup material * / hardness in Shore A					
	Nitrile rubber NBR	Silicone SI				
DR-SPU 100	10.01.01.01104	10.01.01.01105				
DR-SPU 125	10.01.01.01099	10.01.01.01100				
DR-SPU 160	10.01.01.01111	10.01.01.01112				
DR-SPU 210	10.01.01.01089	10.01.01.01090				
DR-SPU 210 B	10.01.01.10502	-				
DR-SPU 250	10.01.01.01094	10.01.01.01095				
DR-SPU 250 B	10.01.01.10579	-				
DR-SPU 300	10.01.01.01131	10.01.01.01132				
DR-SPU 360 B	10.01.01.10584	-				
DR-SPU 400	10.01.01.01136	-				

<sup>\*</sup>Additional material specifications at beginning of the section "Vacuum Suction Cups"

### **Ordering Data Spare Parts Sensing Valve**

Туре	Sensing valve
SPU 125 G1/4-IG TV	10.05.10.00061
SPU 160 G1/2-IG TV	10.05.10.00061
SPU 210 G1/2-IG TV	10.05.10.00061
SPU 250 G1/2-IG TV	10.05.10.00038



### **Technical Data Suction Plates SPU**

Туре	Suction force Ds [N]*	Suction force d2 [N]**	Volume [cm³]	Min. curve radius [mm] (convex)	Recommended internal hose diameter d [mm]***
SPU 100 G1/4-IG	425	185	44	130	9
SPU 125 G1/4-IG	660	365	76	220	9
SPU 125 G1/4-IG TV	660	365	75	220	9
SPU 125 G1/4-IG AE	660	365	77	-	9
SPU 160 G1/2-IG	1090	600	142	350	12
SPU 160 G1/2-IG TV	1090	600	142	350	9
SPU 160 G1/2-IG AE	1090	600	151	-	12
SPU 210 G1/2-IG	1870	1250	226	750	12
SPU 210 G1/2-IG B	1870	1190	321	750	12
SPU 210 G1/2-IG TV	1870	1250	192	750	9
SPU 210 G1/2-IG AE	1870	1250	194	-	12
SPU 250 G1/2-IG	2650	1940	370	2200	12
SPU 250 G1/2-IG B	2650	1940	512	1500	12
SPU 250 G1/2-IG TV	2650	1940	371	2200	12
SPU 300 G1/2-IG	3810	3010	491	3500	12
SPU 360 G1/2-IG B	5500	4730	1289	3000	12
SPU 400 G1/2-IG	6780	5870	890	6500	12

<sup>\*</sup>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

<sup>\*\*</sup>Suction force referred to the sealing-edge diameter d2

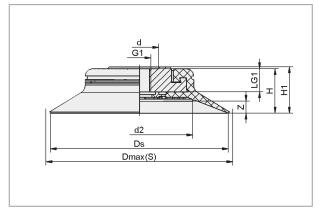
<sup>\*\*\*</sup>The recommended hose diameter refers to a hose length of approx. 2 m  $\,$ 

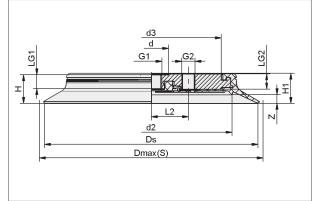
## Suction Plates SPU

Suction area (Ø) from 100 mm to 400 mm



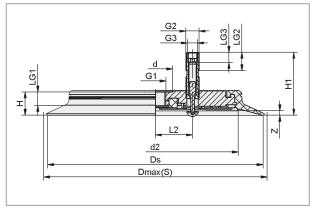
### **Design Data Suction Plates SPU**

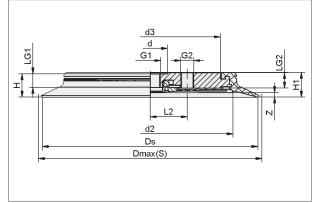




SPU 100

SPU 125 to 400 (B)





SPU 125 to 250 TV

SPU 125 to 210 AE

Туре	Dimensions in mm*														
	d	d2	d3	Dmax(S)**	Ds	G1	G2	G3	Н	H1	L2	LG1	LG2	LG3	Z (Stroke)
SPU 100 G1/4-IG	22	60	-	108.0	100	G1/4"-F	-	-	25.0	26.0	-	13.0	-	-	7
SPU 125 G1/4-IG	22	83	61.0	132.0	125	G1/4"-F	G1/4"-F	-	25.0	26.0	22.0	13.0	14	-	7
SPU 125 G1/4-IG TV	22	83	-	132.0	125	G1/4"-F	G1/4"-M	G1/8"-F	25.0	62.0	22.0	13.0	36	7	7
SPU 125 G1/4-IG AE	22	83	61.0	132.0	125	G1/4"-F	G1/4"-F	-	25.0	26.0	22.0	13.0	14	-	7
SPU 160 G1/2-IG	34	113	88.0	170.0	160	G1/2"-F	G1/4"-F	-	25.0	26.5	36.5	13.5	15	-	7
SPU 160 G1/2-IG TV	34	113	-	170.0	160	G1/2"-F	G1/4"-M	G1/8"-F	25.0	62.0	36.5	13.5	18	10	7
SPU 160 G1/2-IG AE	34	113	88.0	170.0	160	G1/2"-F	G1/4"-F	-	25.0	26.5	36.5	13.5	15	-	7
SPU 210 G1/2-IG	34	163	138.0	220.0	210	G1/2"-F	G1/4"-F	-	25.0	26.5	36.5	13.5	15	-	5
SPU 210 G1/2-IG B	34	159	138.0	220.0	210	G1/2"-F	G1/4"-F	-	29.0	29.5	36.5	13.5	15	-	10
SPU 210 G1/2-IG TV	34	163	-	220.0	210	G1/2"-F	G1/4"-M	G1/8"-F	25.0	62.0	36.5	13.5	38	10	5
SPU 210 G1/2-IG AE	34	163	138.0	220.0	210	G1/2"-F	G1/4"-F	-	25.0	26.5	36.5	13.5	15	-	5
SPU 250 G1/2-IG	34	203	178.0	265.0	250	G1/2"-F	G1/2"-F	-	25.0	26.5	76.0	13.5	15	-	7
SPU 250 G1/2-IG B	34	203	178.0	265.0	250	G1/2"-F	G1/2"-F	-	29.0	30.0	76.0	13.5	15	-	11
SPU 250 G1/2-IG TV	34	203	-	265.0	250	G1/2"-F	G1/2"-M	G3/8"-F	25.0	65.5	76.0	13.5	39	12	7
SPU 300 G1/2-IG	34	253	226.5	320.0	300	G1/2"-F	G1/2"-F	-	25.0	26.5	76.0	13.5	15	-	6
SPU 360 G1/2-IG B	-	309	275.0	385.0	360	G1/2"-F	G1/2"-F	-	35.0	35.5	86.0	17.0	17	-	12
SPU 400 G1/2-IG	-	349	315.0	430.0	400	G1/2"-F	G1/2"-F	-	28.5	29.0	86.0	15.5	17	-	6

<sup>\*</sup>Acceptable dimensional tolerances for rubber parts concerning to DIN ISO 3302-1 M3

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<sup>\*\*</sup>External dimension of the suction cup when it is pressed against the workpiece

### Suction Plates SPK

Suction area (Ø) from 55 mm to 250 mm



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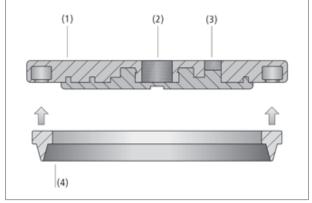
### Suitable for Industry Specific Applications



Suction plates SPK

### **Applications**

- Round suction plate for handling of objects with very rough or structured surfaces (such as ornamental glass, checker plate, broken natural stone, etc.)
- Deactivation of unused suction plates by touch valves (accessory)



System design suction plates SPK

### Design

- Robust and wear-resistant suction plate SPK, consisting of flexible MOS sealing ring (4) made of EPDM and aluminium base plate (1)
- Sealing ring without seams
- Sealing ring is securely clipped into the base plate
- When worn, the sealing ring can be replaced separately
- Lower side of base plate with elastomer insert to prevent damage to workpieces
- Threaded hole for vacuum connection (2) or touch valve (3) (offcentre) sealed with a plug in the factory
- Touch valve can be ordered as an accessory and is easily mounted, use medium-strength locking compound



Suction plates SPK being used for handling corrugated sheet metal

### Our Highlights...

- Sealing lip made of flexible **EPDM**
- Sealing ring clipped securely into the mounting plate
- Support on the bottom
- Low intrinsic volume
- Wide range of different diameters

### Your Benefits...

- > Optimal adaptation to structured surfaces
- > Quick replacement of the sealing element
- > No permanent deformation of thin-walled workpieces
- > Very short cycle times
- > Wide range of cups for handling different workpieces

### Suction Plates SPK

Suction area (Ø) from 55 mm to 250 mm





### **Designation Code Suction Plates SPK**

Abbreviated designation	Suction area Ø in mm	Material and Shore hardness	Connection thread
Example SPK 110 MOS EPDM-15 G1/2-IG: SPK	110	MOS EPDM-15	G1/2-IG
SPK	55 to 250	MOS EPDM-15	G1/4-IG (IG = female (F)) G1/2-IG



### **Ordering Data Suction Plates SPK**

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

- Sealing ring of type DR-SPK elastomer part, available in various diameters
- Aluminium support plate, available with various threads

Available spare parts: sealing ring DR-SPK Available accessories: touch valve

### **Suction Plates SPK**

Туре	Part Number
SPK 55 MOS EPDM-15 G1/4-IG	10.01.01.12060
SPK 80 MOS EPDM-15 G1/4-IG	10.01.01.12061
SPK 110 MOS EPDM-15 G1/2-IG	10.01.01.12062
SPK 160 MOS EPDM-15 G1/2-IG	10.01.01.12063
SPK 200 MOS EPDM-15 G1/2-IG	10.01.01.12064
SPK 250 MOS EPDM-15 G1/2-IG	10.01.01.12065



### Ordering Data Spare Parts And Accessories Suction Plates SPK

Туре	Sealing ring DR-SPK	Sensing valve
SPK 55 MOS EPDM-15 G1/4-IG	10.01.01.12072	-
SPK 80 MOS EPDM-15 G1/4-IG	10.01.01.12073	10.05.10.00061
SPK 110 MOS EPDM-15 G1/2-IG	10.01.01.12074	10.05.10.00061
SPK 160 MOS EPDM-15 G1/2-IG	10.01.01.12075	10.05.10.00061
SPK 200 MOS EPDM-15 G1/2-IG	10.01.01.12076	10.05.10.00038
SPK 250 MOS EPDM-15 G1/2-IG	10.01.01.12077	-



### **Technical Data Suction Plates SPK**

Туре	Suction force [N]*	Volume [cm³]	Min. curve radius [mm] (convex)	Recom. internal hose diame- ter d [mm]**
SPK 55 MOS EPDM-15 G1/4-IG	121	12	250	9
SPK 80 MOS EPDM-15 G1/4-IG	256	21	400	9
SPK 110 MOS EPDM-15 G1/2-IG	471	67	500	12
SPK 160 MOS EPDM-15 G1/2-IG	1060	129	1000	12
SPK 200 MOS EPDM-15 G1/2-IG	1700	199	1600	12
SPK 250 MOS EPDM-15 G1/2-IG	2714	291	2600	12

<sup>\*</sup>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

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<sup>\*\*</sup>The recommended hose diameter refers to a hose length of approx. 2 m

## Suction Plates SPK

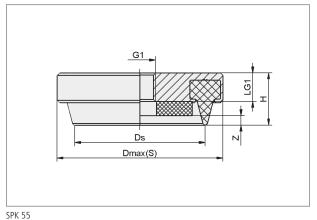
Suction area (Ø) from 55 mm to 250 mm

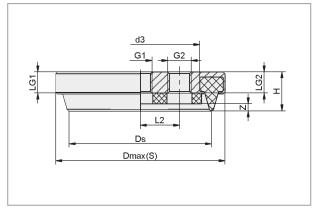


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### **Design Data Suction Plates SPK**





SPK 80 to 250

Туре	Dimension	ns in mm*								
	d3	Dmax(S)**	Ds	G1	G2***	Н	LG1	LG2	L2	Z (Stroke)
SPK 55 MOS EPDM-15 G1/4-IG	-	70.0	55	G1/4"-F	-	22.0	11.5	-	-	4
SPK 80 MOS EPDM-15 G1/4-IG	66.8	95.2	80	G1/4"-F	G1/4"-F	22.0	11.5	11.5	22.0	4
SPK 110 MOS EPDM-15 G1/2-IG	96.0	130.0	110	G1/2"-F	G1/4"-F	25.5	14.5	14.5	36.5	6
SPK 160 MOS EPDM-15 G1/2-IG	148.0	179.0	159	G1/2"-F	G1/4"-F	25.5	14.5	14.5	36.5	6
SPK 200 MOS EPDM-15 G1/2-IG	185.0	219.0	199	G1/2"-F	G1/2"-F	25.5	14.5	14.5	76.0	6
SPK 250 MOS EPDM-15 G1/2-IG	235.0	269.0	249	G1/2"-F	G1/2"-F	25.5	14.5	14.5	76.0	6

<sup>\*</sup>Acceptable dimensional tolerances for rubber sealings concerning to DIN 3302-1 M3

 $<sup>{}^{\</sup>star\star}\textsc{External}$  dimension of the suction cup when it is pressed against the workpiece by the vacuum

<sup>\*\*\*</sup>A plug is fitted in this connection in the factory

## Flat Suction Cups SGON

Suction area (LxW) from 4 x 2 mm to 90 x 30 mm





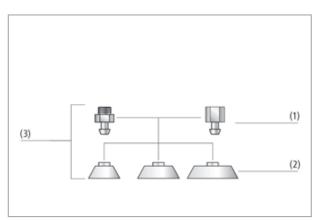
### Suitable for Industry Specific Applications



Flat suction cups SGON

### **Applications**

- Oval and flat suction cup for handling of narrow workpieces, including curved objects, such as sections, pipes, packaging
- Handling of frame elements, such as doors and windows
- Considerably higher suction force than round, flat suction cups when handling narrow workpieces



System design flat suction cups SGON

### Design

- Robust, wear-resistant suction cup SGON (3) with single sealing lip, consisting of suction cup SGO (2) and connection nipple (1)
- Nipple plugged into cup
- Cups of the size 24x8 mm and larger are additionally secured with a two-ear clamp to prevent rotation
- Within each nipple family, the replacement cups and nipples can be combined as desired



Flat suction cups SGON being used for handling blister packaging

### Our Highlights...

- · Oval, flat suction cup
- Cups of the size 24x8 mm and larger additionally secured with a two-ear clamp
- Optimum shape
- Supports on the bottom

### Your Benefits...

- > For long (sections, pipes) or flat workpieces with bars
- > Protection against unwanted rotation during use
- > High suction force in spite of small dimensions
- > No permanent deformation of thin-walled workpieces

## Flat Suction Cups SGON

Suction area (LxW) from 4 x 2 mm to 90 x 30 mm



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## **Designation Code Flat Suction Cups SGON**

Abbreviated designation	Suction area LxW in mm	Material and Shore hardness	Connection thread
Example SGON 30x10 SI-60 G1/8-IG:			
SGON	30x10	SI-60	G1/8-IG
SGON	4x2	HT1-60	M3-AG $(AG = male(M))$
	to	NBR-55	M5-AG
	90x30	NBR-60	M5-IG (IG = female (F))
		NBR-70	G1/8-AG
		NBR-AS-55 (antistatic)	G1/8-IG
		NBR-AS-60 (antistatic)	G1/4-AG
		SI-60	G1/4-IG
		SI-65	
		SI-70	



### **Ordering Data Flat Suction Cups SGON**

Suction cup SGON (elastomer part + connection nipple) is delivered unassembled. The delivery consists of:

- Suction cup of type SGO elastomer part, available in various dimensions (LxW) and materials
- Connection nipple of type SA-NIP available with various threads
- cups of the size 24 x 8 mm and larger are delivered with a two-ear clamp

Available spare parts: suction cup SGO, connection nipple SA-NIP, two-ear clamp

# Flat Suction Cups SGON

Suction area (LxW) from 4 x 2 mm to 90 x 30 mm



### Flat Suction Cups SGON

Туре	Suction cup material * / hardness in Shore A					
	HT1-60	NBR-55	NBR-60	NBR-70	NBR-AS-55	
SGON 4x2 M3-AG	10.01.05.00404	-	10.01.01.00564	-	-	
SGON 7x3.5 M3-AG	10.01.05.00405	-	10.01.01.00489	-	-	
SGON 12x4 M5-AG	10.01.05.00406	10.01.05.00236	-	-	10.01.05.00238	
SGON 15x5 M5-AG	10.01.05.00407	-	10.01.05.00106	-	-	
SGON 15x5 M5-IG	10.01.05.00418	-	10.01.05.00105	-	-	
SGON 18x6 M5-AG	10.01.05.00408	-	10.01.05.00104	-	-	
SGON 18x6 M5-IG	10.01.05.00419	-	10.01.05.00103	-	-	
SGON 24x8 G1/8-AG	10.01.05.00409	-	10.01.05.00102	-	-	
SGON 24x8 G1/8-IG	10.01.05.00420	-	10.01.05.00101	-	-	
SGON 30x10 G1/8-AG	10.01.05.00410	-	10.01.05.00100	-	-	
SGON 30x10 G1/8-IG	10.01.05.00421	-	10.01.05.00099	-	-	
SGON 45x15 G1/4-AG	10.01.05.00411	-	10.01.05.00098	-	-	
SGON 45x15 G1/4-IG	10.01.05.00422	-	10.01.05.00097	-	-	
SGON 60x20 G1/4-AG	10.01.05.00412	-	10.01.05.00096	-	-	
SGON 60x20 G1/4-IG	10.01.05.00423	-	10.01.05.00095	-	-	
SGON 75x25 G1/4-AG	10.01.05.00413	-	10.01.05.00094	-	-	
SGON 75x25 G1/4-IG	10.01.05.00424	-	10.01.05.00093	-	-	
SGON 90x30 G1/4-AG	-	-	-	10.01.05.00092	-	
SGON 90x30 G1/4-IG	-	-	-	10.01.05.00091	-	

<sup>\*</sup>Additional material specifications at beginning of the section "Vacuum Suction Cups"

Туре	Suction cup material * / hardness in Shore A					
	NBR-AS-60	SI-60	SI-65	SI-70		
SGON 4x2 M3-AG	-	10.01.01.00565	-	-		
SGON 7x3.5 M3-AG	10.01.05.00228	10.01.01.00567	-	-		
SGON 12x4 M5-AG	-	-	10.01.01.00221	-		
SGON 15x5 M5-AG	10.01.05.00229	10.01.05.00120	-	-		
SGON 15x5 M5-IG	-	10.01.05.00119	-	-		
SGON 18x6 M5-AG	10.01.05.00230	10.01.05.00118	-	-		
SGON 18x6 M5-IG	-	10.01.05.00117	-	-		
SGON 24x8 G1/8-AG	10.01.05.00231	10.01.05.00088	-	-		
SGON 24x8 G1/8-IG	-	10.01.05.00087	-	-		
SGON 30x10 G1/8-AG	-	10.01.05.00116	-	-		
SGON 30x10 G1/8-IG	-	10.01.05.00115	-	-		
SGON 45x15 G1/4-AG	-	10.01.05.00114	-	-		
SGON 45x15 G1/4-IG	-	10.01.05.00113	-	-		
SGON 60x20 G1/4-AG	-	10.01.05.00112	-	-		
SGON 60x20 G1/4-IG	-	10.01.05.00111	-	-		
SGON 75x25 G1/4-AG	-	10.01.05.00110	-	-		
SGON 75x25 G1/4-IG	-	10.01.05.00109	-	-		
SGON 90x30 G1/4-AG	-	-	-	10.01.05.00108		
SGON 90x30 G1/4-IG	-	-	-	10.01.05.00107		

 $<sup>{}^{\</sup>star} \text{Additional material specifications at beginning of the section "Vacuum Suction Cups"}$ 

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# Flat Suction Cups SGON

Suction area (LxW) from 4 x 2 mm to 90 x 30 mm



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### **Ordering Data Spare Parts Flat Suction Cups**

Туре	Suction cup material * / l	hardness in Shore A			
	FPM-50	HT1-60	NBR-55	NBR-60	NBR-70
SGO 4x2	-	10.01.05.00426	-	10.01.01.00456	-
SGO 7x3.5	-	10.01.05.00427	-	10.01.01.00488	-
SGO 12x4	-	10.01.05.00428	10.01.05.00235	-	-
SGO 15x5	-	10.01.05.00429	-	10.01.05.00071	-
SGO 18x6	-	10.01.05.00430	-	10.01.05.00072	-
SGO 24x8	-	10.01.05.00437	-	10.01.05.00151	-
SGO 30x10	10.01.05.00848	10.01.05.00438	-	10.01.05.00152	-
SGO 45x15	-	10.01.05.00439	-	10.01.05.00153	-
SGO 60x20	-	10.01.05.00440	-	10.01.05.00154	-
SGO 75x25	-	10.01.05.00441	-	10.01.05.00155	-
SGO 90x30	-	-	-	-	10.01.05.00156

<sup>\*</sup>Additional material specifications at beginning of the section "Vacuum Suction Cups"

Туре	Suction cup material * / hardness in Shore A							
	NBR-AS-55	NBR-AS-60	SI-60	SI-65	SI-70			
SGO 4x2	-	-	10.01.01.00463	-	-			
SGO 7x3.5	-	10.01.05.00224	10.01.01.00464	-	-			
SGO 12x4	10.01.05.00237	-	-	10.01.01.00222	-			
SGO 15x5	-	10.01.05.00225	10.01.05.00079	-	-			
SGO 18x6	-	10.01.05.00226	10.01.05.00080	-	-			
SGO 24x8	-	10.01.05.00739	10.01.05.00157	-	-			
SGO 30x10	-	-	10.01.05.00158	-	-			
SGO 45x15	-	-	10.01.05.00159	-	-			
SGO 60x20	-	-	10.01.05.00160	-	-			
SGO 75x25	-	-	10.01.05.00161	-	-			
SGO 90x30	-	-	-	-	10.01.05.00162			

<sup>\*</sup>Additional material specifications at beginning of the section "Vacuum Suction Cups"

### **Ordering Data Spare Parts Suction Cup Nipples**

Туре	Connection nipples [AG]		Connection nipples [IG	i]	two-ear clamp*	
SGON 4x2 M3	SA-NIP N003 M3-AG	10.01.01.00316	-	-	-	-
SGON 7x3.5 M3	SA-NIP N003 M3-AG	10.01.01.00316	-	-	-	-
SGON 12x4 M5	SA-NIP N020 M5-AG	10.01.01.00312	-	-	-	-
SGON 15x5 M5	SA-NIP N021 M5-AG	10.01.05.00126	SA-NIP N021 M5-IG	10.01.05.00125	-	-
SGON 18x6 M5	SA-NIP N021 M5-AG	10.01.05.00126	SA-NIP N021 M5-IG	10.01.05.00125	-	-
SGON 24x8 G1/8	SA-NIP N022 G1/8-AG	10.01.05.00124	SA-NIP N022 G1/8-IG	10.01.05.00123	ZOKL 11-13	10.07.10.00032
SGON 30x10 G1/8	SA-NIP N022 G1/8-AG	10.01.05.00124	SA-NIP N022 G1/8-IG	10.01.05.00123	ZOKL 11-13	10.07.10.00032
SGON 45x15 G1/4	SA-NIP N023 G1/4-AG	10.01.05.00122	SA-NIP N023 G1/4-IG	10.01.05.00121	ZOKL 15-18	10.07.10.00033
SGON 60x20 G1/4	SA-NIP N023 G1/4-AG	10.01.05.00122	SA-NIP N023 G1/4-IG	10.01.05.00121	ZOKL 15-18	10.07.10.00033
SGON 75x25 G1/4	SA-NIP N023 G1/4-AG	10.01.05.00122	SA-NIP N023 G1/4-IG	10.01.05.00121	ZOKL 15-18	10.07.10.00033
SGON 90x30 G1/4	SA-NIP N023 G1/4-AG	10.01.05.00122	SA-NIP N023 G1/4-IG	10.01.05.00121	ZOKL 15-18	10.07.10.00033

<sup>\*</sup>In the case of replacement cup SGO, the two-ear terminal is included

# Flat Suction Cups SGON

Suction area (LxW) from 4 x 2 mm to 90 x 30 mm



### **Technical Data Flat Suction Cups SGON**

Туре	Suction force [N]*	Volume [cm³]	Min. curve radius [mm] (convex)	Recommended inter- nal hose diameter d [mm]**	Nipple family
SGON 4x2	0.42	0.018	1	2	N 003
SGON 7x3.5	1.00	0.029	3	2	N 003
SGON 12x4	1.80	0.173	3	2	N 020
SGON 15x5	3.10	0.175	4	2	N 021
SGON 18x6	4.50	0.205	4	2	N 021
SGON 24x8	8.00	0.327	8	4	N 022
SGON 30x10	12.20	0.516	8	4	N 022
SGON 45x15	28.20	2.306	10	6	N 023
SGON 60x20	50.10	3.611	20	6	N 023
SGON 75x25	78.30	5.860	30	6	N 023
SGON 90x30	112.60	9.473	35	6	N 023

<sup>\*</sup>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

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 $<sup>\</sup>ensuremath{^{**}}\xspace$  The recommended hose diameter refers to a hose length of approx. 2 m

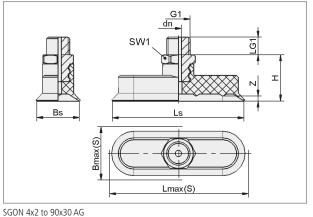
# Flat Suction Cups SGON

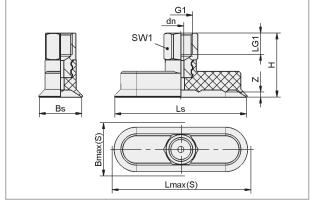
Suction area (LxW) from 4 x 2 mm to 90 x 30 mm



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# **Design Data Flat Suction Cups SGON**





SGON 15x5 to 90x30 IG

Туре	Dimensions i	n mm*								
	Bmax(S)**	Bs	dn	G1	Н	LG1	Lmax(S)**	Ls	SW1	Z (Stroke)
SGON 4x2 M3-AG	2.5	2.0	1.0	M3-M	8	3.0	4.5	4.0	5	0.5
SGON 7x3.5 M3-AG	4.5	3.5	1.0	M3-M	8	3.0	7.5	7.0	5	8.0
SGON 12x4 M5-AG	5.0	3.9	1.5	M5-M	18	4.5	13.0	11.9	8	0.5
SGON 15x5 M5-AG	5.5	5.0	2.0	M5-M	17	5.0	15.5	15.0	8	0.7
SGON 15x5 M5-IG	5.5	5.0	2.0	M5-F	22	5.5	15.5	15.0	8	0.7
SGON 18x6 M5-AG	7.0	6.0	2.0	M5-M	17	5.0	18.5	18.0	8	8.0
SGON 18x6 M5-IG	7.0	6.0	2.0	M5-F	22	5.5	18.5	18.0	8	8.0
SGON 24x8 G1/8-AG	9.0	8.0	3.5	G1/8"-M	17	8.0	24.5	24.0	14	1.0
SGON 24x8 G1/8-IG	9.0	8.0	3.5	G1/8"-F	25	9.0	24.5	24.0	14	1.0
SGON 30x10 G1/8-AG	11.5	9.4	3.5	G1/8"-M	17	8.0	30.5	29.4	14	1.5
SGON 30x10 G1/8-IG	11.5	9.4	3.5	G1/8"-F	25	9.0	30.5	29.4	14	1.5
SGON 45x15 G1/4-AG	16.5	14.4	3.5	G1/4"-M	26	10.0	46.0	44.4	17	2.0
SGON 45x15 G1/4-IG	16.5	14.4	3.5	G1/4"-F	36	12.0	46.0	44.4	17	2.0
SGON 60x20 G1/4-AG	22.0	19.0	3.5	G1/4"-M	26	10.0	61.0	59.0	17	2.5
SGON 60x20 G1/4-IG	22.0	20.0	3.5	G1/4"-F	36	12.0	61.0	60.0	17	2.5
SGON 75x25 G1/4-AG	27.5	25.0	3.5	G1/4"-M	26	10.0	77.0	75.0	17	2.8
SGON 75x25 G1/4-IG	27.5	25.0	3.5	G1/4"-F	36	12.0	77.0	75.0	17	2.8
SGON 90x30 G1/4-AG	33.0	30.0	3.5	G1/4"-M	26	10.0	92.5	90.0	17	3.5
SGON 90x30 G1/4-IG	33.0	30.0	3.5	G1/4"-F	36	12.0	92.5	90.0	17	3.5

<sup>\*</sup>Acceptable dimensional tolerances for rubber parts concerning to DIN ISO 3302-1 M3

 $<sup>^{\</sup>star\star}\text{External}$  dimension of the suction cup when it is pressed against the workpiece by the vacuum

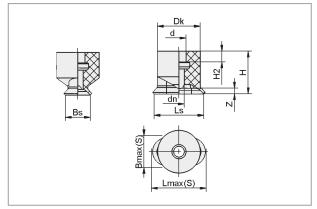
# Flat Suction Cups SGON

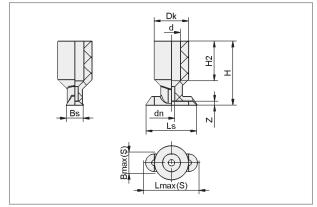
Suction area (LxW) from 4 x 2 mm to 90 x 30 mm



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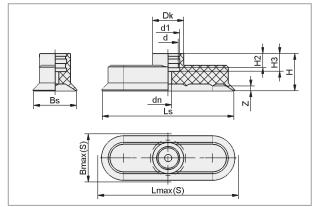
### Design Data Flat Suction Cups SGO - Spare Parts for SGON





SGO 4x2 and 7x3.5

SGO 12x4



SGO 15x5 to 90x30

Туре	Dimensions i	in mm*										
	Bmax(S)**	Bs	d	dn	d1	Dk	Н	H2	Н3	Lmax(S)**	Ls	Z (Stroke)
SGO 4x2	2.5	2.0	2.0	1.2	-	6.0	6	1.5	-	4.5	4.0	0.5
SGO 7x3.5	4.5	3.5	2.0	1.5	-	6.0	6	1.5	-	7.5	7.0	0.8
SGO 12x4	5.0	4.0	4.2	1.5	-	8.0	15	9.3	-	13.0	12.0	0.5
SGO 15x5	5.5	4.6	4.5	1.2	6	8.5	12	3.0	5.5	15.5	14.6	0.7
SGO 18x6	7.0	5.6	4.5	1.5	6	8.5	12	3.0	5.5	18.5	17.6	0.8
SGO 24x8	9.0	7.6	5.5	1.5	7	11.5	12	3.0	5.5	24.5	23.6	1.0
SGO 30x10	11.5	9.4	5.5	2.5	7	11.5	12	3.0	5.5	30.5	29.4	1.5
SGO 45x15	16.5	14.4	11.5	3.0	13	15.5	21	8.0	10.0	46.0	44.4	2.0
SGO 60x20	22.0	19.0	11.5	4.0	13	15.5	21	8.0	10.0	61.0	59.0	2.5
SGO 75x25	27.5	24.0	11.5	4.0	13	17.5	21	8.0	10.0	77.0	74.0	2.8
SGO 90x30	33.0	29.0	11.5	4.0	13	17.5	21	8.0	10.0	92.5	89.0	3.5

<sup>\*</sup>Acceptable dimensional tolerances for rubber parts concerning to DIN ISO 3302-1 M3

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<sup>\*\*</sup>External dimension of the suction cup when it is pressed against the workpiece by the vacuum

### Suction Plates SPLO



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Suction area (LxW) from 60 x 20 mm to 370 x 80 mm





### Suitable for Industry Specific Applications



Suction plates SPLO

# **Applications**

- Oval suction plate for handling of long, narrow workpieces such as sections or door and window frames
- Considerably higher suction force than round, flat suction cups with long, narrow workpieces
- SPLO 100x32-TV and SPLO 300x100-TV available with touch valve to detect presence of workpieces
- SPLO 100x30 to SPLO 300x100 with long sealing lip for handling very curved workpieces



Suction plates SPLO mounted on a manually guided vacuum lifting device

### Design

- Robust and wear-resistant suction plate with single sealing lip
- Sealing lip vulcanized to support plate
- SPLO 100x32-TV and SPLO 300x100-TV with touch valve
- · Sealing lip made of NBR for minimum marking of workpieces



Suction plates SPLO being used for handling wooden doors

### Our Highlights...

- Oval, flat suction plate
- Support plate made of steel/ aluminum with sealing lip vulcanized to it
- Sealing lip made of NBR
- Various sizes and shapes
- Supports on the bottom

### Your Benefits...

- > Handling of long, narrow workpieces, also curved workpieces (such as sections)
- > Capable of handling heavy loads; flexible mounting facilities
- > Little marking, even of sensitive surfaces
- > Wide range of cups for many different workpieces
- > No permanent deformation of thin-walled workpieces

## Suction Plates SPLO

Suction area (LxW) from 60 x 20 mm to 370 x 80 mm



### **Designation Code Suction Plates SPLO**

Abbreviated designation	Suction area LxW in mm	Material and Shore hardness	Connection thread	Product addition
Example SPLO 60x20 NBR-55 G1/8-IG: SPLO	60x20	NBR-55	G1/8-IG	
SPLO	60x20 to 370x80	NBR-55	G1/8-IG (IG = female (F)) G1/4-IG	TV touch valve



### **Ordering Data Suction Plates SPLO**

Suction plate SPLO, available in various diameters and optional with touch valve, is delivered with support plate vulcanized to elastomer

### **Suction Plates SPLO**

Type*	Part Number
SPLO 60x20 NBR-55 G1/8-IG	10.01.05.00001
SPLO 100x32 NBR-55 G1/4-IG	10.01.05.00002
SPLO 100x32 NBR-55 TV	10.01.05.00003
SPLO 100x30 NBR-55	10.01.05.00182
SPLO 200x30 NBR-55	10.01.05.00183
SPLO 300x30 NBR-55	10.01.05.00184
SPLO 150x55 NBR-55	10.01.05.00046
SPLO 200x55 NBR-55	10.01.05.00004
SPLO 250x55 NBR-55	10.01.05.00186
SPLO 300x55 NBR-55	10.01.05.00187
SPLO 300x100 NBR-55	10.01.05.00050
SPLO 300x100 NBR-55 TV	10.01.05.00188
SPLO 370x80 NBR-55	10.01.05.00006

<sup>\*</sup>Additional material specifications at beginning of the section "Vacuum Suction Cups"

### **Technical Data Suction Plates SPLO**

Туре	Suction force [N]*	Volume [cm³]	Min. curve radius [mm] (convex)
SPLO 60x20 NBR-55 G1/8-IG	50	3	15
SPLO 100x32 NBR-55 G1/4-IG	134	11	50
SPLO 100x32 NBR-55 TV	134	11	50
SPLO 100x30 NBR-55	126	10	25
SPLO 200x30 NBR-55	260	24	30
SPLO 300x30 NBR-55	400	32	30
SPLO 150x55 NBR-55	340	60	75
SPLO 200x55 NBR-55	465	80	50
SPLO 250x55 NBR-55	590	83	50
SPLO 300x55 NBR-55	710	93	50
SPLO 300x100 NBR-55	1250	256	175
SPLO 300x100 NBR-55 TV	1250	256	175
SPLO 370x80 NBR-55	1270	194	100

<sup>\*</sup>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

Vacuum Vacuum Suction Cups Knowledge

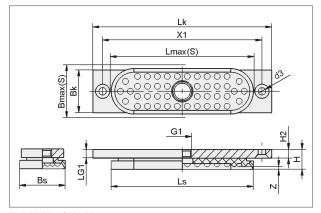
## Suction Plates SPLO

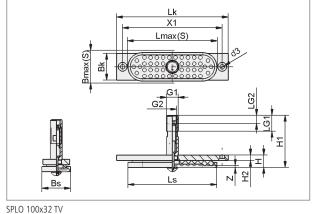
Suction area (LxW) from 60 x 20 mm to 370 x 80 mm



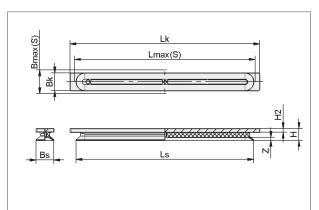


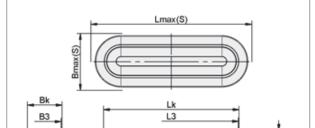
### **Design Data Suction Plates SPLO**



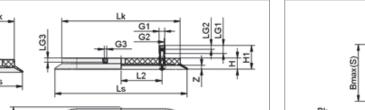


SPLO 60x20 and 100x32

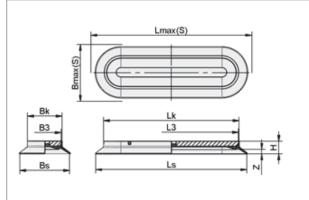




SPLO 100x30, 200x30 and 300x30



SPLO 150x55, 200x55, 250x55, 300x55 and 370x80



SPLO 300x100 TV

Lmax(S)

# **Flat Suction Cups (Oval)**

### Suction Plates SPLO

Suction area (LxW) from 60 x 20 mm to 370 x 80 mm



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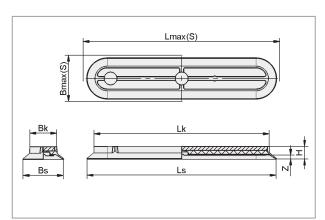
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SPLO 370x80

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### **Design Data Suction Plates SPLO**

Туре	Dimensio	ns in mm*									
	Bk	Bmax(S)**	Bs	В3	d3	G1	G2	G3	Н	H1	H2
SPLO 60x20 NBR-55 G1/8-IG	20.0	21.0	19.0	-	4.5	G1/8"-F	-	-	12.5	-	6
SPLO 100x32 NBR-55 G1/4-IG	30.0	34.0	27.0	-	5.3	G1/4"-F	-	-	14.0	-	6
SPLO 100x32 NBR-55 TV	30.0	34.0	32.0	-	5.3	G1/4"-M	G1/8"-F	-	14.0	54.0	6
SPLO 100x30 NBR-55	30.0	33.5	29.3	-	-	-	-	-	20.0	-	6
SPLO 200x30 NBR-55	30.0	32.0	29.2	-	-	-	-	-	20.0	-	6
SPLO 300x30 NBR-55	30.0	33.0	30.0	-	-	-	-	-	20.0	-	6
SPLO 150x55 NBR-55	32.0	61.0	52.3	29.0	-	-	-	-	19.4	-	-
SPLO 200x55 NBR-55	31.0	62.0	50.7	26.0	-	-	-	-	22.0	-	-
SPLO 250x55 NBR-55	31.5	58.0	47.6	29.0	-	-	-	-	22.0	-	-
SPLO 300x55 NBR-55	31.0	60.0	51.4	28.0	-	-	-	-	19.0	-	-
SPLO 300x100 NBR-55	67.7	108.0	98.0	65.0	-	-	-	-	25.0	-	-
SPLO 300x100 NBR-55 TV	67.7	108.0	98.0	65.0	-	G1/4"-M	G1/8"-F	M6-F	25.0	53.5	-
SPLO 370x80 NBR-55	53.0	86.0	79.4	45.0	-	-	-	-	25.0	-	-

<sup>\*</sup>Acceptable dimensional tolerances for rubber parts concerning to DIN ISO 3302-1 M3

<sup>\*\*</sup>External dimension of the suction cup when it is pressed against the workpiece by the vacuum

Туре	Dimensio	ns in mm*	+								
	LG1	LG2	LG3	Lk	Lmax(S)**	Ls	L2	L3	X1	Y1	Z (Stroke)
SPLO 60x20 NBR-55 G1/8-IG	6	-	-	75.0	61.0	59.0	-	-	65	-	1
SPLO 100x32 NBR-55 G1/4-IG	6	-	-	125.8	102.0	100.0	-	-	112	-	2
SPLO 100x32 NBR-55 TV	18	9	-	125.8	125.8	100.0	-	-	112	-	2
SPLO 100x30 NBR-55	-	-	-	120.0	120.0	98.6	-	-	-	-	5
SPLO 200x30 NBR-55	-	-	-	220.0	203.0	200.0	-	-	-	-	5
SPLO 300x30 NBR-55	-	-	-	320.0	304.0	300.0	-	-	-	-	5
SPLO 150x55 NBR-55	-	-	-	126.5	157.0	147.0	-	124.0	-	-	8
SPLO 200x55 NBR-55	-	-	-	178.0	208.0	197.7	-	171.0	-	-	8
SPLO 250x55 NBR-55	-	-	-	226.0	255.0	243.0	-	224.5	-	-	8
SPLO 300x55 NBR-55	-	-	-	277.0	305.0	296.4	-	273.0	-	-	7
SPLO 300x100 NBR-55	-	-	-	266.7	308.0	297.0	-	264.0	-	-	9
SPLO 300x100 NBR-55 TV	13	10	9	266.7	308.0	297.0	92.0	264.0	70	40.0	9
SPLO 370x80 NBR-55	-	-	-	344.9	376.0	372.4	-	338.0	-	-	8

<sup>\*</sup>Acceptable dimensional tolerances for rubber parts concerning to DIN ISO 3302-1 M3

 $<sup>\</sup>ensuremath{^{\star\star}}\xspace$  External dimension of the suction cup when it is pressed against the workpiece by the vacuum

### Bellows Suction Cups FSGA (1.5 Folds)

Suction area (Ø) from 6 mm to 78 mm



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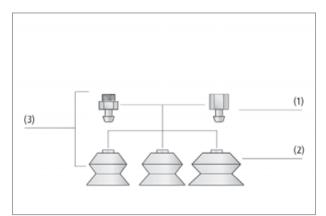
### Suitable for Industry Specific Applications



Bellows suction cups FSGA (1.5 folds)

# **Applications**

- Round, bellows suction cup with 1.5 folds for handling of extremely sensitive workpieces (optimum damping effect due to folds and smooth sealing lip)
- Handling of workpieces with uneven surfaces, such as pipes (folds permit optimal adaptation to concave and convex surfaces)



System design bellows suction cups FSGA (1.5 folds)

### Design

- Robust, wear-resistant suction cup FSGA (3) with single sealing lip, consisting of suction cup FGA (2) with 1.5 folds and connection nipple (1)
- All nipples are plugged in
- Suction cups with a diameter of 25 mm or more with supports on
- With each nipple family, the replacement cups and nipples can be combined as desired



Bellows suction cups FSGA being used for handling cardboard boxes

### Our Highlights...

- Wide range of diameters and materials
- Soft, tapered sealing lip
- 1.5 folds
- Very stiff top fold
- Supports on the bottom (diameter > 25 mm)

- > For a wide range of different workpieces
- > Very good adaptation to curved or uneven workpiece surfaces
- > High suction force and optimum damping effect during placement on workpieces
- > Good resistance to horizontal forces at high acceleration values
- > No permanent deformation of thin-walled workpieces

### Bellows Suction Cups FSGA (1.5 Folds)

Suction area (Ø) from 6 mm to 78 mm





### Designation Code Bellows Suction Cups FSGA (1.5 Folds)

Abbreviated designation	Suction area Ø in mm	Material and Shore hardness	Connection thread
Example FSGA 14 HT1-60 G1/8-IG:			
FSGA	14	HT1-60	G1/8-IG
FSGA	6	HT1-60	M5-AG $(AG = male(M))$
	to	NBR-55	G1/8-AG
	78	NK-45	G1/8-IG (IG = female (F))
		SI-55	G1/4-AG
			G1/4-IG



### Ordering Data Bellows Suction Cups FSGA (1.5 Folds)

Suction cup FSGA (elastomer part + connection nipple) is delivered unassembled (diameters of 33 mm and more are assembled). The delivery consists of:

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

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

### **Bellows Suction Cups FSGA (1.5 Folds)**

Туре	Suction cup material * / hardr	ness in Shore A		
	HT1-60	NBR-55	NK-45	SI-55
FSGA 6 M5-AG	10.01.06.02996	10.01.06.02994	-	10.01.06.02995
FSGA 6 M5-IG	10.01.06.03000	10.01.06.02998	-	10.01.06.02999
FSGA 11 G1/8-AG	10.01.06.01226	10.01.06.00075	10.01.06.00408	10.01.06.00085
FSGA 11 G1/8-IG	10.01.06.01232	10.01.06.00061	10.01.06.00407	10.01.06.00068
FSGA 11 M5-AG	10.01.06.01227	10.01.06.00076	10.01.06.00406	10.01.06.00086
FSGA 14 G1/8-AG	10.01.06.00932	10.01.06.00381	10.01.06.00387	10.01.06.00384
FSGA 14 G1/8-IG	10.01.06.00948	10.01.06.00380	10.01.06.00386	10.01.06.00383
FSGA 14 M5-AG	10.01.06.00933	10.01.06.00379	10.01.06.00385	10.01.06.00382
FSGA 16 G1/8-AG	10.01.06.01228	10.01.06.00077	10.01.06.00411	10.01.06.00087
FSGA 16 G1/8-IG	10.01.06.01233	10.01.06.00062	10.01.06.00410	10.01.06.00069
FSGA 16 M5-AG	10.01.06.01229	10.01.06.00078	10.01.06.00409	10.01.06.00088
FSGA 20 G1/8-AG	10.01.06.00936	10.01.06.00390	10.01.06.00396	10.01.06.00393
FSGA 20 G1/8-IG	10.01.06.00952	10.01.06.00389	10.01.06.00395	10.01.06.00392
FSGA 20 M5-AG	10.01.06.00937	10.01.06.00388	10.01.06.00394	10.01.06.00391
FSGA 22 G1/8-AG	10.01.06.01230	10.01.06.00079	10.01.06.00414	10.01.06.00089
FSGA 22 G1/8-IG	10.01.06.01234	10.01.06.00063	10.01.06.00413	10.01.06.00070
FSGA 22 M5-AG	10.01.06.01231	10.01.06.00080	10.01.06.00412	10.01.06.00090
FSGA 25 G1/8-AG	10.01.06.00940	10.01.06.00399	10.01.06.00405	10.01.06.00402
FSGA 25 G1/8-IG	10.01.06.00956	10.01.06.00398	10.01.06.00404	10.01.06.00401
FSGA 33 G1/4-AG	10.01.06.00941	10.01.06.00081	10.01.06.00330	10.01.06.00091
FSGA 33 G1/4-IG	10.01.06.00957	10.01.06.00064	10.01.06.00415	10.01.06.00071
FSGA 43 G1/4-AG	10.01.06.00942	10.01.06.00082	10.01.06.00418	10.01.06.00092
FSGA 43 G1/4-IG	10.01.06.00958	10.01.06.00065	10.01.06.00417	10.01.06.00072
FSGA 53 G1/4-AG	10.01.06.00943	10.01.06.00083	10.01.06.00326	10.01.06.00093
FSGA 53 G1/4-IG	10.01.06.00977	10.01.06.00066	10.01.06.00419	10.01.06.00073
FSGA 63 G1/4-AG	10.01.06.02476	10.01.06.00685	10.01.06.00687	10.01.06.00686
FSGA 63 G1/4-IG	10.01.06.02477	10.01.06.00691	10.01.06.00693	10.01.06.00692
FSGA 78 G1/4-AG	10.01.06.02478	10.01.06.00084	10.01.06.00340	10.01.06.00094
FSGA 78 G1/4-IG	10.01.06.02479	10.01.06.00067	10.01.06.00421	10.01.06.00074

<sup>\*</sup>Additional material specifications at beginning of the section "Vacuum Suction Cups"

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Suction area (Ø) from 6 mm to 78 mm



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### **Ordering Data Spare Parts Bellows Suction Cups**

Туре	Suction cup material * / hardnes	Suction cup material * / hardness in Shore A							
	HT1-60	NBR-55	NK-45	SI-55					
FGA 6	10.01.06.02603	10.01.06.02981	-	10.01.06.01571					
FGA 11	10.01.06.01247	10.01.06.00095	10.01.06.00423	10.01.06.00098					
FGA 14	10.01.06.00868	10.01.06.00370	10.01.06.00372	10.01.06.00371					
FGA 16	10.01.06.01248	10.01.06.00096	10.01.06.00424	10.01.06.00099					
FGA 20	10.01.06.00870	10.01.06.00373	10.01.06.00375	10.01.06.00374					
FGA 22	10.01.06.01249	10.01.06.00097	10.01.06.00425	10.01.06.00100					
FGA 25	10.01.06.00872	10.01.06.00376	10.01.06.00378	10.01.06.00377					
FGA 33	10.01.06.00873	10.01.06.00130	10.01.06.00426	10.01.06.00126					
FGA 43	10.01.06.00874	10.01.06.00131	10.01.06.00427	10.01.06.00127					
FGA 53	10.01.06.00875	10.01.06.00132	10.01.06.00428	10.01.06.00128					
FGA 63	10.01.06.02473	10.01.06.00688	10.01.06.00690	10.01.06.00689					
FGA 78	10.01.06.02474	10.01.06.00133	10.01.06.00429	10.01.06.00129					

<sup>\*</sup>Additional material specifications at beginning of the section "Vacuum Suction Cups"

### **Ordering Data Spare Parts Connection Nipples**

Туре	Connection nipples [AG]		Connection nipples [IG]	
FSGA 6 M5	SA-NIP N004 M5-AG	10.01.01.03526	SA-NIP N004 M5-IG	10.01.01.03518
FSGA 11 M5	SA-NIP N016 M5-AG	10.01.06.00123	-	-
FSGA 11 G1/8	SA-NIP N016 G1/8-AG	10.01.06.05735	SA-NIP N016 G1/8-IG	10.01.06.05731
FSGA 14 M5	SA-NIP N016 M5-AG	10.01.06.00123	-	-
FSGA 14 G1/8	SA-NIP N016 G1/8-AG	10.01.06.05735	SA-NIP N016 G1/8-IG	10.01.06.05731
FSGA 16 M5	SA-NIP N016 M5-AG	10.01.06.00123	-	-
FSGA 16 G1/8	SA-NIP N016 G1/8-AG	10.01.06.05735	SA-NIP N016 G1/8-IG	10.01.06.05731
FSGA 20 M5	SA-NIP N016 M5-AG	10.01.06.00123	-	-
FSGA 20 G1/8	SA-NIP N016 G1/8-AG	10.01.06.05735	SA-NIP N016 G1/8-IG	10.01.06.05731
FSGA 22 M5	SA-NIP N016 M5-AG	10.01.06.00123	-	-
FSGA 22 G1/8	SA-NIP N016 G1/8-AG	10.01.06.05735	SA-NIP N016 G1/8-IG	10.01.06.05731
FSGA 25 G1/8	SA-NIP N016 G1/8-AG	10.01.06.05735	SA-NIP N016 G1/8-IG	10.01.06.05731
FSGA 33 G1/4	SA-NIP N018 G1/4-AG	10.01.06.01065	SA-NIP N018 G1/4-IG	10.01.06.01066
FSGA 43 G1/4	SA-NIP N018 G1/4-AG	10.01.06.01065	SA-NIP N018 G1/4-IG	10.01.06.01066
FSGA 53 G1/4	SA-NIP N018 G1/4-AG	10.01.06.01065	SA-NIP N018 G1/4-IG	10.01.06.01066
FSGA 63 G1/4	SA-NIP N018 G1/4-AG	10.01.06.01065	SA-NIP N018 G1/4-IG	10.01.06.01066
FSGA 78 G1/4	SA-NIP N019 G1/4-AG	10.01.06.01959	SA-NIP N019 G1/4-IG	10.01.06.01960



Bellows Suction Cups FSGA (1.5 Folds)

Suction area (Ø) from 6 mm to 78 mm

### Technical Data Bellows Suction Cups FSGA (1.5 Folds)

Туре	Suction force [N]*	Pull-off force [N]**	Volume [cm³]	Min. curve radius [mm] (convex)	Recommended in- ternal hose diame- ter d [mm]***	Nipple family
FSGA 6	0.40	1.4	0.111	2	4	N 004
FSGA 11	0.95	3.8	0.225	10	4	N 016
FSGA 14	1.20	5.0	0.420	13	4	N 016
FSGA 16	2.30	6.7	0.750	20	4	N 016
FSGA 20	4.70	10.7	1.150	30	4	N 016
FSGA 22	5.70	15.2	1.400	25	4	N 016
FSGA 25	5.30	17.3	3.150	20	4	N 016
FSGA 33	13.60	39.6	4.750	40	6	N 018
FSGA 43	22.80	64.5	11.445	60	6	N 018
FSGA 53	51.30	95.0	26.488	75	6	N 018
FSGA 63	85.00	135.0	43.829	75	6	N 018
FSGA 78	137.40	218.0	75.583	70	6	N 019

<sup>\*</sup>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

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 $<sup>\</sup>ensuremath{^{*}}\xspace^{*}$  The pull-off force of the versions made of natural rubber is reduced by about 40%

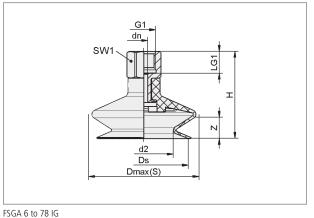
 $<sup>^{\</sup>star\,\star\,\star}\text{The}$  recommended hose diameter refers to a hose length of approx. 2 m

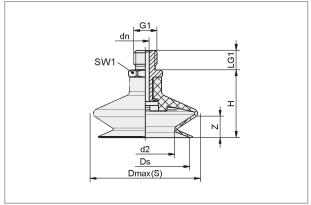
### Bellows Suction Cups FSGA (1.5 Folds)



Suction area (Ø) from 6 mm to 78 mm

### Design Data Bellows Suction Cups FSGA (1.5 Folds)





FSGA 6 to 78 AG

Туре	Dimensions in n	nm*							
	d2	dn	Dmax(S)**	Ds	G1	Н	LG1	SW1	Z (Stroke)
FSGA 6 M5-AG	3.0	2.0	8.0	5.7	M5-M	14.0	4.5	8	2
FSGA 6 M5-IG	3.0	2.0	8.0	5.7	M5-F	19.0	5.5	8	2
FSGA 11 G1/8-AG	5.1	3.5	13.0	10.4	G1/8"-M	22.0	7.5	14	4
FSGA 11 G1/8-IG	5.1	3.5	13.0	10.4	G1/8"-F	28.0	8.0	14	4
FSGA 11 M5-AG	5.1	2.5	13.0	10.4	M5-M	21.0	5.0	7	4
FSGA 14 G1/8-AG	5.0	3.5	14.5	12.5	G1/8"-M	21.5	7.5	14	5
FSGA 14 G1/8-IG	5.0	3.5	14.5	12.5	G1/8"-F	27.5	8.0	14	5
FSGA 14 M5-AG	5.0	2.5	14.5	12.5	M5-M	20.5	5.0	7	5
FSGA 16 G1/8-AG	8.4	3.5	18.5	15.6	G1/8"-M	25.2	7.5	14	7
FSGA 16 G1/8-IG	8.4	3.5	18.5	15.6	G1/8"-F	31.2	8.0	14	7
FSGA 16 M5-AG	8.4	2.5	18.5	15.6	M5-M	24.2	5.0	7	7
FSGA 20 G1/8-AG	11.0	3.5	21.0	18.1	G1/8"-M	21.2	7.5	14	5
FSGA 20 G1/8-IG	11.0	3.5	21.0	18.1	G1/8"-F	27.2	8.0	14	5
FSGA 20 M5-AG	11.0	2.5	21.0	18.1	M5-M	20.2	5.0	7	5
FSGA 22 G1/8-AG	11.7	3.5	25.0	21.5	G1/8"-M	25.0	7.5	14	6
FSGA 22 G1/8-IG	11.7	3.5	25.0	21.5	G1/8"-F	31.0	8.0	14	6
FSGA 22 M5-AG	11.7	2.5	25.0	21.5	M5-M	24.0	5.0	7	6
FSGA 25 G1/8-AG	9.9	3.5	26.5	22.5	G1/8"-M	29.0	7.5	14	9
FSGA 25 G1/8-IG	9.9	3.5	26.5	22.5	G1/8"-F	35.0	8.0	14	9
FSGA 33 G1/4-AG	17.0	4.4	38.0	30.0	G1/4"-M	31.0	11.0	17	9
FSGA 33 G1/4-IG	17.0	4.4	38.0	30.0	G1/4"-F	42.0	12.0	17	9
FSGA 43 G1/4-AG	21.9	4.4	47.5	38.0	G1/4"-M	31.6	11.0	17	10
FSGA 43 G1/4-IG	21.9	4.4	47.5	38.0	G1/4"-F	42.6	12.0	17	10
FSGA 53 G1/4-AG	33.0	4.4	60.0	50.0	G1/4"-M	38.0	11.0	17	12
FSGA 53 G1/4-IG	33.0	4.4	60.0	50.0	G1/4"-F	49.0	12.0	17	12
FSGA 63 G1/4-AG	44.5	4.4	68.0	60.0	G1/4"-M	38.0	11.0	17	14
FSGA 63 G1/4-IG	44.5	4.4	68.0	60.0	G1/4"-F	49.0	12.0	17	14
FSGA 78 G1/4-AG	54.0	8.2	84.5	74.0	G1/4"-M	53.0	11.0	21	14
FSGA 78 G1/4-IG	54.0	8.2	84.5	74.0	G1/4"-F	62.0	12.0	21	14

<sup>\*</sup>Acceptable dimensional tolerances for rubber parts concerning to DIN ISO 3302-1 M3

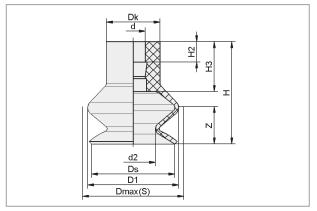
<sup>\*\*</sup>External dimension of the suction cup when it is pressed against the workpiece by the vacuum

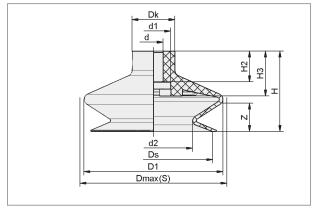
# Bellows Suction Cups FSGA (1.5 Folds)

Suction area (Ø) from 6 mm to 78 mm



### Design Data Bellows Suction Cups FGA - Spare Parts for FSGA





FGA 11 to 25

FGA 6, 33 to 78

Туре	Dimensions	in mm*									
	d	d1	d2	D1	Dk	Dmax(S)**	Ds	Н	H2	Н3	Z (Stroke)
FGA 6	3.7	5.8	3.0	7.5	7	8.0	5.7	9.0	2.0	3.2	2
FGA 11	4.5	-	5.1	12.0	10	13.0	10.4	16.0	3.8	9.3	4
FGA 14	4.5	-	5.0	13.7	10	14.5	12.5	15.5	3.8	8.5	5
FGA 16	4.5	-	8.4	17.0	10	18.5	15.6	19.2	3.8	9.4	7
FGA 20	4.5	-	11.0	19.9	10	21.0	18.1	15.2	3.8	8.7	5
FGA 22	4.5	-	11.7	24.2	10	25.0	21.5	19.0	3.8	9.1	6
FGA 25	4.5	-	9.9	25.0	10	26.5	22.5	23.0	3.8	8.9	9
FGA 33	8.0	16.0	17.0	36.0	18	38.0	30.0	27.0	13.0	14.0	9
FGA 43	8.0	14.5	21.9	45.9	18	47.5	38.0	27.6	13.0	17.1	10
FGA 53	8.0	14.5	33.0	58.6	18	60.0	50.0	34.0	13.0	19.0	12
FGA 63	8.0	14.5	44.5	67.0	18	68.0	60.0	34.0	13.0	18.8	14
FGA 78	11.8	21.8	54.0	83.0	25	84.5	74.0	47.0	19.7	31.4	14

<sup>\*</sup>Acceptable dimensional tolerances for rubber parts concerning to DIN ISO 3302-1 M3

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<sup>\*\*</sup>External dimension of the suction cup when it is pressed against the workpiece by the vacuum

### Bellows Suction Cups FSGA VU1 (1.5 Folds)

Suction area (Ø) from 30 mm to 110 mm





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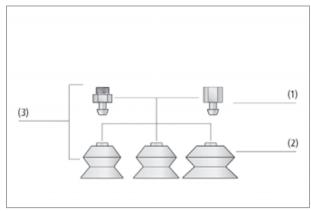
### Suitable for Industry Specific Applications



Bellows suction cups FSGA VU1 (1.5 folds)

### **Applications**

- Round bellows suction cup with 1.5 folds for hard use in multishift operations with very short cycle times
- · Handling of workpieces with very abrasive surfaces such as rough cardboard sheets
- Suction cup with special slot: for handling oily metal sheets (better resistance to lateral forces)
- Suction cup without special slot: for handling cardboard, wood and similar materials



System design bellows suction cups FSGA VU1 (1.5 folds)

### Design

- Robust, wear-resistant suction cup FSGA (3) with single sealing lip, consisting of suction cup FGA (2) (Vulkollan VU1) with 1.5 folds and connection nipple (1)
- Suction cup connected positively to nipple; no turning even when handling heavy loads
- Suction cups with supports on the bottom
- With each nipple family, the replacement cups and nipples can be combined as desired



Bellows suction cups FSGA VU1 being used for handling cardboard boxes

### Our Highlights...

- Material Vulkollan VU1 with high resistance to tearing
- Good resistance to chemicals
- Minimum abrasion: approx. 10 - 12 mm<sup>3</sup> to DIN 53516
- Supports on the bottom
- Very stiff top fold

- > Very wear-resistant suction cup for very high loads and a long lifetime
- > Unaffected by oil (handling of sheet metal)
- > Lifetime up to 20 times higher compared to standard NBR
- > No permanent deformation of thin-walled workpieces
- > Good resistance to horizontal forces at high acceleration forces

### Bellows Suction Cups FSGA VU1 (1.5 Folds)

Suction area (Ø) from 30 mm to 110 mm





### Designation Code Bellows Suction Cups FSGA VU1 (1.5 Folds)

Abbreviated designation	Suction area Ø in mm	Material and Shore hardness	Connection thread	Product addition
Example FSGA 60 VU1-72 G1/4-IG:				
FSGA	60	VU1-72	G1/4-IG	
FSGA	30	VU1-72	G1/4-AG (AG = male (M))	ON oil slot
	to		G1/4-IG (IG = female (F))	
	110		G1/2-IG	



### Ordering Data Bellows Suction Cups FSGA VU1 (1.5 Folds)

Suction cup FSGA VU1 (elastomer part + connection nipple) is delivered assembled. The assembly consists of:

- Suction cup of type FGA VU1 elastomer part, available in various diameters, optional with oil groove
- Connection nipple of type SA-NIP available with various threads

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

### **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	-	-				

<sup>\*</sup>Additional material specifications at beginning of the section "Vacuum Suction Cups"

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Suction area (Ø) from 30 mm to 110 mm



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### Ordering Data Spare Parts Bellows Suction Cups And Connection Nipples

Bellows suction cup (round)
10.01.06.00177
10.01.06.00301
10.01.06.00302
10.01.06.00178
10.01.06.00207
10.01.06.00179
10.01.06.00190
10.01.06.00492

 $<sup>^{\</sup>star}$ Additional material specifications at beginning of the section "Vacuum Suction Cups"

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Туре	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-SCHE 77 G1/2-IG FSGA	10.01.06.00593

### Technical Data Bellows Suction Cups FSGA VU1 (1.5 Folds)

Туре	Suction force [N]*	Pull-off force [N]	Volume [cm³]	Min. curve radius [mm] (convex)	Recommended in- ternal hose diame- ter d [mm]**	Nipple family
FSGA 30 VU1-72	13.5	32	5.8	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	75.9	80	6	N 015
FSGA 110 VU1-72	295.0	420	350.0	100	9	N 037

<sup>\*</sup>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

<sup>\*\*</sup>The recommended hose diameter refers to a hose length of approx. 2  $\mbox{m}$ 

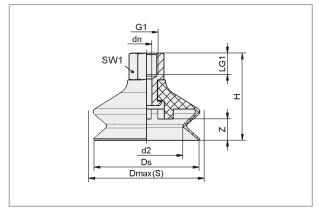
### Bellows Suction Cups FSGA VU1 (1.5 Folds)

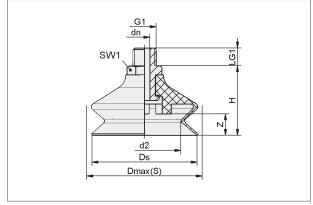
Suction area (Ø) from 30 mm to 110 mm



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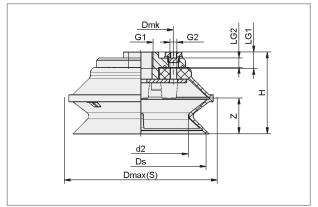
### Design Data Bellows Suction Cups FSGA VU1 (1.5 Folds)





FSGA 30 to 85 VU1 IG

FSGA 30 to 85 VU1 AG



FSGA 110 VU1 IG

Туре	Dimensi	ons in mm*										
	d2	Dmax(S)**	D mk	dn	Ds	G1	G2	Н	LG1	LG2	SW1	Z (Stroke)
FSGA 30 VU1-72 G1/4-AG	17.0	31.5	-	3.5	29	G1/4"-M	-	32.0	10	-	17	8.5
FSGA 30 VU1-72 G1/4-IG	17.0	31.5	-	3.5	29	G1/4"-F	-	42.0	12	-	17	8.5
FSGA 40 VU1-72 G1/4-AG	26.8	42.5	-	3.5	38	G1/4"-M	-	31.0	10	-	17	12.8
FSGA 40 VU1-72 G1/4-IG	26.8	42.5	-	3.5	38	G1/4"-F	-	41.0	12	-	17	12.8
FSGA 50 VU1-72 G1/4-AG	33.5	53.0	-	3.5	47	G1/4"-M	-	37.5	10	-	17	14.5
FSGA 50 VU1-72 G1/4-IG	33.5	53.0	-	3.5	47	G1/4"-F	-	47.5	12	-	17	14.5
FSGA 60 VU1-72 G1/4-AG	40.0	61.5	-	6.0	57	G1/4"-M	-	39.0	10	-	17	12.5
FSGA 60 VU1-72 G1/4-IG	40.0	61.5	-	6.0	57	G1/4"-F	-	49.0	12	-	17	12.5
FSGA 85 VU1-72 G1/4-AG	50.2	86.5	-	6.0	83	G1/4"-M	-	52.0	10	-	22	15.0
FSGA 85 VU1-72 G1/4-IG	50.2	86.5	-	6.0	83	G1/4"-F	-	62.0	12	-	22	15.0
FSGA 110 VU1-72 G1/2-IG	80.0	127.0	55.0	-	110	G1/2"-F	G1/8"-F	69.0	14	8	-	30.0

<sup>\*</sup>Acceptable dimensional tolerances for rubber parts concerning to DIN ISO 3302-1 M3

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<sup>\*\*</sup>External dimension of the suction cup when it is pressed against the workpiece by the vacuum

### Bellows Suction Cups FSGA VU1 (1.5 Folds)

Suction area (Ø) from 30 mm to 110 mm

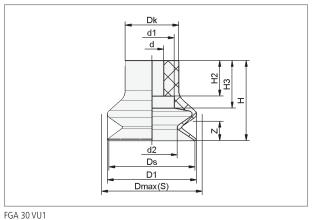


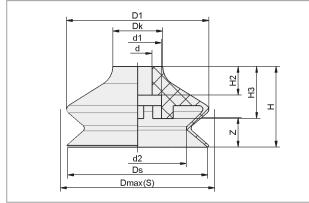
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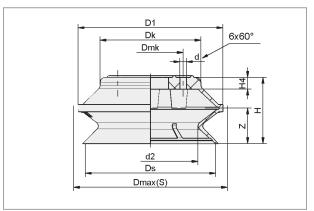


### Design Data Bellows Suction Cups FGA VU1 - spare parts for FSGA VU1





FGA 40 to 85 VU1



FGA 110 VU1

Туре	Dimens	imensions in mm*											
	d	d1	d2	D1	Dk	Ds	Dmax(S)**	D mk	Н	H2	Н3	H4	Z (Stroke)
FGA 30 VU1-72	8	15.0	17.0	30	18.0	29	32	-	27.0	12	16.0	-	8.5
FGA 40 VU1-72	8	13.6	26.8	40	14.0	38	43	-	27.0	8	15.0	-	12.8
FGA 50 VU1-72	8	13.6	33.5	50	17.5	47	53	-	32.5	8	17.8	-	14.5
FGA 60 VU1-72	12	20.0	41.0	60	21.0	59	62	-	34.0	12	22.0	-	12.0
FGA 85 VU1-72	12	25.0	55.0	85	25.0	82	87	-	47.0	20	25.0	-	15.0
FGA 110 VU1-72	6	-	80.0	120	85.0	110	127	40.0	56.0	-	-	8.0	30.0

<sup>\*</sup>Acceptable dimensional tolerances for rubber parts concerning to DIN ISO 3302-1 M3

<sup>\*\*</sup>External dimension of the suction cup when it is pressed against the workpiece by the vacuum

### Bellows Suction Cups FSGA (1.5 Folds) from Ø110 mm

Suction area (Ø) 110 mm and 150 mm









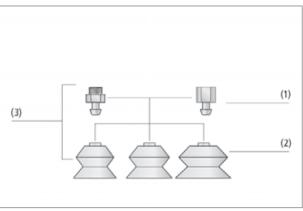
### Suitable for Industry Specific Applications



Bellows suction cups FSGA (1.5 folds) from Ø110 mm

### **Applications**

- Round bellows suction cup with 1.5 folds for handling of cardboard, sheet metal and wood
- Handling of large and heavy workpieces which are easily damaged (optimal adaptation to convex surfaces)



System design bellows suction cups FSGA (1.5 folds)

### Design

- Robust and hard-wearing suction cup FSGA (3) with single sealing lip, consisting of suction cup FGA (2) with 1.5 folds and connection plate (1)
- Connection plate is screwed to suction cup FGA. Suction cup FGA can be replaced separately when worn
- Suction cups with supports on the bottom
- With each nipple family, the replacement cups and nipples can be combined as desired



Bellows suction cups FSGA being used for handling pressed wooden boards

#### Our Highlights...

- Large diameter
- Soft, tapered sealing lip
- 1.5 folds
- Very stiff top fold
- Supports on the bottom

#### Your Benefits...

- > Handling of large, heavy workpieces which are easily damaged
- > Very good adaptation to curved workpiece surfaces
- > High suction force and optimum damping effect during placement on workpiece
- > Good resistance to horizontal forces at high acceleration values
- > No permanent deformation of thin-walled workpieces

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# Bellows Suction Cups FSGA (1.5 Folds) from Ø110 mm

Suction area (Ø) 110 mm and 150 mm

### Designation Code Bellows Suction Cups FSGA (1.5 Folds) from Ø110 mm

Abbreviated designation	Suction area Ø in mm	Material and Shore hardness	Connection thread
Example FSGA 110 NBR-70 G1/2-IG:			
FSGA	110	NBR-70	G1/2-IG
FSGA	110	NBR-70	G1/2-IG (IG = female (F))
	150	SI-55	
		SI-70	

### Ordering Data Bellows Suction Cups FSGA (1.5 Folds) from Ø110 mm

Suction cup FSGA (elastomer part + connection nipple) is delivered assembled. The assembly consists of:

- Suction cup of type FGA elastomer part, available in the diameters 110 mm and 150 mm and various materials
- Connection nipple of type SA-NIP available with various threads

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

#### Bellows Suction Cups FSGA (1.5 Folds) from Ø110 mm

Туре	Suction cup material * / hardness in Shore A						
	NBR-70 SI-55 SI-70						
FSGA 110 G1/2-IG	10.01.06.00118	10.01.06.00119	-				
FSGA 150 G1/2-IG	10.01.06.00120	-	10.01.06.00121				

<sup>\*</sup>Additional material specifications at beginning of the section "Vacuum Suction Cups"

### Ordering Data Spare Parts Bellows Suction Cups and Connection Nipples

Type*	Nitrile rubber NBR	Silicone SI	Туре	Connection nipple	
FGA 110	10.01.06.00114	10.01.06.00115	FSGA 110 G1/2-IG	SA-NIP N010 G1/2-IG	10.01.01.00796
FGA 150	10.01.06.00116	10.01.06.00117	FSGA 150 G1/2-IG	SA-NIP N010 G1/2-IG	10.01.01.00796

<sup>\*</sup>Additional material specifications at beginning of the section "Vacuum Suction

### Technical Data Bellows Suction Cups FSGA (1.5 Folds) from Ø110 mm

Туре	Suction force [N]*	Pull-off force [N]	Volume [cm³]	Min. curve radius [mm] (convex)	Recommended internal hose di- ameter d [mm]**	Nipple family
FSGA 110 G1/2-IG	280	570	330	85	12	N 010
FSGA 150 G1/2-IG	570	1000	800	250	12	N 010

<sup>\*</sup>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

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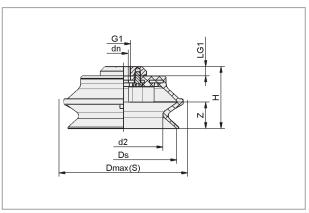
<sup>\*\*</sup>The recommended hose diameter refers to a hose length of approx. 2 m



Bellows Suction Cups FSGA (1.5 Folds) from Ø110 mm

Suction area (Ø) 110 mm and 150 mm

### Design Data Bellows Suction Cups FSGA (1.5 Folds) from Ø110 mm

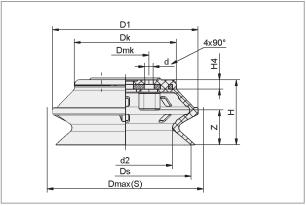


FSGA 110 to 150

Туре	Dimensions in mm*							
	d2	dn	Dmax(S)**	Ds	G1	Н	LG1	Z (Stroke)
FSGA 110 G1/2-IG	80	13.5	130	111	G1/2"-F	69.5	13	29.0
FSGA 150 G1/2-IG	111	13.5	177	150	G1/2"-F	88.5	13	37.5

<sup>\*</sup>Acceptable dimensional tolerances for rubber parts concerning to DIN ISO 3302-1 M3

### Design Data Bellows Suction Cups FGA from Ø110 - Spare Parts for FSGA



FGA 110 to 150

Туре	Dimensions	in mm*								
	d	d2	D1	Dmk	Dmax(S)**	Dk	Ds	Н	H4	Z (Stroke)
FGA 110	7	80	123	40	130	86	111	55	8	29.5
FGA 150	7	111	168	40	177	120	150	74	10	37.0

<sup>\*</sup>Acceptable dimensional tolerances for rubber parts concerning to DIN ISO 3302-1 M3

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<sup>\*\*</sup>External dimension of the suction cup when it is pressed against the workpiece by the vacuum

<sup>\*\*</sup>External dimension of the suction cup when it is pressed against the workpiece by the vacuum

### Bellows Suction Cups FSGPL (1.5 Folds)

Suction area (Ø) from 100 mm to 250 mm



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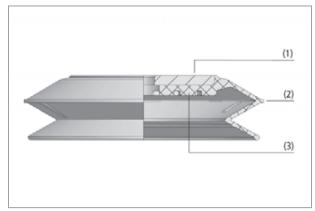
### **Suitable for Industry Specific Applications**



Bellows suction cups FSGPL (1.5 folds)

### **Applications**

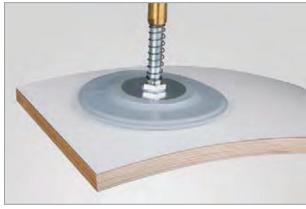
- Round, bellows suction cup with 1.5 folds for handling of cardboard, sheet metal, wood and ceramics
- Handling of workpieces with uneven surfaces (optimal adaptation due to smooth sealing lip)



System design bellows suction cups FSGPL (1.5 folds)

### Design

- Suction cup FSGPL with 1.5 folds (2) and vulcanized mounting
- Steel mounting plate with female thread
- Lower side of mounting plate covered with an elastomer coating (3)
- Optionally available without threaded hole



Bellows suction cups FSGPL being used for handling coated wood

### Our Highlights...

- Large diameter
- Very soft, tapered sealing lip
- 1.5 folds
- Elastomer supports on the bottom

- > For use with large, heavy but also sensitive workpieces
- > Good adaptation to curved workpiece surfaces
- > High suction force and damping effect during placement on workpiece
- > No permanent deformation or breakage of easily damaged workpieces

### 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 NBR-55 G1/2-IG:			
FSGPL	200	NBR-55	G1/2-IG
FSGPL	100	HT1-60	G1/2-IG (IG = female (F))
	120	NBR-55	
	150		
	200		
	250		



### Ordering Data Bellows Suction Cups FSGPL (1.5 Folds)

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

### **Bellows Suction Cups FSGPL (1.5 Folds)**

Туре	Suction cup material * / hardness in Shore A HT1-60	NBR-55
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

<sup>\*</sup>Additional material specifications at beginning of the section "Vacuum Suction Cups"

### Technical Data Bellows Suction Cups FSGPL (1.5 Folds)

Туре	Suction force [N]*	Pull-off force [N]	Volume [cm³]	Min. curve radius [mm] (convex)	Recommended inter- nal hose diameter d [mm]**
FSGPL 100	150	250	150	100	12
FSGPL 120	280	400	295	150	12
FSGPL 150	370	600	449	250	12
FSGPL 200	850	950	877	350	12
FSGPL 250	1610	2000	1677	500	12

<sup>\*</sup>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

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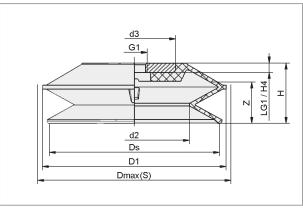
 $<sup>\</sup>ensuremath{^{*}}\ensuremath{^{*}}\ensuremath{^{The}}$  recommended hose diameter refers to a hose length of approx. 2 m



Bellows Suction Cups FSGPL (1.5 Folds)

Suction area (Ø) from 100 mm to 250 mm

### Design Data Bellows Suction Cups FSGPL (1.5 Folds)



FSGPL 100 to 250

Туре	Dimensions	in mm*								
	d2	d3	D1	Dmax(S)**	Ds	G1***	Н	H4	LG1	Z (Stroke)
FSGPL 100 G1/2-IG	57.2	44.0	101	106.5	96.1	G1/2"-F	43.3	8	8	29.1
FSGPL 120 G1/2-IG	79.3	69.4	128	135.0	118.2	G1/2"-F	51.0	8	8	35.7
FSGPL 150 G1/2-IG	93.0	69.4	155	160.0	143.5	G1/2"-F	51.0	8	8	35.7
FSGPL 200 G1/2-IG	137.0	119.4	202	208.0	191.0	G1/2"-F	54.0	8	8	37.2
FSGPL 250 G1/2-IG	186.0	167.0	250	256.0	239.3	G1/2"-F	60.0	8	8	43.0

<sup>\*</sup>Acceptable dimensional tolerances for rubber parts concerning to DIN ISO 3302-1 M3

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<sup>\*\*</sup>External dimension of the suction cup when it is pressed against the workpiece by the vacuum

<sup>\*\*\*</sup>Mounting plate optionally available without drilled holes

### Bellows Suction Cups FSG (2.5 Folds)

Suction area (Ø) from 3 mm to 88 mm





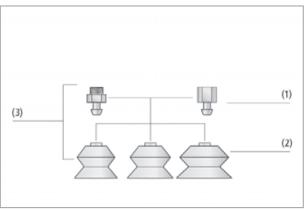
#### Suitable for Industry Specific Applications



Bellows suction cups FSG (2.5 folds)

# **Applications**

- Round, bellows suction cup with 2.5 folds for handling of extremely sensitive workpieces (optimum damping effect)
- Handling of workpieces with extremely uneven surfaces, such as pipes (optimal adaptation to concave and convex surfaces)
- Internal support (from diameter 52 mm) prevents workpiece from being pulled in
- Special design of the folds permits use in systems with very short cycle times



System design bellows suction cups FSG (2.5 folds)

### Design

- Robust, wear-resistant suction cup FSG (3) with single sealing lip, consisting of suction cup FG (2) with 2.5 folds and connection nipple (1)
- All nipples are plugged in
- Suction cups with a diameter of 52 mm or more with supports on
- With each nipple family, the replacement cups and nipples can be combined as desired



Bellows suction cups FSG being used for handling hot plastic parts

### Our Highlights...

- Wide range of diameters and materials
- 2.5 folds
- · Soft, flexible folds
- Soft, tapered sealing lip
- Supports on the bottom (diameter from 52 mm)

- > Wide range of workpiece shapes and sizes
- > High suction force and optimum damping effect during placement on workpieces
- > Very high stroke of suction cup
- > Very good adaptation to curved workpiece surfaces
- > No permanent deformation of thin-walled workpieces

### Bellows Suction Cups FSG (2.5 Folds)

Suction area (Ø) from 3 mm to 88 mm



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### Designation Code Bellows Suction Cups FSG (2.5 Folds)

Abbreviated designation	Suction area Ø in mm	Material and Shore hardness	Connection thread
Example FSG 18 SI-55 G1/8-IG:			
FSG	18	SI-55	G1/8-IG
FSG	3	HT1-60	M5-AG $(AG = male (M))$
	to	NBR-55	M5-IG (IG = female (F))
	88	NBR-AS-55	G1/8-AG
		NK-45	G1/8-IG
		SI-55	G1/4-AG
		SI-AS-55	G1/4-IG



### Ordering Data Bellows Suction Cups FSG (2.5 Folds)

Suction cup FSG (elastomer part + connection nipple) is delivered unassembled. The delivery consists of:

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

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



Bellows Suction Cups FSG (2.5 Folds)

Suction area (Ø) from 3 mm to 88 mm

### **Bellows Suction Cups FSG (2.5 Folds)**

Туре	Suction cup mater	rial * / hardness in Sl	hore A			
	HT1-60	NBR-55	NBR-AS-55	NK-45	SI-55	SI-AS-55
FSG 3 M3-AG	10.01.06.03711	10.01.06.03712	10.01.06.03714	-	10.01.06.03713	10.01.06.03715
FSG 3 M5-AG	10.01.06.03716	10.01.06.03717	10.01.06.03719	-	10.01.06.03718	10.01.06.03720
FSG 4 M5-AG	10.01.06.02968	10.01.06.02964	10.01.06.03073	-	10.01.06.02966	-
FSG 4 M5-IG	10.01.06.02969	10.01.06.02965	10.01.06.03074	-	10.01.06.02967	-
FSG 5 M5-AG	10.01.06.01235	10.01.06.00663	-	-	10.01.06.00665	-
FSG 5 M5-IG	10.01.06.01242	10.01.06.00662	-	-	10.01.06.00664	-
FSG 7 G1/8-AG	10.01.06.01236	10.01.06.00020	-	-	10.01.06.00034	-
FSG 7 G1/8-IG	10.01.06.01243	10.01.06.00001	-	-	10.01.06.00010	-
FSG 7 M5-AG	10.01.06.01237	10.01.06.00021	-	-	10.01.06.00035	-
FSG 9 G1/8-AG	10.01.06.00962	10.01.06.00022	-	10.01.06.00432	10.01.06.00036	-
FSG 9 G1/8-IG	10.01.06.00978	10.01.06.00002	-	10.01.06.00431	10.01.06.00011	-
FSG 9 M5-AG	10.01.06.00963	10.01.06.00023	-	10.01.06.00430	10.01.06.00037	-
FSG 12 G1/8-AG	10.01.06.01238	10.01.06.00562	-	10.01.06.00564	10.01.06.00563	-
FSG 12 G1/8-IG	10.01.06.01244	10.01.06.00559	-	10.01.06.00561	10.01.06.00560	-
FSG 12 M5-AG	10.01.06.01255	10.01.06.00565	-	10.01.06.00567	10.01.06.00566	-
FSG 14 G1/8-AG	10.01.06.00966	10.01.06.00024	-	10.01.06.00435	10.01.06.00038	-
FSG 14 G1/8-IG	10.01.06.00982	10.01.06.00003	-	10.01.06.00434	10.01.06.00012	-
FSG 14 M5-AG	10.01.06.00967	10.01.06.00025	-	10.01.06.00433	10.01.06.00039	-
FSG 18 G1/8-AG	10.01.06.00968	10.01.06.00026	-	10.01.06.00438	10.01.06.00040	-
FSG 18 G1/8-IG	10.01.06.00984	10.01.06.00004	-	10.01.06.00437	10.01.06.00013	-
FSG 18 M5-AG	10.01.06.00969	10.01.06.00027	-	10.01.06.00436	10.01.06.00041	-
FSG 20 G1/8-AG	10.01.06.01239	10.01.06.00028	-	10.01.06.00441	10.01.06.00042	-
FSG 20 G1/8-IG	10.01.06.01245	10.01.06.00005	-	10.01.06.00440	10.01.06.00014	-
FSG 20 M5-AG	10.01.06.01240	10.01.06.00029	-	10.01.06.00439	10.01.06.00043	-
FSG 25 G1/8-AG	10.01.06.00972	10.01.06.00334	-	10.01.06.00443	10.01.06.00337	-
FSG 25 G1/8-IG	10.01.06.00988	10.01.06.00333	-	10.01.06.00442	10.01.06.00336	-
FSG 32 G1/4-AG	10.01.06.01241	10.01.06.00030	-	10.01.06.00445	10.01.06.00044	-
FSG 32 G1/4-IG	10.01.06.01246	10.01.06.00006	-	10.01.06.00444	10.01.06.00015	-
FSG 42 G1/4-AG	10.01.06.00974	10.01.06.00031	-	10.01.06.00447	10.01.06.00045	-
FSG 42 G1/4-IG	10.01.06.00990	10.01.06.00007	-	10.01.06.00446	10.01.06.00016	-
FSG 52 G1/4-AG	10.01.06.02387	10.01.06.00582	-	10.01.06.02385	10.01.06.00586	-
FSG 52 G1/4-IG	10.01.06.02388	10.01.06.00584	-	10.01.06.02386	10.01.06.00587	-
FSG 62 G1/4-AG	10.01.06.02480	10.01.06.00032	-	10.01.06.00449	10.01.06.00046	-
FSG 62 G1/4-IG	10.01.06.02481	10.01.06.00008	-	10.01.06.00448	10.01.06.00017	-
FSG 88 G1/4-AG	-	10.01.06.00033	-	10.01.06.00451	10.01.06.00047	-
FSG 88 G1/4-IG	-	10.01.06.00009	-	10.01.06.00450	10.01.06.00018	-

 $<sup>\</sup>hbox{^*Additional material specifications at beginning of the section "Vacuum Suction Cups"}\\$ 

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Suction area (Ø) from 3 mm to 88 mm



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### Ordering Data Bellows Suction Cups FG (2.5 Folds) - Spare Parts for FSG

Туре	Suction cup material * / hardness in Shore A								
	HT1-60	NBR-55	NBR-AS-55	NK-45	SI-55	SI-AS-55			
FG 3	10.01.06.03639	10.01.06.03704	10.01.06.03706	-	10.01.06.03705	10.01.06.03707			
FG 4	10.01.06.02930	10.01.06.02962	10.01.06.03067	-	10.01.06.02963	10.01.06.03277			
FG 5	10.01.06.01250	10.01.06.00640	10.01.06.00641	-	10.01.06.00642	10.01.06.00643			
FG 7	10.01.06.01251	10.01.06.00050	-	-	10.01.06.00055	10.01.06.00508			
FG 9	10.01.06.00878	10.01.06.00051	10.01.06.03259	10.01.06.00452	10.01.06.00056	10.01.06.03260			
FG 12	10.01.06.01252	10.01.06.00557	-	10.01.06.00558	10.01.06.00549	10.01.06.03360			
FG 14	10.01.06.00880	10.01.06.00052	-	10.01.06.00453	10.01.06.00057	10.01.06.03394			
FG 18	10.01.06.00881	10.01.06.00053	10.01.06.03400	10.01.06.00454	10.01.06.00058	-			
FG 20	10.01.06.01253	10.01.06.00054	-	10.01.06.00455	10.01.06.00059	-			
FG 25	10.01.06.00883	10.01.06.00335	-	10.01.06.00456	10.01.06.00338	-			
FG 32	10.01.06.01254	10.01.06.00140	-	10.01.06.00457	10.01.06.00144	-			
FG 42	10.01.06.00885	10.01.06.00141	-	10.01.06.00458	10.01.06.00145	-			
FG 52	10.01.06.02365	10.01.06.00583	-	10.01.06.02382	10.01.06.00585	-			
FG 62	10.01.06.02475	10.01.06.00142	-	10.01.06.00459	10.01.06.00146	-			
FG 88	-	10.01.06.00143	-	10.01.06.00460	10.01.06.00147	-			

<sup>\*</sup>Additional material specifications at beginning of the section "Vacuum Suction Cups"

### **Ordering Data Spare Parts Connection Nipples**

Туре	Connection nipples [AG]		Connection nipples [IG]	
FSG 3 M3	SA-NIP N055 M3-AG	10.01.01.00313	-	-
FSG 3 M5	SA-NIP N055 M5-AG	10.01.01.13084	-	-
FSG 4 M5	SA-NIP N017 M5-AG	10.01.06.00314	SA-NIP N017 M5-IG	10.01.06.00313
FSG 5 M5	SA-NIP N017 M5-AG	10.01.06.00314	SA-NIP N017 M5-IG	10.01.06.00313
FSG 7 G1/8	SA-NIP N016 G1/8-AG	10.01.06.05735	SA-NIP N016 G1/8-IG	10.01.06.05731
FSG 7 M5	SA-NIP N016 M5-AG	10.01.06.00123	SA-NIP N016 M5-IG	10.01.06.03384
FSG 9 M5	SA-NIP N016 M5-AG	10.01.06.00123	SA-NIP N016 M5-IG	10.01.06.03384
FSG 9 G1/8	SA-NIP N016 G1/8-AG	10.01.06.05735	SA-NIP N016 G1/8-IG	10.01.06.05731
FSG 12 M5	SA-NIP N016 M5-AG	10.01.06.00123	SA-NIP N016 M5-IG	10.01.06.03384
FSG 12 G1/8	SA-NIP N016 G1/8-AG	10.01.06.05735	SA-NIP N016 G1/8-IG	10.01.06.05731
FSG 14 M5	SA-NIP N016 M5-AG	10.01.06.00123	SA-NIP N016 M5-IG	10.01.06.03384
FSG 14 G1/8	SA-NIP N016 G1/8-AG	10.01.06.05735	SA-NIP N016 G1/8-IG	10.01.06.05731
FSG 18 M5	SA-NIP N016 M5-AG	10.01.06.00123	SA-NIP N016 M5-IG	10.01.06.03384
FSG 18 G1/8	SA-NIP N016 G1/8-AG	10.01.06.05735	SA-NIP N016 G1/8-IG	10.01.06.05731
FSG 20 M5	SA-NIP N016 M5-AG	10.01.06.00123	SA-NIP N016 M5-IG	10.01.06.03384
FSG 20 G1/8	SA-NIP N016 G1/8-AG	10.01.06.05735	SA-NIP N016 G1/8-IG	10.01.06.05731
FSG 25 G1/8	SA-NIP N016 G1/8-AG	10.01.06.05735	SA-NIP N016 G1/8-IG	10.01.06.05731
FSG 32 G1/4	SA-NIP N018 G1/4-AG	10.01.06.01065	SA-NIP N018 G1/4-IG	10.01.06.01066
FSG 42 G1/4	SA-NIP N018 G1/4-AG	10.01.06.01065	SA-NIP N018 G1/4-IG	10.01.06.01066
FSG 52 G1/4	SA-NIP N018 G1/4-AG	10.01.06.01065	SA-NIP N018 G1/4-IG	10.01.06.01066
FSG 62 G1/4	SA-NIP N018 G1/4-AG	10.01.06.01065	SA-NIP N018 G1/4-IG	10.01.06.01066
FSG 88 G1/4	SA-NIP N019 G1/4-AG	10.01.06.01959	SA-NIP N019 G1/4-IG	10.01.06.01960



Suction area (Ø) from 3 mm to 88 mm



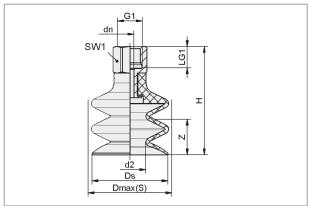
### Technical Data Bellows Suction Cups FSG (2.5 Folds)

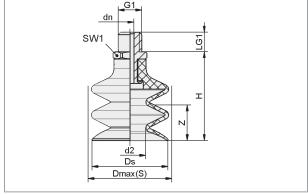
Туре	Suction force [N]*	Pull-off force [N]**	Volume [cm³]	Min. curve radius [mm]	Recommended internal hose diameter	Nipple family
				(convex)	d [mm]***	
FSG 3	0,2	0.4	0.022	4	2	N 055
FSG 4	0.3	0.6	0.053	4	2	N 017
FSG 5	0.1	0.8	0.033	8	2	N 017
FSG 7	0.1	0.9	0.043	8	4	N 016
FSG 9	0.7	2.3	0.150	10	4	N 016
FSG 12	0.9	3.5	0.600	13	4	N 016
FSG 14	1.2	5.7	0.975	15	4	N 016
FSG 18	2.3	8.5	1.350	20	4	N 016
FSG 20	3.8	12.1	2.000	30	4	N 016
FSG 25	4.5	19.0	5.400	30	4	N 016
FSG 32	12.0	36.9	10.000	35	6	N 018
FSG 42	13.6	44.0	19.786	75	6	N 018
FSG 52	27.0	96.0	37.587	75	6	N 018
FSG 62	39.6	137.0	72.500	75	6	N 018
FSG 88	45.2	286.0	143.668	100	9	N 019

<sup>\*</sup>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

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### Design Data Bellows Suction Cups FSG (2.5 Folds)





FSG 3 to 88 IG

FSG 3 to 88 AG

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Cups Know

Suction Cup

Grippers

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Valve

<sup>\*\*</sup>The pull-off force of the versions made of natural rubber is reduced by about 40%

<sup>\*\*\*</sup>The recommended hose diameter refers to a hose length of approx. 2 m



### Bellows Suction Cups FSG (2.5 Folds)

Suction area (Ø) from 3 mm to 88 mm

### Design Data Bellows Suction Cups FSG (2.5 Folds)

Туре	Dimensions i	n mm*							
	d2	dn	Ds	Dmax(S)**	G1	Н	LG1	SW1	Z (Stroke)
FSG 3 M3-AG	1.8	0.7	3.0	4.0	M3-M	8.7	3.0	5	2
FSG 3 M5-AG	1.8	0.7	3.0	4.0	M5-M	10.2	4.5	7	2
FSG 4 M5-AG	2.4	2.0	3.8	7.0	M5-M	19.0	5.0	8	2
FSG 4 M5-IG	2.4	2.0	3.8	7.0	M5-F	24.0	5.5	8	2
FSG 5 M5-AG	2.6	2.0	5.0	7.0	M5-M	19.0	5.0	8	2
FSG 5 M5-IG	2.6	2.0	5.0	7.0	M5-F	24.0	5.5	8	2
FSG 7 G1/8-AG	1.8	3.5	5.9	9.0	G1/8"-M	20.0	7.5	14	3
FSG 7 G1/8-IG	1.8	3.5	5.9	9.0	G1/8"-F	26.0	8.5	14	3
FSG 7 M5-AG	1.8	2.5	5.9	9.0	M5-M	19.0	5.0	7	3
FSG 9 G1/8-AG	4.1	3.5	9.0	9.5	G1/8"-M	21.0	7.5	14	3
FSG 9 G1/8-IG	4.1	3.5	9.0	9.5	G1/8"-F	27.0	8.5	14	3
FSG 9 M5-AG	4.1	2.5	9.0	9.5	M5-M	20.0	5.0	7	3
FSG 12 G1/8-AG	5.0	3.5	12.0	13.0	G1/8"-M	27.0	7.5	14	7
FSG 12 G1/8-IG	5.0	3.5	12.0	13.0	G1/8"-F	33.0	8.5	14	7
FSG 12 M5-AG	5.0	2.5	12.0	13.0	M5-M	26.0	5.0	7	7
FSG 14 G1/8-AG	5.4	3.5	14.5	15.5	G1/8"-M	28.8	7.5	14	9
FSG 14 G1/8-IG	5.4	3.5	14.5	15.5	G1/8"-F	34.8	8.5	14	9
FSG 14 M5-AG	5.4	2.5	14.5	15.5	M5-M	27.8	5.0	7	9
FSG 18 G1/8-AG	8.0	3.5	17.2	19.0	G1/8"-M	28.6	7.5	14	9
FSG 18 G1/8-IG	8.0	3.5	17.2	19.0	G1/8"-F	34.6	8.0	14	9
FSG 18 M5-AG	8.0	2.5	17.2	19.0	M5-M	27.6	5.0	7	9
FSG 20 G1/8-AG	10.5	3.5	20.0	21.0	G1/8"-M	28.1	7.5	14	9
FSG 20 G1/8-IG	10.5	3.5	20.0	21.0	G1/8"-F	34.1	8.0	14	9
FSG 20 M5-AG	10.5	2.5	20.0	21.0	M5-M	27.1	5.0	7	9
FSG 25 G1/8-AG	10.0	3.5	23.0	26.0	G1/8"-M	40.0	7.5	14	18
FSG 25 G1/8-IG	10.0	3.5	23.0	26.0	G1/8"-F	46.0	8.0	14	18
FSG 32 G1/4-AG	16.0	4.4	32.0	33.5	G1/4"-M	41.5	11.0	17	15
FSG 32 G1/4-IG	16.0	4.4	32.0	33.5	G1/4"-F	52.5	12.0	17	15
FSG 42 G1/4-AG	17.8	4.4	42.6	45.0	G1/4"-M	50.0	11.0	17	20
FSG 42 G1/4-IG	17.8	4.4	42.6	45.0	G1/4"-F	61.0	12.0	17	20
FSG 52 G1/4-AG	24.6	4.4	52.5	55.0	G1/4"-M	52.7	11.0	17	25
FSG 52 G1/4-IG	24.6	4.4	52.5	55.0	G1/4"-F	63.7	12.0	17	25
FSG 62 G1/4-AG	29.5	4.4	62.2	65.0	G1/4"-M	58.0	11.0	17	29
FSG 62 G1/4-IG	29.5	4.4	62.2	65.0	G1/4"-F	69.0	12.0	17	29
FSG 88 G1/4-AG	29.3	8.2	89.0	95.5	G1/4"-M	92.5	11.0	21	34
FSG 88 G1/4-IG	29.3	8.2	89.0	95.5	G1/4"-F	101.5	12.0	21	34

<sup>\*</sup>Acceptable dimensional tolerances for rubber parts concerning to DIN ISO 3302-1 M3

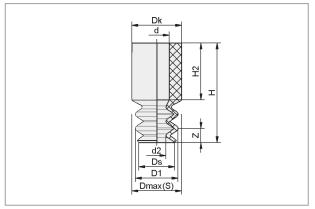
<sup>\*\*</sup>External dimension of the suction cup when it is pressed against the workpiece by the vacuum

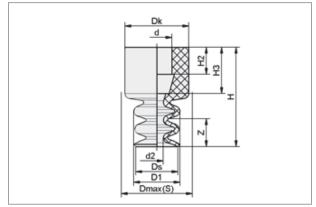
### Bellows Suction Cups FSG (2.5 Folds)

Suction area (Ø) from 3 mm to 88 mm



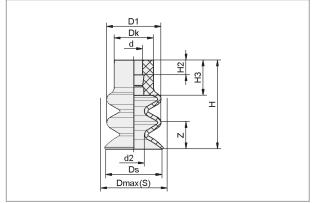
### Design Data Bellows Suction Cups FG (2.5 Folds) - Spare Parts for FSG

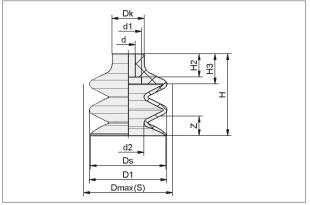




FG 5, 52, 62

FG 3, 4, 7, 9





FG 12 to 25 FG 32 to 88

Type	Dimensions	in mm*								
	d	d2	D1	Dk	Dmax(S)**	Ds	Н	H2	Н3	Z (Stroke)
FG 3	1.7	1.8	3.6	4	4.0	3.0	6.7	2.1	-	1
FG 4	3.5	2.4	5.1	7	7.0	3.8	14.0	3.9	7.0	2
FG 5	3.5	2.6	6.0	7	7.0	5.0	14.0	8.0	-	2
FG 7	4.5	1.8	6.5	9	9.0	5.9	14.0	3.8	6.5	3
FG 9	4.5	4.1	8.9	9	9.5	9.0	15.0	3.8	8.2	3
FG 12	4.5	5.0	12.0	10	13.0	12.0	21.0	3.8	6.5	7
FG 14	4.5	5.4	13.9	10	15.5	14.5	22.8	3.8	6.5	9
FG 18	4.5	8.0	17.8	10	19.0	17.2	22.6	3.8	6.5	9
FG 20	4.5	10.5	20.0	10	21.0	20.0	22.1	3.8	6.5	9
FG 25	4.5	10.0	25.0	10	26.0	23.0	34.0	3.8	6.5	18
FG 32	8.0	16.0	32.4	18	33.5	32.0	37.5	13.0	17.0	15
FG 42	8.0	17.8	43.5	18	45.0	42.6	46.0	13.0	17.0	20
FG 52	8.0	24.6	52.0	18	55.0	52.5	48.7	13.0	-	25
FG 62	8.0	29.5	62.0	18	65.0	62.2	54.0	13.0	-	29
FG 88	11.7	29.3	88.2	25	95.5	89.0	86.5	19.7	26.0	34

<sup>\*</sup>Acceptable dimensional tolerances for rubber parts concerning to DIN ISO 3302-1 M3

Vacuum Suction Cups

 $<sup>{}^{\</sup>star\star}\text{External dimension of the suction cup when it is pressed against the workpiece by the vacuum}$ 

### Bellows Suction Cups FSG VU1 (2.5 Folds)

Suction area (Ø) from 30 mm to 85 mm







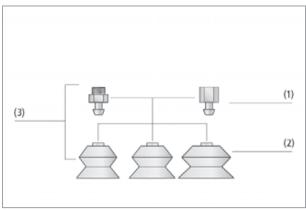
### Suitable for Industry Specific Applications



Bellows suction cups FSG VU1 (2.5 folds)

### Applications

- Round bellows suction cup with 2.5 folds for hard use in multishift operations with very short cycle times
- Handling of workpieces with very abrasive surfaces
- Suction cup with special groove: for handling oily metal sheets (better handling of lateral forces)
- Suction cup without special groove: for handling cardboard, wood and similar materials



System design bellows suction cups FSG VU1 (2.5 folds)

### Design

- Robust and wear-resistant suction cup FSG (3) with single sealing lip, consisting of suction cup FG (2) (Vulkollan VU1) with 2.5 folds and connection nipple (1)
- Suction cup positively connected to nipple to prevent turning, even when lifting heavy loads
- With each nipple family, the replacement cups and nipples can be combined as desired



Bellows suction cups FSG VU1 being used for handling corrugated cardboard

### Our Highlights...

- Material Vulkollan VU1 with high resistance to tearing
- Good resistance to chemicals
- Minimum abrasion, approx.
   10 12 mm<sup>3</sup> to DIN 53516
- Supports on the bottom
- Very stiff top fold

- > Very wear-resistant suction cup for very high loading and a long lifetime
- > Unaffected by oil (handling of sheet metal)
- > Lifetime up to 20 times longer compared to standard NBR
- > No permanent deformation of thin-walled workpieces
- > Good resistance to horizontal forces at high acceleration values

### Bellows Suction Cups FSG VU1 (2.5 Folds)

Suction area (Ø) from 30 mm to 85 mm



### Designation Code Bellows Suction Cups FSG VU1 (2.5 Folds)

Abbreviated designation	Suction area Ø in mm	Material and Shore hardness	Connection thread	Product addition
Example FSG 60 VU1-72 G1/4-AG:				
FSG	60	VU1-72	G1/4-AG	
FSG	30	VU1-72	G1/4-AG	ON oil slot
	60		(AG = male (M))	
	85		G1/4-IG	
			(IG = female (F))	



### Ordering Data Bellows Suction Cups FSG VU1 (2.5 Folds)

Suction cup FSG VU1 (elastomer part + connection nipple) is delivered assembled. The assembly consists of:

- Suction cup of type FG VU1 elastomer part, available in various diameters
- Connection nipple of type SA-NIP available with various threads

Available spare parts: suction cup FG VU1, connection nipple SA-NIP

#### **Bellows Suction Cups FSG VU1 (2.5 Folds)**

Type*	Connection			
	G1/4"-M	G1/4"-F		
FSG 30 VU1-72	10.01.06.00200	10.01.06.00166		
FSG 60 VU1-72	10.01.06.00238	10.01.06.00236		
FSG 60 VU1-72 ON	10.01.06.00201	10.01.06.00171		
FSG 85 VU1-72	10.01.06.00239	10.01.06.00237		
FSG 85 VU1-72 ON	10.01.06.00202	10.01.06.00167		

<sup>\*</sup>Additional material specifications at beginning of the section "Vacuum Suction Cups"

### Ordering Data Spare Parts Bellows Suction Cups And Connection Nipples

Type*	Bellows suction cup (round)	Туре	Connection nipple	
FG 30 VU1-72	10.01.06.00173	FSG 30 VU1-72 G1/4-AG	SA-NIP N013 G1/4-AG DN350	10.01.06.00183
FG 60 VU1-72	10.01.06.00174	FSG 30 VU1-72 G1/4-IG	SA-NIP N013 G1/4-IG DN350	10.01.06.00180
FG 60 VU1-72 ON	10.01.06.00208	FSG 60 VU1-72 G1/4-AG	SA-NIP N014 G1/4-AG DN600	10.01.06.00184
FG 85 VU1-72	10.01.06.00175	FSG 60 VU1-72 G1/4-IG	SA-NIP N014 G1/4-IG DN600	10.01.06.00181
FG 85 VU1-72 ON	10.01.06.00209	FSG 85 VU1-72 G1/4-AG	SA-NIP N015 G1/4-AG DN600	10.01.06.00185
*Additional material specifications at beg	inning of the section "Vacuum Suction Cups"	FSG 85 VII1-72 G1/4-IG	SA-NIP N015 G1/4-IG DN600	10 01 06 00182



### Technical Data Bellows Suction Cups FSG VU1 (2.5 Folds)

Туре	Suction force [N]*	Pull-off force [N]*	Volume [cm³]	Min. curve radius [mm] (convex)	Recommended internal hose diameter d [mm]**	Nipple family
FSG 30 VU1-72	13.5	32	9	25	6	N 013
FSG 60 VU1-72	61.0	100	67	50	6	N 014
FSG 85 VU1-72	120.0	250	202	60	6	N 015

<sup>\*</sup>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



 $<sup>\</sup>ensuremath{^{*}}\ensuremath{^{*}}\ensuremath{^{The}}$  recommended hose diameter refers to a hose length of approx. 2 m

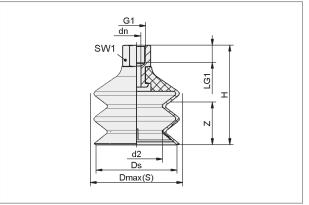
Suction area (Ø) from 30 mm to 85 mm

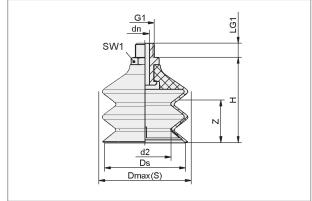


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### Bellows Suction Cups FSG VU1 (2.5 Folds)

### Design Data Bellows Suction Cups FSG VU1 (2.5 Folds)





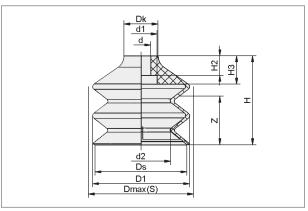
U1 AG

30 to 85 VU1 IG	FSG	G 30 to 85 VL

Туре	Dimensions	in mm*							
	d2	dn	Ds	Dmax(S)**	G1	Н	LG1	SW1	Z (Stroke)
FSG 30 VU1-72 G1/4-AG	15	3.5	29.0	31.5	G1/4"-M	45	10	17	15
FSG 30 VU1-72 G1/4-IG	15	3.5	29.0	31.5	G1/4"-F	55	12	17	15
FSG 60 VU1-72 G1/4-AG	36	6.0	59.0	62.5	G1/4"-M	60	10	17	30
FSG 60 VU1-72 G1/4-IG	36	6.0	59.0	62.5	G1/4"-F	70	12	17	30
FSG 85 VU1-72 G1/4-AG	51	6.0	80.2	90.0	G1/4"-M	90	10	22	38
FSG 85 VU1-72 G1/4-IG	51	6.0	80.2	90.0	G1/4"-F	100	12	22	38

<sup>\*</sup>Acceptable dimensional tolerances for rubber parts concerning to DIN ISO 3302-1 M3

### Design Data Bellows Suction Cups FG VU1 - Spare Parts for FSG VU1



FG 30 to 85 VU1

Туре	Dimension	ns in mm*									
	d	d1	d2	D1	Dk	Dmax(S)**	Ds	Н	H2	Н3	Z (Stroke)
FG 30 VU1-72	8	15	15	30	18	31.5	29.0	40	12	16	15
FG 60 VU1-72	12	20	36	60	21	62.5	59.0	55	12	18	30
FG 85 VU1-72	12	25	51	85	25	90.0	80.2	85	20	27	38

<sup>\*</sup>Acceptable dimensional tolerances for rubber parts concerning to DIN ISO 3302-1  ${\rm M3}$ 

 $<sup>\</sup>star\star$ External dimension of the suction cup when it is pressed against the workpiece by the vacuum

<sup>\*\*</sup>External dimension of the suction cup when it is pressed against the workpiece by the vacuum

### Bellows Suction Cups FSGB (3.5 Folds)

Suction area (Ø) 25 mm











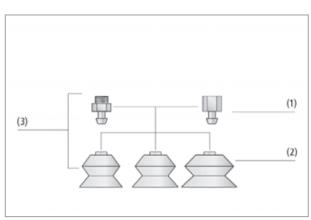
### Suitable for Industry Specific Applications



Bellows suction cups FSGB (3.5 folds)

### **Applications**

- Round, bellows suction cup with 3.5 folds for handling of easily damaged workpieces due to optimum damping effect, big stroke and smooth sealing lip
- Handling of very uneven workpieces, such as pipes (folds permit optimal adaptation to convex surfaces)
- Handling of workpieces which have to be lifted as carefully as possible (suction cup has very long stroke)



System design bellows suction cups FSGB (3.5 folds)

### Design

- Robust, wear-resistant suction cup FSGB (3) with single sealing lip, consisting of suction cup FGB (2) with 3.5 folds and connection nipple (1)
- Nipple is plugged into suction cup
- With each nipple family, the replacement cups and nipples can be combined as desired



Bellows suction cups FSGB being used for handling pipes

### Our Highlights...

- 3.5 folds
- Soft, tapered sealing lip
- · Soft, flexible folds

- > High suction force and extremely good damping effect during placement on easily damaged workpieces
- > Very good adaptation to curved workpiece surfaces
- > Very long suction cup stroke; excellent compensation for varying workpiece heights

### Bellows Suction Cups FSGB (3.5 Folds)

Suction area (Ø) 25 mm



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### Designation Code Bellows Suction Cups FSGB (3.5 Folds)

Abbreviated designation	Suction area Ø in mm	Material and Shore hardness	Connection thread
Example FSGB 25 SI-55 G1/8-IG: FSGB	25	SI-55	G1/8-IG
FSGB	25	NBR-55	G1/8-AG (AG = male (M))
		SI-55	G1/8-IG ( $IG = female(F)$ )

### Ordering Data Bellows Suction Cups FSGB (3.5 Folds)

Suction cup FSGB (elastomer part + connection nipple) is delivered unassembled. The delivery consists of:

- Suction cup of type FGB elastomer part, available in various materials
- Connection nipple of type SA-NIP available with various threads

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

### **Bellows Suction Cups FSGB (3.5 Folds)**

Туре	Suction cup material * / hardness in Shore A				
	NBR-55	SI-55			
FSGB 25 G1/8-AG	10.01.06.00112	10.01.06.00113			
FSGB 25 G1/8-IG	10.01.06.00110	10.01.06.00111			

<sup>\*</sup>Additional material specifications at beginning of the section "Vacuum Suction Cups"

### **Ordering Data Spare Parts Bellows Suction Cups and Connection Nipples**

Type*	Nitrile rubber NBR	Silicone SI	Туре	Connection nipple	
FGB 25	10.01.06.00109	10.01.06.00108	FSGB 25 G1/8-AG	SA-NIP N016 G1/8-AG DN350	10.01.06.05735
*Additional materia	al specifications at beginning of the	e section "Vacuum Suction Cups"	FSGB 25 G1/8-IG	SA-NIP N016 G1/8-IG DN350	10.01.06.05731



### Technical Data Bellows Suction Cups FSGB (3.5 Folds)

Туре	Suction force	Pull-off force	Volume	Min. curve radius	Recommended in-	Nipple family
	[N]*	[N]*	[cm³]	[mm]	ternal hose diame-	
				(convex)	ter d [mm]**	
FSGB 25	5	20	7.1	25	4	N 016

<sup>\*</sup>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.

<sup>\*\*</sup>The recommended hose diameter refers to a hose length of approx. 2 m.

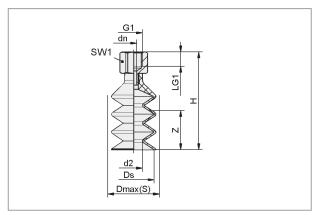
### Bellows Suction Cups FSGB (3.5 Folds)

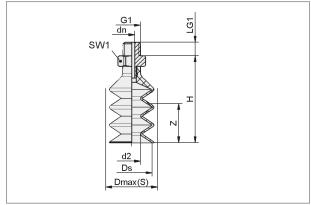
Suction area (Ø) 25 mm



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### Design Data Bellows Suction Cups FSGB (3.5 Folds)





FSGB 25 IG

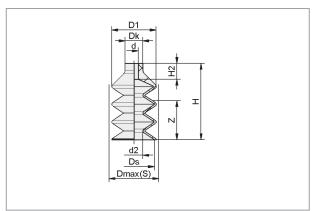
FSGB 25 AG

Туре	Dimensions in	n mm*							
	d2	dn	Dmax(S)**	Ds	G1	н	LG1	SW1	Z (Stroke)
FSGB 25 G1/8-AG	10	3.5	27	23	G1/8"-M	51	7.5	14	22
FSGB 25 G1/8-IG	10	3.5	27	23	G1/8"-F	57	8.5	14	22

<sup>\*</sup>Acceptable dimensional tolerances for rubber parts concerning to DIN ISO 3302-1 M3

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### Design Data Bellows Suction Cups FGB - Spare Parts for FSGB



FGB 25

Туре	Dimensions i	n mm*							
	d	d2	D1	Dk	Dmax(S)**	Ds	Н	H2	Z (Stroke)
FGB 25	5	10	25	10	27	23	43	9	22

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

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<sup>\*\*</sup>External dimension of the suction cup when it is pressed against the workpiece by the vacuum

<sup>\*\*</sup>External dimension of the suction cup when it is pressed against the workpiece by the vacuum

Suction area (LxW) from 95 x 40 mm and 140 x 65 mm



Bellows Suction Cups FSGAO (1.5 Folds)







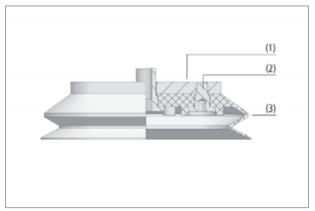
### Suitable for Industry Specific Applications



Bellows suction cups FSGAO (1.5 folds)

### **Applications**

- Oval bellows suction cup with 1.5 folds for use in multi-shift operations with very short cycle times
- · Handling of oily and narrow, curved metal sheet
- Handling of cardboard, wood and similar materials under rough operating conditions
- Handling of workpieces with extremely abrasive surfaces such as rough cardboard sheets



System design bellows suction cups FSGAO (1.5 folds)

### Design

- Suction cup FSGAO, consisting of suction cup FGAO (Vulkollan VU1) with 1.5 folds (3) and connection plate (1)
- Connection plate screwed (2) to suction cup and capable of handling very heavy loads
- The suction cup can be replaced separately when worn



Bellows suction cups FSGAO being used for handling metal beams

### Our Highlights...

- Material Vulkollan VU1 with high resistance to tearing
- Good resistance to chemicals
- Minimum abrasion: approx. 10 - 12 mm<sup>3</sup> to DIN 53516
- 1.5 folds

- > Very wear-resistant suction cup for heavy loads and a long lifetime
- > Unaffected by oil (handling of sheet-metal parts)
- > Lifetime up to 20 times longer compared to standard NBR
- > High suction force and optimum damping effected during placement on the workpiece

### **Bellows Suction Cups (Oval)**

### Bellows Suction Cups FSGAO (1.5 Folds)

Suction area (LxW) from 95 x 40 mm and 140 x 65 mm



### Designation Code Bellows Suction Cups FSGAO (1.5 Folds)

Abbreviated designation	Suction area LxW in mm	Material and Shore hardness	Connection thread
Example FSGAO 95x40 VU1-72 G1/8-AG:			
FSGAO	95x40	VU1-72	G1/8-AG
FSGAO	95x40	VU1-72	G1/8-AG (AG = male (M))



### Ordering Data Bellows Suction Cups FSGAO (1.5 Folds)

Suction cup FSGAO (elastomer part + support plate) is delivered assembled. The assembly consists of:

- Suction cup of type FGAO elastomer part, available in various dimensions (LxW)
- Aluminium support plate

Available spare parts: suction cup FGAO

### Bellows Suction Cups FSGAO (1.5 Folds)

Type*	Part Number
FSGAO 95x40 VU1-72 G1/8-AG	10.01.06.00503
FSGAO 140x65 VU1-72 G1/4-AG	10.01.06.00498

<sup>\*</sup>Additional material specifications at beginning of the section "Vacuum Suction Cups"



### **Ordering Data Spare Parts Bellows Suction Cups**

Type*	Article No.
FGAO 95x40 VU1-72 N038	10.01.06.00499
FGAO 140x65 VU1-72 N039	10.01.06.00468

<sup>\*</sup>Additional material specifications at beginning of the section "Vacuum Suction Cups"



#### Technical Data Bellows Suction Cups FSGAO (1.5 Folds)

Туре	Suction force [N]*	Pull-off force [N]	Volume [cm³]	Min. curve radius [mm] (convex)	Recommended inter- nal hose diameter d [mm]**	Nipple family
FSGAO 95x40 VU1-72 G1/8-AG	95	110	38	20	9	N 038
FSGAO 140x65 VU1-72 G1/4-AG	225	255	114	30	9	N 039

<sup>\*</sup>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 Cups Knowledge

 $<sup>\</sup>ensuremath{^{\star\star}}\xspace$  The recommended hose diameter refers to a hose length of approx. 2 m

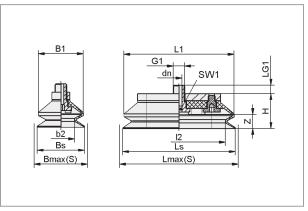
Suction area (LxW) from 95 x 40 mm and 140 x 65 mm



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### Bellows Suction Cups FSGAO (1.5 Folds)

### Design Data Bellows Suction Cups FSGAO (1.5 Folds)

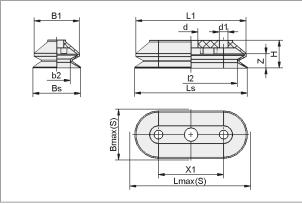


FSGAO 95x40 to 140x65 VU1

Туре	Dime	mensions in mm*												
	b2	B1	Bmax(S)**	Bs	dn	G1	Н	LG1	12	L1	Lmax(S)**	Ls	SW1	Z (Stroke)
FSGAO 95x40 VU1-72 G1/8-AG	23	38	42.5	40	5	G1/8"-M	30	8	78	93	97	95.0	4	12
FSGAO 140x65 VU1-72 G1/4-AG	36	65	68.5	65	8	G1/4"-M	38	10	111	140	142	140.0	8	16

<sup>\*</sup>Acceptable dimensional tolerances for rubber parts concerning to DIN ISO 3302-1 M3

### Design Data Bellows Suction Cups FGAO - Spare Parts for FSGAO



FGAO 95x40 to 140x65 VU1

Туре	Dimen	nensions in mm*											
	b2	B1	Bmax(S)**	Bs	d	d1	Н	L1	12	Lmax(S)**	Ls	X1	Z (Stroke)
FGAO 95x40 VU1-72 N038	23	38	42.5	40	11.5	7.5	23.5	93.0	78	97	95	55	12
FGAO 140x65 VU1-72 N039	36	65	68.5	65	15.5	9.5	30.0	140.0	111	142	140	75	16

<sup>\*</sup>Acceptable dimensional tolerances for rubber parts concerning to DIN ISO 3302-1 M3

<sup>\*\*</sup>External dimension of the suction cup when it is pressed against the workpiece by the vacuum

<sup>\*\*</sup>External dimension of the suction cup when it is pressed against the workpiece by the vacuum

# **Suction Cups for Handling Sheet Metal**

### Bell-Shaped Suction Cups SAXM

Suction area (Ø) from 20 mm to 115 mm





#### Suitable for Industry Specific Applications

· Handling of workpieces with oily surfaces

Handling of workpieces with convex surfaces

Handling of blanks at destackers

• High-speed suction cups with demands for highest holding and shear forces for fast handling of sheet metal and car body parts

• Loading and unloading CNC metal and laser cutting machines

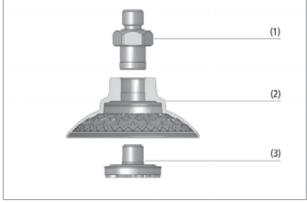




### Design

**Applications** 

- Round bell-shaped suction cup (2) with flexible sealing lip, optimum internal structure, special oil groove and inner support
- Wear-resistant material Elastodur of suction cup (ED-85) and friction disc (ED-65)
- Two-part Schmalz connector (SC) consisting of connector upper part (1) and lower part including a friction disc (3)
- Connector upper part with protection against lose
- Connection elements with male thread have an integrated seal on the thread
- Available as mounted suction cup or as individual parts



System design bell-shaped suction cups SAXM



Bell-shaped suction cups SAXM for handling formed sheet metal parts

#### Our Highlights...

- Significantly increased stroke of suction cup
- Optimum internal structure
- Large-area, structured inner support
- Innovative material ED
- · Environmental friendly, modular design

- > Very good adjustment to different workpiece outlines
- > Highest transmission of holding forces and adaptation of shear forces, especially on oily sheet metal
- > Avoidance of deep-drawing, even with thin sheets
- > Highly wear-resistant, resistant to the effects of ozone and aggressive draw
- > Minimum costs, quick replacement of individual components, 100% recyclable

# **Suction Cups for Handling Sheet Metal**

### Bell-Shaped Suction Cups SAXM

Suction area (Ø) from 20 mm to 115 mm



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# **Designation Code Bell-Shaped Suction Cups SAXM**

Abbreviated designation	Suction area Ø	Material and	Connection thread
	in mm	Shore hardness	
Example SAXM 20 ED-85 G1/4-IG:			
SAXM	20	ED-85	G1/4-IG
SAXM	20	ED-85	G1/4-AG (AG = male (M))
	to		G1/4-IG (IG = female (F))
	115		G3/8-AG
			M10-AG
			M14x1.5-AG
			NPT3/8-IG
			RA rectangular adapter

### **Ordering Data Bell-Shaped Suction Cups SAXM**

Bell-shaped suction cup SAXM (elastomer part + connection element) is delivered assembled. As an alternative the individual parts can also be ordered separately. To do this, the following ordering steps are required:

- Bell-shaped suction cup of type SAXM (step 1) elastomer part, available in various diameters
- Connector upper part (step 2) available with various threads
- Connector lower part (step 3) including molded friction disc

### **Bell-shaped Suction Cup SAXM (Assembled)**

Type*	Connection						
	G1/4"-M	G1/4"-F	G3/8"-M	M10-M	M14x1.5-M	NPT3/8-F	Rectangular
							adapter
SAXM 20 ED-85	10.01.19.00101	10.01.19.00080	10.01.19.00102	10.01.19.00098	10.01.19.00099	10.01.19.00103	10.01.19.00100
SAXM 30 ED-85	10.01.19.00049	10.01.19.00014	10.01.19.00050	10.01.19.00016	10.01.19.00017	10.01.19.00063	10.01.19.00018
SAXM 40 ED-85	10.01.19.00051	10.01.19.00019	10.01.19.00052	10.01.19.00021	10.01.19.00022	10.01.19.00064	10.01.19.00023
SAXM 50 ED-85	10.01.19.00053	10.01.19.00024	10.01.19.00054	10.01.19.00026	10.01.19.00027	10.01.19.00065	10.01.19.00028
SAXM 60 ED-85	10.01.19.00055	10.01.19.00029	10.01.19.00056	10.01.19.00031	10.01.19.00032	10.01.19.00066	10.01.19.00033
SAXM 80 ED-85	10.01.19.00057	10.01.19.00034	10.01.19.00058	10.01.19.00036	10.01.19.00037	10.01.19.00067	10.01.19.00038
SAXM 100 ED-85	10.01.19.00059	10.01.19.00039	10.01.19.00060	10.01.19.00041	10.01.19.00042	10.01.19.00068	10.01.19.00043
SAXM 115 ED-85	10.01.19.00061	10.01.19.00044	10.01.19.00062	10.01.19.00046	10.01.19.00047	10.01.19.00069	10.01.19.00048

 $<sup>^{\</sup>star}$ Additional material specifications at beginning of the section "Vacuum Suction Cups"

### Step 1: Bell-shaped Suction Cup SAXM (Single Component)

Part Number
10.01.19.00003
10.01.19.00004
10.01.19.00005
10.01.19.00006
10.01.19.00007
10.01.19.00008
10.01.19.00009
10.01.19.00010

<sup>\*</sup>Additional material specifications at beginning of the section "Vacuum Suction Cups"



## Bell-Shaped Suction Cups SAXM

Suction area (Ø) from 20 mm to 115 mm

## Step 2: Connector Upper Part (Single Component)

Туре	SAXM 2040	SAXM 5080	SAXM 100115
SC-A 045 G1/4-AG L	10.01.06.02818	-	-
SC-A 055 G1/4-AG L	-	10.01.06.02821	-
SC-A 065 G1/4-AG L	-	-	10.01.06.02824
SC-A 045 G1/4-IG L	10.01.06.02736	-	-
SC-A 055 G1/4-IG L	-	10.01.06.02742	-
SC-A 065 G1/4-IG L	-	-	10.01.06.02774
SC-A 045 G3/8-AG L	10.01.06.02807	-	-
SC-A 055 G3/8-AG L	-	10.01.06.02809	-
SC-A 065 G3/8-AG L	-	-	10.01.06.02810
SC-A 045 M10x1.5-AG L	10.01.06.02819	-	-
SC-A 055 M10x1.5-AG L	-	10.01.06.02822	-
SC-A 065 M10x1.5-AG L	-	-	10.01.06.02825
SC-A 045 M14x1.5-AG L	10.01.06.02820	-	-
SC-A 055 M14x1.5-AG L	-	10.01.06.02823	-
SC-A 065 M14x1.5-AG L	-	-	10.01.06.02826
SC-A 045 NPT3/8-IG L	10.01.06.02939	-	-
SC-A 055 NPT3/8-IG L	-	10.01.06.02941	-
SC-A 065 NPT3/8-IG L	-	-	10.01.06.02943
SC-A 045 RA L	10.01.06.02813	-	-
SC-A 055 RA L	-	10.01.06.02815	-
SC-A 065 RA L	-	-	10.01.06.02817

## Step 3: Connector Lower Part (Single Component)

Туре	SAXM 2040	SAXM 5080	SAXM 100115
SC-S 045 FDC-L	10.01.06.02803	-	-
SC-S 055 FDC-L	-	10.01.06.02804	-
SC-S 065 FDC-L	-	-	10.01.06.02805

## Technical Data Bell-Shaped Suction Cups SAXM

Туре	Suction force [N]*	Lateral force [N]**	Lateral force oily surface [N]**	Volume [cm³]	Min. curve radius [mm] (convex)	Recom. internal hose diameter d [mm]***
SAXM 20 ED-85 SC045	20	15	20	2.7	20	5
SAXM 30 ED-85 SC045	39	32	41	4.5	18	5
SAXM 40 ED-85 SC045	69	38	71	8.3	25	5
SAXM 50 ED-85 SC055	109	58	110	18.0	25	6
SAXM 60 ED-85 SC055	154	85	155	27.7	30	6
SAXM 80 ED-85 SC055	270	150	269	55.5	33	6
SAXM 100 ED-85 SC065	412	230	414	104.1	40	6
SAXM 115 ED-85 SC065	549	320	584	150.1	50	6

<sup>\*</sup>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

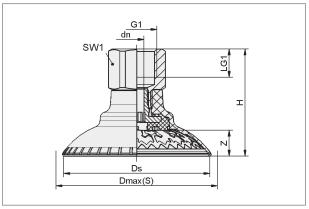
<sup>\*\*</sup>The specified lateral forces are values measured at a vacuum of -0.6 bar with a dry or oily, smooth, flat workpiece surface. Depending on the workpiece surface and its quality, the actual values may deviate from these values.

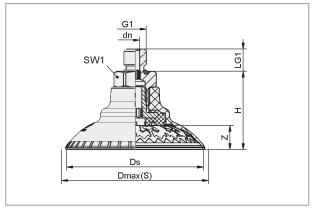
<sup>\*\*\*</sup>The recommended hose diameter refers to a hose length of approx. 2 m

## Bell-Shaped Suction Cups SAXM

Suction area (Ø) from 20 mm to 115 mm

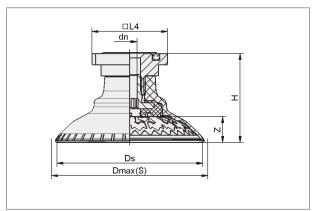
## Design Data Bell-Shaped Suction Cups SAXM (Assembled)





SAXM 20 to 115 IG

SAXM 20 to 115 AG



SAXM 20 to 115 RA

Туре	Dimensions	s in mm*							
	dn	Dmax(S)**	Ds	G1	Н	LG1	L4	SW1	Z (Stroke)
SAXM 20 ED-85 G1/4-AG	5	26.0	21.8	G1/4"-M	24	10	-	17	3.0
SAXM 20 ED-85 G1/4-IG	5	26.0	21.8	G1/4"-F	34	12	-	17	3.0
SAXM 20 ED-85 G3/8-AG	5	26.0	21.8	G3/8"-M	24	10	-	22	3.0
SAXM 20 ED-85 M10-AG	4	26.0	21.8	M10-M	24	10	-	17	3.0
SAXM 20 ED-85 M14x1.5-AG	5	26.0	21.8	M14x1.5-M	24	10	-	17	3.0
SAXM 20 ED-85 NPT3/8-IG	5	26.0	21.8	NPT3/8-F	34	14	-	22	3.0
SAXM 20 ED-85 RA	5	26.0	21.8	-	26	-	31.8	-	3.0
SAXM 30 ED-85 G1/4-AG	5	35.2	31.6	G1/4"-M	25	10	-	17	4.3
SAXM 30 ED-85 G1/4-IG	5	35.2	31.6	G1/4"-F	35	12	-	17	4.3
SAXM 30 ED-85 G3/8-AG	5	35.2	31.6	G3/8"-M	26	10	-	22	4.3
SAXM 30 ED-85 M10-AG	4	35.2	31.6	M10-M	25	10	-	17	4.3
SAXM 30 ED-85 NPT3/8-IG	5	35.2	31.6	NPT3/8-F	35	14	-	22	4.3
SAXM 30 ED-85 M14x1.5-AG	5	35.2	31.6	M14x1.5-M	25	10	-	17	4.3
SAXM 30 ED-85 RA	5	35.2	31.6	-	27	-	31.8	-	4.3

<sup>\*</sup>Acceptable dimensional tolerances for rubber parts concerning to DIN ISO 3302-1 M3

<sup>\*\*</sup>External dimension of the suction cup when it is pressed against the workpiece by the vacuum



## Bell-Shaped Suction Cups SAXM

Suction area (Ø) from 20 mm to 115 mm

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## Design Data Bell-Shaped Suction Cups SAXM (Assembled)

Туре	Dimensions	s in mm*							
	dn	Dmax(S)**	Ds	G1	Н	LG1	L4	SW1	Z (Stroke)
SAXM 40 ED-85 G1/4-AG	5	45.4	41.3	G1/4"-M	28	10	-	17	6.9
SAXM 40 ED-85 G1/4-IG	5	45.4	41.3	G1/4"-F	38	12	-	17	6.9
SAXM 40 ED-85 G3/8-AG	5	45.4	41.3	G3/8"-M	28	10	-	22	6.9
SAXM 40 ED-85 M10-AG	4	45.4	41.3	M10-M	28	10	-	17	6.9
SAXM 40 ED-85 M14x1.5-AG	5	45.4	41.3	M14x1.5-M	28	10	-	17	6.9
SAXM 40 ED-85 NPT3/8-IG	5	45.4	41.3	NPT3/8-F	38	14	-	22	6.9
SAXM 40 ED-85 RA	5	45.4	41.3	-	30	-	31.8	-	6.9
SAXM 50 ED-85 G1/4-AG	6	58.4	51.5	G1/4"-M	33	10	-	17	8.4
SAXM 50 ED-85 G1/4-IG	6	58.4	51.5	G1/4"-F	43	12	-	17	8.4
SAXM 50 ED-85 G3/8-AG	6	58.4	51.5	G3/8"-M	33	10	-	22	8.4
SAXM 50 ED-85 M10-AG	4	58.4	51.5	M10-M	33	10	-	17	8.4
SAXM 50 ED-85 M14x1.5-AG	6	58.4	51.5	M14x1.5-M	33	10	-	17	8.4
SAXM 50 ED-85 NPT3/8-IG	6	58.4	51.5	NPT3/8-F	43	14	-	22	8.4
SAXM 50 ED-85 RA	6	58.4	51.5	-	35	-	31.8	-	8.4
SAXM 60 ED-85 G1/4-AG	6	69.7	61.5	G1/4"-M	35	10	-	17	10.9
SAXM 60 ED-85 G1/4-IG	6	69.7	61.5	G1/4"-F	45	12	-	17	10.9
SAXM 60 ED-85 G3/8-AG	6	69.7	61.5	G3/8"-M	36	10	-	22	10.9
SAXM 60 ED-85 M10-AG	4	69.7	61.5	M10-M	35	10	-	17	10.9
SAXM 60 ED-85 M14x1.5-AG	6	69.7	61.5	M14x1.5-M	35	10	-	17	10.9
SAXM 60 ED-85 NPT3/8-IG	6	69.7	61.5	NPT3/8-F	45	14	-	22	10.9
SAXM 60 ED-85 RA	6	69.7	61.5	-	38	-	31.8	-	10.9
SAXM 80 ED-85 G1/4-AG	6	92.2	81.0	G1/4"-M	38	10	-	17	13.9
SAXM 80 ED-85 G1/4-IG	6	92.2	81.0	G1/4"-F	48	12	-	17	13.9
SAXM 80 ED-85 G3/8-AG	6	92.2	81.0	G3/8"-M	39	10	-	22	13.9
SAXM 80 ED-85 M10-AG	4	92.2	81.0	M10-M	38	10	-	17	13.9
SAXM 80 ED-85 M14x1.5-AG	6	92.2	81.0	M14x1.5-M	38	10	-	17	13.9
SAXM 80 ED-85 NPT3/8-IG	6	92.2	81.0	NPT3/8-F	48	14	-	22	13.9
SAXM 80 ED-85 RA	6	92.2	81.0	-	41	-	31.8	-	13.9
SAXM 100 ED-85 G1/4-AG	6	111.1	99.7	G1/4"-M	47	10	-	22	17.1
SAXM 100 ED-85 G1/4-IG	6	111.1	99.7	G1/4"-F	57	12	-	22	17.1
SAXM 100 ED-85 G3/8-AG	6	111.1	99.7	G3/8"-M	47	10	-	22	17.1
SAXM 100 ED-85 M10-AG	4	111.1	99.7	M10-M	47	10	-	22	17.1
SAXM 100 ED-85 M14x1.5-AG	6	111.1	99.7	M14x1.5-M	47	10	-	22	17.1
SAXM 100 ED-85 NPT3/8-IG	6	111.1	99.7	NPT3/8-F	57	14	-	22	17.1
SAXM 100 ED-85 RA	6	111.1	99.7	-	49	-	31.8	-	17.1
SAXM 115 ED-85 G1/4-AG	6	129.4	115.2	G1/4"-M	50	10	-	22	20.0
SAXM 115 ED-85 G1/4-IG	6	129.4	115.2	G1/4"-F	60	12	-	22	20.0
SAXM 115 ED-85 G3/8-AG	6	129.4	115.2	G3/8"-M	50	10	-	22	20.0
SAXM 115 ED-85 M10-AG	4	129.4	115.2	M10-M	50	10	-	22	20.0
SAXM 115 ED-85 M14x1.5-AG	6	129.4	115.2	M14x1.5-M	50	10	-	22	20.0
SAXM 115 ED-85 NPT3/8-IG	6	129.4	115.2	NPT3/8-F	60	14	-	22	20.0
SAXM 115 ED-85 RA	6	129.4	115.2	-	52	-	31.8	-	20.0

<sup>\*</sup>Acceptable dimensional tolerances for rubber parts concerning to DIN ISO 3302-1 M3

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Vacuum Suction Cups

Vacuum Grip- Spec ping Systems Gripl

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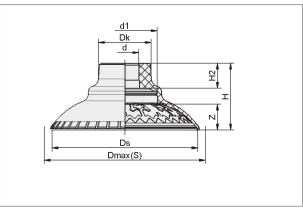
 $<sup>\</sup>star\star$ External dimension of the suction cup when it is pressed against the workpiece by the vacuum



## Bell-Shaped Suction Cups SAXM

Suction area (Ø) from 20 mm to 115 mm

#### Design Data Bell-Shaped Suction Cup SAXM (Single Component)



SAXM 20 to 115

Туре	Dimensions in	mm*						
	d	d1	Dk	Dmax(S)**	Ds	Н	H2	Z (Stroke)
SAXM 20 ED-85 SC045	9.7	15.3	19.5	26.0	21.8	17	7.0	3.0
SAXM 30 ED-85 SC045	9.7	15.6	19.2	35.2	31.6	18	7.0	4.3
SAXM 40 ED-85 SC045	9.7	15.6	19.2	45.4	41.3	21	7.0	6.9
SAXM 50 ED-85 SC055	11.8	27.6	22.2	58.4	51.5	26	10.5	8.4
SAXM 60 ED-85 SC055	11.8	27.6	22.2	69.7	61.5	28	10.5	10.9
SAXM 80 ED-85 SC055	11.8	27.6	22.0	92.2	81.0	31	10.5	13.9
SAXM 100 ED-85 SC065	14.0	39.6	25.6	111.1	99.7	39	14.3	17.1
SAXM 115 ED-85 SC065	14.0	39.6	28.9	129.4	115.2	42	14.3	20.0

<sup>\*</sup>Acceptable dimensional tolerances for rubber parts concerning to DIN ISO 3302-1 M3

<sup>\*\*</sup>External dimension of the suction cup when it is pressed against the workpiece by the vacuum

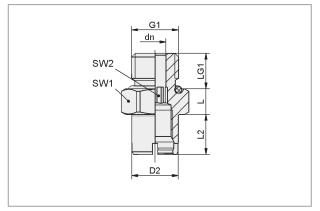
# SCHMALZ

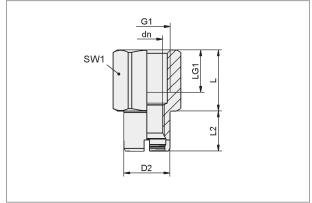
Bell-Shaped Suction Cups SAXM

Suction area (Ø) from 20 mm to 115 mm

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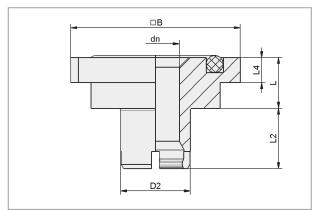
## **Design Data Connector Upper Part (Single Component)**





SC-A...AG





SC-A...RA

Туре	Dimension	s in mm								
	В	dn	D2	G1	L	L2	L4	LG1	SW1	SW2
SC-A 045 G1/4-AG L	-	5.1	10.5	G1/4"-M	7.2	7.8	-	10	17	5
SC-A 055 G1/4-AG L	-	6.1	13.0	G1/4"-M	7.2	11.3	-	10	17	6
SC-A 065 G1/4-AG L	-	6.1	15.0	G1/4"-M	8.0	15.1	-	10	22	6
SC-A 045 G1/4-IG L	-	6.9	10.5	G1/4"-F	17.2	7.8	-	12	17	-
SC-A 055 G1/4-IG L	-	8.9	13.0	G1/4"-F	17.2	11.3	-	12	17	-
SC-A 065 G1/4-IG L	-	8.9	15.0	G1/4"-F	18.0	15.1	-	12	22	-
SC-A 045 G3/8-AG L	-	5.1	10.5	G3/8"-M	7.7	7.8	-	10	22	5
SC-A 055 G3/8-AG L	-	6.1	13.0	G3/8"-M	7.7	11.3	-	10	22	6
SC-A 065 G3/8-AG L	-	6.1	15.0	G3/8"-M	8.0	15.1	-	10	22	6
SC-A 045 M10-AG L	-	4.1	10.5	M10-M	7.2	7.8	-	10	17	4
SC-A 055 M10-AG L	-	4.1	13.0	M10-M	7.2	11.3	-	10	17	4
SC-A 065 M10-AG L	-	4.1	15.0	M10-M	8.0	15.1	-	10	22	4
SC-A 045 M14x1.5-AG L	-	5.1	10.5	M14x1.5-M	7.2	7.8	-	10	17	5
SC-A 055 M14x1.5-AG L	-	6.1	13.0	M14x1.5-M	7.2	11.3	-	10	17	6
SC-A 065 M14x1.5-AG L	-	6.1	15.0	M14x1.5-M	8.0	15.1	-	10	22	6
SC-A 045 NPT3/8-IG L	-	6.9	10.5	NPT3/8-F	17.2	7.8	-	14	22	-
SC-A 055 NPT3/8-IG L	-	8.9	13.0	NPT3/8-F	17.2	11.3	-	14	22	-
SC-A 065 NPT3/8-IG L	-	8.9	15.0	NPT3/8-F	18.0	15.1	-	14	22	-
SC-A 045 RA L	31.8	6.9	10.5	-	9.5	7.8	4.7	-	-	-
SC-A 055 RA L	31.8	8.9	13.0	-	9.5	11.3	4.7	-	-	-
SC-A 065 RA L	31.8	8.9	15.0	-	9.5	15.1	4.7	-	_	_

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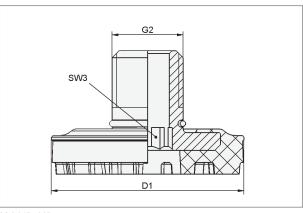
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## Bell-Shaped Suction Cups SAXM

Suction area (Ø) from 20 mm to 115 mm

## **Design Data Connector Lower Part (Single Component)**



SC-S 045...065

Туре	Dimensions in mm		
	D1	G2	SW3
SC-S 045 FDC-L	15	M8x1-M	5
SC-S 055 FDC-L	28	M10x1-M	6
SC-S 065 FDC-L	39	M10x1-M	6

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## Bell-Shaped Suction Cups SAOXM (Oval)

Suction area (LxW) 60 x 20 mm to 100 x 40 mm

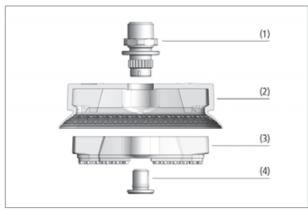




#### Suitable for Industry Specific Applications



Bell-shaped suction cups SAOXM (oval)



System design bell-shaped suction cups SAOXM (oval)



Bell-shaped suction cups SAOXM for handling formed sheet metal parts

#### **Applications**

- Oval high-speed suction cup for applications with demands for highest holding forces and shear forces especially for narrow metal sheets and car body parts
- Handling of long workpieces, workpieces with internal ribbing and reinforcing plates
- Handling of workpieces with oily surfaces
- Loading and unloading CNC metal and laser cutting machines
- Handling of workpieces with convex surfaces

#### Design

- Oval bell-shaped suction cup (2) with flexible sealing lip and optimum inner structure
- Wear-resistant material Elastodur of suction cup (ED-85) and friction disc (ED-65)
- Insert (3) with friction disc for reinforcing the suction cup
- Two-piece, reusable Schmalz Connector (SC) consisting of an upper part (1) and a lower part (4)
- Upper part of the connector with anti-rotation guard
- Lower part of the connector with anti-loosening guard
- Available as assembled suction cup or as individual parts

#### Our Highlights...

- Very high suction cup stroke
- Optimized internal structure
- · Large-surface, structured inner support
- Innovative material Elastodur
- Environmentally friendly, modular design

#### Your Benefits...

- > Optimum adjustability for different workpiece contours
- > Extremely high absorption of holding and lateral forces, especially on oily sheet metal
- > Avoiding of deep-drawing, even with thin sheets
- > Extremely wear-resistant, resistant to the effects of ozone and aggressive drawing oils
- > Minimum cost, quick replacement of individual components, 100 % recyclable





Suction area (LxW) 60 x 20 mm to 100 x 40 mm



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Bell-Shaped Suction Cups SAOXM (Oval)

Designation Code Bell-Shaped Suction Cups SAOXM (Oval)

Abbreviated designation	Suction area LxW in mm	Material and Shore hardness	Connection thread
Example SAOXM 60x20 ED-85 G1/4-IG:			
SAOXM	60x20	ED-85	G1/4-IG
SAOXM	60x20 80x30 100x40	ED-85	G1/4-IG (IG = female (F)) G1/4-AG (AG = male (M)) G3/8-IG G3/8-AG M10x-AG M14x1.5-AG NPT3/8-IG RA rectangular adapter

#### Ordering Data Bell-Shaped Suction Cups SAOXM (Oval)

Bell-shaped suction cup SAOXM (elastomer part with insert including friction disc + connection element) is delivered assembled. As an alternative the individual parts can also be ordered separately. To do this, the following ordering steps are required:

- Bell-shaped suction cup of type SAOXM (step 1) elastomer part, available in various dimensions
- Insert (step 2) including moulded on friction disc
- Connector upper part (step 3) available with various threads
- Connector lower part (step 4)

#### Bell-Shaped Suction Cups SAOXM (Oval) (Assembled)

Туре	Connection			
	G1/4"-M	G1/4"-F	G3/8"-M	G3/8"-F
SAOXM 60x20 ED-85	10.01.24.00033	10.01.24.00013	10.01.24.00036	10.01.24.00017
SAOXM 80x30 ED-85	10.01.24.00034	10.01.24.00014	10.01.24.00037	10.01.24.00018
SAOXM 100x40 ED-85	10.01.24.00035	10.01.24.00015	10.01.24.00038	10.01.24.00019

Туре	Connection			
	M10-M	M14x1.5-M	NPT3/8-F	Rectangular adapter
SAOXM 60x20 ED-85	10.01.24.00025	10.01.24.00029	10.01.24.00042	10.01.24.00021
SAOXM 80x30 ED-85	10.01.24.00026	10.01.24.00030	10.01.24.00043	10.01.24.00022
SAOXM 100x40 ED-85	10.01.24.00027	10.01.24.00031	10.01.24.00044	10.01.24.00023

#### Step 1: Bell-Shaped Suction Cups SAOXM (Oval) (Single Component)

Туре	Part Number
SAOXM 60x20 ED-85 SC045-AR	10.01.24.00001
SAOXM 80x30 ED-85 SC045-AR	10.01.24.00002
SAOXM 100x40 ED-85 SC055-AR	10.01.24.00003

#### Step 2: Insert (Single Component)

Туре	SAOXM 60x20	SAOXM 80x30	SAOXM 100x40
SC-I 045 AR-FDC	10.01.24.00009	10.01.24.00010	-
SC-I 055 AR-FDC	-	-	10.01.24.00011



## Bell-Shaped Suction Cups SAOXM (Oval)

Suction area (LxW) 60 x 20 mm to 100 x 40 mm

#### Step 3: Connector Upper Part (Single Component)

Туре	SAOXM 60x20	SAOXM 80x30	SAOXM 100x40
SC-A 045-AR G1/4-AG L	10.01.06.03131	10.01.06.03131	-
SC-A 045-AR G1/4-IG L	10.01.06.03130	10.01.06.03130	-
SC-A 045-AR G3/8-AG L	10.01.06.03133	10.01.06.03133	-
SC-A 045-AR G3/8-IG L	10.01.06.03132	10.01.06.03132	-
SC-A 045-AR M10x1.5-AG L	10.01.06.03136	10.01.06.03136	-
SC-A 045-AR M14x1.5-AG L	10.01.06.03137	10.01.06.03137	-
SC-A 045-AR NPT3/8-IG L	10.01.06.03140	10.01.06.03140	-
SC-A 045-AR RA L	10.01.06.03135	10.01.06.03135	-
SC-A 055-AR G1/4-AG L	-	-	10.01.06.03165
SC-A 055-AR G1/4-IG L	-	-	10.01.06.03164
SC-A 055-AR G3/8-AG L	-	-	10.01.06.03167
SC-A 055-AR G3/8-IG L	-	-	10.01.06.03166
SC-A 055-AR M10x1.5-AG L	-	-	10.01.06.03170
SC-A 055-AR M14x1.5-AG L	-	-	10.01.06.03171
SC-A 055-AR NPT3/8-IG L	-	-	10.01.06.03174
SC-A 055-AR RA L	-	-	10.01.06.03169

## Step 4: Connector Lower Part (Single Component)

Туре	SAOXM 60x20	SAOXM 80x30	SAOXM 100x40
SC-S 045 L	10.01.06.02740	10.01.06.02740	-
SC-S 055 L	-	-	10.01.06.02746

#### Technical Data Bell-Shaped Suction Cups SAOXM (Oval)

Туре	Suction force [N]*	Lateral force [N]**	Lateral force oily surface [N]**	Volume [cm³]	Min. curve radius [mm] (convex)	Recom. internal hose diameter d [mm]***
SAOXM 60x20 ED-85	56	44	62	5	10	4
SAOXM 80x30 ED-85	105	110	134	13	20	4
SAOXM 100x40 ED-85	173	135	156	24	32	6

<sup>\*</sup>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

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<sup>\*\*</sup>The specified lateral forces are values measured at a vacuum of -0.6 bar with a dry or oily, smooth, flat workpiece surface. Depending on the workpiece surface and its quality, the actual values may deviate from these values

<sup>\*\*\*</sup>The recommended hose diameter refers to a hose length of approx. 2 m

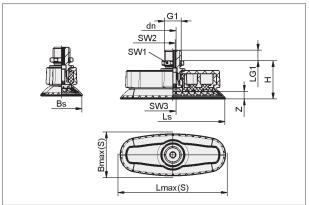
Design Data Bell-Shaped Suction Cups SAOXM (Oval) (Assembled)

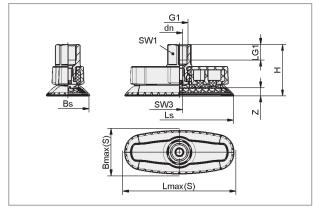


Bell-Shaped Suction Cups SAOXM (Oval)

Suction area (LxW) 60 x 20 mm to 100 x 40 mm

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SAOXM...IG (female)

□L4 dn SW3

Lmax(S)

SAOXM...RA

SAOXM...AG (male)



Bell-Shaped Suction Cups SAOXM (Oval)

Suction area (LxW) 60 x 20 mm to 100 x 40 mm

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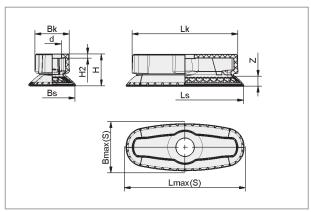
#### Design Data Bell-Shaped Suction Cups SAOXM (Oval) (Assembled)

Туре	Dimensions	in mm	1*										
	Bmax(S)**	Bs	dn	G1	Н	LG1	Lmax(S)**	Ls	L4	SW	SW	SW	Z (Stroke)
										1	2	3	
SAOXM 60x20 ED-85 G1/4-AG	24.0	18.7	4.1	G1/4"-M	29.8	8	67	61.8	-	17	4	5	5
SAOXM 60x20 ED-85 G1/4-IG	24.0	18.7	5.1	G1/4"-F	38.5	12	67	61.8	-	17	-	5	5
SAOXM 60x20 ED-85 G3/8-AG	24.0	18.7	4.1	G3/8"-M	29.8	8	67	61.8	-	19	4	5	5
SAOXM 60x20 ED-85 G3/8-IG	24.0	18.7	5.1	G3/8"-F	38.5	12	67	61.8	-	22	-	5	5
SAOXM 60x20 ED-85 M10-AG	24.0	18.7	4.1	M10-M	31.3	8	67	61.8	-	16	4	5	5
SAOXM 60x20 ED-85 M14x1.5-AG	24.0	18.7	4.1	M14x1.5-M	31.3	8	67	61.8	-	22	4	5	5
SAOXM 60x20 ED-85 NPT3/8-IG	24.0	18.7	5.1	NPT3/8-F	38.5	14	67	61.8	-	22	-	5	5
SAOXM 60x20 ED-85 RA	24.0	18.7	5.1	-	30.8	-	67	61.8	31.8	-	-	5	5
SAOXM 80x30 ED-85 G1/4-AG	41.5	31.9	4.1	G1/4"-M	30.3	8	88	82.1	-	17	4	5	6
SAOXM 80x30 ED-85 G1/4-IG	41.5	31.9	5.1	G1/4"-F	39.1	12	88	82.1	-	17	-	5	6
SAOXM 80x30 ED-85 G3/8-AG	41.5	31.9	4.1	G3/8"-M	30.3	8	88	82.1	-	19	4	5	6
SAOXM 80x30 ED-85 G3/8-IG	41.5	31.9	5.1	G3/8"-F	39.1	12	88	82.1	-	22	-	5	6
SAOXM 80x30 ED-85 M10-AG	41.5	31.9	4.1	M10-M	31.8	8	88	82.1	-	16	4	5	6
SAOXM 80x30 ED-85 M14x1.5-AG	41.5	31.9	4.1	M14x1.5-M	31.8	8	88	82.1	-	22	4	5	6
SAOXM 80x30 ED-85 NPT3/8-IG	41.5	31.9	5.1	NPT3/8-F	39.1	14	88	82.1	-	22	-	5	6
SAOXM 80x30 ED-85 RA	41.5	31.9	5.1	-	31.4	-	88	82.1	31.8	-	-	5	6
SAOXM 100x40 ED-85 G1/4-AG	51.0	41.6	5.1	G1/4"-M	37.7	8	109	101.8	-	17	5	6	7
SAOXM 100x40 ED-85 G1/4-IG	51.0	41.6	6.1	G1/4"-F	45.7	12	109	101.8	-	17	-	6	7
SAOXM 100x40 ED-85 G3/8-AG	51.0	41.6	5.1	G3/8"-M	37.7	8	109	101.8	-	19	5	6	7
SAOXM 100x40 ED-85 G3/8-IG	51.0	41.6	6.1	G3/8"-F	45.7	12	109	101.8	-	22	-	6	7
SAOXM 100x40 ED-85 M10-AG	51.0	41.6	4.1	M10-M	37.7	8	109	101.8	-	16	4	6	7
SAOXM 100x40 ED-85 M14x1.5-AG	51.0	41.6	5.1	M14x1.5-M	39.2	8	109	101.8	-	22	5	6	7
SAOXM 100x40 ED-85 NPT3/8-IG	51.0	41.6	6.1	NPT3/8-F	45.7	15	109	101.8	-	22	-	6	7
SAOXM 100x40 ED-85 RA	51.0	41.6	6.1	-	38.2	-	109	101.8	31.8	-	-	6	7
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<sup>\*</sup>Acceptable dimensional tolerances for rubber parts concerning to DIN ISO 3302-1 M3

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#### Design Data Bell-Shaped Suction Cups SAOXM (without Connection Element) (Single Component)



SAOXM..

Туре	Dimensio	Dimensions in mm*										
	Bk	Bmax(S)**	Bs	d	Н	H2	Lk	Lmax(S)**	Ls	Z (Stroke)		
SAOXM 60x20 ED-85 SC045-AR	20.0	24.0	18.7	12.8	21.9	3	60.0	67	61.8	5		
SAOXM 80x30 ED-85 SC045-AR	24.1	41.5	31.9	12.8	22.4	3	74.3	88	82.1	6		
SAOXM 100x40 ED-85 SC055-AR	32.3	51.0	41.6	15.2	29.3	3	89.9	109	101.8	7		

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

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 $<sup>\</sup>star\star$ External dimension of the suction cup when it is pressed against the workpiece by the vacuum

 $<sup>\</sup>ensuremath{^{\star\star}}\xspace$  External dimension of the suction cup when it is pressed against the workpiece by the vacuum

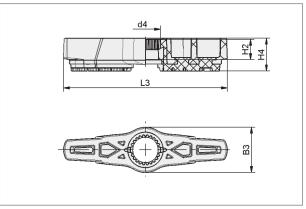


Bell-Shaped Suction Cups SAOXM (Oval)

Suction area (LxW) 60 x 20 mm to 100 x 40 mm

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## **Design Data Insert SAOXM (Single Component)**



SC-I...AR-FDC

Туре	Dimensions in mm										
	For suction cup	B3	d4	H2	H4	L3					
	type										
SC-I 045 AR-FDC	SAOXM 60x20	16.0	12.7	9	13.9	55.8					
SC-I 045 AR-FDC	SAOXM 80x30	19.1	12.7	9	13.9	69.0					
SC-I 055 AR-FDC	SAOXM 100x40	27.3	18.6	12	14.5	84.3					

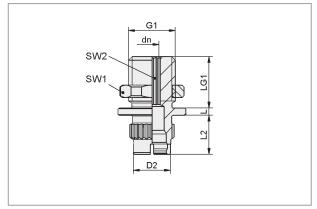


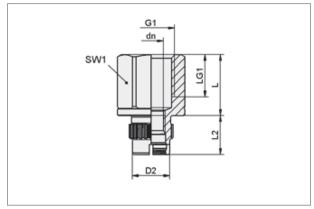
Bell-Shaped Suction Cups SAOXM (Oval)

Suction area (LxW) 60 x 20 mm to 100 x 40 mm

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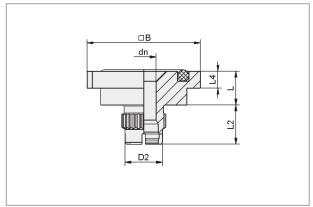
#### Design Data Connector Upper Part SAOXM (Single Component)





SC-A...AG (male)

SC-A...IG (female)



SC-A...RA

Туре	Dimension	s in mm								
	В	dn	D2	G1	L	L2	L4	LG1	SW1	SW2
SC-A 045-AR G1/4-AG L	-	4.1	10.5	G1/4"-M	2.0	11	-	14.5	17	4
SC-A 045-AR G1/4-IG L	-	6.9	10.5	G1/4"-F	17.2	11	-	14.8	17	-
SC-A 045-AR G3/8-AG L	-	4.1	10.5	G3/8"-M	2.0	11	-	14.5	19	4
SC-A 045-AR G3/8-IG L	-	6.9	10.5	G3/8"-F	17.2	11	-	12.0	22	-
SC-A 045-AR M10-AG L	-	4.1	10.5	M10-M	3.5	11	-	14.5	16	4
SC-A 045-AR M14x1.5-AG L	-	4.1	10.5	M14x1.5-M	2.0	11	-	16.0	22	4
SC-A 045-AR NPT3/8-IG L	-	6.9	10.5	NPT3/8-F	17.2	11	-	14.0	22	-
SC-A 045-AR RA L	31.8	6.9	10.5	-	9.5	11	4.7	-	-	-
SC-A 055-AR G1/4-AG L	-	5.1	13.0	G1/4"-M	2.5	15	-	14.5	17	5
SC-A 055-AR G1/4-IG L	-	8.9	13.0	G1/4"-F	17.0	15	-	14.8	17	-
SC-A 055-AR G3/8-AG L	-	5.1	13.0	G3/8"-M	2.5	15	-	14.5	19	5
SC-A 055-AR G3/8-IG L	-	8.9	13.0	G3/8"-F	17.0	15	-	12.0	22	-
SC-A 055-AR M10-AG L	-	4.1	13.0	M10-M	2.5	15	-	14.5	16	4
SC-A 055-AR M14x1.5-AG L	-	5.1	13.0	M14x1.5-M	2.5	15	-	16.0	22	5
SC-A 055-AR NPT3/8-IG L	-	8.9	13.0	NPT3/8-F	17.0	15	-	14.0	22	-
SC-A 055-AR RA L	31.8	8.9	13.0	-	9.5	15	4.7	-	-	-

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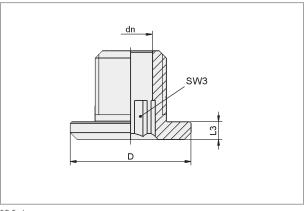


Bell-Shaped Suction Cups SAOXM (Oval)

Suction area (LxW) 60 x 20 mm to 100 x 40 mm

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## **Design Data Connector Lower Part SAOXM (Single Component)**



SC-S...L

Туре	Dimensions in mm			
	dn	D	L3	SW3
SC-S 045 L	5.1	13	2	5
SC-S 055 L	6.1	21	3	6

## Flat Suction Cups SAF

Suction area (Ø) from 30 mm to 125 mm





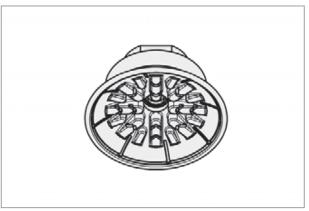
#### Suitable for Industry Specific Applications



Flat suction cups SAF

#### **Applications**

- Round, flat suction cup for dynamic handling of metal sheets with very short cycle times
- · Handling of thin steel sheets and aluminum sheets without deformation
- For use in feeder systems for press lines in the automobile
- Special slot on the bottom prevents oily sheets from slipping, permitting precise positioning in stamping presses etc.



System design flat suction cups SAF

#### Design

- Robust and wear-resistant suction cup SAF made of NBR with single sealing lip, special slot and inner support
- Suction cup SAF vulcanized to the connection nipple (very high strength)
- Suction cup available with various connection types
- Available in two material hardness values (45 Shore, 60 Shore)



Flat suction cups SAF being used for handling sheet metal parts

#### Our Highlights...

- Wide range of diameters
- Large-area structured inner support
- Soft and flexible sealing lip
- Various material hardness
- Nipple vulcanized to the suction cup

#### Your Benefits...

- > For a wide range of workpiece sizes and shapes
- > No deep-drawing of the workpiece; capable of handling high lateral forces, even on oily metal sheets
- > Excellent sealing, even on slightly curved surfaces
- > Optimum adaptation to varying workpieces
- > Prevention of machine damages and downtimes as the result of lost suction cups

## Flat Suction Cups SAF

Suction area (Ø) from 30 mm to 125 mm



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## **Designation Code Flat Suction Cups SAF**

Abbreviated designation	Suction area Ø in mm	Material and Shore hardness	Connection thread	
Example SAF 80 NBR-60 G3/8-IG:				
SAF	80	NBR-60	G3/8-IG	
SAF	30	NBR-45	G1/4-AG (AG = male (M))	
	to	NBR-60	G1/4-IG (IG = female (F))	
	125		G3/8-IG	
			M10-AG	
			M14x1.5-AG	
			RA rectangular adapter	



## **Ordering Data Flat Suction Cups SAF**

Suction cup SAF, available in various diameters, is delivered with connection nipple vulcanized to elastomer part.

#### Flat Suction Cups SAF

Type*	Connection	Connection										
	G1/4"-M	G1/4"-F	G3/8"-F	M10-M	M14x1.5-M	Rect. adapter						
SAF 30 NBR-60	10.01.01.10646	10.01.01.10506	10.01.01.10705	10.01.01.10713	10.01.01.10730	10.01.01.10790						
SAF 30 NBR-45	10.01.01.11421	10.01.01.11400	10.01.01.11420	10.01.01.11425	10.01.01.11426	10.01.01.11423						
SAF 40 NBR-60	10.01.01.10647	10.01.01.10508	10.01.01.10708	10.01.01.10716	10.01.01.10733	10.01.01.10793						
SAF 40 NBR-45	10.01.01.11430	10.01.01.11401	10.01.01.11431	10.01.01.11435	10.01.01.11436	10.01.01.11433						
SAF 50 NBR-60	10.01.01.10635	10.01.01.10688	10.01.01.10510	10.01.01.10719	10.01.01.10736	10.01.01.10796						
SAF 50 NBR-45	10.01.01.11440	10.01.01.11441	10.01.01.11402	10.01.01.11444	10.01.01.11445	10.01.01.11442						
SAF 60 NBR-60	10.01.01.10622	10.01.01.10689	10.01.01.10512	10.01.01.10721	10.01.01.10739	10.01.01.10799						
SAF 60 NBR-45	10.01.01.11450	10.01.01.11451	10.01.01.11403	10.01.01.11454	10.01.01.11455	10.01.01.11452						
SAF 80 NBR-60	10.01.01.10623	10.01.01.10690	10.01.01.10514	10.01.01.10724	10.01.01.10742	10.01.01.10802						
SAF 80 NBR-45	10.01.01.11460	10.01.01.11461	10.01.01.11404	10.01.01.11466	10.01.01.11467	10.01.01.11464						
SAF 100 NBR-60	10.01.01.10624	10.01.01.10691	10.01.01.10516	10.01.01.10726	10.01.01.10745	10.01.01.10805						
SAF 100 NBR-45	10.01.01.11470	10.01.01.11471	10.01.01.11405	10.01.01.11476	10.01.01.11477	10.01.01.11474						
SAF 125 NBR-60	10.01.01.10666	10.01.01.10692	10.01.01.10518	10.01.01.10728	10.01.01.10748	10.01.01.10808						
SAF 125 NBR-45	10.01.01.11480	10.01.01.11481	10.01.01.11406	10.01.01.11485	10.01.01.11486	10.01.01.11483						

<sup>\*</sup>Additional material specifications at beginning of the section "Vacuum Suction Cups"

## **Technical Data Flat Suction Cups SAF**

Туре	Suction force [N]*	Lateral force [N]**	Lateral force oily surface [N]**	Volume [cm³]	Min. curve radius [mm] (convex)	Recommended internal hose diameter d [mm]***
SAF 30	38	30	28	2.7	40	4
SAF 40	69	52	50	5.3	50	4
SAF 50	100	80	76	9.5	65	4
SAF 60	150	105	85	16.7	75	6
SAF 80	272	205	180	36.7	100	6
SAF 100	430	310	300	59.9	135	6
SAF 125	660	475	400	119.0	165	9

<sup>\*</sup>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

<sup>\*\*</sup>The specified lateral forces are values measured at a vacuum of -0.6 bar with a dry or oily, smooth, flat workpiece surface. Depending on the workpiece surface and its quality, the actual values may deviate from these values.

<sup>\*\*\*</sup>The recommended hose diameter refers to a hose length of approx. 2 m

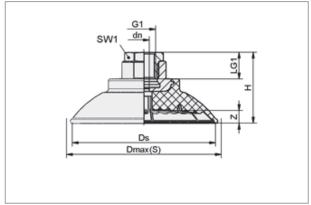


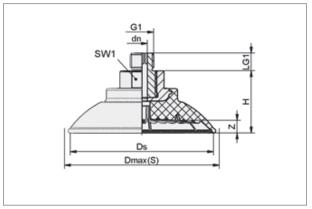
Flat Suction Cups SAF

Suction area (Ø) from 30 mm to 125 mm

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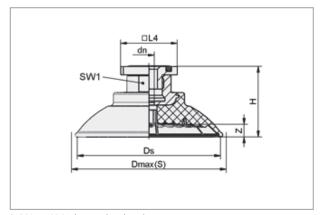
## **Design Data Flat Suction Cups SAF**





SAF 30 to 125 IG





SAF 30 to 125 RA (rectangular adapter)

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## Flat Suction Cups SAF

Suction area (Ø) from 30 mm to 125 mm

**Design Data Flat Suction Cups SAF** 

VacuumSuction CupsKnowledge

Туре	Dimensions in	mm*							
	Dmax(S)**	dn	Ds	G1	Н	LG1	L4	SW1	Z (Stroke)
SAF 30 G1/4-AG	34	4	31	G1/4"-M	20.0	10	-	17	3.0
SAF 30 G1/4-IG	34	4	31	G1/4"-F	20.0	12	-	17	3.0
SAF 30 G3/8-IG	34	4	31	G3/8"-F	36.0	9	-	22	3.0
SAF 30 M10x1.5-AG	34	4	31	M10-M	20.0	12	-	17	3.0
SAF 30 M14x1.5-AG	34	4	31	M14x1.5-M	20.0	12	-	17	3.0
SAF 30 RA	34	4	31	-	23.2	-	32	17	3.0
SAF 40 G1/4-AG	46	4	41	G1/4"-M	22.0	10	-	17	4.0
SAF 40 G1/4-IG	46	4	41	G1/4"-F	22.0	12	-	17	4.0
SAF 40 G3/8-IG	46	4	41	G3/8"-F	38.0	9	-	22	4.0
SAF 40 M10x1.5-AG	46	4	41	M10-M	22.0	12	-	17	4.0
SAF 40 M14x1.5-AG	46	4	41	M14x1.5-M	22.0	12	-	17	4.0
SAF 40 RA	46	4	41	-	25.0	-	32	17	4.0
SAF 50 G1/4-AG	56	6	50	G1/4"-M	28.0	10	-	22	5.0
SAF 50 G1/4-IG	56	6	50	G1/4"-F	33.0	15	-	22	5.0
SAF 50 G3/8-IG	56	6	50	G3/8"-F	28.0	15	-	22	5.0
SAF 50 M10x1.5-AG	56	4	50	M10-M	28.0	12	-	22	5.0
SAF 50 M14x1.5-AG	56	6	50	M14x1.5-M	28.0	12	-	22	5.0
SAF 50 RA	56	6	50	-	27.5	-	32	22	5.0
SAF 60 G1/4-AG	67	6	61	G1/4"-M	31.0	10	-	22	6.0
SAF 60 G1/4-IG	67	6	61	G1/4"-F	36.0	15	-	22	6.0
SAF 60 G3/8-IG	67	6	61	G3/8"-F	31.0	15	-	22	6.0
SAF 60 M10x1.5-AG	67	4	61	M10-M	31.0	12	-	22	6.0
SAF 60 M14x1.5-AG	67	6	61	M14x1.5-M	31.0	12	-	22	6.0
SAF 60 RA	67	6	61	-	30.5	-	32	22	6.0
SAF 80 G1/4-AG	89	6	83	G1/4"-M	35.0	10	-	22	7.6
SAF 80 G1/4-IG	89	6	83	G1/4"-F	40.0	20	-	22	7.6
SAF 80 G3/8-IG	89	6	83	G3/8"-F	35.0	15	-	22	7.6
SAF 80 M10x1.5-AG	89	4	83	M10-M	35.0	12	-	22	7.6
SAF 80 M14x1.5-AG	89	6	83	M14x1.5-M	35.0	12	-	22	7.6
SAF 80 RA	89	6	83	-	34.5	-	32	22	7.6
SAF 100 G1/4-AG	110	6	103	G1/4"-M	36.0	10	-	22	9.5
SAF 100 G1/4-IG	110	6	103	G1/4"-F	41.0	20	-	22	9.5
SAF 100 G3/8-IG	110	6	103	G3/8"-F	36.0	15	-	22	9.5
SAF 100 M10x1.5-AG	110	4	103	M10-M	36.0	12	-	22	9.5
SAF 100 M14x1.5-AG	110	6	103	M14x1.5-M	36.0	12	-	22	9.5
SAF 100 RA	110	6	103	-	35.5	-	32	22	9.5
SAF 125 G1/4-AG	135	6	128	G1/4"-M	43.0	10	-	22	12.5
SAF 125 G1/4-IG	135	6	128	G1/4"-F	48.0	20	-	22	12.5
SAF 125 G3/8-IG	135	9	128	G3/8"-F	43.0	15	-	22	12.5
SAF 125 M10x1.5-AG	135	4	128	M10-M	43.0	12	-	22	12.5
SAF 125 M14x1.5-AG	135	6	128	M14x1.5-M	43.0	12	-	22	12.5
SAF 125 RA	135	9	128	-	42.5	-	32	22	12.5

<sup>\*</sup>Acceptable dimensional tolerances for rubber parts concerning to DIN ISO 3302-1 M3

 $<sup>\</sup>ensuremath{^{\star\star}}\xspace$  External dimension of the suction cup when it is pressed against the workpiece by the vacuum

Bellows Suction Cups SAB (1.5 Folds)

Suction area (Ø) from 22 mm to 125 mm





#### Suitable for Industry Specific Applications



Bellows suction cups SAB (1.5 folds)



# System design bellows suction cups SAB (1.5 folds)

## Our Highlights...

- · Wide range of diameters
- 1.5 folds
- Stiff top fold
- Large, structured inner sup-
- Nipple vulcanized to cup

#### **Applications**

- Round, bellows suction cup with 1.5 folds for dynamic handling of metal sheets (short cycle times)
- · Handling of thin steel sheets and aluminum sheets without deformation
- Handling of pre-shaped metal sheet parts, since bellows shape permits optimum adaptation
- For use e.g. in feeder systems for press lines in the automobile
- Special slot on the bottom of the cup prevents the oily metal sheets from slipping and permits precise positioning in punching presses etc.

#### Design

- Robust and wear-resistant suction cup SAB with 1.5 folds, made of NBR, special slot and inner support
- Suction cup SAB vulcanized to the connection nipple (very high
- Suction cups available with various connection types

#### Your Benefits...

- > For a wide range of workpiece sizes and shapes
- > Optimum adaptation and sealing to curved workpieces, very good damping during placement on workpiece
- > Good resistance to horizontal forces and lateral acceleration
- > No deep-drawing of the workpiece; capable of handling high lateral forces even on oily metal sheets
- > Prevention of machine damage and downtimes due to lost suction cups



Bellows suction cups SAB being used for handling car bodywork parts



Suction area (Ø) from 22 mm to 125 mm



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#### Designation Code Bellows Suction Cups SAB (1.5 Folds)

Abbreviated designation	Suction area Ø in mm	Material and Shore hardness	Connection thread
Example SAB 30 NBR-60 G1/4-AG:			
SAB	30	NBR-60	G1/4-AG
SAB	22	NBR-60	G1/4-AG (AG = male (M))
	to		G1/4-IG (IG = female (F))
	125		G3/8-IG
			M10-AG
			M14x1.5-AG
			RA rectangular adapter



## Ordering Data Bellows Suction Cups SAB (1.5 Folds)

Suction cup SAB, available in various diameters, is delivered with connection nipple vulcanized to elastomer part.

#### **Bellows Suction Cups SAB (1.5 Folds)**

Type*	Connection					
	G1/4"-M	G1/4"-F	G3/8"-F	M10-M	M14x1.5-M	Rectangular adapt.
SAB 22 NBR-60	10.01.06.01653	10.01.06.01533	10.01.06.01650	10.01.06.01654	10.01.06.01655	10.01.06.01663
SAB 30 NBR-60	10.01.06.01197	10.01.06.01196	10.01.06.01198	10.01.06.01200	10.01.06.01201	10.01.06.01203
SAB 40 NBR-60	10.01.06.00803	10.01.06.00670	10.01.06.00924	10.01.06.00994	10.01.06.01006	10.01.06.01054
SAB 50 NBR-60	10.01.06.00804	10.01.06.00851	10.01.06.00672	10.01.06.00996	10.01.06.01008	10.01.06.01055
SAB 60 NBR-60	10.01.06.00805	10.01.06.00852	10.01.06.00674	10.01.06.00998	10.01.06.01010	10.01.06.01056
SAB 80 NBR-60	10.01.06.00806	10.01.06.00850	10.01.06.00676	10.01.06.01000	10.01.06.01012	10.01.06.01057
SAB 100 NBR-60	10.01.06.00807	10.01.06.00853	10.01.06.00678	10.01.06.01002	10.01.06.01014	10.01.06.01058
SAB 125 NBR-60	10.01.06.00825	10.01.06.00854	10.01.06.00680	10.01.06.01004	10.01.06.01016	10.01.06.01059

<sup>\*</sup>Additional material specifications at beginning of the section "Vacuum Suction Cups"

#### Technical Data Bellows Suction Cups SAB (1.5 Folds)

Туре	Suction force [N]*	Pull-off force [N]	Lateral force [N]**	Lateral force oily surface [N]**	Volume [cm³]	Min. curve radius [mm] (convex)	Recommended in- ternal hose diame- ter d [mm]***
SAB 22 NBR-60	16	24	18	6	2.5	20	4
SAB 30 NBR-60	22	33	30	13	5.7	40	4
SAB 40 NBR-60	38	59	36	33	8.7	40	4
SAB 50 NBR-60	53	87	55	52	16.1	50	4
SAB 60 NBR-60	82	130	82	77	28.8	65	6
SAB 80 NBR-60	135	221	145	140	67.6	75	6
SAB 100 NBR-60	190	357	220	214	115.0	90	6
SAB 125 NBR-60	250	558	352	335	220.0	140	9

<sup>\*</sup>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

<sup>\*\*</sup>The specified lateral forces are values measured at a vacuum of -0.6 bar with a dry or oily, smooth, flat workpiece surface. Depending on the workpiece surface and its quality, the actual values may deviate from these values.

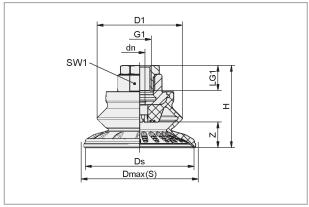
<sup>\*\*\*</sup>The recommended hose diameter refers to a hose length of approx. 2 m



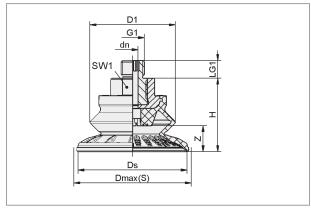
Bellows Suction Cups SAB (1.5 Folds)

Suction area (Ø) from 22 mm to 125 mm

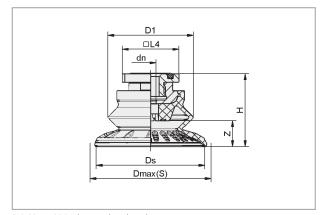
## Design Data Bellows Suction Cups SAB (1.5 Folds)







SAB 22 to 125 AG (male)



SAB 22 to 125 RA (rectangular adapter)



Bellows Suction Cups SAB (1.5 Folds)

Suction area (Ø) from 22 mm to 125 mm

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## Design Data Bellows Suction Cups SAB (1.5 Folds)

Туре	Dimension	s in mm*								
	D1	dn	Ds	Dmax(S)**	G1	Н	LG1	L4	SW1	Z (Stroke)
SAB 22 NBR-60 G1/4-AG	22	3.5	21	24	G1/4"-M	25.0	10.0	-	16	5.8
SAB 22 NBR-60 G1/4-IG	22	3.5	21	24	G1/4"-F	25.0	12.0	-	16	5.8
SAB 22 NBR-60 G3/8-IG	22	3.5	21	24	G3/8"-F	41.0	9.5	-	22	5.8
SAB 22 NBR-60 M10x1.5-AG	22	3.5	21	24	M10-M	25.0	12.0	-	16	5.8
SAB 22 NBR-60 M14x1.5-AG	22	3.5	21	24	M14x1.5-M	25.0	12.0	-	16	5.8
SAB 22 NBR-60 RA	22	3.5	21	24	-	28.2	-	31.8	-	5.8
SAB 30 NBR-60 G1/4-AG	32	4.0	31	34	G1/4"-M	28.0	10.0	-	17	9.0
SAB 30 NBR-60 G1/4-IG	32	4.0	31	34	G1/4"-F	28.0	12.0	-	17	9.0
SAB 30 NBR-60 G3/8-IG	32	4.0	31	34	G3/8"-F	44.0	9.5	-	22	9.0
SAB 30 NBR-60 M10x1.5-AG	32	4.0	31	34	M10-M	28.0	12.0	-	17	9.0
SAB 30 NBR-60 M14x1.5-AG	32	4.0	31	34	M14x1.5-M	28.0	12.0	-	17	9.0
SAB 30 NBR-60 RA	32	4.0	31	34	-	31.2	-	31.8	-	9.0
SAB 40 NBR-60 G1/4-AG	32	4.0	40	45	G1/4"-M	28.8	10.0	-	17	10.0
SAB 40 NBR-60 G1/4-IG	32	4.0	40	45	G1/4"-F	28.8	12.0	-	17	10.0
SAB 40 NBR-60 G3/8-IG	32	4.0	40	45	G3/8"-F	44.8	9.5	-	22	10.0
SAB 40 NBR-60 M10x1.5-AG	32	4.0	40	45	M10-M	28.8	12.0	-	17	10.0
SAB 40 NBR-60 M14x1.5-AG	32	4.0	40	45	M14x1.5-M	28.8	12.0	-	17	10.0
SAB 40 NBR-60 RA	32	4.0	40	45	-	31.2	-	31.8	-	10.0
SAB 50 NBR-60 G1/4-AG	40	6.0	50	56	G1/4"-M	36.9	10.0	-	22	11.5
SAB 50 NBR-60 G1/4-IG	40	6.0	50	56	G1/4"-F	42.0	20.0	-	22	11.5
SAB 50 NBR-60 G3/8-IG	40	6.0	50	56	G3/8"-F	36.9	15.0	-	22	11.5
SAB 50 NBR-60 M10x1.5-AG	40	4.0	50	56	M10-M	36.9	12.0	-	22	11.5
SAB 50 NBR-60 M14x1.5-AG	40	6.0	50	56	M14x1.5-M	36.9	12.0	-	22	11.5
SAB 50 NBR-60 RA	40	6.0	50	56	-	36.6	-	31.8	-	11.5
SAB 60 NBR-60 G1/4-AG	48	6.0	61	67	G1/4"-M	41.3	10.0	-	22	14.5
SAB 60 NBR-60 G1/4-IG	48	6.0	61	67	G1/4"-F	46.3	20.0	-	22	14.5
SAB 60 NBR-60 G3/8-IG	48	6.0	61	67	G3/8"-F	41.3	15.0	-	22	14.5
SAB 60 NBR-60 M10x1.5-AG	48	4.0	61	67	M10-M	41.3	12.0	-	22	14.5
SAB 60 NBR-60 M14x1.5-AG	48	6.0	61	67	M14x1.5-M	41.3	12.0	-	22	14.5
SAB 60 NBR-60 RA	48	6.0	61	67		41.0	-	31.8	-	14.5
SAB 80 NBR-60 G1/4-AG	64	6.0	81	89 89	G1/4"-M	49.9	10.0	-	22	22.1
SAB 80 NBR-60 G1/4-IG	64	6.0	81		G1/4"-F	54.9	20.0	-	22	22.1
SAB 80 NBR-60 G3/8-IG	64	6.0	81	89 89	G3/8"-F	49.9	15.0	-		22.1
SAB 80 NBR-60 M10x1.5-AG SAB 80 NBR-60 M14x1.5-AG	64 64	4.0 6.0	81 81	89	M10-M M14x1.5-M	49.9 49.9	12.0 12.0	-	22	22.1 22.1
SAB 80 NBR-60 RA	64	6.0	81	89	IVI 1 4X I . 3-IVI	49.9	12.0	31.8	22	22.1
SAB 100 NBR-60 G1/4-AG	77	6.0	101	110	G1/4"-M	56.6	10.0	31.0	22	25.8
SAB 100 NBR-60 G1/4-IG	77	6.0	101	110	G1/4 -W	61.8	20.0	-	22	25.8
SAB 100 NBR-60 G3/8-IG	77	6.0	101	110	G3/8"-F	56.6	15.0	-	22	25.8
SAB 100 NBR-60 M10x1.5-AG	77	4.0	101	110	M10-M	56.6	12.0	-	22	25.8
SAB 100 NBR-60 M14x1.5-AG	77	6.0	101	110	M14x1.5-M	56.6	12.0	-	22	25.8
SAB 100 NBR-60 RA	77	6.0	101	110	- INI-C'I V4-11A	56.3	12.0	31.8	- 22	25.8
SAB 125 NBR-60 G1/4-AG	94	6.0	126	135	G1/4"-M	67.8	10.0	51.0	22	32.0
SAB 125 NBR-60 G1/4-IG	94	6.0	126	135	G1/4"-F	72.8	20.0	_	22	32.0
SAB 125 NBR-60 G3/8-IG	94	9.0	126	135	G3/8"-F	67.8	15.0	_	22	32.0
SAB 125 NBR-60 M10x1.5-AG	94	4.0	126	135	M10-M	67.8	12.0	-	22	32.0
SAB 125 NBR-60 M14x1.5-AG	94	6.0	126	135	M14x1.5-M	67.8	12.0	-	22	32.0
SAB 125 NBR-60 RA	94	6.0	126	135		67.5	12.0	31.8	-	32.0
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<sup>\*</sup>Acceptable dimensional tolerances for rubber parts concerning to DIN ISO 3302-1 M3  $\,$ 

Vacuum Gripping Systems

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Switches and Monitoring

 $<sup>{}^{\</sup>star\star}\textsc{External}$  dimension of the suction cup when it is pressed against the workpiece by the vacuum

## Flat Suction Cups SAOF (Oval)

Suction area (LxW) from 50 x 16 mm to 140 x 70 mm





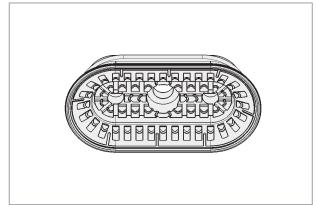
#### Suitable for Industry Specific Applications



Flat suction cups SAOF (oval)

## **Applications**

- Oval, flat suction cup for dynamic handling of metal sheets with short cycle times
- Handling of thin steel sheets and aluminum sheets without deformation or deep-drawing
- For use e.g. in feeder systems for press lines in the automobile
- Handling of long, narrow metal sheet parts, e.g. reinforcing ribs and plates
- Slot on the bottom prevents oily sheets from slipping and permits precise positioning in stamping presses etc.



System design flat suction cups SAOF (oval)

#### Design

- Robust, wear-resistant oval suction cup SAOF made of NBR with single sealing lip, special slot and inner support
- Connection nipple glued to the suction cup with a reinforcing element (very high strength)
- Suction cup available with various connection types
- Available in two material hardness values (45 Shore, 60 Shore)



Flat suction cups SAOF being used for handling pressed sheet-metal parts

#### Our Highlights...

- Wide range of sizes
- Large, structured inner support
- · Flat, oval suction cup
- · Soft and flexible sealing lip
- Nipple vulcanized to suction cup

#### Your Benefits...

- > For a wide range of workpiece sizes and shapes
- > No deep-drawing of the workpiece; capable of handling high lateral forces, even on oily metal sheets
- > Handling of long, narrow workpieces (sections, tubes) or flat workpieces with bars
- > Good sealing, even on slightly curved surfaces
- > Prevention of machine damage and downtimes as the result of lost suction cups



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## Flat Suction Cups SAOF (Oval)

Suction area (LxW) from 50 x 16 mm to 140 x 70 mm

#### **Designation Code Flat Suction Cups SAOF (Oval)**

Abbreviated designation	Suction area LxW in mm	Material and Shore hardness	Connection thread	
Example SAOF 80x40 NBR-60 G1/4-IG:				
SAOF	80x40	NBR-60	G1/4-IG	
SAOF	50x16	NBR-45	G1/4-AG (AG = male (M))	
	to	NBR-60	G1/4-IG (IG = female (F))	
	140x70		G3/8-IG	
			M10-AG	
			M14x1.5-AG	
			RA rectangular adapter	



#### Ordering Data Flat Suction Cups SAOF (Oval)

Suction cup SAOF, available in various diameters, is delivered with connection nipple vulcanized to elastomer part.

#### Flat Suction Cups SAOF (Oval)

Type*	Connection					
	G1/4"-M	G1/4"-F	G3/8"-F	M10-M	M14x1.5-M	Rectangular adap.
SAOF 50x16 NBR-60	10.01.05.00521	10.01.05.00511	10.01.05.00518	10.01.05.00527	10.01.05.00530	10.01.05.00515
SAOF 50x16 NBR-45	10.01.05.00550	10.01.05.00551	10.01.05.00553	10.01.05.00555	10.01.05.00556	10.01.05.00554
SAOF 60x23 NBR-60	10.01.05.00376	10.01.05.00367	10.01.05.00370	10.01.05.00382	10.01.05.00385	10.01.05.00373
SAOF 60x23 NBR-45	10.01.05.00559	10.01.05.00560	10.01.05.00562	10.01.05.00564	10.01.05.00565	10.01.05.00563
SAOF 90x30 NBR-60	10.01.05.00311	10.01.05.00266	10.01.05.00290	10.01.05.00326	10.01.05.00341	10.01.05.00296
SAOF 90x30 NBR-45	10.01.05.00568	10.01.05.00569	10.01.05.00570	10.01.05.00572	10.01.05.00573	10.01.05.00571
SAOF 80x40 NBR-60	10.01.05.00314	10.01.05.00269	10.01.05.00293	10.01.05.00329	10.01.05.00344	10.01.05.00299
SAOF 80x40 NBR-45	10.01.05.00577	10.01.05.00578	10.01.05.00579	10.01.05.00581	10.01.05.00582	10.01.05.00580
SAOF 100x50 NBR-60	10.01.05.00317	10.01.05.00281	10.01.05.00272	10.01.05.00332	10.01.05.00347	10.01.05.00302
SAOF 100x50 NBR-45	10.01.05.00586	10.01.05.00587	10.01.05.00588	10.01.05.00590	10.01.05.00591	10.01.05.00589
SAOF 120x60 NBR-60	10.01.05.00320	10.01.05.00284	10.01.05.00275	10.01.05.00335	10.01.05.00350	10.01.05.00305
SAOF 120x60 NBR-45	10.01.05.00594	10.01.05.00595	10.01.05.00596	10.01.05.00598	10.01.05.00599	10.01.05.00597
SAOF 140x70 NBR-60	10.01.05.00323	10.01.05.00287	10.01.05.00278	10.01.05.00338	10.01.05.00353	10.01.05.00308
SAOF 140x70 NBR-45	10.01.05.00603	10.01.05.00604	10.01.05.00605	10.01.05.00607	10.01.05.00608	10.01.05.00606

<sup>\*</sup>Additional material specifications at beginning of the section "Vacuum Suction Cups"

#### Technical Data Flat Suction Cups SAOF (Oval)

Туре	Suction force [N]*	Lateral force [N]**	Lateral force oily surface [N]**	Volume [cm³]	Min. curve radius [mm] (convex)	Recommended internal hose diameter d [mm]***
SAOF 50x16	31	24	12	2.3	8	4
SAOF 60x23	57	37	33	3.9	20	4
SAOF 90x30	122	96	64	10.1	40	4
SAOF 80x40	140	110	100	11.7	50	4
SAOF 100x50	217	181	121	21.8	75	6
SAOF 120x60	312	254	170	39.9	75	6
SAOF 140x70	425	344	230	57.3	90	6

<sup>\*</sup>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

<sup>\*\*</sup>The specified lateral forces are values measured at a vacuum of -0.6 bar with a dry or oily, smooth, flat workpiece surface. Depending on the workpiece surface and its quality, the actual values may deviate from these values.

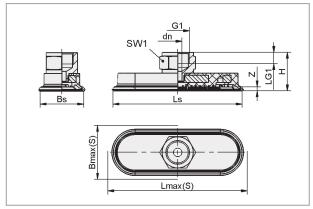
<sup>\*\*\*</sup>The recommended hose diameter refers to a hose length of approx. 2 m



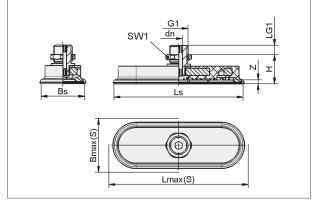
Flat Suction Cups SAOF (Oval)

Suction area (LxW) from 50 x 16 mm to 140 x 70 mm

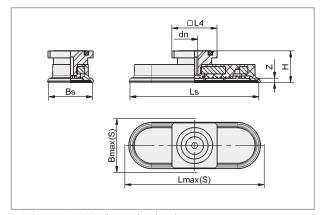
#### Design Data Flat Suction Cups SAOF (Oval)







SAOF 50x16 to 140x70 AG



SAOF 50x16 to 140x70 RA (rectangular adapter)

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## Flat Suction Cups SAOF (Oval)

Suction area (LxW) from 50 x 16 mm to 140 x 70 mm

## Design Data Flat Suction Cups SAOF (Oval)

Туре	Dimensions i	in mm*									
71	Bmax(S)**	Bs	dn	G1	н	L4	LG1	Lmax(S)**	Ls	SW1	Z (Stroke)
SAOF 50x16 G1/4-AG	18	14.6	5	G1/4"-M	26	-	8	52	48.6	17	3
SAOF 50x16 G1/4-IG	18	14.6	6	G1/4"-F	33	-	8	52	48.6	17	3
SAOF 50x16 G3/8-IG	18	14.6	6	G3/8"-F	34	-	9	52	48.6	22	3
SAOF 50x16 M10x1.5-AG	18	14.6	4	M10-M	26	-	10	52	48.6	16	3
SAOF 50x16 M14x1.5-AG	18	14.6	5	M14x1.5-M	28	-	10	52	48.6	22	3
SAOF 50x16 RA	18	14.6	4	-	29	32	-	52	48.6	-	3
SAOF 60x23 G1/4-AG	25	21.6	5	G1/4"-M	18	-	8	64	60.6	17	3
SAOF 60x23 G1/4-IG	25	21.6	6	G1/4"-F	26	-	8	64	60.6	17	3
SAOF 60x23 G3/8-IG	25	21.6	6	G3/8"-F	26	-	9	64	60.6	22	3
SAOF 60x23 M10x1.5-AG	25	21.6	4	M10-M	18	-	10	64	60.6	16	3
SAOF 60x23 M14x1.5-AG	25	21.6	5	M14x1.5-M	20	-	10	64	60.6	22	3
SAOF 60x23 RA	25	21.6	4	-	21	32	-	64	60.6	-	3
SAOF 90x30 G1/4-AG	34	30.6	5	G1/4"-M	19	-	8	94	90.6	17	3
SAOF 90x30 G1/4-IG	34	30.6	6	G1/4"-F	26	-	8	94	90.6	17	3
SAOF 90x30 G3/8-IG	34	30.6	6	G3/8"-F	27	-	9	94	90.6	22	3
SAOF 90x30 M10x1.5-AG	34	30.6	4	M10-M	19	-	10	94	90.6	17	3
SAOF 90x30 M14x1.5-AG	34	30.6	5	M14x1.5-M	21	-	10	94	90.6	22	3
SAOF 90x30 RA	34	30.6	4	-	22	32	-	94	90.6	-	3
SAOF 80x40 G1/4-AG	43	38.6	5	G1/4"-M	20	-	8	85	80.6	17	4
SAOF 80x40 G1/4-IG	43	38.6	6	G1/4"-F	28	-	8	85	80.6	17	4
SAOF 80x40 G3/8-IG	43	38.6	6	G3/8"-F	28	-	9	85	80.6	22	4
SAOF 80x40 M10x1.5-AG	43	38.6	4	M10-M	20	-	10	85	80.6	17	4
SAOF 80x40 M14x1.5-AG	43	38.6	5	M14x1.5-M	22	-	10	85	80.6	22	4
SAOF 80x40 RA	43	38.6	4	-	23	32	-	85	80.6	-	4
SAOF 100x50 G1/4-AG	54	48.1	6	G1/4"-M	22	-	8	106	101.1	17	5
SAOF 100x50 G1/4-IG	54	48.1	8	G1/4"-F	30	-	8	106	101.1	17	5
SAOF 100x50 G3/8-IG	54	48.1	8	G3/8"-F	31	-	9	106	101.1	22	5
SAOF 100x50 M10x1.5-AG	54	48.1	4	M10-M	22	-	10	106	101.1	17	5
SAOF 100x50 M14x1.5-AG	54	48.1	6	M14x1.5-M	24	-	10	106	101.1	22	5
SAOF 100x50 RA	54	48.1	6	-	25	32	-	106	101.1	-	5
SAOF 120x60 G1/4-AG	65	57.6	6	G1/4"-M	24	-	8	128	126.6	17	6
SAOF 120x60 G1/4-IG	65	57.6	8	G1/4"-F	32	-	8	128	126.6	17	6
SAOF 120x60 G3/8-IG	65	57.6	8	G3/8"-F	33	-	9	128	126.6	22	6
SAOF 120x60 M10x1.5-AG	65	57.6	4	M10-M	24	-	10	128	126.6	17	6
SAOF 120x60 M14x1.5-AG	65 65	57.6	6	M14x1.5-M	26	-	10	128	126.6	22	6
SAOF 120x60 RA		57.6	6	- C1/4" N	27 25	32	-	128	126.6	17	6 7
SAOF 140x70 G1/4-AG	76	67.6	6	G1/4"-M		-	8	149	140.6	17	
SAOF 140x70 G1/4-IG	76	67.6	8	G1/4"-F	33	-	8	149	140.6	17	7
SAOF 140x70 G3/8-IG	76	67.6	8	G3/8"-F	34	-	_	149	140.6	22	7 7
SAOF 140x70 M10x1.5-AG	76	67.6	4	M10-M	25	-	10	149	140.6	17	-
SAOF 140x70 M14x1.5-AG	76	67.6	6	M14x1.5-M	27		10	149	140.6	22	7 7
SAOF 140x70 RA	76	67.6	6	-	28	32	-	149	140.6	-	/

<sup>\*</sup>Acceptable dimensional tolerances for rubber parts concerning to DIN ISO 3302-1 M3

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 $<sup>\</sup>star\star$ External dimension of the suction cup when it is pressed against the workpiece by the vacuum

Bellows Suction Cups SAOB (Oval, 1.5 Folds)

Suction area (LxW) from 60 x 30 mm to 140 x 70 mm





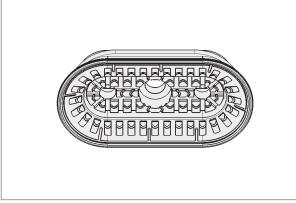
#### Suitable for Industry Specific Applications



Bellows suction cups SAOB (oval, 1.5 folds)

#### **Applications**

- Oval bellows suction cup with 1.5 folds for dynamic handling of long, narrow workpieces e.g. reinforcing ribs and plates
- Handling of thin steel sheets and aluminum sheets without deformation or deep-drawing
- For use e.g. in feeder systems for press lines in the automobile
- Slot on the bottom prevents the oily sheets from slipping and permits precise positioning in stamping presses etc.



System design bellows suction cups SAOB (oval, 1.5 folds)

#### Design

- Robust, wear-resistant oval suction cup SAOB with 1.5 folds made of NBR, single sealing lip, special slot and inner support
- Connection nipple glued to the suction cup with a reinforcing element (very high strength)
- Suction cups available with various connection types



Bellows suction cups SAOB being used for handling car bodywork components

#### Our Highlights...

- 1.5 folds
- Large, structured inner support
- Wide range of sizes
- Stiff top fold
- Soft and flexible sealing lip

#### Your Benefits...

- > For long, narrow workpieces and for stamped bodywork components
- > No deep-drawing of the workpiece and handling of very high lateral forces, even with oily metal sheets
- > For a wide range of workpiece sizes and shapes
- > Resistance to lateral forces and high horizontal accelerations
- > Good sealing, even on slightly curved surfaces



Bellows Suction Cups SAOB (Oval, 1.5 Folds)

Suction area (LxW) from 60 x 30 mm to 140 x 70 mm

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## Designation Code Bellows Suction Cups SAOB (Oval, 1.5 Folds)

Abbreviated designation	Suction area LxW in mm	Material and Shore hardness	Connection thread
Example SAOB 60x30 NBR-60 RA:			
SAOB	60x30	NBR-60	RA
SAOB	60x30	NBR-60	G1/4-AG (AG = male (M))
	80x40		G1/4-IG (IG = female (F))
	110x55		G3/8-IG
	140x70		M10-AG
			M14x1.5-AG
			RA rectangular adapter



#### Ordering Data Bellows Suction Cups SAOB (Oval, 1.5 Folds)

Suction cup SAOB, available in various diameters, is delivered with connection nipple vulcanized to elastomer part.

#### Bellows Suction Cups SAOB (Oval, 1.5 Folds)

Type*	Connection	Connection									
	G1/4"-M	G1/4"-F	G3/8"-F	M10-M	M14x1.5-M	Rectangular adapt.					
SAOB 60x30 NBR-60	10.01.06.00916	10.01.06.00891	10.01.06.00904	10.01.06.01024	10.01.06.01032	10.01.06.00908					
SAOB 80x40 NBR-60	10.01.06.00918	10.01.06.00893	10.01.06.00906	10.01.06.01026	10.01.06.01034	10.01.06.00910					
SAOB 110x55 NBR-60	10.01.06.00920	10.01.06.00900	10.01.06.00895	10.01.06.01028	10.01.06.01036	10.01.06.00912					
SAOB 140x70 NBR-60	10.01.06.00922	10.01.06.00902	10.01.06.00897	10.01.06.01030	10.01.06.01038	10.01.06.00914					

<sup>\*</sup>Additional material specifications at beginning of the section "Vacuum Suction Cups"

#### Technical Data Bellows Suction Cups SAOB (Oval, 1.5 Folds)

Туре	Suction	Pull-off	Lateral	Lateral force oily	Volume	Min. curve radius	Recommended inter-
	force	force	force	surface	[cm³]	[mm]	nal hose diameter
	[N]*	[N]	[N]**	[N]**		(convex)	d [mm]***
SAOB 60x30 NBR-60	38	70	73	42	10.5	18	4
SAOB 80x40 NBR-60	65	132	153	74	21.8	25	6
SAOB 110x55 NBR-60	110	234	299	124	53.1	50	6
SAOB 140x70 NBR-60	165	355	473	246	106.0	70	6

<sup>\*</sup>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

<sup>\*\*</sup>The specified lateral forces are values measured at a vacuum of -0.6 bar with a dry or oily, smooth, flat workpiece surface. Depending on the workpiece surface and its quality, the actual values may deviate from these values.

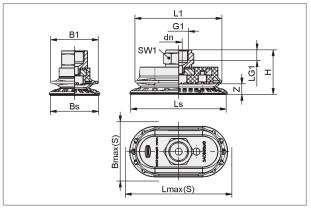
<sup>\*\*\*</sup>The recommended hose diameter refers to a hose length of approx. 2 m



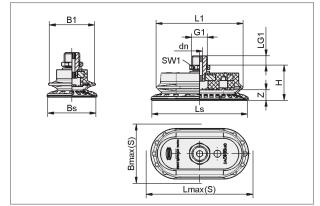
Bellows Suction Cups SAOB (Oval, 1.5 Folds)

Suction area (LxW) from 60 x 30 mm to 140 x 70 mm

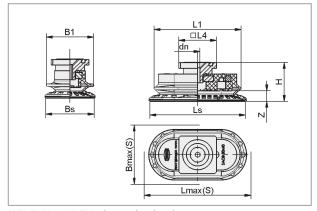
## Design Data Bellows Suction Cups SAOB (Oval, 1.5 Folds)



SAOB 60x30 to 140x70 IG (female)



SAOB 60x30 and 140x70 AG (male)



SAOB 60x30 to 140x70 RA (rectangular adapter)

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Bellows Suction Cups SAOB (Oval, 1.5 Folds)

Suction area (LxW) from 60 x 30 mm to 140 x 70 mm

## Design Data Bellows Suction Cups SAOB (Oval, 1.5 Folds)

Туре	Dimensions in mm*												
	B1	Bmax(S)**	Bs	dn	G1	Н	L1	L4	LG1	Lmax(S)**	Ls	SW1	Z (Stroke)
SAOB 60x30 NBR-60 G1/4-AG	31	33	30.6	5	G1/4"-M	27.0	56	-	8	63.0	60.6	17	7.0
SAOB 60x30 NBR-60 G1/4-IG	31	33	30.6	6	G1/4"-F	34.5	56	-	8	63.0	60.6	17	7.0
SAOB 60x30 NBR-60 G3/8-IG	31	33	30.6	6	G3/8"-F	35.0	56	-	9	63.0	60.6	22	7.0
SAOB 60x30 NBR-60 M10x1.5-AG	31	33	30.6	4	M10-M	27.0	56	-	10	63.0	60.6	17	7.0
SAOB 60x30 NBR-60 M14x1.5-AG	31	33	30.6	5	M14x1.5-M	29.0	56	-	10	63.0	60.6	22	7.0
SAOB 60x30 NBR-60 RA	31	33	30.6	4	-	30.0	56	31.8	-	63.0	60.6	-	7.0
SAOB 80x40 NBR-60 G1/4-AG	40	43	40.6	5	G1/4"-M	29.7	73	-	8	83.0	80.6	17	9.0
SAOB 80x40 NBR-60 G1/4-IG	40	43	40.6	6	G1/4"-F	37.2	73	-	8	83.0	80.6	17	9.0
SAOB 80x40 NBR-60 G3/8-IG	40	43	40.6	6	G3/8"-F	37.7	73	-	9	83.0	80.6	22	9.0
SAOB 80x40 NBR-60 M10x1.5-AG	40	43	40.6	4	M10-M	29.7	73	-	10	83.0	80.6	17	9.0
SAOB 80x40 NBR-60 M14x1.5-AG	40	43	40.6	5	M14x1.5-M	31.7	73	-	10	83.0	80.6	22	9.0
SAOB 80x40 NBR-60 RA	40	43	40.6	4	-	32.7	73	31.8	-	83.0	80.6	-	9.0
SAOB 110x55 NBR-60 G1/4-AG	53	59	55.1	6	G1/4"-M	35.5	99	-	8	114.0	110.1	17	12.0
SAOB 110x55 NBR-60 G1/4-IG	53	59	55.1	8	G1/4"-F	43.0	99	-	8	114.0	110.1	17	12.0
SAOB 110x55 NBR-60 G3/8-IG	53	59	55.1	8	G3/8"-F	43.5	99	-	9	114.0	110.1	22	12.0
SAOB 110x55 NBR-60 M10x1.5-AG	53	59	55.1	4	M10-M	35.5	99	-	10	114.0	110.1	17	12.0
SAOB 110x55 NBR-60 M14x1.5-AG	53	59	55.1	6	M14x1.5-M	37.5	99	-	10	114.0	110.1	22	12.0
SAOB 110x55 NBR-60 RA	53	59	55.1	6	-	38.5	99	31.8	-	114.0	110.1	-	12.0
SAOB 140x70 NBR-60 G1/4-AG	67	75	70.1	6	G1/4"-M	39.5	126	-	8	146.0	141.1	17	16.5
SAOB 140x70 NBR-60 G1/4-IG	67	75	70.1	8	G1/4"-F	47.0	126	-	8	146.0	141.1	17	16.5
SAOB 140x70 NBR-60 G3/8-IG	67	75	70.1	8	G3/8"-F	47.5	126	-	9	146.0	141.1	22	16.5
SAOB 140x70 NBR-60 M10x1.5-AG	67	75	70.1	4	M10-M	39.5	126	-	10	146.0	141.1	17	16.5
SAOB 140x70 NBR-60 M14x1.5-AG	67	75	70.1	6	M14x1.5-M	41.5	126	-	10	146.0	141.1	22	16.5
SAOB 140x70 NBR-60 RA	67	75	70.1	6	-	42.5	126	31.8	-	146.0	141.1	-	16.5

<sup>\*</sup>Acceptable dimensional tolerances for rubber parts concerning to DIN ISO 3302-1 M3

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<sup>\*\*</sup>External dimension of the suction cup when it is pressed against the workpiece by the vacuum

## Bell-Shaped Suction Cups SAOG (Oval)

Suction area (LxW) from 60 x 20 mm to 95 x 40 mm



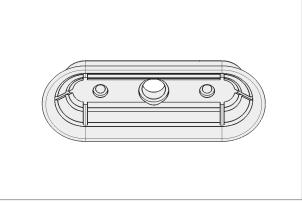
#### Suitable for Industry Specific Applications



Bell-shaped suction cups SAOG (oval)

#### **Applications**

- Oval bell-shaped suction cup for handling of long, oiled workpieces with extremely small curved radii
- Very dynamic handling of metal sheets (short cycle times)
- Inner support for deformation-free handling of thin steel sheets and aluminum sheets or deep-drawing
- Usage in feeder systems for press lines in the automobile industry
- Slot lot on the bottom prevents oily sheets from slipping; permits precise positioning in stamping presses etc.



System design bell-shaped suction cups SAOG (oval)

#### Design

- Oval, bell-shaped suction cup with single sealing lip, special slot and inner support
- Suction cups made of NBR material, hardness 45 Shore



Bell-shaped suction cups SAOG being used for handling very curved sheet metal parts

#### Our Highlights...

- · Oval, bell-shape
- Material NBR, material hardness 45 Shore
- Wide range of connection elements

#### Your Benefits...

- > Optimum adaptation to narrow, very curved workpieces
- > Adaptation to workpieces with small curved radii
- > Mounting on all common load cross-beams and feeder systems possible





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## Suction area (LxW) from 60 x 20 mm to 95 x 40 mm

Abbreviated designation	Suction area LxW in mm	Material and Shore hardness	Connection thread
Example SAOG 60x20 NBR-45 RA:			
SAOG	60x20	NBR-45	RA
SAOG	60x20 80x30 95x40	NBR-45	G1/4-AG (AG = male (M)) G1/4-IG (IG = female (F)) G3/8-AG G3/8-IG M10-AG M14x1.5-AG RA rectangular adapter



#### Ordering Data Bell-Shaped Suction Cups SAOG (Oval)

Suction cup SAOG, available in various diameters, is delivered with connection nipple vulcanized to elastomer part.

#### **Bell-Shaped Suction Cups SAOG (Oval)**

Type*	Connection								
	G1/4"-M	G1/4"-F	G3/8"-M	G3/8"-F	M10-M	M14x1.5-M	Rectangular adapter		
SAOG 60x20 NBR-45	10.01.01.11755	10.01.01.11754	10.01.01.11758	10.01.01.11757	10.01.01.11760	10.01.01.11761	10.01.01.11762		
SAOG 80x30 NBR-45	10.01.01.11659	10.01.01.11649	10.01.01.11651	10.01.01.11614	10.01.01.11653	10.01.01.11655	10.01.01.11668		
SAOG 95x40 NBR-45	10.01.01.11660	10.01.01.11650	10.01.01.11652	10.01.01.11615	10.01.01.11654	10.01.01.11656	10.01.01.11669		

<sup>\*</sup>Additional material specifications at beginning of the section "Vacuum Suction Cups"

#### Technical Data Bell-Shaped Suction Cups SAOG (Oval)

Туре	Suction force [N]*	Lateral force [N]**	Lateral force oily surface [N]**	Volume [cm³]	Min. curve radius [mm] (convex)	Recom. internal hose diameter d [mm]***
SAOG 60x20 NBR-45	56	35	10	4.9	13	4
SAOG 80x30 NBR-45	105	65	45	13.2	20	4
SAOG 95x40 NBR-45	165	97	68	26.9	25	4

<sup>\*</sup>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

<sup>\*\*</sup>The specified lateral forces are values measured at a vacuum of -0.6 bar with a dry or oily, smooth, flat workpiece surface. Depending on the workpiece surface and its quality, the actual values may deviate from these values.

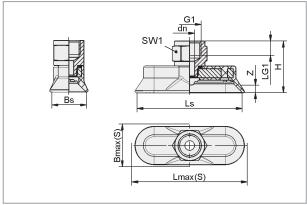
<sup>\*\*\*</sup>The recommended hose diameter refers to a hose length of approx. 2 m



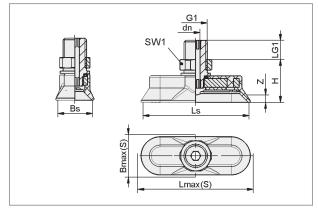
Bell-Shaped Suction Cups SAOG (Oval)

Suction area (LxW) from 60 x 20 mm to 95 x 40 mm

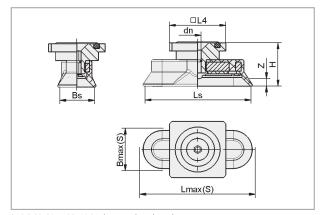
## Design Data Bell-Shaped Suction Cups SAOG (Oval)







SAOG 60x20 to 95x40 AG



SAOG 60x20 to 95x40 RA (rectangular adapter)



Bell-Shaped Suction Cups SAOG (Oval)

Suction area (LxW) from 60 x 20 mm to 95 x 40 mm

## Design Data Bell-Shaped Suction Cups SAOG (Oval)

Туре	Dimensions in	n mm*									
	Bmax(S)**	Bs	dn	G1	Н	L4	LG1	Lmax(S)**	Ls	SW1	Z (Stroke)
SAOG 60x20 NBR-45 G1/4-AG	26	20	5	G1/4"-M	24.5	-	10.5	66	60	17	4.5
SAOG 60x20 NBR-45 G1/4-IG	26	20	6	G1/4"-F	29.0	-	8.0	66	60	17	4.5
SAOG 60x20 NBR-45 G3/8-AG	26	20	5	G3/8"-M	21.0	-	8.0	66	60	22	4.5
SAOG 60x20 NBR-45 G3/8-IG	26	20	6	G3/8"-F	29.5	-	9.0	66	60	22	4.5
SAOG 60x20 NBR-45 M10x1.5-AG	26	20	4	M10-M	21.5	-	10.0	66	60	16	4.5
SAOG 60x20 NBR-45 M14x1.5-AG	26	20	5	M14x1.5-M	23.5	-	10.0	66	60	22	4.5
SAOG 60x20 NBR-45 RA	26	20	4	-	24.5	31.8	-	66	60	-	4.5
SAOG 80x30 NBR-45 G1/4-AG	36	30	5	G1/4"-M	27.5	-	10.5	86	80	17	10.0
SAOG 80x30 NBR-45 G1/4-IG	36	30	6	G1/4"-F	32.0	-	8.0	86	80	17	10.0
SAOG 80x30 NBR-45 G3/8-AG	36	30	5	G3/8"-M	24.0	-	8.0	86	80	22	10.0
SAOG 80x30 NBR-45 G3/8-IG	36	30	6	G3/8"-F	32.5	-	9.0	86	80	22	10.0
SAOG 80x30 NBR-45 M10x1.5-AG	36	30	4	M10-M	24.5	-	10.0	86	80	16	10.0
SAOG 80x30 NBR-45 M14x1.5-AG	36	30	5	M14x1.5-M	26.5	-	10.0	86	80	22	10.0
SAOG 80x30 NBR-45 RA	36	30	4	-	27.5	31.8	-	86	80	-	10.0
SAOG 95x40 NBR-45 G1/4-AG	46	40	5	G1/4"-M	30.5	-	10.5	102	95	17	6.0
SAOG 95x40 NBR-45 G1/4-IG	46	40	6	G1/4"-F	35.0	-	8.0	102	95	17	6.0
SAOG 95x40 NBR-45 G3/8-AG	46	40	5	G3/8"-M	27.0	-	8.0	102	95	22	6.0
SAOG 95x40 NBR-45 G3/8-IG	46	40	6	G3/8"-F	35.5	-	9.0	102	95	22	6.0
SAOG 95x40 NBR-45 M10x1.5-AG	46	40	4	M10-M	27.5	-	10.0	102	95	16	6.0
SAOG 95x40 NBR-45 M14x1.5-AG	46	40	5	M14x1.5-M	29.5	-	10.0	102	95	22	6.0
SAOG 95x40 NBR-45 RA	46	40	4	-	30.5	31.8	-	102	95	-	6.0

<sup>\*</sup>Acceptable dimensional tolerances for rubber parts concerning to DIN ISO 3302-1 M3

<sup>\*\*</sup>External dimensions of the suction cup when it is pressed against the workpiece by the vacuum

Bellows Suction Cups SAB2 P (2.5 Folds)

Suction area (Ø) 20 mm





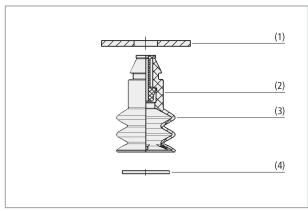
#### Suitable for Industry Specific Applications



Bellows suction cups SPB2 P (2.5 Folds)

## **Applications**

- Round bellows suction cups with 2.5 folds for handling sheet metal parts such as in CNC metal and laser cutting machines
- Applications with requirements for high holding forces and resistance to lateral forces even on oiled and contaminated workpiece surfaces
- Use in area gripping systems and "suction cup carpets"; optional integration of flow restrictor to reduce leakage occurring at partial occupancy



System design bellows suction cups SPB2 P (2.5 Folds)

#### Design

- Round bellows suction cups SAB2 P (3) with 2.5 folds and radial ribs and sealing lip with sealing edge
- Machine side existing hole for tool-free assembly through push-in function (1)
- Optional integration of flow restrictor (2) to reduce leakage occurring at partial occupancy
- Optional integration of a filter (4) as a prefilter (120 micron filtration rating)



Bellows suction cups SAB2 P for handling sheet metal parts

#### Our Highlights...

- Tool-free installation by push-in function
- Optimized sealing lip with radial ribs and sealing edge
- Soft bellows with big stroke at low restoring force
- Two different materials NBR and HT1

#### Your Benefits...

- > Quick installation and removal of the suction cups
- > High suction power even when used in rough environmental conditions (e.g. oil, chips or dirt)
- > Use in area gripping systems and "suction cup carpets"; compensation of height differences and damping effect
- > High wear and ozone resistance (NBR) and no marks (HT1)



Bellows Suction Cups SAB2 P (2.5 Folds)

Suction area (Ø) 20 mm

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		Designation Code Bellows Suction Cups SAB2 P (2.5 Folds)
<b>P</b>		

Abbreviated designation	Suction area Ø in mm	Material and Shore hardness	Product addition
Example SAB2 20 HT1-60 P:			
SAB2	20	HT1-60	P
SAB2	20	HT1-60	P push-in function
		NBR-60	

Ordering Data Bellows Suction Cups SAB2 P (2.5 Folds)

Suction cup SAB2 P is delivered as a ready-to-connect-component. Available in materials HT1 and NBR.

Available accessories: filter screen, flow restrictor

#### Bellows Suction Cups SAB2 P (2.5 Folds)

Туре	Suction cup material * / hardness in Shore A	ial * / hardness in Shore A				
	HT1-60	NBR-60				
SAB2 20 P	10.01.06.03235	10.01.06.03263				

## Ordering Data Accessories Bellows Suction Cups SAB2 P (2.5 Folds)

Туре	Flow resistance								
	SW 80	SW 100	SW 130	SW 150	Filter screen				
SAB2 20 P	10.05.04.00090	10.05.04.00091	10.05.04.00092	10.05.04.00093	10.01.06.02565				

## Technical Data Bellows Suction Cups SAB2 P (2.5 Folds)

Туре	Suction force [N]*	Pull-off force [N]	Min. curve radius [mm] (convex)	Volume [cm³]
SAB2 20 P	4.7	13	20	2.6

<sup>\*</sup>The specified suction forces are theoretical values with a smooth, dry workpiece surface - they do not include safety factors

# **Suction Cups for Handling Sheet Metal**

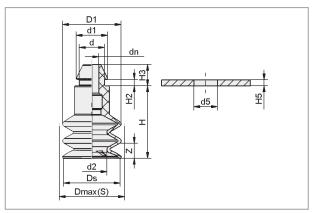


Bellows Suction Cups SAB2 P (2.5 Folds)

Suction area (Ø) 20 mm

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## Design Data Bellows Suction Cups SAB2 P (2.5 Folds)



SAB2 P

Туре	Dimensi	imensions in mm*											
	d	d1	d2	d5	D1	Dmax(S)**	dn	Ds	Н	H2	Н3	H5	Z (Stroke)
SAB2 20 HT1-60 P	8.5	10.6	10	7.9	19.7	20.5	4.7	19.1	24.5	2.2	7.2	2	9
SAB2 20 NBR-60 P	8.5	10.6	10	7.9	19.7	20.5	4.7	19.1	24.5	2.2	7.2	2	9

<sup>\*</sup>Acceptable dimensional tolerances for rubber parts according to DIN ISO 3302-1 M3

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 $<sup>\</sup>ensuremath{^{\star\star}}\xspace$  External dimension of the suction cup when it is pressed against the workpiece by the vacuum

## Flat Suction Cups SHFN

Suction area (Ø) from 50 mm to 85 mm



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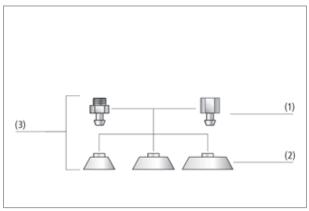
#### Suitable for Industry Specific Applications



Flat suction cups SHFN

## **Applications**

- Round, flat suction cup for handling of furniture parts, parquet flooring, laminated and unlaminated chipboard, etc.
- Version with vulcanized insert, for vacuum systems in rough operating conditions, where the suction cups are not always fully covered or may be placed directly on the edge of the workpiece
- Handling of objects with very rough surfaces with sealing ring made of special foam



System design flat suction cups SHFN

## Design

- Adaptable suction cup SHFN (3), consisting of cup SHF (2) and connection nipple (1)
- Nipple plugged into cup; version SHFN...E with nipple screwed into vulcanized insert
- Ribs on the upper surface of the cup for higher stability on the version without vulcanized insert
- Optionally available with sealing ring made of special foam and/ or with touch valve
- Individual deactivation of unused suction cups with optional touch valve to prevent entry of air



Flat suction cups SHFN being used for handling chipboards

#### Our Highlights...

- Soft sealing lip
- Sealing lip with inner sealing
- Specifically structured lower surface of cup
- Version SHFN...E with insert
- Dirt filter (optional)
- Sealing ring made of special foam (optional)

#### Your Benefits...

- > Optimal adaptation to uneven workpiece surfaces
- > Very good sealing on rough and smooth surfaces
- > Suitable for highly dynamic operations and short cycle
- > Increased stability in rough operating conditions
- > Usage in dusty surroundings
- > Suitable for workpieces with very rough surfaces



## Flat Suction Cups SHFN

Suction area (Ø) from 50 mm to 85 mm



#### **Designation Code Flat Suction Cups SHFN**

Abbreviated designation	Suction area Ø in mm	Material and Shore hardness	Connection thread	Type of construction	Product addition
Example SHFN 50 NK-45 G1/4-AG: SHFN	50	NK-45	G1/4-AG		
SHFN	50 70 85	NK-45	G1/4-AG (AG = male (M)) G1/4-IG (IG = female (F))	- pluggable metal inlay E vulcanized metal inlay	MOS sealing ring, made of special foam TV touch valve



#### **Ordering Data Flat Suction Cups SHFN**

Suction cup SHFN (elastomer part + connection nipple) is delivered assembled. The assembly consists of:

- Suction cup of type SHF elastomer part, available in various diameters
- Connection nipple of type SA-NIP available with various threads
- Optional product addition: sealing ring and touch valve

Available spare parts: suction cup SHF, connection nipple SA-NIP, sealing ring

Available accessories: touch valve, filter screen

#### **Flat Suction Cups SHFN**

Туре	Connection nipple			
	SHFN G1/4"-AG	SHFNE G1/4"-AG	SHFN G1/4"-IG	SHFNE G1/4"-IG
SHFN 50 NK-45	10.01.01.11693	-	10.01.01.11694	-
SHFN 50 NK-45 MOS	10.01.01.11695	-	10.01.01.11696	-
SHFN 50 NK-45 TV	10.01.01.11699	-	-	-
SHFN 50 NK-45 MOS-TV	10.01.01.11700	-	-	-
SHFN 70 NK-45	10.01.01.11689	10.01.01.12197	10.01.01.11690	10.01.01.12216
SHFN 70 NK-45 MOS	10.01.01.11691	10.01.01.12217	10.01.01.11692	10.01.01.12218
SHFN 70 NK-45 TV	10.01.01.11697	10.01.01.12221	-	-
SHFN 70 NK-45 MOS-TV	10.01.01.11698	10.01.01.12222	-	-
SHFN 85 NK-45	10.01.01.11775	10.01.01.12210	10.01.01.11776	10.01.01.12211
SHFN 85 NK-45 MOS	10.01.01.11777	10.01.01.12212	10.01.01.11778	10.01.01.12213
SHFN 85 NK-45 TV	10.01.01.11779	10.01.01.12224	-	-
SHFN 85 NK-45 MOS-TV	10.01.01.11780	10.01.01.12225	-	-

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## Flat Suction Cups SHFN



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Suction area (Ø) from 50 mm to 85 mm

#### Ordering Data Spare Parts And Accessories Flat Suction Cups SHFN

Туре	Flat suction cup (round) SHF	Sealing ring made of special foam material	Connection nipples SA-NIP	Sensing valve	Filter screen (round)
SHFN 50 NK-45 G1/4-AG	10.01.01.11687	-	10.01.01.11772	-	10.07.01.00211
SHFN 50 NK-45 G1/4-IG	10.01.01.11687	-	10.01.01.11822	-	10.07.01.00211
SHFN 50 NK-45 G1/4-AG MOS	10.01.01.11688	10.01.06.01679	10.01.01.11772	-	10.07.01.00211
SHFN 50 NK-45 G1/4-IG MOS	10.01.01.11688	10.01.06.01679	10.01.01.11822	-	10.07.01.00211
SHFN 50 NK-45 G1/4-AG TV	10.01.01.11687	-	-	10.05.10.00058	-
SHFN 50 NK-45 G1/4-AG MOS-TV	10.01.01.11688	-	-	10.05.10.00058	-
SHFN 70 NK-45 G1/4-AG	10.01.01.11682	-	10.01.01.11772	-	10.07.01.00211
SHFN 70 NK-45 G1/4-IG	10.01.01.11682	-	10.01.01.11822	-	10.07.01.00211
SHFN 70 NK-45 G1/4-AG E	10.01.01.12165	-	10.01.01.12194	-	10.05.03.00023
SHFN 70 NK-45 G1/4-IG E	10.01.01.12165	-	10.01.01.12192	-	10.05.03.00023
SHFN 70 NK-45 G1/4-AG MOS	10.01.01.11686	10.01.06.01678	10.01.01.11772	-	10.07.01.00211
SHFN 70 NK-45 G1/4-IG MOS	10.01.01.11686	10.01.06.01678	10.01.01.11822	-	10.07.01.00211
SHFN 70 NK-45 G1/4-AG E MOS	10.01.01.12215	10.01.06.01678	10.01.01.12194	-	10.05.03.00023
SHFN 70 NK-45 G1/4-IG E MOS	10.01.01.12215	10.01.06.01678	10.01.01.12192	-	10.05.03.00023
SHFN 70 NK-45 G1/4-AG TV	10.01.01.11682	-	-	10.05.10.00058	-
SHFN 70 NK-45 G1/4-AG E TV	10.01.01.12165	-	-	10.05.10.00065	-
SHFN 70 NK-45 G1/4-AG MOS-TV	10.01.01.11686	-	-	10.05.10.00058	-
SHFN 70 NK-45 G1/4-AG E MOS-TV	10.01.01.12215	10.01.06.01678	-	10.05.10.00065	-
SHFN 85 NK-45 G1/4-AG	10.01.01.11773	-	10.01.01.11772	-	10.07.01.00211
SHFN 85 NK-45 G1/4-IG	10.01.01.11773	-	10.01.01.11822	-	10.07.01.00211
SHFN 85 NK-45 G1/4-AG E	10.01.01.12209	-	10.01.01.12194	-	10.05.03.00023
SHFN 85 NK-45 G1/4-IG E	10.01.01.12209	-	10.01.01.12192	-	10.05.03.00023
SHFN 85 NK-45 G1/4-AG MOS	10.01.01.11774	10.01.06.01720	10.01.01.11772	-	10.07.01.00211
SHFN 85 NK-45 G1/4-IG MOS	10.01.01.11774	10.01.06.01720	10.01.01.11822	-	10.07.01.00211
SHFN 85 NK-45 G1/4-AG E MOS	10.01.01.12223	-	10.01.01.12194	-	10.05.03.00023
SHFN 85 NK-45 G1/4-IG E MOS	10.01.01.12223	-	10.01.01.12192	-	10.05.03.00023
SHFN 85 NK-45 G1/4-AG TV	10.01.01.11773	-	-	10.05.10.00058	-
SHFN 85 NK-45 G1/4-AG E TV	10.01.01.12209	-	-	10.05.10.00065	-
SHFN 85 NK-45 G1/4-AG MOS-TV	10.01.01.11774	10.01.06.01720	-	10.05.10.00058	-
SHFN 85 NK-45 G1/4-AG E MOS-TV	10.01.01.12223	10.01.06.01720	-	10.05.10.00065	-

#### **Technical Data Flat Suction Cups SHFN**

Type*	Suction force Ds [N]**	Suction force d2 [N]***	Lateral force [N]	Volume [cm³]	Min. curve ra- dius [mm] (convex)	Recom. internal hose diameter d [mm]****	Nipple family
SHFN 50 NK-45	110	40	95	7.3	41	4	N 041
SHFN 50 NK-45 TV	110	40	95	7.3	41	4	N 041
SHFN 70 NK-45	200	100	145	16.0	95	6	N 041
SHFN 70 NK-45 E	200	100	145	16.0	95	6	N 009
SHFN 70 NK-45 TV	200	100	145	16.0	95	6	N 041
SHFN 70 NK-45 E TV	200	100	145	16.0	95	6	N 009
SHFN 85 NK-45	300	175	210	25.0	176	6	N 041
SHFN 85 NK-45 E	300	175	210	25.0	176	6	N 009
SHFN 85 NK-45 TV	300	175	210	25.0	176	6	N 041
SHFN 85 NK-45 E TV	300	175	210	25.0	176	6	N 009

<sup>\*</sup>Note: For technical data on the sensing valves, see Chapter "Valve Technology"

<sup>\*\*</sup>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

<sup>\*\*\*</sup>Suction force referred to the sealing-edge diameter  $\mbox{d2}$ 

<sup>\*\*\*\*</sup>The recommended hose diameter refers to a hose length of approx. 2 m  $\,$ 

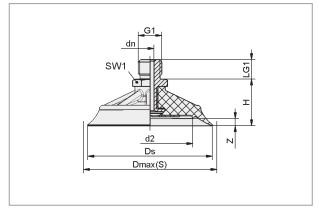
## Flat Suction Cups SHFN

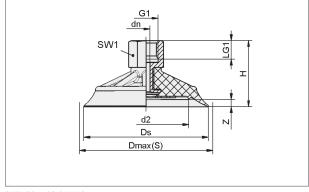
Suction area (Ø) from 50 mm to 85 mm



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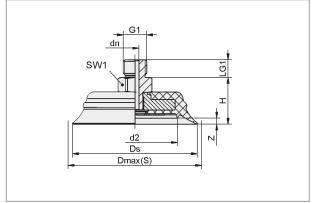
## **Design Data Flat Suction Cups SHFN**

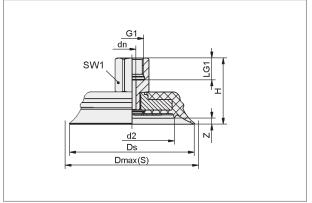




SHFN 50 to 85 G1/4-AG (TV)

SHFN 50 to 85 G1/4-IG





SHFN 70 to 85 G1/4-AG E (TV)

SHFN 70 to 85 G1/4-IG E

Туре	Dimensions	in mm*							
	d2	Dmax(S)**	dn	Ds	G1	Н	LG1	SW1	Z (Stroke)
SHFN 50 NK-45 G1/4-AG	30	55.0	4.4	52	G1/4"-M	26.2	11	17	3
SHFN 50 NK-45 G1/4-IG	30	55.0	4.4	52	G1/4"-F	37.2	11	17	3
SHFN 50 NK-45 G1/4-AG TV	30	55.0	4.4	52	G1/4"-M	32.2	11	17	3
SHFN 70 NK-45 G1/4-AG	48	74.0	4.4	70	G1/4"-M	26.2	11	17	4
SHFN 70 NK-45 G1/4-AG E	48	74.0	4.4	70	G1/4"-M	26.2	10	17	4
SHFN 70 NK-45 G1/4-IG	48	74.0	4.4	70	G1/4"-F	37.2	11	17	4
SHFN 70 NK-45 G1/4-IG E	48	74.0	4.4	70	G1/4"-F	37.2	12	17	4
SHFN 70 NK-45 G1/4-AG TV	48	74.0	4.4	70	G1/4"-M	32.2	11	17	4
SHFN 70 NK-45 G1/4-AG E TV	48	74.0	4.4	70	G1/4"-M	33.4	10	17	4
SHFN 85 NK-45 G1/4-AG	62	89.0	4.4	85	G1/4"-M	26.2	11	17	4
SHFN 85 NK-45 G1/4-AG E	62	89.0	4.4	85	G1/4"-M	26.2	10	17	4
SHFN 85 NK-45 G1/4-IG	62	89.0	4.4	85	G1/4"-F	37.2	11	17	4
SHFN 85 NK-45 G1/4-IG E	62	89.0	4.4	85	G1/4"-F	37.2	12	17	4
SHFN 85 NK-45 G1/4-AG TV	62	89.0	4.4	85	G1/4"-M	32.2	11	17	4
SHFN 85 NK-45 G1/4-AG E TV	62	89.0	4.4	85	G1/4"-M	33.4	10	17	4

<sup>\*</sup>Acceptable dimensional tolerances for rubber parts concerning to DIN ISO 3302-1 M3

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 $<sup>{}^{\</sup>star\star}\text{External}$  dimension of the suction cup when it is pressed against the workpiece by the vacuum

## Flat Suction Cups SHFN

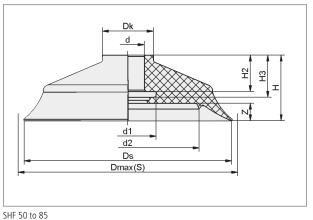
Suction area (Ø) from 50 mm to 85 mm

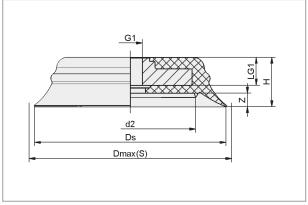


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## Design Data Flat Suction Cups SHF - Spare Parts for SHFN





SHF 70 E to 85 E

Туре	Dimensi	Dimensions in mm*											
	d	d1	d2	Dk	Dmax(S)**	Ds	G1	Н	H2	Н3	LG1	Z (Stroke)	
SHF 50 NK-45	7.5	17	30	17	55	52	-	22.2	12.8	14.3	-	3	
SHF 70 NK-45	7.5	17	48	17	74	70	-	22.2	12.8	14.3	-	4	
SHF 70 NK-45 E	-	-	48	-	74	70	M10x1.25-F	18.1	-	-	10	4	
SHF 85 NK-45	7.5	17	62	17	89	85	-	22.2	12.8	14.3	-	4	
SHF 85 NK-45 E	-	-	62	-	89	85	M10x1.25-F	18.1	-	-	10	4	

<sup>\*</sup>Acceptable dimensional tolerances for rubber parts concerning to DIN ISO 3302-1 M3

<sup>\*\*</sup>External dimension of the suction cup when it is pressed against the workpiece by the vacuum

## Suction Plates SHF

Suction area (Ø) from 125 mm to 210 mm

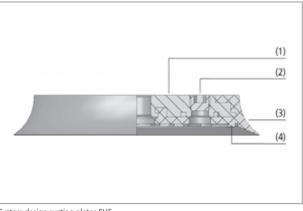




#### Suitable for Industry Specific Applications



Suction plates SHF



System design suction plates SHF



Suction plates SHF being used for handling pressed wooden boards

#### **Applications**

- Round suction plate for handling of sheets, furniture elements, parquet and similar large, flat workpieces
- · Handling of wooden parts with rough surfaces

#### Design

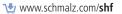
- Suction plate SHF, consisting of sealing ring (3) and aluminum mounting plate (1)
- Connection (2) on the side, normally sealed with a screw plug (glued into position for extra safety)
- Sealing ring clipped securely to mounting plate (can be changed without tools)
- Double internal sealing edge (4) for better sealing to rough surfaces
- Optional touch valve can be ordered separately (use mediumstrength locking compound for installation)
- Filter screen available optionally

#### Our Highlights...

- Soft sealing lip
- Double internal sealing edge
- Specifically structured lower surface
- Modular design

#### Your Benefits...

- > Optimal adaptation to uneven workpiece surfaces
- > Very good sealing on rough and smooth surfaces
- > Highly dynamic movement and short cycle times
- > Gasket can be changed quickly without tools



## Suction Plates SHF

Suction area (Ø) from 125 mm to 210 mm



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#### **Designation Code Suction Plates SHF**

Abbreviated designation	Suction area Ø in mm	Material and Shore hardness	Connection thread
Example SHF 210 NK-45 G1/2-IG: SHF	210	NK-45	G1/2-IG
SHF	125 160 210	NK-45	G1/4-IG (IG = female (F)) G1/2-IG

#### **Ordering Data Suction Plates SHF**

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

- Sealing ring of type DR-SHF elastomer part, available in various diameters
- Aluminium support plate available with various threads

Available spare parts: sealing ring DR-SHF Available accessories: touch valve, filter screen

#### **Suction Plates SHF**

Type*	Part Number
SHF 125 NK-45 G1/4-IG	10.01.01.11788
SHF 160 NK-45 G1/2-IG	10.01.01.12025
SHF 210 NK-45 G1/2-IG	10.01.01.11814

<sup>\*</sup>Additional material specifications at beginning of the section "Vacuum Suction Cups"

#### **Ordering Data Spare Parts And Accessories Suction Plates SHF**

Туре	Sealing ring DR-SHF	Filter screen (center)	Filter screen (outside)	Sensing valve
SHF 125 NK-45 G1/4-IG	10.01.01.11783	10.07.01.00215	10.07.01.00215	10.05.10.00061
SHF 160 NK-45 G1/2-IG	10.01.01.12023	10.07.01.00110	10.07.01.00215	10.05.10.00061
SHF 210 NK-45 G1/2-IG	10.01.01.11809	10.07.01.00110	10.07.01.00215	10.05.10.00061

#### **Technical Data Suction Plates SHF**

Туре	Suction force Ds [N]*	Suction force d2 [N]**	Volume [cm³]	Min. curve radius [mm] (convex)	Recommended internal hose dia- meter d [mm]***
SHF 125 G1/4-IG	625	290	70	305	9
SHF 160 G1/2-IG	1025	580	117	500	12
SHF 210 G1/2-IG	1770	1160	224	885	12

<sup>\*</sup>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

<sup>\*\*</sup>Suction force referred to the sealing-edge diameter d2

<sup>\*\*\*</sup>The recommended hose diameter refers to a hose length of approx. 2 m

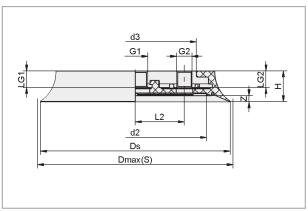
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## Suction Plates SHF

Suction area (Ø) from 125 mm to 210 mm

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#### **Design Data Suction Plates SHF**



SHF 125 to 210

Type*	Dimensio	Dimensions in mm**										
	d2	d3	Dmax(S)***	Ds	G1	G2****	Н	L2	LG1	LG2	Z (Stroke)	
SHF 125 G1/4-IG	85	70	133	125	G1/4"-F	G1/4"-F	26	26.5	14	12.8	6	
SHF 160 G1/2-IG	120	103	168	160	G1/2"-F	G1/4"-F	26	41.4	14	12.8	6	
SHF 210 G1/2-IG	170	134	218	210	G1/2"-F	G1/4"-F	26	52.8	14	12.8	6	

<sup>\*</sup>The connection dimensions for the sensing valve can be found under "Sensing valves TV/TVN" in Section "Valve technology"

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<sup>\*\*</sup>Acceptable dimensional tolerances for rubber parts concerning to DIN ISO 3302-1 M3

 $<sup>{}^{\</sup>star\star\star}\text{External}$  dimension of the suction cup when it is pressed against the workpiece by the vacuum

 $<sup>\</sup>ensuremath{^{*\,*\,*\,*}}\ensuremath{^{*\,}}\ensuremath{^{A}}$  plug is fitted in this connection in the factory

## Suction Plates SPC

Suction area (Ø) from 160 mm to 250 mm





#### Suitable for Industry Specific Applications

pressed air into a separate area of the suction cup

• Round suction plate for handling and separation of flat, porous workpieces, including those with a "suck-through" effect Separation of workpieces by injection of a throttled flow of com-

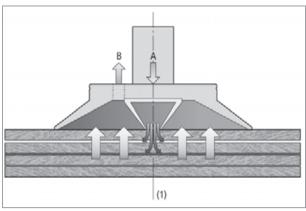


Suction plates SPC

#### Design

**Applications** 

- Robust, wear-resistant suction cup SPC with double sealing lip, consisting of two seals (inner and outer) and aluminium support plate
- Seals are clipped securely into the support plate with specially shaped sections
- Inner seal separates the central cell for the flow of compressed air from the vacuum area
- When worn, the seals can be replaced separately; the aluminum supporting plate can be re-used
- The support plate has one threaded hole in the center (for connection of the compressed air A) for the separation (1) and a second threaded hole towards the edge (for connection of the vacuum B) for gripping
- Series SPC-TV with touch valve: deactivation of unused suction cups to prevent the entry of unwanted air



System design suction plates SPC

## Our Highlights...

- Double sealing lip
- Separation function by applying a compressed air pulse
- Low internal volume
- Optimum shape

#### Your Benefits...

- > Special suction cup for flat, porous workpiceces, such as sheets of MDF, hardboard
- > Prevents porous workpieces from sticking together; overcomes the self-adhesion during unstacking of sheets
- > Very short cycle times
- > High suction forces in spite of small dimensions



Suction plates SPC being used for seperation of chipboards



## Suction Plates SPC

Suction area (Ø) from 160 mm to 250 mm



#### **Designation Code Suction Plates SPC**

Abbreviated designation	Suction area Ø in mm	Material and Shore hardness	Connection thread	Product addition
Example SPC 160 NBR-55 G1/2-IG TV:				
SPC	160	NBR-55	G1/2-IG	TV
SPC	160	NBR-55	G1/2-IG (IG = female (F))	TV touch valve
	210			
	250			



#### **Ordering Data Suction Plates SPC**

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

- Outer and inner sealing ring of type DR-SPC elastomer part, available in various diameters
- Aluminium support plate available with various threads
- Optional product range supplement touch valve

Available spare parts: sealing ring DR-SPC, touch valve

#### **Suction Plates SPC**

Type*	Part Number
SPC 160 NBR-55 G1/2-IG	10.01.01.01185
SPC 160 NBR-55 G1/2-IG TV	10.01.01.01186
SPC 210 NBR-55 G1/2-IG	10.01.01.01187
SPC 210 NBR-55 G1/2-IG TV	10.01.01.01188
SPC 250 NBR-55 G1/2-IG	10.01.01.01189
SPC 250 NBR-55 G1/2-IG TV	10.01.01.01211

<sup>\*</sup>Additional material specifications at beginning of the section "Vacuum Suction Cups"



#### Ordering Data Spare Parts Suction Plates And Sensing Valve

Туре	Outer sealing ring	Inner sealing ring	Sensing valve
SPC 160 NBR-55 G1/2-IG (TV)	10.01.01.01190	10.01.01.11371	10.05.10.00061
SPC 210 NBR-55 G1/2-IG (TV)	10.01.01.01191	10.01.01.11371	10.05.10.00061
SPC 250 NBR-55 G1/2-IG (TV)	10.01.01.01192	10.01.01.11371	10.05.10.00038



#### **Technical Data Suction Plates SPC**

Туре	Suction force Ds [N]*	Suction force d2 [N]**	Volume [cm³]	Recommended internal hose diameter d [mm]***
SPC 160 NBR-55 G1/2-IG	975	475	156	12
SPC 160 NBR-55 G1/2-IG TV	975	475	156	9
SPC 210 NBR-55 G1/2-IG	1760	1125	193	12
SPC 210 NBR-55 G1/2-IG TV	1760	1125	193	9
SPC 250 NBR-55 G1/2-IG	2540	1815	388	12
SPC 250 NBR-55 G1/2-IG TV	2540	1815	388	12

<sup>\*</sup>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 Cups Knowledge

<sup>\*\*</sup>Suction force referred to the sealing-edge diameter d2  $\,$ 

<sup>\*\*\*</sup>The recommended hose diameter refers to a hose length of approx. 2 m

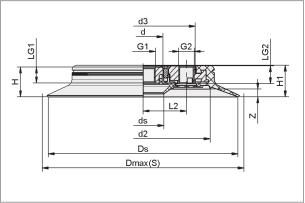
## Suction Plates SPC

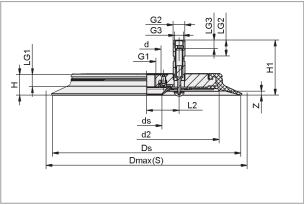
Suction area (Ø) from 160 mm to 250 mm



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## **Design Data Suction Plates SPC**





SPC 160 to 250 SPC 160 to 250 TV

Туре	Dimensions in	mm*						
	d	d2	d3	ds	Dmax(S)**	Ds	G1	G2
SPC 160 NBR-55 G1/2-IG	34	113	88.0	33.5	162.5	160	G1/2"-F	G1/4"-F
SPC 160 NBR-55 G1/2-IG TV	34	113	-	33.5	162.5	160	G1/2"-F	G1/4"-M
SPC 210 NBR-55 G1/2-IG	34	163	138.0	33.5	215.0	210	G1/2"-F	G1/4"-F
SPC 210 NBR-55 G1/2-IG TV	34	163	-	33.5	215.0	210	G1/2"-F	G1/4"-M
SPC 250 NBR-55 G1/2-IG	34	203	178.0	33.5	252.5	250	G1/2"-F	G1/2"-F
SPC 250 NBR-55 G1/2-IG TV	34	203	-	33.5	252.5	250	G1/2"-F	G1/2"-M

<sup>\*</sup>Acceptable dimensional tolerances for rubber parts concerning to DIN ISO 3302-1 M3

 $<sup>\</sup>star\star$ External dimension of the suction cup when it is pressed against the workpiece by the vacuum

Туре	Dimensions in	mm*						
	G3	Н	H1	L2	LG1	LG2	LG3	Z (Stroke)
SPC 160 NBR-55 G1/2-IG	-	25	26.5	36.5	13.5	15	-	7
SPC 160 NBR-55 G1/2-IG TV	G1/8"-F	25	62.0	36.5	13.5	18	6	7
SPC 210 NBR-55 G1/2-IG	-	23	24.5	36.5	13.5	15	-	5
SPC 210 NBR-55 G1/2-IG TV	G1/8"-F	23	62.0	36.5	13.5	18	10	5
SPC 250 NBR-55 G1/2-IG	-	25	26.5	76.0	13.5	15	-	7
SPC 250 NBR-55 G1/2-IG TV	G1/8"-F	25	67.0	76.0	13.5	16	12	7

<sup>\*</sup>Acceptable dimensional tolerances for rubber parts concerning to DIN ISO 3302-1 M3

<sup>\*\*</sup>External dimension of the suction cup when it is pressed against the workpiece by the vacuum

## Flat Suction Cups SPF

Suction area (Ø) from 10 to 60 mm





#### Suitable for Industry Specific Applications

• Round, flat suction cup for usage in cardboard box and tray

• Handling of cardboard and rigid packaging in top-loading and

Heavy-duty applications that require suction cups with excellent





#### Design

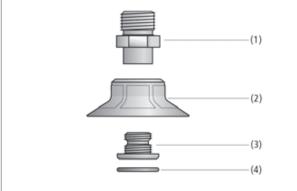
**Applications** 

side-loading machines

sealing and low wear

Palletizing and depalletizing processes

- Round flat suction cup SPF (2) with soft, flexible sealing lip and supporting studs on the suction surface
- 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 (1) 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



System design flat suction cups SPF

Flat suction cups SPF being used in packaging machines

## Our Highlights...

- Flexible, adaptable sealing lip
- · Robust, reinforced main body
- Supporting studs on the suction surface
- Wear-proof and abrasionproof material Elastodur ED-65

#### Your Benefits...

- > Excellent sealing when used on cardboard and rigid packaging
- > High intrinsic stability of the suction cup
- > Maximum effective diameter for high suction force
- > Very low wear, approx. 3 times higher compared to



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## Flat Suction Cups SPF

Suction area (Ø) from 10 to 60 mm



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Abbreviated designation	Suction area Ø in mm	Material and Shore hardness	Type connection element
Example SPF-20 ED-65 SC040: SPF	20	ED-65	SC040
SPF	10	ED-65	SC030
	to		SC040
	60		SC050

#### **Ordering Data Flat Suction Cups SPF**

Suction cup SPF (elastomer part + connection element) is delivered assembled. As an alternative the individual parts can also be ordered separately. To do this, the following ordering steps are required:

- Suction cup of type SPF (step 1) elastomer part, available in various diameters
- Connection element of type SC (step 2) available with various threads

Available accessories: filter screen

#### Flat Suction Cups SPF (Mounted)

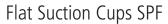
Type*	Part Number
SPF 10 ED-65 M5-IG	10.01.01.13254
SPF 15 ED-65 G1/8-AG	10.01.01.13238
SPF 15 ED-65 G1/8-IG	10.01.01.13239
SPF 20 ED-65 G1/8-AG	10.01.01.13240
SPF 20 ED-65 G1/8-IG	10.01.01.13241
SPF 25 ED-65 G1/8-AG	10.01.01.13242
SPF 25 ED-65 G1/8-IG	10.01.01.13243
SPF 30 ED-65 G1/8-AG	10.01.01.13244
SPF 30 ED-65 G1/8-IG	10.01.01.13245
SPF 40 ED-65 G1/4-AG	10.01.01.13246
SPF 40 ED-65 G1/4-IG	10.01.01.13247
SPF 50 ED-65 G1/4-AG	10.01.01.13248
SPF 50 ED-65 G1/4-IG	10.01.01.13249
SPF 60 ED-65 G1/4-AG	10.01.01.13250
SPF 60 ED-65 G1/4-IG	10.01.01.13251

<sup>\*</sup>Additional material specifications at beginning of the section "Vacuum Suction Cups"

#### 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

<sup>\*</sup>Additional material specifications at beginning of the section "Vacuum Suction Cups"



Suction area (Ø) from 10 to 60 mm



## Step 2: Connection Elements Flat Suction Cups SPF

Туре	SPF 10	SPF 15	SPF 20	SPF 25	SPF 30	SPF 40	SPF 50	SPF 60
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	-	-	-
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

## **Accessories Flat Suction Cups SPF**

Туре	Filter screen
SPF 10 ED-65 SC030	-
SPF 15 ED-65 SC040	-
SPF 20 ED-65 SC040	10.07.01.00309
SPF 25 ED-65 SC040	10.07.01.00309
SPF 30 ED-65 SC040	10.07.01.00309
SPF 40 ED-65 SC050	10.07.01.00308
SPF 50 ED-65 SC050	10.07.01.00308
SPF 60 ED-65 SC050	10.07.01.00308



#### 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. inter- nal hose diame- ter d [mm]**	Type Connection element
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	25	4	SC 040
SPF 25 ED-65 SC040	22.7	27.1	17.0	1.7	40	4	SC 040
SPF 30 ED-65 SC040	29.5	35.3	22.5	2.5	45	6	SC 040
SPF 40 ED-65 SC050	49.5	62.5	25.0	5.1	75	6	SC 050
SPF 50 ED-65 SC050	74.2	87.4	44.0	8.0	100	6	SC 050
SPF 60 ED-65 SC050	107.0	135.0	65.0	12.7	75	6	SC 050

<sup>\*</sup>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

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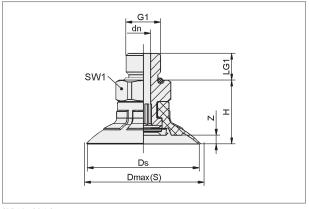
<sup>\*\*</sup>The recommended hose diameter refers to a hose length of approx. 2 m

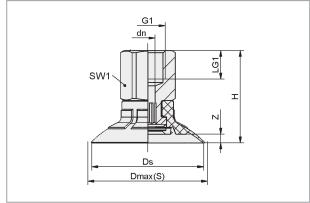
# Flat Suction Cups SPF



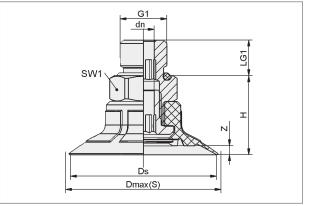
Suction area (Ø) from 10 to 60 mm

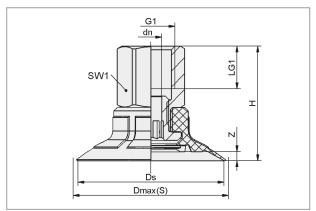
## **Design Data Flat Suction Cups SPF**





SPF 10...30 AG SPF 10...30 IG





SPF 40...60 AG SPF 40...60 IG

Туре	Dimensions in	mm*						
	dn	Ds	Dmax(S)**	G1	н	LG1	SW1	Z (Stroke)
SPF 10 ED-65 M5-IG	3.1	10.5	12.0	M5-F	19	5.5	8	1.0
SPF 15 ED-65 G1/8-AG	4.1	16.4	18.5	G1/8"-M	16	7.5	14	1.5
SPF 15 ED-65 G1/8-IG	4.1	16.4	18.5	G1/8"-F	24	8.0	14	1.5
SPF 20 ED-65 G1/8-AG	4.1	21.4	23.3	G1/8"-M	17	7.5	14	2.0
SPF 20 ED-65 G1/8-IG	4.1	21.4	23.3	G1/8"-F	25	8.0	14	2.0
SPF 25 ED-65 G1/8-AG	4.1	26.4	28.0	G1/8"-M	17	7.5	14	2.0
SPF 25 ED-65 G1/8-IG	4.1	26.4	28.0	G1/8"-F	25	8.0	14	2.0
SPF 30 ED-65 G1/8-AG	4.1	31.4	33.6	G1/8"-M	18	7.5	14	2.5
SPF 30 ED-65 G1/8-IG	4.1	31.4	33.6	G1/8"-F	26	8.0	14	2.5
SPF 40 ED-65 G1/4-AG	6.1	41.4	43.7	G1/4"-M	22	10.0	17	2.5
SPF 40 ED-65 G1/4-IG	6.1	41.4	43.7	G1/4"-F	32	12.0	17	2.5
SPF 50 ED-65 G1/4-AG	6.1	51.4	53.9	G1/4"-M	23	10.0	17	3.5
SPF 50 ED-65 G1/4-IG	6.1	51.4	53.9	G1/4"-F	33	12.0	17	3.5
SPF 60 ED-65 G1/4-AG	6.1	61.2	65.0	G1/4"-M	25	10.0	17	5.1
SPF 60 ED-65 G1/4-IG	6.1	61.2	65.0	G1/4"-F	35	12.0	17	5.1

<sup>\*</sup>Acceptable dimensional tolerances for rubber parts concerning to DIN ISO 3302-1 M3

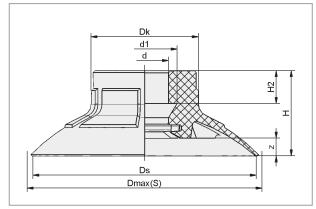
<sup>\*\*</sup>External dimension of the suction cup when it is pressed against the workpiece by the vacuum

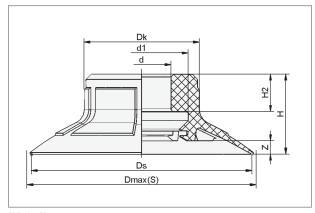
## Flat Suction Cups SPF

Suction area (Ø) from 10 to 60 mm



## **Design Data Flat Suction Cups SPF**





SPF 10...30

Туре	Dimensions in	mm*						
	d	d1	Dk	Ds	Dmax(S)**	н	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	53.9	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

<sup>\*</sup>Acceptable dimensional tolerances for rubber parts concerning to DIN ISO 3302-1 M3

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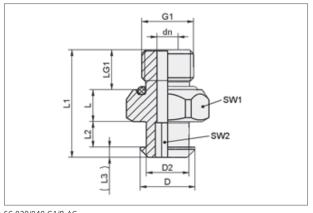
<sup>\*\*</sup>External dimension of the suction cup when it is pressed against the workpiece by the vacuum

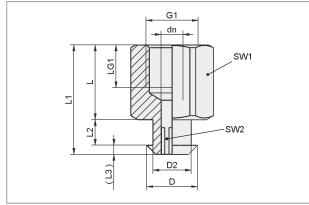
## Flat Suction Cups SPF

Suction area (Ø) from 10 to 60 mm

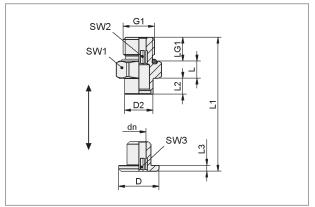


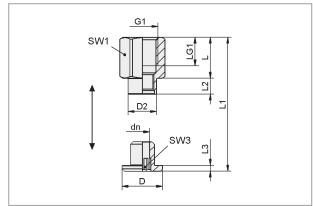
## **Design Data Connection Elements Flat Suction Cups SPF**





SC 030/040 G1/8-AG SC 040 G1/8-IG





SC 050 G1/4-AG SC 050 G1/4-IG

Туре	Dimension	s 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

## Bellows Suction Cups SPB1 (1.5 Folds)

Suction area (Ø) from 10 mm to 80 mm

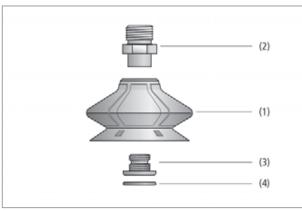




#### Suitable for Industry Specific Applications



Bellows suction cups SPB1 (1.5 folds)



System design bellows suction cups SPB1 (1.5 folds)



Bellows suction cups SPB1 being used for handling of cardboard

#### **Applications**

- Round, bellows suction cup with 1.5 folds for the use in cardboard box and tray erectors
- Handling of cardboard and rigid packaging in top-loading and side-loading machines
- Palletizing and depalletizing processes
- Heavy-duty applications that require suction cups with excellent sealing and low wear

#### Design

- 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
- Starting at 40 mm diameter with a two-piece connection element: consisting of machine-side component (2) and suction-side component (3)
- Clip-in filter screen (4) as pre-filter
- All connection elements with male thread are equipped with integrated sealing

#### Our Highlights...

- Flexible, adaptable sealing lip
- Robust, reinforced main body
- Interlocking of sealing-lip and fold due to locking elements
- Large effective suction surface
- Wear-proof and abrasionproof material Elastodur ED-65

#### Your Benefits...

- > Excellent sealing performance on cardboard and rigid packaging
- > High intrinsic stability in dynamic processes
- > Form-locking connection to avoid sliding of the suction
- > High suction force but small dimensions of the suction cup
- > Very low wear; approx. 3x the service life of NBR

## Bellows Suction Cups SPB1 (1.5 Folds)

Suction area (Ø) from 10 mm to 80 mm



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## Designation Code Bellows Suction Cups SPB1 (1.5 Folds)

Abbreviated designation	Suction area Ø in mm	Material and Shore hardness	Connection thread
Example SPB1-30 ED-65 G1/8-AG:			
SPB1	30	ED-65	G1/8-AG
SPB1	10	ED-65	M5-AG $(AG = (male (M)))$
	to		M5-IG (IG = female (F))
	80		G1/8-AG
			G1/8-IG
			G1/4-AG
			G1/4-IG



#### Ordering Data Bellows Suction Cups SPB1 (1.5 Folds)

Suction cup SPB1 (elastomer part + connection element) is delivered assembled. As an alternative the individual parts can also be ordered separately. To do this, the following ordering steps are required:

- Suction cup of type SPB1 (step 1) elastomer part, available in various diameters
- Connection element of type SC (step 2) available with various threads

Available accessories: filter screen, suction cup insert

#### Bellows Suction Cups SPB1 (1.5 Folds) (Mounted)

Type*	Part Number
SPB1 10 ED-65 M5-AG	10.01.06.03489
SPB1 10 ED-65 M5-IG	10.01.06.03568
SPB1 15 ED-65 G1/8-AG	10.01.06.03490
SPB1 15 ED-65 G1/8-IG	10.01.06.03491
SPB1 20 ED-65 G1/8-AG	10.01.06.03492
SPB1 20 ED-65 G1/8-IG	10.01.06.03493
SPB1 25 ED-65 G1/8-AG	10.01.06.03494
SPB1 25 ED-65 G1/8-IG	10.01.06.03495
SPB1 30 ED-65 G1/8-AG	10.01.06.03496
SPB1 30 ED-65 G1/8-IG	10.01.06.03497
SPB1 40 ED-65 G1/4-AG	10.01.06.03498
SPB1 40 ED-65 G1/4-IG	10.01.06.03499
SPB1 50 ED-65 G1/4-AG	10.01.06.03500
SPB1 50 ED-65 G1/4-IG	10.01.06.03501
SPB1 60 ED-65 G1/4-AG	10.01.06.03502
SPB1 60 ED-65 G1/4-IG	10.01.06.03503
SPB1 80 ED-65 G1/4-AG	10.01.06.03504
SPB1 80 ED-65 G1/4-IG	10.01.06.03505

<sup>\*</sup>Additional material specifications at beginning of the section "Vacuum Suction Cups"



Suction area (Ø) from 10 mm to 80 mm



#### Step 1: Bellows Suction Cups SPB1 (1.5 Folds) (Single Component)

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
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<sup>\*</sup>Additional material specifications at beginning of the section "Vacuum Suction Cups"

#### Step 2: Connection elements Bellows Suction Cups SPB1 (1.5 Folds) (Single Component)

Туре	SPB1 10	SPB1 15	SPB1 20	SPB1 25	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	-
SC 040 G1/8-IG	-	10.01.06.02482	10.01.06.02482	10.01.06.02482	-

Туре	SPB1 40	SPB1 50	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

## Ordering Data Accessories Bellows Suction Cups SPB1 (1.5 Folds)

Туре	Filter screen	Suction cup insert
SPB1 10 ED-65 SC030	-	10.01.06.02802
SPB1 15 ED-65 SC040	-	10.01.06.02490
SPB1 20 ED-65 SC040	10.07.01.00309	10.01.06.02490
SPB1 25 ED-65 SC040	10.07.01.00309	10.01.06.02490
SPB1 30 ED-65 SC040	10.07.01.00309	10.01.06.02490
SPB1 40 ED-65 SC050	10.07.01.00308	10.01.06.02487
SPB1 50 ED-65 SC050	10.07.01.00308	10.01.06.02487
SPB1 60 ED-65 SC050	10.07.01.00308	10.01.06.02487
SPB1 80 ED-65 SC065	10.07.01.00364	10.01.06.03194

#### Technical Data Bellows Suction Cups SPB1 (1.5 Folds)

Туре	Suction force [N]*	Pull-off force [N]	Lateral force [N]	Volume [cm³]	Min. curve radi- us [mm]	Recom. internal hose diameter	Type Connection
	[1	[1	[**]	[c ]	(convex)	d [mm]**	element
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	20	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	35	6	SC 040
SPB1 40 ED-65 SC050	35.9	46.8	24.8	18.3	70	6	SC 050
SPB1 50 ED-65 SC050	54.7	72.7	31.2	30.2	100	6	SC 050
SPB1 60 ED-65 SC050	78.0	100.9	49.4	49.2	200	6	SC 050
SPB1 80 ED-65 SC065	166.0	200.0	59.0	98.4	100	6	SC 065

<sup>\*</sup>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

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 $<sup>\</sup>ensuremath{^{*}}\ensuremath{^{*}}\ensuremath{^{The}}$  recommended hose diameter refers to a hose length of approx. 2 m

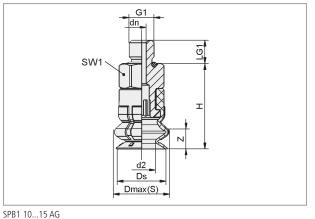
## Bellows Suction Cups SPB1 (1.5 Folds)

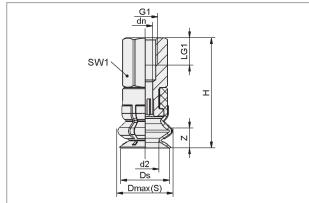
Suction area (Ø) from 10 mm to 80 mm



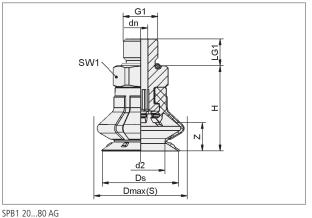
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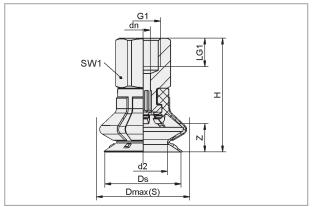
## Design Data Bellows Suction Cups SPB1 (1.5 Folds)





SPB1 10...15 IG





SPB1 20...80 IG

Туре	Dimensions	in mm*							
	dn	d2	Dmax(S)**	Ds	G1	Н	LG1	SW1	Z (Stroke)
SPB1 10 ED-65 M5-AG	1.8	5.6	11.3	9.8	M5-M	17	4.7	8	4
SPB1 10 ED-65 M5-IG	3.1	5.6	11.3	9.8	M5-F	22	5.5	8	4
SPB1 15 ED-65 G1/8-AG	4.1	9.5	19.7	15.4	G1/8"-M	21	7.5	14	6
SPB1 15 ED-65 G1/8-IG	4.1	9.5	19.7	15.4	G1/8"-F	29	8.0	14	6
SPB1 20 ED-65 G1/8-AG	4.1	13.8	26.3	21.4	G1/8"-M	24	7.5	14	8
SPB1 20 ED-65 G1/8-IG	4.1	13.8	26.3	21.4	G1/8"-F	32	8.0	14	8
SPB1 25 ED-65 G1/8-AG	4.1	16.9	31.3	26.4	G1/8"-M	27	7.5	14	11
SPB1 25 ED-65 G1/8-IG	4.1	16.9	31.3	26.4	G1/8"-F	35	8.0	14	11
SPB1 30 ED-65 G1/8-AG	4.1	20.0	36.7	31.4	G1/8"-M	29	7.5	14	13
SPB1 30 ED-65 G1/8-IG	4.1	20.0	36.7	31.4	G1/8"-F	37	8.0	14	13
SPB1 40 ED-65 G1/4-AG	6.1	26.1	48.0	41.4	G1/4"-M	37	10.0	17	16
SPB1 40 ED-65 G1/4-IG	6.1	26.1	48.0	41.4	G1/4"-F	47	12.0	17	16
SPB1 50 ED-65 G1/4-AG	6.1	32.3	58.4	51.4	G1/4"-M	39	10.0	17	18
SPB1 50 ED-65 G1/4-IG	6.1	32.3	58.4	51.4	G1/4"-F	49	12.0	17	18
SPB1 60 ED-65 G1/4-AG	6.1	38.6	69.6	61.4	G1/4"-M	43	10.0	17	22
SPB1 60 ED-65 G1/4-IG	6.1	38.6	69.6	61.4	G1/4"-F	53	12.0	17	22
SPB1 80 ED-65 G1/4-AG	6.1	56.0	88.0	81.4	G1/4"-M	54	10.0	22	27
SPB1 80 ED-65 G1/4-IG	6.1	56.0	88.0	81.4	G1/4"-F	54	12.0	22	27

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

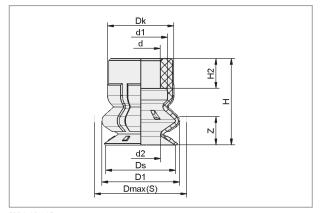
 $<sup>\</sup>ensuremath{^{\star\star}}\xspace$  External dimension of the suction cup when it is pressed against the workpiece by the vacuum

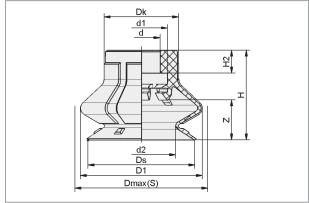
## Bellows Suction Cups SPB1 (1.5 Folds)

Suction area (Ø) from 10 mm to 80 mm



## Design Data Bellows Suction Cups SPB1 (1.5 Folds)





SPB1-10...15

SPB1 20...80

Туре	Dimensions	in mm*								
	d	d1	d2	D1	Dk	Dmax(S)**	Ds	Н	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

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

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<sup>\*\*</sup>External dimension of the suction cup when it is pressed against the workpiece by the vacuum

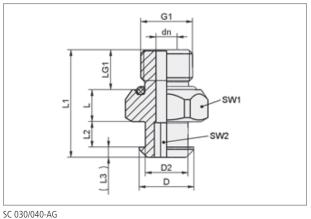


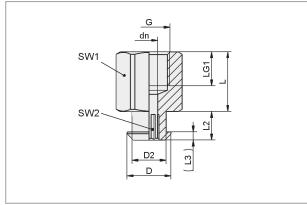
Suction area (Ø) from 10 mm to 80 mm



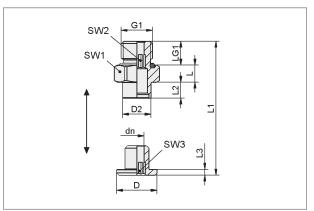
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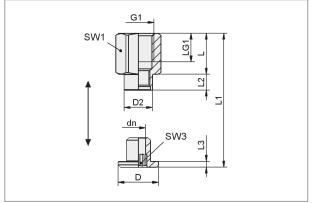
## Design Data Connection Elements Bellows Suction Cups SPB1 (1.5 Folds)





SC 040 G1/8-IG





SC 050/065 G1/4-AG SC 050/065 G1/4-IG

Туре	Dimension	s 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

Bellows Suction Cups SPOB1 (Oval, 1.5 Folds)

Suction area (LxW) from 60x20 mm to 100x40 mm





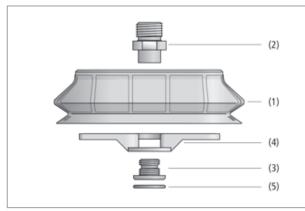
#### Suitable for Industry Specific Applications



Bellows suction cups SPOB1 (oval, 1.5 folds)

#### **Applications**

- Oval, bellows suction cup with 1.5 folds for the use in cardboard box and tray erectors
- Handling of cardboard and rigid or flexible packaging in top-loading and side-loading machines
- Palletizing and depalletizing processes
- Heavy-duty applications that require suction cups with excellent sealing and low wear



System design bellows suction cups SPOB1 (oval, 1.5 folds)

#### Design

- Oval, bellows suction cup SPOB1 with 1.5 folds and soft, flexible sealing lip
- Made of wear-proof material Elastodur ED-65 with a long service
- All sizes come with a 2-piece connection element: consisting of machine-side component (2) and suction-side component (3)
- Size 100 mm x 40 mm with additional suction cup insert (4); included in scope of delivery reusable connection elements
- Clip-in filter screen (5) as pre-filter (filter pore size 250 μm)



Bellows suction cups SPOB1 being used for handling of cardboard

#### Our Highlights...

- Oval shape
- · Suction cup features robust, reinforced main body
- "Interlocking" of sealing-lip and fold due to locking elements
- Made from wear-proof and abrasion-proof material Elastodur ED-65

#### Your Benefits...

- > Ideal for all oblong workpieces
- > High intrinsic stability of the suction cup in dynamic processes
- > Form-locking connection to avoid sliding of the suction
- > Very low wear; approx. 3x the service life of NBR

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Suction area (LxW) from 60x20 mm to 100x40 mm



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#### Designation Code Bellows Suction Cups SPOB1 (Oval, 1.5 Folds)

Abbreviated designation	Suction area Ø in mm	Material and Shore hardness	Connection thread
Example SPOB1 60x20 ED-65 G1/8-AG:			
SPOB1	60x20	ED-65	G1/8-AG
SPOB1	60x20	ED-65	G1/4-AG (AG = male (M))
	100x40		G1/4-IG (IG = female (F))
			G1/8-AG
			G1/8-IG



#### Ordering Data Bellows Suction Cups SPOB1 (Oval, 1.5 Folds)

Suction cup SPOB1 (elastomer part + connection element) is delivered assembled. As an alternative the individual parts can also be ordered separately. To do this, the following ordering steps are required:

- Suction cup of type SPOB1 (step 1) elastomer part, available in various diameters
- Connection element of type SC (step 2) available with various threads, includes stabilization plate for model size 100 x 400 mm

Available accessories: filter screen

#### Bellows Suction Cups SPOB1 (Oval, 1.5 Folds) (Mounted)

Type*	Part Number
SPOB1 60x20 ED-65 G1/8-AG	10.01.06.03510
SPOB1 60x20 ED-65 G1/8-IG	10.01.06.03511
SPOB1 100x40 ED-65 G1/4-AG	10.01.06.03512
SPOB1 100x40 ED-65 G1/4-IG	10.01.06.03513

<sup>\*</sup>Additional material specifications at beginning of the section "Vacuum Suction Cups"

#### Step 1: Bellows Suction Cups SPOB1 (Oval, 1.5 Folds)

Type*	Part Number
SPOB1 60x20 ED-65 SC040	10.01.06.02462
SPOB1 100x40 ED-65 SC050	10.01.06.02461

<sup>\*</sup>Additional material specifications at beginning of the section "Vacuum Suction Cups"

#### Step 2: Ordering data Connection elements Bellows Suction Cups SPOB1 (Oval, 1.5 Folds)

Туре	SPOB1 60x20	SPOB1 100x40
SC 04-AR G1/8-AG	10.01.06.02495	-
SC 040-AR G1/8-IG	10.01.06.02496	-
SC 050-AR G1/4-AG	-	10.01.06.02491
SC 050-AR G1/4-IG	-	10.01.06.02493



#### Ordering Data Accessories Bellows Suction Cups SPOB1 (Oval, 1.5 Folds)

Туре	Filter screen
SPOB1 60x20 ED-65 SC040	10.07.01.00309
SPOB1 100x40 ED-65 SC050	10.07.01.00308

## Bellows Suction Cups SPOB1 (Oval, 1.5 Folds)

Suction area (LxW) from 60x20 mm to 100x40 mm

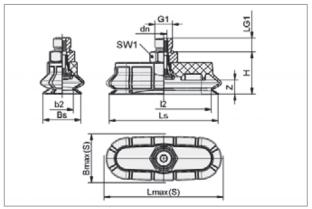


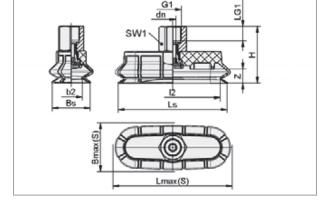
#### Technical Data Bellows Suction Cups SPOB1 (Oval, 1.5 Folds)

Туре	Suction force	Pull-off force	Lateral force	Volume	Min. curve	Recommend-	Туре
	[N]*	[N]	[N]	[cm³]	radius	ed internal	Connection
					[mm]	hose diame-	element
					(convex)	ter d [mm]**	
SPOB1 60x20 ED-65 SC040	32.5	39.8	32.2	11.0	25	6	SC 040
SPOB1 100x40 ED-65 SC050	111.2	131.4	76.9	60.1	50	6	SC 050

<sup>\*</sup>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 Bellows Suction Cups SPOB1 (Oval, 1.5 Folds)





SPOB1 AG

SPOB1 IG

Туре	Dimens	sions in mm*										
	b2	Bmax(S)**	Bs	dn	G1	н	LG1	Lmax(S)**	Ls	12	SW1	Z (Stroke)
SPOB1 60x20 ED-65 G1/8-AG	12.8	27.5	21.4	3.6	G1/8"-M	18	7.5	67.0	61.4	53.5	14	8
SPOB1 60x20 ED-65 G1/8-IG	12.8	27.5	21.4	3.6	G1/8"-F	18	8.0	67.0	61.4	53.5	14	8
SPOB1 100x40 ED-65 G1/4-AG	25.9	52.0	41.4	6.1	G1/4"-M	30	10.0	113.0	104.4	88.9	17	16
SPOB1 100x40 ED-65 G1/4-IG	25.9	52.0	41.4	6.1	G1/4"-F	30	12.0	113.0	104.4	88.9	17	16

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

Suction Cups Knowledge

<sup>\*\*</sup>The recommended hose diameter refers to a hose length of approx. 2  $\mbox{m}$ 

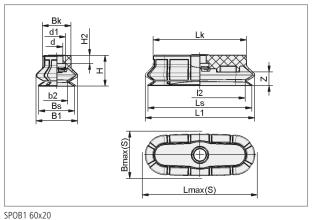
<sup>\*\*</sup>External dimension of the suction cup when it is pressed against the workpiece by the vacuum

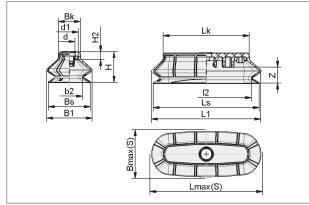
Suction area (LxW) from 60x20 mm to 100x40 mm



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## Design Data Bellows Suction Cups SPOB1 (Oval, 1.5 Folds)



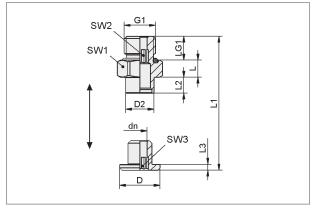


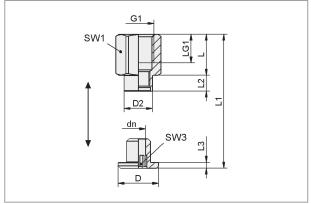
SPOB1 100x40

Туре	Dime	Dimensions in mm*													
	b2	B1	Bk	Bmax(S)**	Bs	d	d1	Н	H2	12	L1	Lk	Lmax(S)**	Ls	Z (Stroke)
SPOB1 60x20 ED-65 SC040	12.8	24.6	16.8	27.5	21.4	7.3	10.5	18	4.8	53.4	64.6	55.1	67.0	61.4	8
SPOB1 100x40 ED-65 SC050	25.9	44.6	21.6	52.0	41.4	11.0	17.5	30	7.0	88.9	107.6	84.6	113.0	104.4	16

<sup>\*</sup>Acceptable dimensional tolerances for rubber parts concerning to DIN ISO 3302-1 M3

## Design Data Connection Elements Bellows Suction Cups SPOB1 (Oval, 1.5 Folds)





SC040/050-AG SC040/050-IG

Туре	Dimensio	Dimensions in mm												
	D	D2	dn	G1	L	L1	L2	L3	LG1	SW1	SW2	SW3		
SC 040-AR G1/8-AG	10.3	8	4	G1/8"-M	6.0	20.3	4.8	2.0	7.5	14	4	4		
SC 040-AR G1/8-IG	10.3	8	4	G1/8"-F	14.0	20.8	4.8	2.0	8.0	14	-	4		
SC 050-AR 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-AR G1/4-IG	17.0	12	6	G1/4"-F	17.2	26.5	6.8	2.5	12.0	17	-	6		

<sup>\*\*</sup>External dimension of the suction cup when it is pressed against the workpiece by the vacuum

## Bellows Suction Cups SPB2 (2.5 Folds)

Suction area (Ø) from 20 mm to 50 mm





#### Suitable for Industry Specific Applications

for palletizing and depalletizing processes

in top-loading and side-loading machines

• Round bellows suction cups with 2.5 folds for use in carton and tray erectors with high demands on suction cup stroke, dynamics

• Handling of non-rigid workpieces such as filled cardboard boxes

 Applications which require high adaptability and high height compensation, such as taking cartons from a magazine in rotary

• Handling of cardboard, inherently stable and flexible packaging



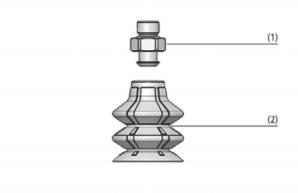
# Bellow suction cups SPB2 (2.5 folds)

#### Design

**Applications** 

and wear resistance

- Round bellows suction cup SPB2 with 2.5 folds (2) and flexible sealing lip
- Diameter up to 30 mm with a one-piece plug-in connection element (1)
- From diameter 40 mm with two-piece connection element: consisting of machine-side component and suction cup-side
- Available as mounted suction cup consisting of connection element and suction cup or as individual parts



System design bellows suction cups SPB2 (2.5 Folds)



Bellows Suction Cups SPB2 being used in side-loading machines

#### Our Highlights...

- High suction cup stroke
- Large inner fold diameters
- Flexible, adaptable sealing lip
- Locking elements between sealing lip and fold
- · Wear and abrasion resistant material Elastodur ED-65

#### Your Benefits...

- > Good adaptability and height adjustment on curved surfaces
- > High volume flow rates and short cycle times
- > Good sealing on cardboard and rigid packaging
- > Gearing prevents shifting of the suction cup
- > Low wear, lifetime of ED-65 about 3 times longer than



Suction area (Ø) from 20 mm to 50 mm



Designation Code Bellows Suction Cups SPB2 (2.5 Folds)

Abbreviated designation	Suction area Ø in mm	Material and Shore hardness	Connection thread
Example SPB2 30 ED-65 G1/8-AG:			
SPB2	30	ED-65	G1/8-AG
SPB2	20	ED-65	G1/4-AG (AG = male (M))
	to		G1/4-IG (IG = female (F))
	50		G1/8-AG
			G1/8-IG

#### Ordering Data Bellows Suction Cups SPB2 (2.5 Folds)

Suction cup SPB2 (elastomer part + connection element) is delivered assembled. As an alternative the individual parts can also be ordered separately. To do this, the following ordering steps are required:

- Suction cup of type SPB2 (step 1) elastomer part, available in various diameters
- Connection element of type SC (step 2) available with various threads

#### Bellows Suction Cups SPB2 (2.5 Folds) (Mounted)

Туре	Connection			
	G1/4"-M	G1/4"-F	G1/8"-M	G1/8"-F
SPB2 20 ED-65	-	-	10.01.06.03453	10.01.06.03454
SPB2 25 ED-65	-	-	10.01.06.03455	10.01.06.03456
SPB2 30 ED-65	-	-	10.01.06.03457	10.01.06.03458
SPB2 40 ED-65	10.01.06.03459	10.01.06.03460	-	-
SPB2 50 ED-65	10.01.06.03461	10.01.06.03462	-	-

#### Step 1: Bellows Suction Cups SPB2 (2.5 Folds) (Single Component)

Туре	Part Number
SPB2 20 ED-65 SC040	10.01.06.03409
SPB2 25 ED-65 SC040	10.01.06.03410
SPB2 30 ED-65 SC040	10.01.06.03411
SPB2 40 ED-65 SC050	10.01.06.03412
SPB2 50 ED-65 SC050	10.01.06.03413

#### Step 2: Connection Elements Bellows Suction Cups SPB2 (2.5 Folds)

Туре	SPB2 20	SPB2 25	SPB2 30	SPB2 40	SPB2 50
SC 040 G1/8-AG	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	-	-
SC 050 G1/4-AG	-	-	-	10.01.06.02487	10.01.06.02487
SC 050 G1/4-IG	-	-	-	10.01.06.02488	10.01.06.02488

## Bellows Suction Cups SPB2 (2.5 Folds)

Suction area (Ø) from 20 mm to 50 mm

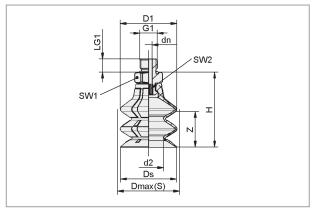


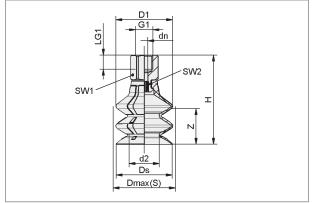
#### Technical Data Bellows Suction Cups SPB2 (2.5 Folds) (Single Component)

Туре	Suction force [N]*	Pull-off force [N]	Lateral force [N]	Volume [cm³]	Min. curve radius [mm] (convex)	Recommended in- ternal hose diam- eter d [mm]**	Type Connection element
SPB2 20 ED-65 SC040	6.8	15.7	8.4	4.2	20	4	SC 040
SPB2 25 ED-65 SC040	9.9	20.1	9.1	7.6	20	4	SC 040
SPB2 30 ED-65 SC040	14.4	28.4	12.8	12.4	30	6	SC 040
SPB2 40 ED-65 SC050	24.8	40.5	20.3	27.9	60	6	SC 050
SPB2 50 ED-65 SC050	34.6	61.8	28.5	51.8	75	6	SC 050

<sup>\*</sup>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 safety factors

#### Design Data Bellows Suction Cups SPB2 (2.5 Folds) (aasembled)





SPB2...AG

SPB2...IG

Туре	Dimensio	ns in mm*									
	dn	d2	D1	Dmax(S)**	Ds	G1	Н	LG1	SW1	SW2	Z (Stroke)
SPB2 20 ED-65 G1/8-AG	4.0	12.0	22.1	23.5	21.4	G1/8"-M	31	7.5	14	4	13
SPB2 20 ED-65 G1/8-IG	4.0	12.0	22.1	23.5	21.4	G1/8"-F	39	8.0	14	4	13
SPB2 25 ED-65 G1/8-AG	4.0	14.5	27.2	28.0	26.4	G1/8"-M	37	7.5	14	4	17
SPB2 25 ED-65 G1/8-IG	4.0	14.5	27.2	28.0	26.4	G1/8"-F	45	8.0	14	4	17
SPB2 30 ED-65 G1/8-AG	4.0	16.9	32.2	34.0	31.4	G1/8"-M	42	7.5	14	4	20
SPB2 30 ED-65 G1/8-IG	4.0	16.9	32.2	34.0	31.4	G1/8"-F	50	8.0	14	4	20
SPB2 40 ED-65 G1/4-AG	6.1	22.9	42.2	44.5	41.3	G1/4"-M	52	10.0	17	6	25
SPB2 40 ED-65 G1/4-IG	6.1	22.9	42.2	44.5	41.3	G1/4"-F	62	12.0	17	6	25
SPB2 50 ED-65 G1/4-AG	6.1	27.1	52.2	55.5	51.3	G1/4"-M	63	10.0	17	6	32
SPB2 50 ED-65 G1/4-IG	6.1	27.1	52.2	55.5	51.3	G1/4"-F	73	12.0	17	6	32

<sup>\*</sup>Acceptable dimensional tolerances for rubber parts concerning to DIN ISO 3302-1 M3

 $<sup>^{\</sup>star\star}$  The recommended hose diameter refers to a hose length of approx. 2 m  $^{\star\star}$ 

 $<sup>\</sup>star\star$ External dimension of the suction cup when it is pressed against the workpiece by the vacuum



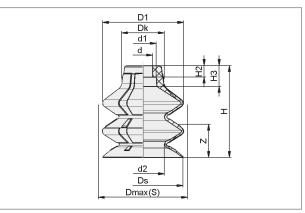
Suction area (Ø) from 20 mm to 50 mm



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#### Design Data Bellows Suction Cups SPB2 (2.5 Folds) (Single Component)



SPB2 ... ED-65

Туре	Dimensions	s in mm*									
	d	d1	d2	D1	Dk	Dmax(S)**	Ds	Н	H2	Н3	Z (Stroke)
SPB2 20 ED-65 SC040	7.5	10.5	12.0	22.2	15.0	23.5	21.4	25	4.6	7.0	13
SPB2 25 ED-65 SC040	7.5	10.5	14.5	27.2	15.5	28.0	26.4	31	4.6	7.8	17
SPB2 30 ED-65 SC040	7.5	10.5	16.9	32.2	16.8	34.0	31.4	36	4.6	7.9	20
SPB2 40 ED-65 SC050	11.0	17.3	22.9	42.2	22.5	44.5	41.3	45	7.0	9.9	25
SPB2 50 ED-65 SC050	11.0	17.3	27.1	52.2	23.5	55.5	51.3	56	7.0	11.6	32

<sup>\*</sup>Acceptable dimensional tolerances for rubber parts concerning to DIN ISO 3302-1 M3

<sup>\*\*</sup>External dimension of the suction cup when it is pressed against the workpiece by the vacuum

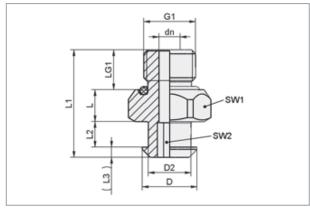
## Bellows Suction Cups SPB2 (2.5 Folds)

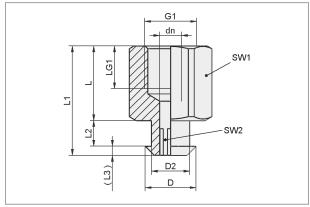
Suction area (Ø) from 20 mm to 50 mm



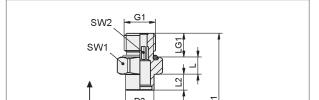
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## **Design Data Connection Elements Bellows Suction Cups SPB2**

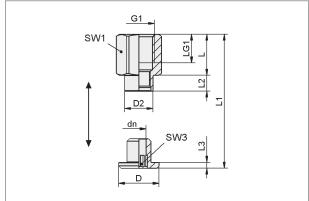




SC 030/040 G1/8-AG



SC 040 G1/8-IG



SC 050 G1/4-AG

SC 050 G1/4-IG

Туре	Dimension	ns in mm										
	D	D2	dn	G1	L	L1	L2	L3	LG1	SW1	SW2	SW3
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

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## Bellows Suction Cups SPB2 P (2.5 Folds)

Suction area (Ø) 20 and 40 mm





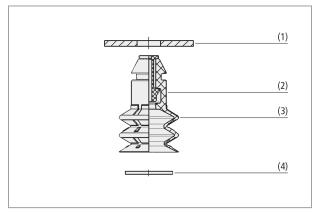
#### Suitable for Industry Specific Applications



Bellows suction cups SPB2 P (2.5 folds)

# **Applications**

- Round bellows suction cup with 2.5 folds used for palletizing and depalletizing processes in the packaging industry
- Handling of packaging materials such as cardboard boxes, rigid and flexible packaging
- Handling of blister packaging, shrink-wrapped products, plastic bags or trays
- Used in area gripping systems and "suction cup carpets"; optionally integrated flow resistances to reduce leakage occurring at partial occupancy



System design bellows suction cups SPB2 P (2.5 folds)

#### Design

- Round bellows suction cup SPB2 P with 2.5 folds (3) and soft, flexible sealing lip
- Integrated flow restrictor (2) with diameters from 0.8 to 1.5 mm
- Tool free assembly directly in an existing drill hole (1) due to push-in function (2)
- Optional integration of filter screen (4) as a pre-filter (120 µm filter pore size)



Bellows suction cups SPB2 P being used for handling of cardboard boxes

#### Our Highlights...

- Tool-free installation due to push-in function
- Flexible, adaptable sealing lip
- Soft bellows with a large stroke and low restoring force
- · Interlocking of sealing lip and fold due to locking elements
- · Food grade material (FDA conform) Silicone SI

#### Your Benefits...

- > Quick installation and removal of the suction cups
- > Optimal sealing on cardboard boxes and packaging material as well as on arching, non-rigid surfaces
- > Used in area gripping systems and "suction cup carpets"; damping effect and compensation for height differences
- > Form-locking connection to avoid sliding of the suction
- > Direct use in the food industry possible

## Bellows Suction Cups SPB2 P (2.5 Folds)

Suction area (Ø) 20 and 40 mm



#### Designation Code Bellows Suction Cups SPB2 P (2.5 Folds)

Abbreviated designation	Suction area Ø	Material and	Flow restrictor	Product addition
	in mm	Shore hardness		
Example SPB2 20 SI-40 SW80 P:				
SPB2	20	SI-40	SW80	P
SPB2	20	SI-40	SW80 = 0.8 mm	P push-in function
	40	SI-55	SW100 = 1.0 mm	
			SW130 = 1.3 mm	
			SW150 = 1.5 mm	



#### Ordering Data Bellows Suction Cups SPB2 P (2.5 Folds)

Bellows suction cup SPB2 P is delivered as a ready-to-connect component. Available in different diameters as single component or with integrated flow restrictor.

Available spare parts: Flow restrictor Available accessories: Filter screen

#### Bellows Suction Cups SPB2 P (2.5 Folds)

Туре	Part Number
SPB2 20 SI-40 P	10.01.06.03125
SPB2 40 SI-55 P	10.01.06.03126

#### Bellows Suction Cups SPB2 P (2.5 Folds) (with Flow Restrictor)

Туре	Flow restrictor SW					
	0.80 mm	1.00 mm	1.30 mm	1.50 mm		
SPB2 20 SI-40 SW P	10.01.06.03220	10.01.06.03221	10.01.06.03222	10.01.06.03223		
SPB2 40 SI-55 SW P	10.01.06.03224	10.01.06.03225	10.01.06.03226	10.01.06.03227		



#### Ordering Data Accessories Bellows Suction Cups SPB2 P (2.5 Folds)

Туре	Filter screen
SPB2 20 SI-40 P	10.01.06.02565
SPB2 40 SI-55 P	10.01.06.02572



#### Ordering Data Spare Parts Bellows Suction Cups SPB2 (2.5 Folds)

Туре	Flow restrictor
SW 80 P	10.05.04.00090
SW 100 P	10.05.04.00091
SW 130 P	10.05.04.00092
SW 150 P	10.05.04.00093



#### Technical Data Bellows Suction Cups SPB2 P (2.5 Folds)

Туре	Suction force	Pull-off force	Min. curve radius [mm]	Volume
	[N]*	[N]	(convex)	[cm³]
SPB2 20 SI-40 P	4.9	8	25	2.5
SPB2 40 SI-55 P	14.9	40	75	22.0

<sup>\*</sup>The specified suction forces are theoretical values with a smooth, dry workpiece surface - they do not include safety factors

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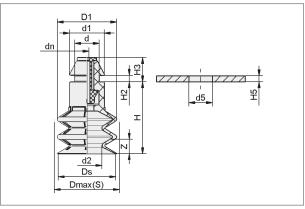


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Suction area (Ø) 20 and 40 mm

## Design Data Bellows Suction Cups SPB2 P (2.5 Folds)



SPB2 20 and 40 P

Туре	Dimensions in mm*												
	d	d1	d2	d5	D1	Dmax(S)**	dn	Ds	Н	H2	Н3	H5	Z (Stroke)
SPB2 20 SI-40 P	8.5	11.8	10.2	7.9	20.0	20.5	4.6	19.6	24.3	2.2	7.2	2	9
SPB2 40 SI-55 P	12.5	15.7	17.8	11.5	43.5	44.6	4.6	42.7	47.0	2.2	7.2	2	20

<sup>\*</sup>Acceptable dimensional tolerances for rubber parts according to DIN ISO 3302-1 M3

<sup>\*\*</sup>External dimension of the suction cup when it is pressed against the workpiece by the vacuum

## Bellows Suction Cups SPB4 (4.5 Folds)

Suction area (Ø) from 20 mm to 50 mm

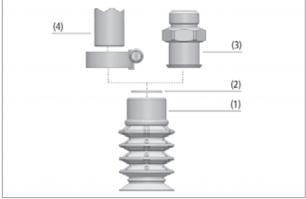




### Suitable for Industry Specific Applications



Bellows suction cups SPB4 (4.5 folds)



System design bellows suction cups SPB4 (4.5 folds)

Bellows suction cups SPB4 being used for handling foil-wrapped products

### **Applications**

- Round, bellows suction cup with 4.5 folds for handling of flexible products such as pouches and other plastic film packaging
- · Process reliable gripping and handling of solid, powdery and liquid filled pouches
- High-speed packaging processes, particularly in conjunction with parallel kinematic robots

### Design

- Bellows suction cup SPB4 (1) with 4.5 folds and soft, flexible sealing lip
- · Special reinforced bellows for additional stability
- Mounting via Schmalz Connector SC (3). Alternatively direct attachment on 3/8" - or 1/2" -pipe via hose clamp (4)
- All mounting elements with male thread include an integrated
- Optional pre-filter (2) (250 µm filter pore size)
- Optional insert disc SPI for the lower suction fold avoids taping the foil

### Our Highlights...

- Thin, steep sealing lip with flow fins
- Functional separation of folds and sealing lip
- Reinforced basic body and folds
- Extra large nominal diameter for high volume flow rates
- Food grade material (FDA conform) Silicone SI and SI-HD

### Your Benefits...

- > Extraordinary sealing on pouches and other flexible materials
- > Compressed bellows have no negative effect on flexibility of sealing lip
- > No collapsing when suction cup is stretched under vacuum
- > Sized for operation with pumps, blowers and multistage ejectors
- > Suitable for applications in the food industry



## Bellows Suction Cups SPB4 (4.5 Folds)

Suction area (Ø) from 20 mm to 50 mm



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# Designation Code Bellows Suction Cups SPB4 (4.5 Folds)

Abbreviated designation	Suction area Ø in mm	Material and Shore hardness	Connection thread
Example SPB4 30 SI-55 G1/4-AG: SPB4	30	SI-55	G1/4-AG
SPB4	20 30 40 50	SI-55 SI-HD	G1/8-AG (AG = male (M)) G1/8-IG (IG = female (F)) G1/4-AG G1/4-IG G3/8-AG G3/8-IG G1/2-AG G1/2-IG

### Ordering Data Bellows Suction Cups SPB4 (4.5 Folds)

Suction cup SPB4 (elastomer part + connection element) is delivered assembled. As an alternative the individual parts can also be ordered separately. To do this, the following ordering steps are required:

- Suction cup of type SPB4 (step 1) elastomer part, available in various diameters
- Connection element of type SC (step 2) available with various threads

Available accessories: filter screen, hose clamp, insert disc

### Bellows Suction Cups SPB4 (4.5 Folds) (Mounted)

Туре	G1/2"-M	G1/2"-F	G1/4"-M	G1/4"-F	G1/8"-M	G1/8"-F	G3/8"-M	G3/8"-F
SPB4-20 SI-55	-	-	10.01.06.03515	10.01.06.03518	10.01.06.03514	10.01.06.03517	10.01.06.03516	10.01.06.03519
SPB4-30 SI-55	-	-	10.01.06.03521	10.01.06.03524	10.01.06.03520	10.01.06.03523	10.01.06.03522	10.01.06.03525
SPB4-40 SI-55	10.01.06.03528	10.01.06.03531	10.01.06.03526	10.01.06.03529	-	-	10.01.06.03527	10.01.06.03530
SPB4-50 SI-55	10.01.06.03534	10.01.06.03537	10.01.06.03532	10.01.06.03535	-	-	10.01.06.03533	10.01.06.03536

### Step 1: Bellows Suction Cups SPB4 (4.5 Folds) (Single Component)

Type*	Part Number
SPB4 20 SI-55 SC080	10.01.06.02588
SPB4 20 SI-HD SC080	10.01.06.03378
SPB4 30 SI-55 SC080	10.01.06.02589
SPB4 30 SI-HD SC080	10.01.06.03180
SPB4 40 SI-55 SC090	10.01.06.02590
SPB4 40 SI-HD SC090	10.01.06.03379
SPB4 50 SI-55 SC090	10.01.06.02613
SPB4 50 SI-HD SC090	10.01.06.03380

<sup>\*</sup>Additional material specifications at beginning of the section "Vacuum Suction Cups"



Suction area (Ø) from 20 mm to 50 mm



### Step 2: Ordering data Connection elements Bellows Suction Cups SPB4 (4.5 Folds) (Single Component)

Туре	SPB4 2030	SPB4 4050
SC 080 G1/8-AG	10.01.06.03142	-
SC 080 G1/8-IG	10.01.06.03270	-
SC 080 G1/4-AG	10.01.06.03268	-
SC 080 G1/4-IG	10.01.06.03271	-
SC 080 G3/8-AG	10.01.06.02593	-
SC 080 G3/8-IG	10.01.06.02594	-
SC 080 NPT1/4-AG	10.01.06.03662	-
SC 080 NPT1/4-IG	10.01.06.03663	-
SC 080 NPT3/8-AG	10.01.06.03664	-
SC 080 NPT3/8-IG	10.01.06.03665	-
SC 090 G1/8-AG	-	10.01.06.03269
SC 090 G1/8-IG	-	10.01.06.03272
SC 090 G1/4-AG	-	10.01.06.02793
SC 090 G1/4-IG	-	10.01.06.03273
SC 090 G3/8-AG	-	10.01.06.02791
SC 090 G3/8-IG	-	10.01.06.03274
SC 090 G1/2-AG	-	10.01.06.02595
SC 090 G1/2-IG	-	10.01.06.02596
SC 090 NPT1/4-AG	-	10.01.06.03666
SC 090 NPT1/4-IG	-	10.01.06.03667
SC 090 NPT3/8-AG	-	10.01.06.03668
SC 090 NPT3/8-IG	-	10.01.06.03669

### Ordering Data Accessories Bellows Suction Cups SPB4 (4.5 Folds)

Туре	Filter screen	Hose clamp	Insert disc SPI
SPB4 20 SI-55 SC080	10.07.01.00320	10.07.10.00002	10.01.06.02915
SPB4 20 SI-HD SC080	10.07.01.00320	10.07.10.00002	10.01.06.02915
SPB4 30 SI-55 SC080	10.07.01.00320	10.07.10.00002	10.01.06.02855
SPB4 30 SI-HD SC080	10.07.01.00320	10.07.10.00002	10.01.06.02855
SPB4 40 SI-55 SC090	10.07.01.00321	10.07.10.00003	10.01.06.02856
SPB4 40 SI-HD SC090	10.07.01.00321	10.07.10.00003	10.01.06.02856
SPB4 50 SI-55 SC090	10.07.01.00321	10.07.10.00003	10.01.06.02916
SPB4 50 SI-HD SC090	10.07.01.00321	10.07.10.00003	10.01.06.02916



### Technical Data Bellows Suction Cups SPB4 (4.5 Folds)

Туре	Suction force [N] at -200 mbar*	Suction force [N] at -400 mbar*	Suction force [N] at -600 mbar*	Pull-off force [N] at -200 mbar	Pull-off force [N] at -400 mbar	Volume [cm³]	Type Connection element
SPB4 20 SI-55 SC080	2.6	5.3	8	4.9	7	7.9	SC 080
SPB4 20 SI-HD SC080	2.6	5.3	8	4.9	7	7.9	SC 080
SPB4 30 SI-55 SC080	5.3	10.6	16	9.9	13	15.6	SC 080
SPB4 30 SI-HD SC080	5.3	10.6	16	9.9	13	15.6	SC 080
SPB4 40 SI-55 SC090	8.3	16.6	25	14.1	23	35.7	SC 090
SPB4 40 SI-HD SC090	8.3	16.6	25	14.1	23	35.7	SC 090
SPB4 50 SI-55 SC090	16.5	33.0	50	22.0	37	64.5	SC 090
SPB4 50 SI-HD SC090	16.5	33.0	50	22.0	37	64.5	SC 090

<sup>\*</sup>The specified suction forces are theoretical values with a smooth, dry workpiece surface - they do not include a safety factor

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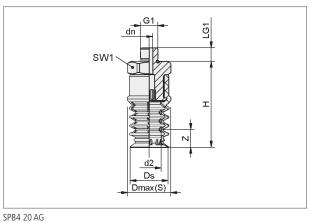
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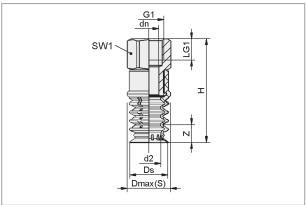


Suction area (Ø) from 20 mm to 50 mm

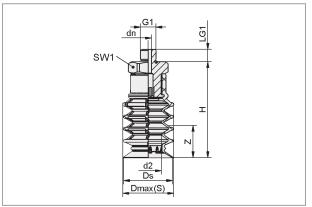


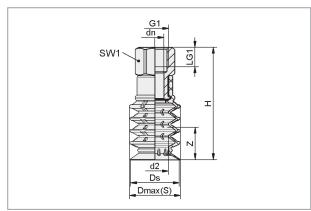
Design Data Bellows Suction Cups SPB4 (4.5 Folds) (Mounted)





SPB4 20 IG





SPB4 30...50 AG SPB4 30...50 IG



Suction area (Ø) from 20 mm to 50 mm



## 7

### Design Data Bellows Suction Cups SPB4 (4.5 Folds) (Mounted)

Туре	Dimensions i	n mm*							
	dn	d2	Dmax(S)**	Ds	G1	Н	LG1	SW1	Z (Stroke)
SPB4 20 SI-55 G1/8-AG	4.0	13.5	24.4	21.4	G1/8"-M	48	7.5	22	10
SPB4 20 SI-55 G1/4-AG	8.0	13.5	24.4	21.4	G1/4"-M	48	10.0	22	10
SPB4 20 SI-55 G3/8-AG	10.3	13.5	24.4	21.4	G3/8"-M	48	10.0	22	10
SPB4 20 SI-55 G1/8-IG	8.6	13.5	24.4	21.4	G1/8"-F	58	12.0	22	10
SPB4 20 SI-55 G1/4-IG	11.0	13.5	24.4	21.4	G1/4"-F	58	12.0	22	10
SPB4 20 SI-55 G3/8-IG	11.0	13.5	24.4	21.4	G3/8"-F	58	12.0	22	10
SPB4 30 SI-55 G1/8-AG	4.0	17.0	31.5	30.2	G1/8"-M	60	7.5	22	20
SPB4 30 SI-55 G1/4-AG	8.0	17.0	31.5	30.2	G1/4"-M	60	10.0	22	20
SPB4 30 SI-55 G3/8-AG	10.3	17.0	31.5	30.2	G3/8"-M	60	10.0	22	20
SPB4 30 SI-55 G1/8-IG	8.6	17.0	31.5	30.2	G1/8"-F	70	12.0	22	20
SPB4 30 SI-55 G1/4-IG	11.0	17.0	31.5	30.2	G1/4"-F	70	12.0	22	20
SPB4 30 SI-55 G3/8-IG	11.0	17.0	31.5	30.2	G3/8"-F	70	12.0	22	20
SPB4 40 SI-55 G1/4-AG	8.0	23.0	41.5	40.5	G1/4"-M	73	10.0	27	27
SPB4 40 SI-55 G3/8-AG	10.3	23.0	41.5	40.5	G3/8"-M	73	10.0	27	27
SPB4 40 SI-55 G1/2-AG	15.0	23.0	41.5	40.5	G1/2"-M	73	14.0	27	27
SPB4 40 SI-55 G1/4-IG	11.4	23.0	41.5	40.5	G1/4"-F	87	12.0	27	27
SPB4 40 SI-55 G3/8-IG	15.0	23.0	41.5	40.5	G3/8"-F	87	12.0	27	27
SPB4 40 SI-55 G1/2-IG	15.0	23.0	41.5	40.5	G1/2"-F	87	16.0	27	27
SPB4 50 SI-55 G1/4-AG	8.0	30.0	51.5	50.3	G1/4"-M	84	10.0	27	37
SPB4 50 SI-55 G3/8-AG	10.3	30.0	51.5	50.3	G3/8"-M	84	10.0	27	37
SPB4 50 SI-55 G1/2-AG	15.0	30.0	51.5	50.3	G1/2"-M	84	14.0	27	37
SPB4 50 SI-55 G1/4-IG	11.4	30.0	51.5	50.3	G1/4"-F	98	12.0	27	37
SPB4 50 SI-55 G3/8-IG	15.0	30.0	51.5	50.3	G3/8"-F	98	12.0	27	37
SPB4 50 SI-55 G1/2-IG	15.0	30.0	51.5	50.3	G1/2"-F	98	16.0	27	37

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

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<sup>\*\*</sup>External dimension of the suction cup when it is pressed against the workpiece by the vacuum

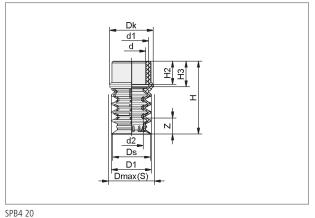
## Bellows Suction Cups SPB4 (4.5 Folds)

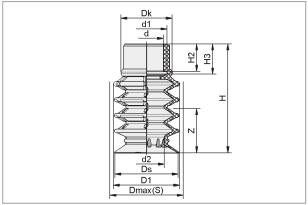
Suction area (Ø) from 20 mm to 50 mm



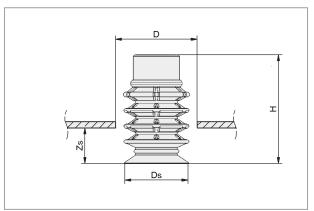


### Design Data Bellows Suction Cups SPB4 (4.5 Folds)





SPB4 30...50



Installation instructions when using a support plate

Туре	Dimensions in mm*												
	d	d1	d2	D**	D1	Dk	Dmax(S)***	Ds	Н	H2	Н3	Z (Stroke)	Zs
SPB4 20 SI-55 SC080	16	19.6	13.5	30	22.0	24	24.4	21.4	41	13	14.4	10	8
SPB4 20 SI-HD SC080	16	19.6	13.5	30	22.0	24	24.4	21.4	41	13	14.4	10	8
SPB4 30 SI-55 SC080	16	19.6	17.0	39	31.0	24	31.5	30.2	52	13	14.4	20	17
SPB4 30 SI-HD SC080	16	19.6	17.0	39	31.0	24	31.5	30.2	52	13	14.4	20	17
SPB4 40 SI-55 SC090	20	24.8	23.0	51	41.0	31	41.5	40.5	66	14	16.0	27	25
SPB4 40 SI-HD SC090	20	24.8	23.0	51	41.0	31	41.5	40.5	66	14	16.0	27	25
SPB4 50 SI-55 SC090	20	24.8	30.0	61	51.0	31	51.5	50.3	76	14	16.0	37	35
SPB4 50 SI-HD SC090	20	24.8	30.0	61	51.0	31	51.5	50.3	76	14	16.0	37	35

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

<sup>\*\*</sup>These parameters ensure that the suction cup seal on the packaging is correct and that the shear force is maximized when using a support plate

<sup>\*\*\*</sup>External dimension of the suction cup when it is pressed against the workpiece by the vacuum

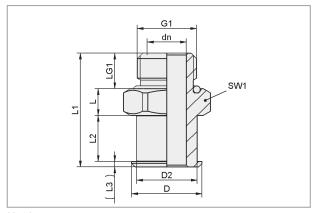
## Bellows Suction Cups SPB4 (4.5 Folds)

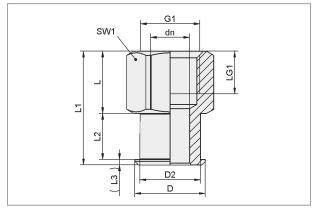
Suction area (Ø) from 20 mm to 50 mm





## Design Data Connection Elements Bellows Suction Cups SPB4 (4.5 Folds)





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Туре	Dimensions	in mm								
	D	D2	dn	G1	L	L1	L2	L3	LG1	SW1
SC 080 G1/8-AG	19.8	17	4	G1/8"-M	7.5	28	13	1.5	8	22
SC 080 G1/8-IG	19.8	17	9	G1/8"-F	17.5	32	13	1.5	12	22
SC 080 G1/4-AG	19.8	17	8	G1/4"-M	7.5	32	13	1.5	10	22
SC 080 G1/4-IG	19.8	17	11	G1/4"-F	17.5	32	13	1.5	12	22
SC 080 G3/8-AG	19.8	17	10	G3/8"-M	7.5	32	13	1.5	10	22
SC 080 G3/8-IG	19.8	17	11	G3/8"-F	17.5	32	13	1.5	12	22
SC 080 NPT1/4-AG	19.8	17	8	NPT1/4-M	7.5	32	13	1.5	10	22
SC 080 NPT1/4-IG	19.8	17	10	NPT1/4-F	17.5	32	13	1.5	13	22
SC 080 NPT3/8-AG	19.8	17	10	NPT3/8-M	7.5	32	13	1.5	10	22
SC 080 NPT3/8-IG	19.8	17	10	NPTF3/8-F	17.5	32	13	1.5	13	22
SC 090 G1/8-AG	25.0	21	4	G1/8"-M	7.5	31	14	2.0	8	27
SC 090 G1/8-IG	25.0	21	9	G1/8"-F	21.5	38	14	2.0	12	27
SC 090 G1/4-AG	25.0	21	8	G1/4"-M	7.5	34	14	2.0	10	27
SC 090 G1/4-IG	25.0	21	11	G1/4"-F	21.5	38	14	2.0	12	27
SC 090 G3/8-AG	25.0	21	10	G3/8"-M	7.5	34	14	2.0	10	27
SC 090 G3/8-IG	25.0	21	15	G3/8"-F	21.5	38	14	2.0	12	27
SC 090 G1/2-AG	25.0	21	15	G1/2"-M	7.5	38	14	2.0	14	27
SC 090 G1/2-IG	25.0	21	15	G1/2"-F	21.5	38	14	2.0	16	27
SC 090 NPT1/4-AG	25.0	21	8	NPT1/4-M	10.0	36	14	2.0	10	27
SC 090 NPT1/4-IG	25.0	21	10	NPT1/4-F	21.5	38	14	2.0	14	27
SC 090 NPT3/8-AG	25.0	21	10	NPT3/8-M	10.0	36	14	2.0	10	27
SC 090 NPT3/8-IG	25.0	21	10	NPTF3/8-F	21.5	38	14	2.0	13	27

Vacuum Suction Cups



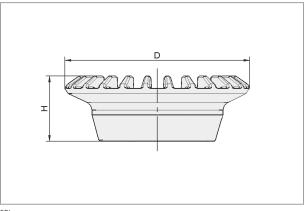
Suction area (Ø) from 20 mm to 50 mm



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## Design Data Suction Cup Inserts SPI (for SPB4)



Туре	Dimensions in mm		
	For suction cup type	D	н
SPI 16 PE	SPB4 20	16	7.5
SPI 24 PE	SPB4 30	24	9.5
SPI 32 PE	SPB4 40	32	11.5
SPI 42 PE	SPB4 50	42	15.0

Bellows Suction Cups SPOB1f (Oval, 1.5 Folds)

Suction area (LxW) from 35x15 mm to 80x35 mm





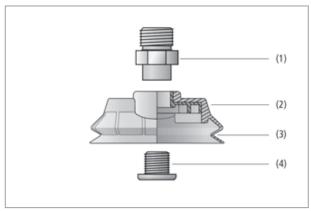
### Suitable for Industry Specific Applications



Bellows suction cups SPOB1f (oval, 1.5 folds)

## **Applications**

- Oval bellows suction cup with 1.5 folds for reliable handling of small, film packaging products such as candy bars, popsicles or
- Used in packaging lines for processing bulk material packaging in the case-packing process step
- Handling of small flow-wrap packaging with different fill levels
- Stability and high suction force in rapid packaging processes thanks to its oval shape



System design bellows suction cups SPOB1f (oval, 1.5 folds)

### Design

- Oval bellows suction cup with 1.5 folds (3) with a very soft and flexible sealing lip
- Integrated anti-rotation guard and easy-to-use function for positioning the suction cup on the workpiece (2)
- Large shaft diameter for high flow rates
- Mounting using one-piece Schmalz SC 040 connection element (1) respectively two-piece Schmalz SC 050 connection element (1) and (4)
- All SC connection elements with male threads come equipped with an integrated sealing ring



SPOB1f bellows suction cups for handling small flow-wrap packaging

### Our Highlights...

- Oval shape with 1.5 folds
- Very flexible and easy-toadapt sealing lip and suction bellows
- Integrated anti-rotation guard
- Large nominal diameter
- FDA-compliant silicone material

### Your Benefits...

- > High holding force and secure gripping even on small workpieces such as tubular bag packaging
- > Optimum sealing for bag packaging even when the bags have an extremely large number of folds and are not very full
- > Simple and reliable positioning of the suction cup on the workpiece (no additional component parts required)
- > High flow rates for short cycle times
- > Capable of direct use in the food product sector



Suction area (LxW) from 35 x 15 mm to 80 x 35 mm



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Designation Code Bellows Suction Cups SPOB1f (Oval, 1.5 Folds)

Abbreviated designation	Suction area LxW	Material and	Type connection element
	in mm	Shore hardness	
Example SPOB1f 60x25 SI-55 SC050:			
SPOB1f	60x25	SI-55	SC050
SPOB1f	35x15	SI-55	SC040
	60x25		SC050
	80x35		

### Ordering Data Bellows Suction Cups SPOB1f (Oval, 1.5 Folds)

The SPOB1f suction cup (elastomer part + connection element) with integrated bag stabilizer is delivered assembled. As an alternative, the suction cup can be ordered as individual parts. To do this, the following ordering steps are required:

- SPOB1f-type suction cup (step 1) elastomer part, available in a range of different diameters
- SC-type connection element (step 2) available with a range of different threads

### Step 1: Bellows Suction Cups SPOB1f (Oval, 1.5 Folds)

Туре	Part Number
SPOB1f 35x15 SI-55 SC040-AR	10.01.06.03625
SPOB1f 60x25 SI-55 SC050-AR	10.01.06.03626
SPOB1f 80x35 SI-55 SC050-AR	10.01.06.03627

### Step 2: Connection Elements Bellows Suction Cups SPOB1f (Oval, 1.5 Folds)

Туре	SPOB1f 35x15	SPOB1f 60x25	SPOB1f 80x35
SC 040-AR G1/8-AG	10.01.06.02495	-	-
SC 040-AR G1/8-IG	10.01.06.02496	-	-
SC 050-AR G1/4-AG	-	10.01.06.03741	10.01.06.03741
SC 050-AR G1/4-IG	-	10.01.06.03742	10.01.06.03742

### Technical Data Bellows Suction Cups SPOB1f (Oval, 1.5 Folds)

Туре	Suction force [N] at -200 mbar*	Suction force [N] at -400 mbar*		Volume [cm³]	Min. work- piece width [mm]	Recom. internal hose diameter d [mm]**	Type Connection element
SPOB1f 35x15 SI-55 SC040	4.2	8.4	12.6	2.1	10.0	6	SC 040
SPOB1f 60x25 SI-55 SC050	12.2	24.4	36.6	11.5	20.0	8	SC 050
SPOB1f 80x35 SI-55 SC050	24.9	49.8	74.7	26.1	30.0	8	SC 050

<sup>\*</sup>The specified suction forces are theoretical values with a smooth, dry workpiece surface - they do not include a safety factor

<sup>\*\*</sup>The recommended hose diameter refers to a hose length of approx. 2 m  $\,$ 

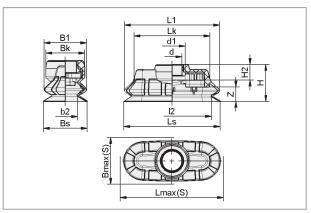


Bellows Suction Cups SPOB1f (Oval, 1.5 Folds)

Suction area (LxW) from 35 x 15 mm to 80 x 35 mm

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## Design Data Bellows Suction Cups SPOB1f (Oval, 1.5 Folds)



SPOB1f

Туре	Dimer	imensions in mm*													
	b2	B1	Bk	Bmax(S)**	Bs	d	d1	Н	H2	12	L1	Lk	Lmax(S)**	Ls	Z (Stroke)
SPOB1f 35x15 SI-55 SC040	8.0	15	14	17	14.6	8.3	11.0	13	5.0	28.0	35	28.5	37	34.6	4
SPOB1f 60x25 SI-55 SC050	13.8	25	22	27	24.5	12.4	17.3	23	6.9	48.8	60	46.9	62	59.5	9
SPOB1f 80x35 SI-55 SC050	21.0	35	24	38	34.5	12.4	17.3	27	6.9	66.0	80	61.1	83	79.5	11

<sup>\*</sup>Acceptable dimensional tolerances for rubber parts concerning to DIN ISO 3302-1 M3

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<sup>\*\*</sup>External dimension of the suction cup when it is pressed against the workpiece by the vacuum

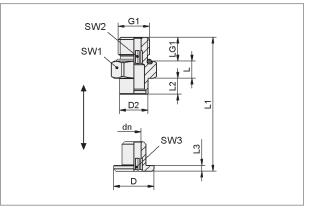


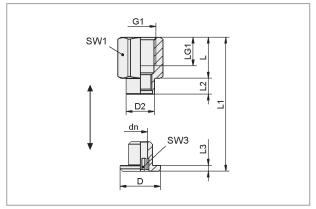
Bellows Suction Cups SPOB1f (Oval, 1.5 Folds)

Suction area (LxW) from 35 x 15 mm to 80 x 35 mm

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## **Design Data Connection Elements Bellows Suction Cups SPOB1f**





SC 040 G1/8-AG / SC 050 G1/4-AG

SC 040 G1/8-IG / SC 050 G1/4-IG

Туре	Dimension	s in mm										
	D	D2	dn	G1	L	L1	L2	L3	LG1	SW1	SW2	SW3
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

## Bellows Suction Cups SPB2f (2.5 Folds)

Suction area (Ø) from 30 mm to 50 mm

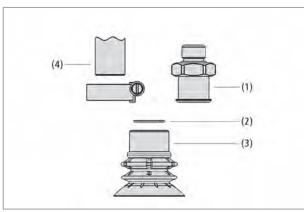




### Suitable for Industry Specific Applications



Bellows Suction Cups SPB2f (2.5 Folds)



System design bellows suction cups SPB2f (2.5 folds)

### **Applications**

- Round bellows suction cup with 2.5 folds for dynamical handling of bags and other types of very flexible packaging
- · Reliably gripping and handling of bags containing fluids, solids or powder and packaging that is not very full
- Stable in extremely quick packaging processes, particularly in conjunction with Delta robots (case packer and pick-and-place applications)

### Design

- SPB2f bellows suction cup with 2.5 folds (3) and a gentle and flexible sealing lip with segmented flow vanes and integrated bag
- Very large shaft diameter for high volume flow rates
- Specially reinforced suction bellows for additional stability
- Installation using the Schmalz SC connection element (1); alternatively by placing directly onto the 3/8" or 1/2" pipe (4) on the machine side and attaching with a hose clamp
- All SC connection elements with male thread are equipped with an integrated sealing ring
- Optional insert filter for pre-filter (2) (250 µm filter pore size)



Bellows suction cup SPB2f for handling bags

### Our Highlights...

- · Extremely flexible and adaptable sealing lip with flow vanes
- Integrated bag stabilizer
- Compact, reinforced main body with 2.5 folds
- Large nominal diameter
- FDA-compliant SI silicone

### Your Benefits...

- > Optimum sealing on bags, even when there are many folds, the bags are not very full or when the bags are swinging about
- > Bag stabilization; even thin and soft plastic films (LDPE) are not sucked in
- > Secure grip and stability, even at high speeds; no swinging workpieces
- > High flow rate for short cycle times
- > Can be used directly in the food industry

## Bellows Suction Cups SPB2f (2.5 Folds)

Suction area (Ø) from 30 mm to 50 mm



VacuumSuction CupsKnowledge

Designation Code Bellows Suction Cups SPB2f (2.5 Folds)
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Abbreviated designation	Suction area Ø in mm	Material and Shore hardness	Connection thread
Example SPB2f 30 SI-55 G1/8-AG:			
SPB2f	30	SI-55	G1/8-AG
SPB2f	30	SI-55	G1/8-AG (AG = male (M))
	to		G1/8-IG (IG = female (F))
	50		G1/4-AG
			G1/4-IG
			G3/8-AG
			G3/8-IG



### Ordering Data Bellows Suction Cups SPB2f (2.5 Folds)

Suction cup SPB2f (elastomer part + connection element) is delivered assembled. As an alternative the individual parts can also be ordered separately. To do this, the following ordering steps are required:

- Suction cup of type SPB2f (step 1) elastomer part, available in various diameters
- Connection element of type SC (step 2) available with various threads

### Bellows Suction Cups SPB2f (2.5 Folds) (Mounted)

Туре	Part Number
SPB2f 30 SI-55 G1/8-AG	10.01.06.03698
SPB2f 30 SI-55 G1/8-IG	10.01.06.03699
SPB2f 30 SI-55 G1/4-AG	10.01.06.03700
SPB2f 30 SI-55 G1/4-IG	10.01.06.03701
SPB2f 30 SI-55 G3/8-AG	10.01.06.03702
SPB2f 30 SI-55 G3/8-IG	10.01.06.03703
SPB2f 40 SI-55 G1/8-AG	10.01.06.03646
SPB2f 40 SI-55 G1/8-IG	10.01.06.03647
SPB2f 40 SI-55 G1/4-AG	10.01.06.03648
SPB2f 40 SI-55 G1/4-IG	10.01.06.03649
SPB2f 40 SI-55 G3/8-AG	10.01.06.03650
SPB2f 40 SI-55 G3/8-IG	10.01.06.03651
SPB2f 50 SI-55 G1/8-AG	10.01.06.03652
SPB2f 50 SI-55 G1/8-IG	10.01.06.03653
SPB2f 50 SI-55 G1/4-AG	10.01.06.03654
SPB2f 50 SI-55 G1/4-IG	10.01.06.03655
SPB2f 50 SI-55 G3/8-AG	10.01.06.03656
SPB2f 50 SI-55 G3/8-IG	10.01.06.03657
SPB2f 50 SI-55 G1/2-AG	10.01.06.03658
SPB2f 50 SI-55 G1/2-IG	10.01.06.03659

### Step 1: Bellows Suction Cups SPB2f (2.5 Folds) (Single Component)

Туре	Part Number
SPB2f 30 SI-55 SC080	10.01.06.03643
SPB2f 40 SI-55 SC080	10.01.06.03559
SPB2f 50 SI-55 SC090	10.01.06.03560



Suction area (Ø) from 30 mm to 50 mm



## Step 2: Connection Elements Bellows Suction Cups SPB2f (2.5 Folds)

Туре	SPB2f 3040	SPB2f 50
SC 080 G1/8-AG	10.01.06.03142	-
SC 080 G1/8-IG	10.01.06.03270	-
SC 080 G1/4-AG	10.01.06.03268	-
SC 080 G1/4-IG	10.01.06.03271	-
SC 080 G3/8-AG	10.01.06.02593	-
SC 080 G3/8-IG	10.01.06.02594	-
SC 080 NPT1/4-AG	10.01.06.03662	-
SC 080 NPT1/4-IG	10.01.06.03663	-
SC 080 NPT3/8-AG	10.01.06.03664	-
SC 080 NPT3/8-IG	10.01.06.03665	-
SC 090 G1/8-AG	-	10.01.06.03269
SC 090 G1/8-IG	-	10.01.06.03272
SC 090 G1/4-AG	-	10.01.06.02793
SC 090 G1/4-IG	-	10.01.06.03273
SC 090 G3/8-AG	-	10.01.06.02791
SC 090 G3/8-IG	-	10.01.06.03274
SC 090 G1/2-AG	-	10.01.06.02595
SC 090 G1/2-IG	-	10.01.06.02596
SC 090 NPT1/4-AG	-	10.01.06.03666
SC 090 NPT1/4-IG	-	10.01.06.03667
SC 090 NPT3/8-AG	-	10.01.06.03668
SC 090 NPT3/8-IG	-	10.01.06.03669

### Technical Data Bellows Suction Cups SPB2f (2.5 Folds)

Туре	Suction force [N] at -200 mbar*	Suction force [N] at -400 mbar*	Suction force [N] at -600 mbar*	Volume [cm³]	Type Connection element
SPB2f 30 SI-55 SC080	4.3	8.5	12.8	7.2	SC 080
SPB2f 40 SI-55 SC080	6.8	13.6	20.4	12.9	SC 080
SPB2f 50 SI-55 SC090	13.7	27.3	41.0	26.5	SC 090

<sup>\*</sup>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 safety factors

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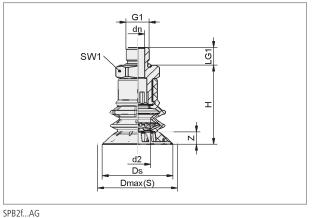
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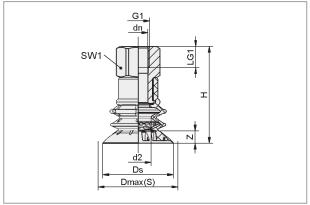
# Bellows Suction Cups SPB2f (2.5 Folds)



Suction area (Ø) from 30 mm to 50 mm

### Design Data Bellows Suction Cups SPB2f (2.5 Folds)





SPB2f...IG

Туре	Dimensions in	mm*						
	d2	Dmax(S)**	Ds	G1	н	LG1	SW1	Z (Stroke)
SPB2f 30 SI-55 G1/8-AG	7.2	32.0	30.0	G1/8"-M	40	7.5	22.0	5
SPB2f 30 SI-55 G1/8-IG	7.2	32.0	30.0	G1/8"-F	50	12.0	22.0	5
SPB2f 30 SI-55 G1/4-AG	7.2	32.0	30.0	G1/4"-M	40	10.0	22.0	5
SPB2f 30 SI-55 G1/4-IG	7.2	32.0	30.0	G1/4"-F	50	12.0	22.0	5
SPB2f 30 SI-55 G3/8-AG	7.2	32.0	30.0	G3/8"-M	40	10.0	22.0	5
SPB2f 30 SI-55 G3/8-IG	7.2	32.0	30.0	G3/8"-F	50	12.0	22.0	5
SPB2f 40 SI-55 G1/8-AG	15.3	42.0	39.7	G1/8"-M	45	7.5	22.0	7
SPB2f 40 SI-55 G1/8-IG	15.3	42.0	39.7	G1/8"-F	55	12.0	22.0	7
SPB2f 40 SI-55 G1/4-AG	15.3	42.0	39.7	G1/4"-M	45	10.0	22.0	7
SPB2f 40 SI-55 G1/4-IG	15.3	42.0	39.7	G1/4"-F	55	12.0	22.0	7
SPB2f 40 SI-55 G3/8-AG	15.3	42.0	39.7	G3/8"-M	45	10.0	22.0	7
SPB2f 40 SI-55 G3/8-IG	15.3	42.0	39.7	G3/8"-F	55	12.0	22.0	7
SPB2f 50 SI-55 G1/8-AG	21.0	52.0	49.7	G1/8"-M	53	7.5	27.0	9
SPB2f 50 SI-55 G1/8-IG	21.0	52.0	49.7	G1/8"-F	67	12.0	27.0	9
SPB2f 50 SI-55 G1/4-AG	21.0	52.0	49.7	G1/4"-M	53	10.0	27.0	9
SPB2f 50 SI-55 G1/4-IG	21.0	52.0	49.7	G1/4"-F	67	12.0	27.0	9
SPB2f 50 SI-55 G3/8-AG	21.0	52.0	49.7	G3/8"-M	53	10.0	27.0	9
SPB2f 50 SI-55 G3/8-IG	21.0	52.0	49.7	G3/8"-F	67	12.0	27.0	9
SPB2f 50 SI-55 G1/2-AG	21.0	52.0	49.7	G1/2"-M	53	14.0	27.0	9
SPB2f 50 SI-55 G1/2-IG	21.0	52.0	49.7	G1/2"-F	67	16.0	27.0	9

<sup>\*</sup>Acceptable dimensional tolerances for rubber parts concerning to DIN ISO 3302-1 M3

 $<sup>\</sup>ensuremath{^{**}}\textsc{External}$  dimension of the suction cup when it is pressed against the workpiece by the vacuum

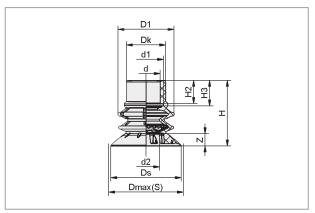
Bellows Suction Cups SPB2f (2.5 Folds)

Suction area (Ø) from 30 mm to 50 mm



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## Design Data Bellows Suction Cups SPB2f (2.5 Folds)



SPB2f 30...50

Туре	Dimension	Dimensions in mm*									
	d	d1	d2	D1	Dk	Dmax(S)**	Ds	Н	H2	Н3	Z (Stroke)
SPB2f 30 SI-55 SC080	16.0	19.6	7.2	24.4	22.0	32.0	30.0	32	13.0	14.4	5
SPB2f 40 SI-55 SC080	16.0	19.6	15.3	31.6	24.4	42.0	39.7	37	13.0	14.4	7
SPB2f 50 SI-55 SC090	20.0	24.8	21.0	41.6	31.0	52.0	49.7	46	14.0	16.0	9

<sup>\*</sup>Acceptable dimensional tolerances for rubber parts concerning to DIN ISO 3302-1 M3

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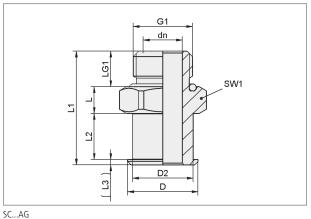
<sup>\*\*</sup>External dimension of the suction cup when it is pressed against the workpiece by the vacuum

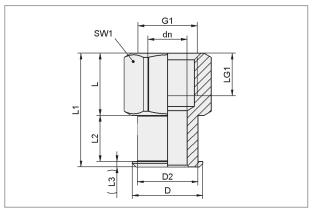


Suction area (Ø) from 30 mm to 50 mm



## **Design Data Connection Elements Bellows Suction Cups SPB2f**





SCIG

Туре	Dimensions	in mm								
	D	D2	dn	G1	L	L1	L2	L3	LG1	SW1
SC 080 G1/8-AG	19.8	17	4	G1/8"-M	7.5	28.0	13.0	1.5	7.5	22
SC 080 G1/8-IG	19.8	17	9	G1/8"-F	17.5	32.0	13.0	1.5	12.0	22
SC 080 G1/4-AG	19.8	17	8	G1/4"-M	7.5	32.0	13.0	1.5	10.0	22
SC 080 G1/4-IG	19.8	17	11	G1/4"-F	17.5	32.0	13.0	1.5	12.0	22
SC 080 G3/8-AG	19.8	17	10	G3/8"-M	7.5	32.0	13.0	1.5	10.0	22
SC 080 G3/8-IG	19.8	17	11	G3/8"-F	17.5	32.0	13.0	1.5	12.0	22
SC 080 NPT1/4-AG	19.8	17	8	NPT1/4-M	7.5	32.2	13.0	1.5	10.2	22
SC 080 NPT1/4-IG	19.8	17	10	NPT1/4-F	17.5	32.0	13.0	1.5	12.8	22
SC 080 NPT3/8-AG	19.8	17	10	NPT3/8-M	7.5	32.4	13.0	1.5	10.4	22
SC 080 NPT3/8-IG	19.8	17	10	NPTF3/8-F	17.5	32.0	13.0	1.5	12.8	22
SC 090 G1/8-AG	25.0	21	4	G1/8"-M	7.5	31.0	14.0	2.0	7.5	27
SC 090 G1/8-IG	25.0	21	9	G1/8"-F	21.5	37.5	14.0	2.0	12.0	27
SC 090 G1/4-AG	25.0	21	8	G1/4"-M	7.5	33.5	14.0	2.0	10.0	27
SC 090 G1/4-IG	25.0	21	11	G1/4"-F	21.5	37.5	14.0	2.0	12.0	27
SC 090 G3/8-AG	25.0	21	10	G3/8"-M	7.5	33.5	14.0	2.0	10.0	27
SC 090 G3/8-IG	25.0	21	15	G3/8"-F	21.5	37.5	14.0	2.0	12.0	27
SC 090 G1/2-AG	25.0	21	15	G1/2"-M	7.5	37.5	14.0	2.0	14.0	27
SC 090 G1/2-IG	25.0	21	15	G1/2"-F	21.5	37.5	14.0	2.0	16.0	27
SC 090 NPT1/4-AG	25.0	21	8	NPT1/4-M	10.0	36.2	14.0	2.0	10.2	27
SC 090 NPT1/4-IG	25.0	21	10	NPT1/4-F	21.5	37.5	14.0	2.0	13.8	27
SC 090 NPT3/8-AG	25.0	21	10	NPT3/8-M	10.0	36.4	14.0	2.0	10.4	27
SC 090 NPT3/8-IG	25.0	21	10	NPTF3/8-F	21.5	37.5	14.0	2.0	12.8	27

## Bellows Suction Cups SPB4f (4.5 Folds)

Suction area (Ø) from 30 mm to 50 mm

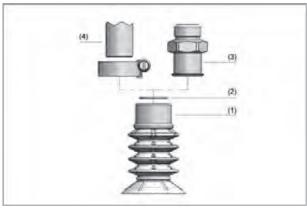




### Suitable for Industry Specific Applications



Bellows suction cups SPB4f (4.5 folds)



System design bellows suction cups SPB4f (4.5 folds)



Bellows suction cup SPB4f for handling bags

### **Applications**

- Round, bellows suction cup with 4.5 folds for handling bags and other very flexible packaging
- Reliable gripping and handling especially of bags and packaging with low filling degree as well as liquid, solid or powder filled pouches
- For use in fast packaging processes, particularly together with delta robots (case packers and pick-and-place applications)

### Design

- Bellows suction cup SPB4f with 4.5 folds (1) as well as soft, flexible sealing lip with segmented flow fins and integrated bag
- · Very large shaft diameter for high volume flow rates
- · Special reinforced bellows for additional stability
- Installation using the Schmalz connection element SC (3); alternatively by attaching directly onto a 3/8" or 1/2" pipe (4) on the machine side and fixing with a hose clamp
- All connection elements SC with male thread are equipped with an integrated sealing ring
- Optional filter as pre-filter (2) (250 µm filter pore size)

### Our Highlights...

- Extremely flexible and adaptable sealing lip with flow fins
- Integrated bag stabilizer
- · Reinforced basic body and
- Very large nominal diameter
- Suction cup made from FDA compliant silicone SI and SI-HD

### Your Benefits...

- > Optimal sealing on bags, even with strong wrinkles, low filling degree or during swivel motion
- > Bag stabilization; even thin and soft plastic films (LDPE) are not drawn in
- > Secure gripping with high lateral loads and swinging workpieces
- > High volume flow rates and short cycle times
- > Can be used directly in the food industry



Suction area (Ø) from 30 mm to 50 mm



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Designation Code Bellows Suction Cups SPB4f (4.5 Folds)

Abbreviated designation	Suction area Ø in mm	Material and Shore hardness	Connection thread
Example SPB4f 40 SI-55 G1/8-IG: SPB4f	40	SI-55	G1/8-IG
SPB4f	30 40 50	SI-55 SI-HD	G1/8-AG (AG = male (M)) G1/8-IG (IG = female (F)) G1/4-AG G1/4-IG G3/8-AG G3/8-IG G1/2-AG G1/2-IG



### Ordering Data Bellows Suction Cups SPB4f (4.5 Folds)

Suction cup SPB4f (elastomer part + connection element) with integrated bag stabilizer is delivered assembled. As an alternative the individual parts can also be ordered separately. To do this, the following ordering steps are required:

- Suction cup of type SPB4f (step 1) elastomer part, available in various diameters
- Connection element of type SC (step 2) available with various threads

Available accessories: filter screen, hose clamp

### Bellows Suction Cups SPB4f (4.5 Folds) (Mounted)

Туре	Part Number
SPB4f 30 SI-55 G1/8-AG	10.01.06.03538
SPB4f 30 SI-55 G1/4-AG	10.01.06.03539
SPB4f 30 SI-55 G3/8-AG	10.01.06.03540
SPB4f 30 SI-55 G1/8-IG	10.01.06.03541
SPB4f 30 SI-55 G1/4-IG	10.01.06.03542
SPB4f 30 SI-55 G3/8-IG	10.01.06.03543
SPB4f 40 SI-55 G1/8-AG	10.01.06.03544
SPB4f 40 SI-55 G1/4-AG	10.01.06.03545
SPB4f 40 SI-55 G3/8-AG	10.01.06.03546
SPB4f 40 SI-55 G1/8-IG	10.01.06.03547
SPB4f 40 SI-55 G1/4-IG	10.01.06.03548
SPB4f 40 SI-55 G3/8-IG	10.01.06.03549
SPB4f 50 SI-55 G1/8-AG	10.01.06.03550
SPB4f 50 SI-55 G1/4-AG	10.01.06.03551
SPB4f 50 SI-55 G3/8-AG	10.01.06.03552
SPB4f 50 SI-55 G1/2-AG	10.01.06.03553
SPB4f 50 SI-55 G1/8-IG	10.01.06.03554
SPB4f 50 SI-55 G1/4-IG	10.01.06.03555
SPB4f 50 SI-55 G3/8-IG	10.01.06.03556
SPB4f 50 SI-55 G1/2-IG	10.01.06.03557



Suction area (Ø) from 30 mm to 50 mm



### Step 1: Bellows Suction Cups SPB4f (4.5 Folds)

Туре	Part Number
SPB4f 30 SI-55 SC080	10.01.06.03264
SPB4f 30 SI-HD SC080	10.01.06.03563
SPB4f 40 SI-55 SC080	10.01.06.03265
SPB4f 40 SI-HD SC080	10.01.06.03448
SPB4f 50 SI-55 SC090	10.01.06.03266
SPB4f 50 SI-HD SC090	10.01.06.03564

### Step 2: Connection Elements Bellows Suction Cups SPB4f (4.5 Folds)

Туре	SPB4f 30	SPB4f 40	SPB4f 50
SC 080 G1/8-AG	10.01.06.03142	10.01.06.03142	-
SC 080 G1/8-IG	10.01.06.03270	10.01.06.03270	-
SC 080 G1/4-AG	10.01.06.03268	10.01.06.03268	-
SC 080 G1/4-IG	10.01.06.03271	10.01.06.03271	-
SC 080 G3/8-AG	10.01.06.02593	10.01.06.02593	-
SC 080 G3/8-IG	10.01.06.02594	10.01.06.02594	-
SC 090 G1/8-AG	-	-	10.01.06.03269
SC 090 G1/8-IG	-	-	10.01.06.03272
SC 090 G1/4-AG	-	-	10.01.06.02793
SC 090 G1/4-IG	-	-	10.01.06.03273
SC 090 G3/8-AG	-	-	10.01.06.02791
SC 090 G3/8-IG	-	-	10.01.06.03274
SC 090 G1/2-AG	-	-	10.01.06.02595
SC 090 G1/2-IG	-	-	10.01.06.02596

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### Ordering Data Accessories Bellows Suction Cups SPB4f (4.5 Folds)

Туре	Filter screen	Hose clamp
SPB4f 30 SI-55 SC080	10.07.01.00320	10.07.10.00002
SPB4f 30 SI-HD SC080	10.07.01.00320	10.07.10.00002
SPB4f 40 SI-55 SC080	10.07.01.00320	10.07.10.00002
SPB4f 40 SI-HD SC080	10.07.01.00320	10.07.10.00002
SPB4f 50 SI-55 SC090	10.07.01.00321	10.07.10.00003
SPB4f 50 SI-HD SC090	10.07.01.00321	10.07.10.00003

### Technical Data Bellows Suction Cups SPB4f (4.5 Folds)

Туре	Suction force [N] at -200 mbar*	Suction force [N] at -400 mbar*	Suction force [N] at -600 mbar*	Volume [cm³]	Type Connection element
SPB4f 30 SI-55 SC080	4.3	8.5	12.8	6.0	SC 080
SPB4f 30 SI-HD SC080	4.3	8.5	12.8	6.0	SC 080
SPB4f 40 SI-55 SC080	6.8	13.6	20.4	15.1	SC 080
SPB4f 40 SI-HD SC080	6.8	13.6	20.4	15.1	SC 080
SPB4f 50 SI-55 SC090	13.7	27.3	41.0	33.1	SC 090
SPB4f 50 SI-HD SC090	13.7	27.3	41.0	33.1	SC 090

<sup>\*</sup>The specified suction forces are theoretical values with a smooth, dry workpiece surface - they do not include a safety factor

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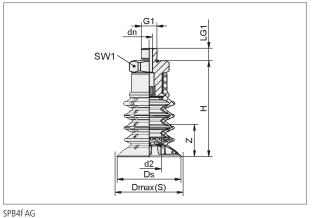
## Bellows Suction Cups SPB4f (4.5 Folds)

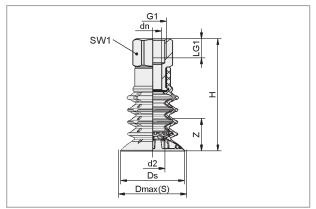


VacuumSuction CupsKnowledge

Suction area (Ø) from 30 mm to 50 mm

## Design Data Bellows Suction Cups SPB4f (4.5 Folds)





SPB4f IG

Туре	Dimensions in	mm*							
	dn	d2	Dmax(S)**	Ds	G1	Н	LG1	SW1	Z (Stroke)
SPB4f 30 SI-55 G1/8-AG	3.0	12.3	32.0	30.7	G1/8"-M	48	7.5	22	10
SPB4f 30 SI-55 G1/4-AG	8.0	12.3	32.0	30.7	G1/4"-M	48	10.0	22	10
SPB4f 30 SI-55 G3/8-AG	10.3	12.3	32.0	30.7	G3/8"-M	48	10.0	22	10
SPB4f 30 SI-55 G1/8-IG	8.6	12.3	32.0	30.7	G1/8"-F	58	12.0	22	10
SPB4f 30 SI-55 G1/4-IG	11.0	12.3	32.0	30.7	G1/4"-F	58	12.0	22	10
SPB4f 30 SI-55 G3/8-IG	11.0	12.3	32.0	30.7	G3/8"-F	58	12.0	22	10
SPB4f 40 SI-55 G1/8-AG	3.0	15.3	42.0	39.7	G1/8"-M	60	7.5	22	20
SPB4f 40 SI-55 G1/4-AG	8.0	15.3	42.0	39.7	G1/4"-M	60	10.0	22	20
SPB4f 40 SI-55 G3/8-AG	8.0	15.3	42.0	39.7	G3/8"-M	60	10.0	22	20
SPB4f 40 SI-55 G1/8-IG	8.6	15.3	42.0	39.7	G1/8"-F	70	12.0	22	20
SPB4f 40 SI-55 G1/4-IG	11.0	15.3	42.0	39.7	G1/4"-F	70	12.0	22	20
SPB4f 40 SI-55 G3/8-IG	11.0	15.3	42.0	39.7	G3/8"-F	70	12.0	22	20
SPB4f 50 SI-55 G1/8-AG	4.0	21.0	52.0	49.7	G1/8"-M	73	7.5	27	26
SPB4f 50 SI-55 G1/4-AG	8.0	21.0	52.0	49.7	G1/4"-M	73	10.0	27	26
SPB4f 50 SI-55 G3/8-AG	10.3	21.0	52.0	49.7	G3/8"-M	73	10.0	27	26
SPB4f 50 SI-55 G1/2-AG	15.0	21.0	52.0	49.7	G1/2"-M	73	14.0	27	26
SPB4f 50 SI-55 G1/8-IG	8.6	21.0	52.0	49.7	G1/8"-F	87	12.0	27	26
SPB4f 50 SI-55 G1/4-IG	11.4	21.0	52.0	49.7	G1/4"-F	87	12.0	27	26
SPB4f 50 SI-55 G3/8-IG	15.0	21.0	52.0	49.7	G3/8"-F	87	12.0	27	26
SPB4f 50 SI-55 G1/2-IG	15.0	21.0	52.0	49.7	G1/2"-F	87	16.0	27	26

<sup>\*</sup>Acceptable dimensional tolerances for rubber parts concerning to DIN ISO 3302-1 M3

 $<sup>\</sup>star\star$ External dimension of the suction cup when it is pressed against the workpiece by the vacuum

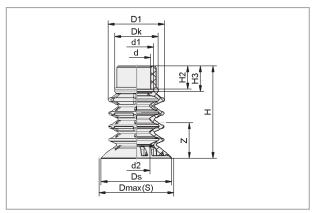
## Bellows Suction Cups SPB4f (4.5 Folds)

Suction area (Ø) from 30 mm to 50 mm



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## Design Data Bellows Suction Cups SPB4f (4.5 Folds)



SPB4f 30...50

Туре	Dimensions in mm*										
	d	d1	d2	D1	Dk	Dmax(S)**	Ds	Н	H2	Н3	Z (Stroke)
SPB4f 30 SI-55 SC080	16	19.6	12.3	22.4	24.4	32	31	40	13	14.4	10
SPB4f 30 SI-HD SC080	16	19.6	12.3	22.4	24.4	32	31	40	13	14.4	10
SPB4f 40 SI-55 SC080	16	19.6	15.3	31.6	24.4	42	40	52	13	14.4	20
SPB4f 40 SI-HD SC080	16	19.6	15.3	31.6	24.4	42	40	52	13	14.4	20
SPB4f 50 SI-55 SC090	20	24.8	21.0	41.6	31.0	52	50	65	14	16.0	26
SPB4f 50 SI-HD SC090	20	24.8	21.0	41.6	31.0	52	50	65	14	16.0	26

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

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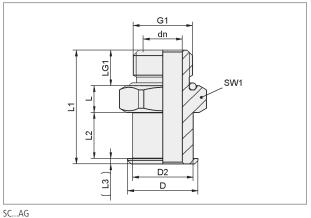
 $<sup>{}^{\</sup>star\star}\textsc{External}$  dimension of the suction cup when it is pressed against the workpiece by the vacuum

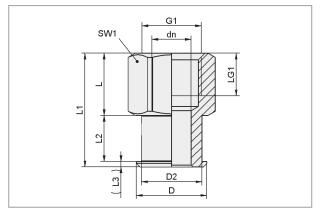


Suction area (Ø) from 30 mm to 50 mm



## **Design Data Connection Elements Bellows Suction Cups SPB4f**





Туре	Dimensions in	mm								
	D	D2	dn	G1	L	L1	L2	L3	LG1	SW1
SC 080 G1/8-AG	19.8	17	4	G1/8"-M	7.5	28.0	13	1.5	8	22
SC 080 G1/8-IG	19.8	17	9	G1/8"-F	17.5	32.0	13	1.5	12	22
SC 080 G1/4-AG	19.8	17	8	G1/4"-M	7.5	32.0	13	1.5	10	22
SC 080 G1/4-IG	19.8	17	11	G1/4"-F	17.5	32.0	13	1.5	12	22
SC 080 G3/8-AG	19.8	17	10	G3/8"-M	7.5	32.0	13	1.5	10	22
SC 080 G3/8-IG	19.8	17	11	G3/8"-F	17.5	32.0	13	1.5	12	22
SC 090 G1/8-AG	25.0	21	4	G1/8"-M	7.5	31.0	14	2.0	8	27
SC 090 G1/8-IG	25.0	21	9	G1/8"-F	21.5	37.5	14	2.0	12	27
SC 090 G1/4-AG	25.0	21	8	G1/4"-M	7.5	33.5	14	2.0	10	27
SC 090 G1/4-IG	25.0	21	11	G1/4"-F	21.5	37.5	14	2.0	12	27
SC 090 G3/8-AG	25.0	21	10	G3/8"-M	7.5	33.5	14	2.0	10	27
SC 090 G3/8-IG	25.0	21	15	G3/8"-F	21.5	37.5	14	2.0	12	27
SC 090 G1/2-AG	25.0	21	15	G1/2"-M	7.5	37.5	14	2.0	14	27
SC 090 G1/2-IG	25.0	21	15	G1/2"-F	21.5	37.5	14	2.0	16	27

## Bellows Suction Cups FGA PVC (1.5 Folds)

Suction area (Ø) from 13 mm to 22 mm







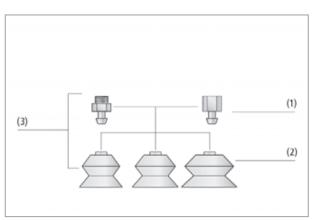
### Suitable for Industry Specific Applications



Bellows suction cups FGA PVC (1.5 folds)

### **Applications**

- Round, bellows suction cup with 1.5 folds for handling of fragile workpieces thanks to damping effect of corrugations and soft
- Usage in box openers and for handling of non-rigid workpieces and soft packaging materials
- Handling tasks in special processes which use chlorinated water, such as rinsing of plastic bags



System design bellows suction cups FGA PVC (1.5 folds)

### Design

- Robust and wear-resistant suction cup FGA (2) with 1.5 folds and single sealing lip
- Very adaptable geometry and soft, flexible material
- Large effective internal diameter
- With each nipple family, the replacement cups and nipples (1) can be combined as desired (3)



Bellows suction cups FGA PVC being used for handling non-rigid workpieces

### Our Highlights...

- 1.5 folds
- · Large effective internal diameter
- Soft and adaptable sealing lip and bottom corrugation
- Stiffer upper corrugation
- Flexible and adaptable material
- Wear-resistant material PVC

### Your Benefits...

- > Good damping when positioning on workpiece
- > High suction force
- > Good adaptation to curved or uneven surfaces
- > High stability against horizontal acceleration
- > Optimum sealing, even on non-rigid workpieces
- > Long operating lifetime, use for FDA and BfR-compliance requirements

## Bellows Suction Cups FGA PVC (1.5 Folds)

Suction area (Ø) from 13 mm to 22 mm



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Designation Code Bellows Suction Cups FGA PVC (1.5 Folds)

Abbreviated designation	Suction area Ø in mm	Material and Shore hardness	Type connection element
Example FGA 13 PVC-50 N016:			
FGA	13	PVC-50	N016
FGA	13	PVC-50	N016
	19		N056
	22		

### Ordering Data Bellows Suction Cups FGA PVC (1.5 Folds)

Suction cup FGA PVC (elastomer part) is supplied as an individual part. In order to receive a complete suction cup (elastomer part + connection nipple), the following ordering steps are required:

- Suction cup of type FGA PVC (step 1) elastomer part, available in various diameters
- Connection nipple of type SA-NIP (step 2) available with various threads

### Step 1: Bellows Suction Cups FGA PVC (1.5 Folds) (Single Component)

Туре	Part Number
FGA 13 PVC-50 N016	10.01.06.01549
FGA 19 PVC-50 N056	10.01.06.01975
FGA 22 PVC-50 N016	10.01.06.01947

<sup>\*</sup>Additional material specifications at beginning of the section "Vacuum Suction Cups"

### Step 2: Connection Nipples Bellows Suction Cups FGA PVC (1.5 Folds)

Туре	M5-AG	G1/8-AG	G1/8-IG
FGA 13 PVC	10.01.06.00123	10.01.06.05735	10.01.06.05731
FGA 19 PVC	10.01.06.03080	10.01.06.03571	10.01.06.03572
FGA 22 PVC	10.01.06.00123	10.01.06.05735	10.01.06.05731

### Technical Data Bellows Suction Cups FGA PVC (1.5 Folds)

Туре	Suction force [N]*	Pull-off force [N]	Volume [cm³]	Min. curve radius [mm] (convex)	Recommended inter- nal hose diameter d [mm]**
FGA 13 PVC-50 N016	1.7	6	0.6	10	4
FGA 19 PVC-50 N056	5.9	10	2.0	20	4
FGA 22 PVC-50 N016	5.3	16	2.3	20	4

<sup>\*</sup>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

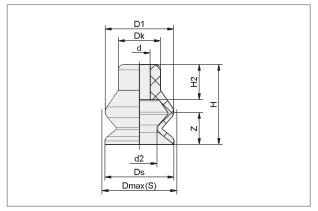
<sup>\*\*</sup>The recommended hose diameter refers to a hose length of approx. 2  $\mbox{\ensuremath{\text{m}}}$ 

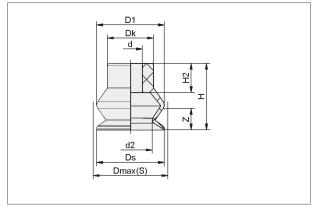
## Bellows Suction Cups FGA PVC (1.5 Folds)

Suction area (Ø) from 13 mm to 22 mm



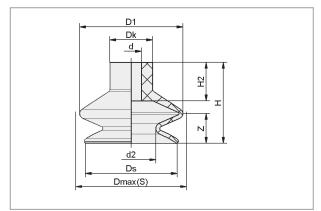
## Design Data Bellows Suction Cups FGA PVC (1.5 Folds) (Single Component)





FGA 13 PVC-50

FGA 19 PVC-50



FGA 22 PVC-50

Туре	Dimensions in	n mm*							
	D1	d	d2	Dk	Dmax(S)**	Ds	Н	H2	Z (Stroke)
FGA 13 PVC-50 N016	12.8	4.0	6.6	7.9	15	12.9	15.0	6.6	6
FGA 19 PVC-50 N056	19.0	6.6	12.2	13.0	22	19.0	18.7	8.2	6
FGA 22 PVC-50 N016	24.2	4.8	11.5	10.0	25	21.5	19.0	9.0	7

<sup>\*</sup>Acceptable dimensional tolerances for rubber parts concerning to DIN ISO 3302-1 M3

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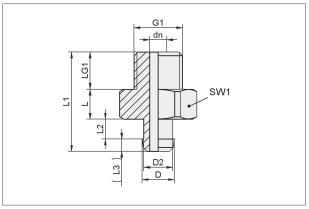
 $<sup>\</sup>ensuremath{^{\star\star}} \textsc{External}$  dimension of the suction cup when it is pressed against the workpiece by the vacuum

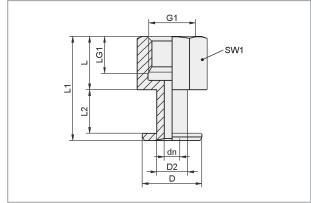
Suction area (Ø) from 13 mm to 22 mm



# Bellows Suction Cups FGA PVC (1.5 Folds)

## Design Data Connection Nipples Bellows Suction Cups FGA PVC (1.5 Folds)





SA-NIP M5-M, G1/8-M SA-NIP G1/8-F

Туре	Dimension	Dimensions in mm										
	D	D2	dn	G1	L	L1	L2	L3	LG1	SW1		
SA-NIP N016 M5-AG DN250	6.5	6	3	M5-M	5.0	16.0	3.5	2.5	5.0	7		
SA-NIP N056 M5-AG DN250	8.2	8	3	M5-M	5.0	17.0	4.0	3.0	5.0	14		
SA-NIP N016 G1/8-AG DN350	6.5	6	4	G1/8"-M	6.0	20.0	4.0	2.5	7.5	14		
SA-NIP N056 G1/8-AG DN400	8.2	8	4	G1/8"-M	5.0	20.0	4.0	3.0	8.0	14		
SA-NIP N016 G1/8-IG DN350	6.5	6	4	G1/8"-F	12.0	18.5	4.0	2.5	8.0	14		
SA-NIP N056 G1/8-IG DN400	8.2	8	4	G1/8"-F	10.0	17.0	4.0	3.0	8.0	14		

Bellows Suction Cups FG PVC (2.5 Folds)

Suction area (Ø) from 18 mm to 50 mm







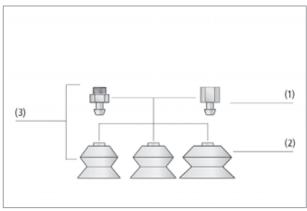
### Suitable for Industry Specific Applications



Bellows suction cups FG PVC (2.5 folds)

### **Applications**

- Round, bellows suction cup with 2.5 folds for handling of extremely fragile workpieces thanks to damping effect of folds and soft sealing lip
- Usage in box openers and for handling of non-rigid workpieces and soft packaging materials
- Handling tasks in special processes which use chlorinated water, such as rinsing of plastic bags



System design bellows suction cups FG PVC (2.5 folds)

### Design

- Robust and wear-resistant suction cup FG (2) with 2.5 folds and single sealing lip
- Very adaptable geometry and soft, flexible material
- Large effective internal diameter
- With each nipple family, the replacement cups and nipples (1) can be combined as desired (3)



Bellows suction cups FG PVC being used for handling small cardboard boxes

### Our Highlights...

- 2.5 folds
- · Large effective internal diameter
- Soft and flexible sealing lip
- Flexible, adaptable material and soft folds
- Wear-resistant material PVC

### Your Benefits...

- > Good damping when positioning on workpiece
- > High suction force
- > Good adaptation to curved or uneven surfaces
- > Optimum sealing, particularly on non-rigid workpieces
- > Long operating lifetime, use for FDA and BfR-compliance requirements

## Bellows Suction Cups FG PVC (2.5 Folds)



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Suction area (Ø) from 18 mm to 50 mm

### Designation Code Bellows Suction Cups FG PVC (2.5 Folds)

Abbreviated designation	Suction area Ø in mm	Material and Shore hardness	Type connection element
Example FG 32 PVC-50:			
FG	32	PVC-50	
FG	18	PVC-50	N016
	23		N033
	32		N057
	40		
	50		



### Ordering Data Bellows Suction Cups FG PVC (2.5 Folds)

Suction cup FG PVC (elastomer part) is supplied as an individual part. In order to receive a complete suction cup (elastomer part + connection nipple), the following ordering steps are required:

- Suction cup of type FG PVC (step 1) elastomer part, available in various diameters
- Connection nipple of type SA-NIP (step 2) available with various threads

### Step 1: Bellows Suction Cups FG PVC (2.5 Folds) (Single Component)

Type*	Part Number
FG 18 PVC-50 N016	10.01.06.01941
FG 23 PVC-50 N057	10.01.06.01942
FG 32 PVC-50	10.01.06.01943
FG 40 PVC-50 N033	10.01.06.02468
FG 50 PVC-50 N033	10.01.06.02469

<sup>\*</sup>Additional material specifications at beginning of the section "Vacuum Suction Cups"

### Step 2: Connection Nipples Bellows Suction Cups FG PVC (2.5 Folds)

Туре	M5-AG	G1/8"-AG	G1/8"-IG	G1/4"-AG	G1/4"-IG
FG 18 PVC	10.01.06.00123	10.01.06.05735	10.01.06.05731	-	-
FG 23 PVC	-	10.01.06.03573	10.01.06.03574	-	-
FG 32 PVC	-	10.01.06.02249	-	-	-
FG 40 PVC	-	-	-	10.01.01.00818	10.01.01.00817
FG 50 PVC	-	-	-	10.01.01.00818	10.01.01.00817



### Technical Data Bellows Suction Cups FG PVC (2.5 Folds)

Туре	Suction force [N]*	Pull-off force [N]	Volume [cm³]	Min. curve radius [mm] (convex)	Recom. internal hose diameter d [mm]**
FG 18 PVC-50 N016	3.2	8	2.0	15	4
FG 23 PVC-50 N057	6.6	15	3.9	20	4
FG 32 PVC-50	13.9	24	9.0	30	6
FG 40 PVC-50 N033	21.7	56	15.2	60	6
FG 50 PVC-50 N033	36.6	68	28.4	75	6

<sup>\*</sup>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

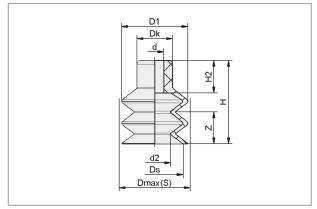
<sup>\*\*</sup>The recommended hose diameter refers to a hose length of approx. 2 m

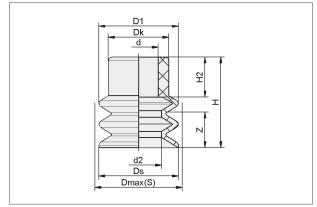
# Bellows Suction Cups FG PVC (2.5 Folds)

Suction area (Ø) from 18 mm to 50 mm



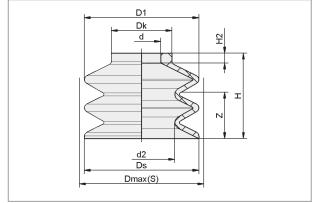
### Design Data Bellows Suction Cups FG PVC (2.5 Folds)

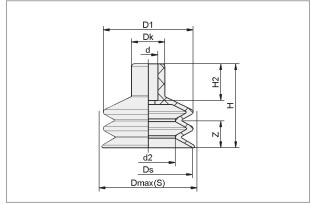




FG 18 PVC-50







FG 32 PVC-50

FG 40 and 50 PVC-50

Туре	Dimensions	in mm*							
	D1	d	d2	Dk	Dmax(S)**	Ds	Н	H2	Z (Stroke)
FG 18 PVC-50 N016	18.6	5.0	8.9	10	20.0	16.0	23.5	9.2	9
FG 23 PVC-50 N057	22.3	11.0	12.9	17	25.0	22.3	25.5	11.3	10
FG 32 PVC-50	32.2	10.7	18.6	17	33.5	32.2	24.0	2.8	15
FG 40 PVC-50 N033	40.4	10.8	23.4	19	44.0	40.0	41.7	20.7	11
FG 50 PVC-50 N033	50.5	10.8	30.4	19	54.0	50.0	47.2	20.7	15

<sup>\*</sup>Acceptable dimensional tolerances for rubber parts concerning to DIN ISO 3302-1 M3

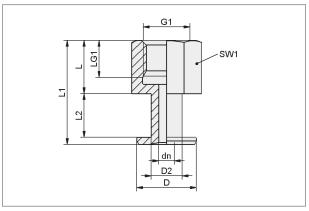
 $<sup>\</sup>star\star$ External dimension of the suction cup when it is pressed against the workpiece by the vacuum

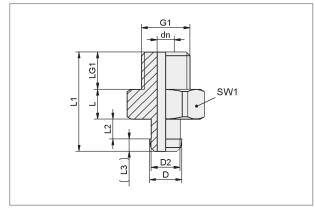
## Bellows Suction Cups FG PVC (2.5 Folds)

Suction area (Ø) from 18 mm to 50 mm



### Design Data Connection Nipples Bellows Suction Cups FG PVC (2.5 Folds)





SA-NIP G1/8"-IG, G1/4"-IG

SA-NIP M5-AG, G1/8"-AG, G1/4"-AG

Туре	Dimensions in mm											
	D	dn	D2	G1	L	L1	LG1	L2	SW1			
SA-NIP N016 M5-AG DN250	6.5	2.5	5.8	M5-M	5	16.0	5.0	3.5	7			
SA-NIP N016 G1/8-AG DN350	6.5	3.5	5.8	G1/8"-M	6	20.0	7.5	4.0	14			
SA-NIP N057 G1/8-AG DN510	14.0	5.1	11.8	G1/8"-M	7	27.8	8.0	11.3	17			
SA-NIP G1/8-AG DN500	16.0	5.0	12.0	G1/8"-M	5	17.6	8.0	2.3	17			
SA-NIP N016 G1/8-IG DN350	6.5	3.5	5.8	G1/8"-F	12	18.5	8.0	4.0	14			
SA-NIP N057 G1/8-IG DN510	14.0	5.1	11.8	G1/8"-F	12	24.0	8.0	11.3	17			
SA-NIP N033 G1/4-AG DN550	13.0	5.5	11.0	G1/4"-M	5	28.0	10.0	13.0	17			
SA-NIP N033 G1/4-IG DN550	13.0	5.5	11.0	G1/4"-F	15	28.0	12.0	13.0	17			

## Bellows Suction Cups FSGB-R (Rectangular)

Suction area (LxW) from 52 x 25 mm to 80 x 50 mm





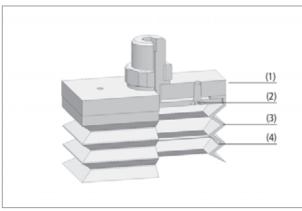
### Suitable for Industry Specific Applications



Bellows suction cups FSGB-R (rectangular)

## **Applications**

- Rectangular bellows suction cups with 2.5 or 3.5 folds for handling of rectangular packing materials with non-uniform
- Handling of film-packed products, filled plastic bags; workpieces with folds
- Handling of non-rigid workpieces and flexible outer packing materials which can be deformed during handling
- Use of supporting frame in variable numbers depending on application



System design bellows suction cups FSGB-R

### Design

- Rectangular bellows suction cup FSGB-R with single sealing lip, consisting of suction cup FGB-R (3) and connection plates (1)
- FSGB-R 52x25 and FSGB-R 60x29 with 2.5 folds; FSGB-R 80x30, FSGB-R80x40 and FSGB-R 80x50 with 3.5 folds
- Very adaptable geometry and soft, flexible sealing lip
- Suction cup is securely clamped between connection plates; screw connection (2) of the cup side permits simple, in-situ replacement of cup
- Supporting frames (4) (available as accessories) can optionally be mounted in one or more of the corrugations



Bellows suction cups FSGB-R being used for handling of packing materials

### Our Highlights...

- Large, rectangular suction surface
- Soft and flexible folds
- Soft and adaptable sealing lip
- Supporting frames for mounting in folds (optional)

### Your Benefits...

- > Good gripping of rectangular workpieces
- > Good adaptation to nonuniform surfaces and nonrigid workpieces
- > Sealing on structured surfaces and workpieces with folds
- > Improved stability of the suction cup's folds

## Bellows Suction Cups FSGB-R (Rectangular)

Suction area (LxW) from 52 x 25 mm to 80 x 50 mm



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Abbreviated designation	Suction area LxW	Material and	Connection thread
	in mm	Shore hardness	
Example FSGB-R 60x29 NBR-50 G1/8-IG:			
FSGB-R	60x29	NBR-50	G1/8-IG
FSGB-R	52x25	NBR-50	G1/8-IG (IG = female (F))
	60x29	SI-50	G1/4-AG (AG = male (M))
	80x30		
	80x40		
	80x50		

### Ordering Data Bellows Suction Cups FSGB-R (Rectangular)

**Designation Code Bellows Suction Cups FSGB-R (Rectangular)** 

Suction cup FSGB-R (elastomer part + connection plate) is delivered assembled. The assembly consists of:

- Suction cup of type FGB-R elastomer part, available in various dimensions (LxW) and materials
- Aluminium support plate available with various threads

Available spare parts: suction cup FGB-R Available accessories: supporting frames

### Bellows Suction Cups FSGB-R (Rectangular)

Туре	Suction cup material * / hardness in Shore A						
	NBR-50	SI-50					
FSGB-R 52x25 G1/4-AG**	10.01.06.02281	10.01.06.02282					
FSGB-R 52x25 G1/8-IG**	10.01.06.02287	10.01.06.02288					
FSGB-R 60x29 G1/4-AG**	10.01.06.02283	-					
FSGB-R 60x29 G1/8-IG**	10.01.06.02289	-					
FSGB-R 80x30 G1/4-AG***	-	10.01.06.02284					
FSGB-R 80x30 G1/8-IG***	-	10.01.06.02290					
FSGB-R 80x40 G1/4-AG***	-	10.01.06.02285					
FSGB-R 80x40 G1/8-IG***	-	10.01.06.02291					
FSGB-R 80x50 G1/4-AG***	-	10.01.06.02286					
FSGB-R 80x50 G1/8-IG***	-	10.01.06.02292					

<sup>\*</sup>Additional material specifications at beginning of the section "Vacuum Suction Cups"

### Ordering Data Spare Parts Bellows Suction Cups FSGB-R

Туре	Suction cup material * / hardne	Suction cup material * / hardness in Shore A						
	NBR-50	SI-50						
FGB-R 52x25**	10.01.06.01115	10.01.06.01116						
FGB-R 60x29**	10.01.06.01117	-						
FGB-R 80x30***	-	10.01.06.01112						
FGB-R 80x40***	-	10.01.06.01113						
FGB-R 80x50***	-	10.01.06.01114						

<sup>\*</sup>Additional material specifications at beginning of the section "Vacuum Suction Cups"

<sup>\*\*2.5</sup> folds

<sup>\*\*\*3.5</sup> folds

<sup>\*\*2.5</sup> folds

<sup>\*\*\*3.5</sup> folds

## Bellows Suction Cups FSGB-R (Rectangular)

Suction area (LxW) from 52 x 25 mm to 80 x 50 mm



## Ordering Data Accessories Bellows Suction Cups FSGB-R (Rectangular)

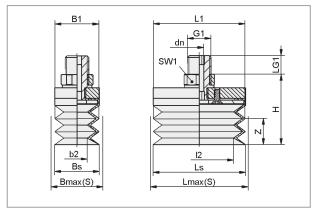
Туре	Supporting frame
FSGB-R 52x25	10.01.06.02276
FSGB-R 60x29	10.01.06.02277
FSGB-R 80x30	10.01.06.02278
FSGB-R 80x40	10.01.06.02279
FSGB-R 80x50	10.01.06.02280

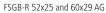
### Technical Data Bellows Suction Cups FSGB-R (Rectangular)

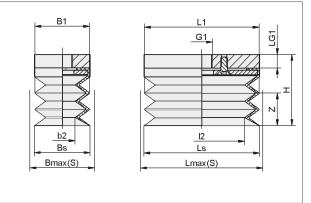
Туре	Suction force [N]*	Volume [cm³]	Number of folds	Recom. internal hose diameter d [mm]**
FSGB-R 52x25	20	16	2.5	6
FSGB-R 60x29	36	22	2.5	6
FSGB-R 80x30	29	41	3.5	6
FSGB-R 80x40	61	61	3.5	9
FSGB-R 80x50	92	80	3.5	9

<sup>\*</sup>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

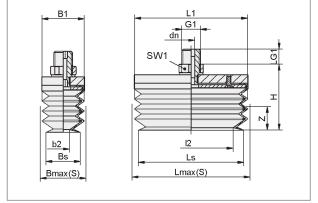
### Design Data Bellows Suction Cups FSGB-R (Rectangular)



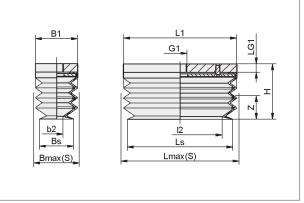




FSGB-R 52x25 and 60x29 IG



FSGB-R 80x30 to 80x50 AG



FSGB-R 80x30 to 50x50 IG

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 $<sup>\</sup>ensuremath{^{\star\star}}\xspace$  The recommended hose diameter refers to a hose length of approx. 2 m

## Bellows Suction Cups FSGB-R (Rectangular)

Suction area (LxW) from 52 x 25 mm to 80 x 50 mm



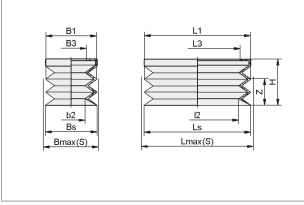
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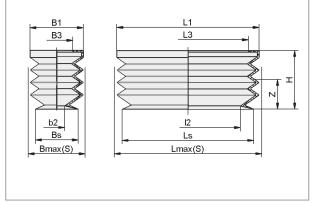
## Design Data Bellows Suction Cups FSGB-R (Rectangular)

Туре	Dimensions in mm*													
	b2	B1	Bmax(S)***	Bs	dn	G1	Н	12	L1	LG1	Lmax(S)***	Ls	SW1	Z (Stroke)**
FSGB-R 52x25 G1/4-AG	10.0	25	27.5	25.0	5	G1/4"-M	50.0	37.0	52	10.5	54.5	52.0	17	15
FSGB-R 52x25 G1/8-IG	10.0	25	27.5	25.0	5	-	32.0	37.0	52	-	54.5	52.0	-	15
FSGB-R 60x29 G1/4-AG	15.0	29	32.0	29.0	5	G1/4"-M	50.0	45.0	60	10.5	63.0	60.0	17	14
FSGB-R 60x29 G1/8-IG	15.0	29	32.0	29.0	-	G1/8"-F	32.0	45.0	60	6.0	63.0	60.0	-	14
FSGB-R 80x30 G1/4-AG	9.0	24	33.0	24.0	5	G1/4"-M	57.0	59.0	74	10.5	83.0	74.0	17	16
FSGB-R 80x30 G1/8-IG	9.0	24	33.0	24.0	-	G1/8"-F	39.0	59.0	74	6.0	83.0	74.0	-	16
FSGB-R 80x40 G1/4-AG	19.0	34	44.0	34.0	5	G1/4"-M	57.0	59.0	74	10.5	84.0	74.0	17	13
FSGB-R 80x40 G1/8-IG	19.0	34	44.0	34.0	-	G1/8"-F	39.0	59.0	74	6.0	84.0	74.0	-	13
FSGB-R 80x50 G1/4-AG	29.0	44	54.0	44.0	5	G1/4"-M	57.0	59.0	74	10.5	84.0	74.0	17	13
FSGB-R 80x50 G1/8-IG	29.0	44	54.0	44.0	-	G1/8"-F	39.0	59.0	74	6.0	84.0	74.0	-	13

<sup>\*</sup>Acceptable dimensional tolerances for rubber parts concerning to DIN ISO 3302-1 M3

### Design Data Bellows Suction Cups FGB-R - Spare Parts for FSGB-R





FGB-R 52x25 and 60x29

FGB-R 80x30 to 80x50

Туре	Dimensions in mm*											
	b2	Bmax(S)***	Bs	B1	В3	Н	I2	L1	L3	Lmax(S)***	Ls	Z (Stroke)**
FGB-R 52x25	10.0	27.5	25.0	25	13	26	37.0	52	40	54.5	52.0	15
FGB-R 60x29	15.0	32.0	29.0	29	17	26	45.0	60	48	63.0	60.0	14
FGB-R 80x30	9.0	33.0	24.0	30	18	33	59.0	80	68	83.0	74.0	16
FGB-R 80x40	19.0	44.0	34.0	40	28	33	59.0	80	68	84.0	74.0	13
FGB-R 80x50	29.0	54.0	44.0	50	38	33	59.0	80	68	84.0	74.0	13

<sup>\*</sup>Acceptable dimensional tolerances for rubber parts concerning to DIN ISO 3302-1 M3

<sup>\*\*</sup>The specified stroke is for use with a supporting frame in each fold.

<sup>\*\*\*</sup>External dimension of the suction cup when it is pressed against the workpiece by the vacuum

<sup>\*\*</sup>The specified stroke is for use with a supporting frame in each fold.

<sup>\*\*\*</sup>External dimension of the suction cup when it is pressed against the workpiece by the vacuum

# **Suction Cups for Packaging**

### Chocolate Suction Cups SPG

Suction area (Ø) 33 mm





#### Suitable for Industry Specific Applications

chocolates in combination with picker robots • Direct handling of round, oval or square chocolates

• Bell-shaped suction cup for dynamic handling and packing of

 Handling of confectionery with structured surfaces or toppings Suitable for direct contact with food due to FDA-compliant

• Handling of round chocolates with maximum diameter of 35 mm and oval/square chocolates with maximum diagonal



Chocolate suction cups SPG

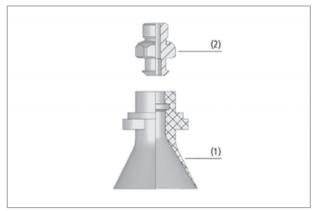
## Design

**Applications** 

material silicone

measurement of 30 mm

- Suction cup (1) with extremely thin, soft sealing lip and tapered suction cup geometry
- Optimal sealing lip shape for handling workpieces with structured
- Use of one-piece insertable connection element (2), with G1/8" male or female thread, for changing the suction cup quickly
- Connection element with male thread has integrated seal



System design chocolate suction cups SPG



Chocolate suction cups SPG being used for handling chocolates

#### Our Highlights...

- Extremely thin sealing lip
- Tapered sealing lip shape
- · Large nominal flow
- FDA-compliant material silicone

#### Your Benefits...

- > Good sealing on decorated chocolates
- > Even square chocolates are enclosed by suction cup; dynamic handling possible
- > Leakage compensation on highly-structured chocolates
- > Suitable for direct contact with food

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# **Suction Cups for Packaging**

### Chocolate Suction Cups SPG

Suction area (Ø) 33 mm

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#### **Designation Code Chocolate Suction Cups SPG**

Abbreviated designation	Suction area Ø in mm	Material and Shore hardness	Type connection element
Example SPG 33 SI-45 SC040:	22	CL 4E	55040
SPG SPG	33	<b>SI-45</b> SI-45	SC040 SC040
		SI-HD	300.0



#### **Ordering Data Chocolate Suction Cups SPG**

Chocolate suction cup SPG (elastomer part) is supplied as an individual part. In order to receive a complete suction cup (elastomer part + connection element), the following ordering steps are required:

- Suction cup of type SPG (step 1) elastomer part
- Connection element of type SC (step 2) available with various threads

### Step 1: Chocolate Suction Cups SPG (Single Component)

Type*	Part Number
SPG 33 SI-45 SC040	10.01.19.00002
SPG 33 SI-HD SC040	10.01.19.00165

<sup>\*</sup>Additional material specifications at beginning of the section "Vacuum Suction Cups"

#### Step 2: Connection Elements Chocolate Suction Cup SPG

Туре	Part Number
SC 040 G1/8-AG	10.01.06.02490
SC 040 G1/8-IG	10.01.06.02482

#### **Technical Data Chocolate Suction Cups SPG**

Туре	Volume [cm³]	Recommended internal hose [mm]	Max. diameter of the chocolats [mm]*	Weight of workpiece [g]**
SPG 33 SI-45	7,6	4	35	20
SPG 33 SI-HD	8.0	4	35	20

<sup>\*</sup>The suction force and operating vacuum are dependent on the geometry and surface characteristics of the chocolate. We recommend a maximum operating vacuum of -150 mbar.

<sup>\*\*</sup>For handling with high accelerations (up to 10g)

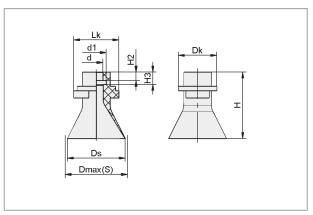
# **Suction Cups for Packaging**

## Chocolate Suction Cups SPG

Suction area (Ø) 33 mm



### **Design Data Chocolate Suction Cups SPG**

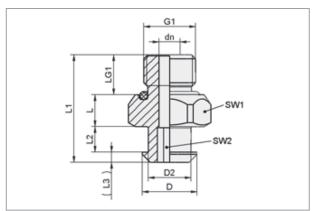


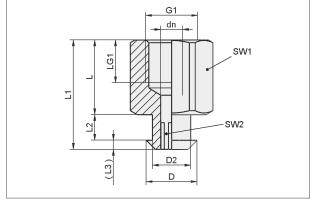
SPG 33

Туре	Dimensions	imensions in mm*							
	d	d1	Dk	Dmax(S)**	Ds	Н	H2	Н3	Lk
SPG 33 SI-45 SC040	7.3	11	21.5	35.0	32.1	38	4.8	7	25.5
SPG 33 SI-HD SC040	7.3	11	21.5	35.0	32.1	38	4.8	7	25.5

<sup>\*</sup>Acceptable dimensional tolerances for rubber parts concerning to DIN ISO 3302-1 M3

### **Design Data Connection Elements Chocolate Suction Cup SPG**





SC 040 G1/8-AG

SC 040 G1/8-IG

Туре	Dimension	imensions in mm									
	dn	D	D2	G1	L	L1	L2	L3	LG1	SW1	SW2
SC 040 G1/8-AG	4	10.3	8	G1/8"-M	6.0	20.2	4.8	1.9	7.5	14	4
SC 040 G1/8-IG	4	10.3	8	G1/8"-F	14.0	20.7	4.8	1.9	8.0	14	4

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<sup>\*\*</sup>External dimension of the suction cup when it is pressed against the workpiece by the vacuum

### Flat Suction Cups SGPN

Suction area (Ø) from 15 mm to 40 mm



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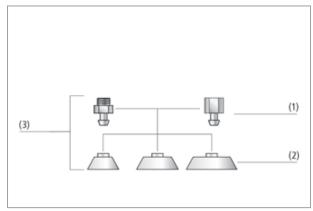
### Suitable for Industry Specific Applications



Flat suction cups SGPN

### **Applications**

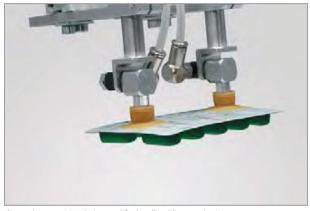
- Round, flat suction cup for handling of wooden veneers, wafers and solar cells
- · Handling of various packing material, e.g. plastic films, paper, blister packs
- Gentle handling of plastic films and paper due to flat, longtapered sealing lip and inner support



System design flat suction cups SGPN

#### Design

- Robust, wear-resistant suction cup SGPN (3) with single sealing lip, consisting of suction cup SGP (2) and connection nipple (1)
- Nipple plugged into cup
- With each nipple family, the replacement cups and nipples can be combined as desired



Flat suction cups SGPN being used for handling blister packagings

#### Our Highlights...

- Flat, long-tapered sealing lip and inner support
- Material: natural rubber NK 40 Shore A
- Material: Silicone SI 50 Shore A
- Material: HT1

#### Your Benefits...

- > No "pulling-in" into the suction cup, i.e. very suitable for plastic film, paper and solar cells
- > No crinkling when gripping paper and plastic film
- > Resistant to ozone, UV radiation and heat; very suitable for handling tasks in the paper and printing industry
- > No marks on the workpiece; even at high temperatures

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### 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 20 SI-50 M5-AG:			
SGPN	20	SI-50	M5-AG
SGPN	15	HT1-60	M5-AG (AG = male (M))
	to	NK-40	G1/8-AG
	40	SI-50	G1/8-IG (IG = female (F))
		FMP-65	G1/4-AG
			G1/4-IG



#### **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*	Suction cup material * / hardness in Shore A					
	FPM-65	HT1-60	NK-40	SI-50		
SGPN 15 M5-AG	-	10.01.01.12396	10.01.01.11977	10.01.01.11980		
SGPN 15 G1/8-AG	10.01.01.12921	10.01.01.12397	10.01.01.10315	10.01.01.11981		
SGPN 15 G1/8-IG	10.01.01.13047	10.01.01.12398	10.01.01.10181	10.01.01.11982		
SGPN 20 M5-AG	-	-	10.01.01.11978	10.01.01.11983		
SGPN 20 G1/8-AG	10.01.01.12922	-	10.01.01.10316	10.01.01.11984		
SGPN 20 G1/8-IG	10.01.01.13048	-	10.01.01.10180	10.01.01.11985		
SGPN 24 M5-AG	-	10.01.01.12403	10.01.01.11979	10.01.01.11986		
SGPN 24 G1/8-AG	-	10.01.01.12404	10.01.01.10317	10.01.01.11987		
SGPN 24 G1/8-IG	-	10.01.01.12405	10.01.01.10182	10.01.01.11988		
SGPN 30 G1/4-AG	-	10.01.01.12399	10.01.01.00791	10.01.01.11989		
SGPN 30 G1/4-IG	-	10.01.01.12400	10.01.01.00790	10.01.01.11990		
SGPN 34 G1/4-AG	10.01.01.12920	-	10.01.01.10831	-		
SGPN 34 G1/4-IG	10.01.01.13046	-	10.01.01.10830	-		
SGPN 35 G1/4-AG	-	10.01.01.12848	10.01.01.00793	10.01.01.12785		
SGPN 35 G1/4-IG	-	10.01.01.12849	10.01.01.00792	10.01.01.12787		
SGPN 40 G1/8-AG	-	10.01.01.12847	10.01.01.11739	10.01.01.12773		
SGPN 40 G1/4-AG	-	10.01.01.12845	10.01.01.00795	10.01.01.12775		
SGPN 40 G1/4-IG	-	10.01.01.12846	10.01.01.00794	10.01.01.12774		
SGPN 34 G1/4-AG SGPN 34 G1/4-IG SGPN 35 G1/4-AG SGPN 35 G1/4-IG SGPN 40 G1/8-AG SGPN 40 G1/4-AG SGPN 40 G1/4-IG	10.01.01.13046	- 10.01.01.12848 10.01.01.12849 10.01.01.12847 10.01.01.12845 10.01.01.12846	10.01.01.10831 10.01.01.10830 10.01.01.00793 10.01.01.00792 10.01.01.11739 10.01.01.00795	- 10.01.01.12785 10.01.01.12787 10.01.01.12773 10.01.01.12775		

<sup>\*</sup>Additional material specifications at beginning of the section "Vacuum Suction Cups"

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## Flat Suction Cups SGPN

Suction area (Ø) from 15 mm to 40 mm

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### **Ordering Data Spare Parts Flat Suction Cups and Connection Nipples**

Type*	Suction cup material * / hardness in Shore A						
	FPM-65	HT1-60	NK-40	SI-50			
SGP 15	10.01.01.12908	10.01.01.12394	10.01.01.10318	10.01.01.10574			
SGP 20	10.01.01.12909	-	10.01.01.10319	10.01.01.11571			
SGP 24	-	10.01.01.12402	10.01.01.10320	10.01.01.10577			
SGP 30	-	10.01.01.12395	10.01.01.00787	10.01.01.01064			
SGP 34	10.01.01.12919	-	10.01.01.10829	-			
SGP 35	-	10.01.01.12811	10.01.01.00788	10.01.01.12784			
SGP 40	-	10.01.01.12812	10.01.01.00789	10.01.01.12772			

<sup>\*</sup>Additional material specifications at beginning of the section "Vacuum Suction Cups"

Tune	Connection ninnle	
Type	Connection nipple	40.04.05.00422
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 G1/4-AG DN550	10.01.01.00818
SGPN 30 G1/4-IG	SA-NIP N033 G1/4-IG DN550	10.01.01.00817
SGPN 34 G1/4-AG	SA-NIP N033 G1/4-AG DN550	10.01.01.00818
SGPN 34 G1/4-IG	SA-NIP N033 G1/4-IG DN550	10.01.01.00817
SGPN 35 G1/4-AG	SA-NIP N034 G1/4-AG DN550	10.01.01.00820
SGPN 35 G1/4-IG	SA-NIP N034 G1/4-IG DN550	10.01.01.00819
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**

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

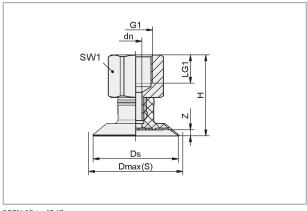
<sup>\*</sup>The specified suction forces are theoretical values at a vacuum of -0.6 bar and with a smooth, dry workpiece surface - they do not include a safety factor

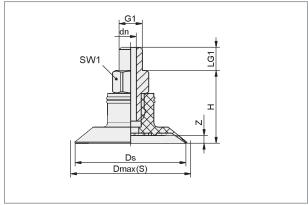
<sup>\*\*</sup>The recommended hose diameter refers to a hose length of approx. 2 m



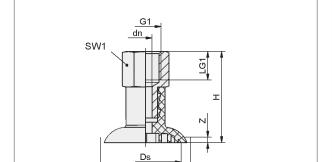
Flat Suction Cups SGPN
Suction area (Ø) from 15 mm to 40 mm

### **Design Data Flat Suction Cups SGPN**



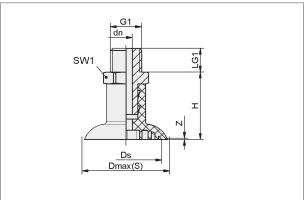


SGPN 15 to 40 IG



Dmax(S)

SGPN 15 to 40 AG



SGPN 35 IG

SGPN 35 AG

## Flat Suction Cups SGPN

Suction area (Ø) from 15 mm to 40 mm

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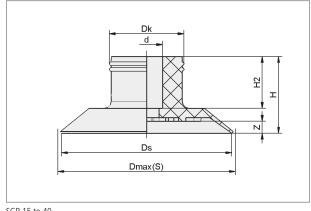
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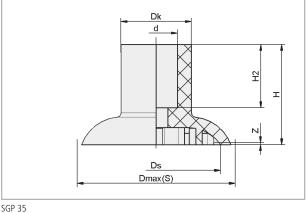
### **Design Data Flat Suction Cups SGPN**

Туре	Dimensions in mm*							
	dn	Dmax(S)**	Ds	G1	н	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	20.0	M5-M	15.4	5.0	7	1.5
SGPN 20 G1/8-AG	3.5	22.0	20.0	G1/8"-M	16.4	7.5	14	1.5
SGPN 20 G1/8-IG	3.5	22.0	20.0	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	34.0	G1/4"-M	28.0	10.0	17	1.4
SGPN 34 G1/4-IG	5.5	37.5	34.0	G1/4"-F	38.0	12.0	17	1.4
SGPN 35 G1/4-AG	5.5	35.0	34.0	G1/4"-M	28.5	10.0	17	0.5
SGPN 35 G1/4-IG	5.5	35.0	34.0	G1/4"-F	38.5	12.0	17	0.5
SGPN 40 G1/8-AG	5.0	42.0	40.0	G1/8"-M	25.6	10.0	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

<sup>\*</sup>Acceptable dimensional tolerances for rubber parts concerning to DIN ISO 3302-1 M3

### Design Data Flat Suction Cups SGP - Spare Parts for SGPN





GP 15 to 40	SGP

Туре	Dimensions in mm*							
	d	Dk	Dmax(S)**	Ds	Н	H2	Z (Stroke)	
SGP 15	4.5	9.5	15.5	14.5	10.0	7.2	0.9	
SGP 20	4.5	11.0	22.0	20.0	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	15.2	37.5	34.0	23.0	16.8	1.4	
SGP 35	10.0	16.5	35.0	30.2	23.5	14.8	0.5	
SGP 40	8.0	16.0	42.0	40.0	20.6	14.5	2.3	

<sup>\*</sup>Acceptable dimensional tolerances for rubber parts concerning to DIN ISO 3302-1 M3

<sup>\*\*</sup>External dimension of the suction cup when it is pressed against the workpiece by the vacuum

<sup>\*\*</sup>External dimension of the suction cup when it is pressed against the workpiece by the vacuum

### Suction Plates SGF

Suction area (Ø) from 125 mm to 400 mm



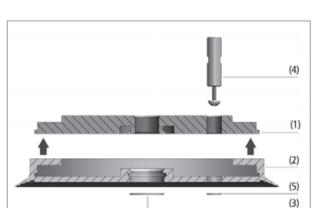




#### Suitable for Industry Specific Applications



Suction plates SGF



System design suction plates SGF



Suction plates SGF being used for handling sensitive glass sheets

#### **Applications**

- Suction plates for handling of flat and smooth workpieces such as glass and plastic sheets where high lateral forces are important e.g. through high accelerations or vertical handling
- · Handling of very thin workpieces, such as flat glass (float glass) or coated glass
- Used in glass manufacturing processes where interleavant powder is used
- Handling of solar modules, e.g. in module manufacturing processes

#### Design

- Aluminum support plate (1) and sealing ring (2)
- Diameters 125 mm to 200 mm: replaceable sealing ring and thin, flat sealing lip
- Diameters 250 mm to 400 mm: vulcanized sealing ring and steep sealing lip
- Central vacuum connection, optionally with clip-in filter screen (3) as pre-filter
- Eccentric connection for touch valve (4) or filter screen (5), as a standard closed with a plug (secured with adhesive)
- Special designed internal structure for handling glass sheets when interleavant powder is used in the process

#### Our Highlights...

- Thin and flat sealing lip (Ø 125 mm io 200 mm)
- Steep sealing lip (Ø 250 mm to 400 mm)
- · Low total weight of the suction plate
- Large effective suction area
- Special material EPDM
- Special material HT1 which leaves no marks

#### Your Benefits...

- > Little relative movement during pick-up; this prevents the surface of the workpiece from being damaged
- > Optimum pick-up characteristics and damping effect when positioning the suction plate
- > High accelerations in automated processes
- > High suction and lateral forces in dynamic processes
- > Usage in areas with high UV and ozone levels
- > No visible marks left on the workpiece, even at high temperatures



### Suction Plates SGF

Suction area (Ø) from 125 mm to 400 mm



Vacuum Vacuum Suction Cups Knowledge

# **Designation Code Suction Plates SGF**

Abbreviated designation	Suction area Ø in mm	Product addition	Material and Shore hardness	Connection thread
Example SGF 125 EPDM-55 G1/4-IG: SGF	125		EPDM-55	G1/4-IG
SGF	125 to 400	HS High stroke	EPDM-55 HT1-60	G1/4-IG (IG = female (F)) G1/2-IG

#### **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
- Aluminium support plate available with various threads

Available spare parts: sealing ring of type DR-SGF Available accessories: touch valve, filter screen

#### **Suction Plates SGF**

Type*	Part Number
SGF 125 EPDM-55 G1/4-IG	10.01.01.12475
SGF 125 HT1-60 G1/4-IG	10.01.01.12892
SGF 150 EPDM-55 G1/2-IG	10.01.01.13019
SGF 150 HT1-60 G1/2-IG	10.01.01.13021
SGF 150 HS HT1-60 G1/2-IG	10.01.01.13178
SGF 200 EPDM-55 G1/2-IG	10.01.01.12476
SGF 200 HT1-60 G1/2-IG	10.01.01.12893
SGF 250 HS HT1-60 G1/2-IG	10.01.01.13153
SGF 250 HS EPDM-55 G1/2-IG	10.01.01.13038
SGF 300 EPDM-55 G1/2-IG	10.01.01.12477
SGF 300 HT1-60 G1/2-IG	10.01.01.13002
SGF 350 HS EPDM-55 G1/2-IG	10.01.01.13039
SGF 350 HS HT1-60 G1/2-IG	10.01.01.13154
SGF 400 EPDM-55 G1/2-IG	10.01.01.12478

<sup>\*</sup>Additional material specifications at beginning of the section "Vacuum Suction Cups"

### **Ordering Data Spare Parts And Accessories Suction Plates SGF**

Туре	Sealing ring DR-SGF	Sensing valve	Filter screen*
SGF 125 EPDM-55 G1/4-IG	10.01.01.12473	10.05.10.00061	10.07.01.00215
SGF 125 HT1-60 G1/4-IG	10.01.01.12890	10.05.10.00061	10.07.01.00215
SGF 150 EPDM-55 G1/2-IG	10.01.01.13018	10.05.10.00061	10.07.01.00110
SGF 150 HT1-60 G1/2-IG	10.01.01.13020	10.05.10.00061	10.07.01.00110
SGF 150 HS HT1-60 G1/2-IG	10.01.01.13176	10.05.10.00061	10.07.01.00110
SGF 200 EPDM-55 G1/2-IG	10.01.01.12474	10.05.10.00061	10.07.01.00110
SGF 200 HT1-60 G1/2-IG	10.01.01.12891	10.05.10.00061	10.07.01.00110
SGF 250 HS HT1-60 G1/2-IG	-	10.05.10.00061	10.07.01.00110
SGF 250 HS EPDM-55 G1/2-IG	-	10.05.10.00061	10.07.01.00110
SGF 300 EPDM-55 G1/2-IG	-	10.05.10.00061	10.07.01.00110
SGF 300 HT1-60 G1/2-IG	-	10.05.10.00061	10.07.01.00110
SGF 350 HS EPDM-55 G1/2-IG	-	10.05.10.00061	10.07.01.00110
SGF 350 HS HT1-60 G1/2-IG	-	10.05.10.00061	10.07.01.00110
SGF 400 EPDM-55 G1/2-IG	-	10.05.10.00061	10.07.01.00110

<sup>\*</sup>Filter screen for centered vacuum connection; for eccentric connection use filter screen 10.07.01.00215.

### Suction Plates SGF

Suction area (Ø) from 125 mm to 400 mm



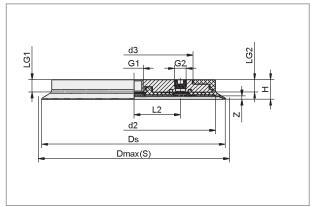
### **Technical Data Suction Plates SGF**

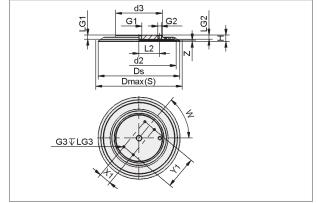
Туре	Suction force Ds	Suction force d2	Volume	Recommended internal hose
	[N]*	[N]**	[cm³]	diameter d [mm]***
SGF 125	730	470	44	9
SGF 150	1060	730	65	9
SGF 150 HS	1060	730	119	9
SGF 200	1880	1610	144	12
SGF 250 HS	2900	2220	372	12
SGF 300	4240	3480	308	12
SGF 350 HS	5700	4730	779	12
SGF 400	7530	6520	560	12

<sup>\*</sup>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

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#### **Design Data Suction Plates SGF**





SGF 125 to 200

SGF 250 to 400

Туре	Dimens	Dimensions in mm*														
	d2	d3	Dmax(S)**	Ds	G1	G2	G3	Н	LG1	LG2	LG3	L2	W	X1	Y1	Z (Stroke)
SGF 125	100.0	70	130	123	G1/4"-F	G1/4"-F	-	21.4	14.0	14.0	-	26.5	-	-	-	3.0
SGF 150	125.0	93	156	148	G1/2"-F	G1/4"-F	-	21.7	14.0	14.0	-	36.5	-	-	-	3.3
SGF 150 HS	126.0	70	165	149	G1/2"-F	G1/4"-F	-	25.9	14.0	14.0	-	26.5	-	-	-	7.5
SGF 200	185.0	134	213	206	G1/2"-F	G1/4"-F	-	22.0	14.0	14.0	-	52.8	-	-	-	3.6
SGF 250 HS	217.0	140	260	248	G1/2"-F	G1/4"-F	M8-F	26.8	14.5	14.5	12	52.5	70	45	100	9.0
SGF 300	272.3	170	305	298	G1/2"-F	G1/4"-F	M8-F	22.3	14.5	14.5	12	76.0	50	45	120	4.5
SGF 350 HS	317.0	170	360	348	G1/2"-F	G1/4"-F	M8-F	26.8	14.5	14.5	12	76.0	50	45	120	9.0
SGF 400	372.3	170	405	398	G1/2"-F	G1/4"-F	M8-F	22.3	14.5	14.5	12	76.0	50	45	120	4.5

 $<sup>^{\</sup>star}$ Acceptable dimensional tolerances for rubber sealings concerning to DIN 3302 - M3

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<sup>\*\*</sup>Suction force referred to the sealing-edge diameter d2  $\,$ 

<sup>\*\*\*</sup>The recommended hose diameter refers to a hose length of approx. 2 m  $\,$ 

 $<sup>\</sup>ensuremath{^{\star\star}} \textsc{External}$  dimension of the suction cup when it is pressed against the workpiece by the vacuum

Suction area (Ø) from 22 mm to 125 mm



### Bellows Suction Cups SAB HT1 (1.5 Folds)



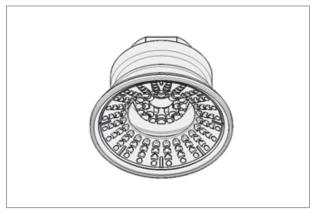
#### Suitable for Industry Specific Applications



Bellows suction cups SAB HT1 (1,5 folds)

# **Applications**

- Round bellows suction cup with 1.5 folds for dynamic handling of glass workpieces
- Handling of flat glass and formed glass pieces
- Use in automated production lines for automotive windscreens or side windows, even after the bending process at temperatures up to 170° C
- Exact positioning in production processes without displacement
- High lateral forces in use with separation powder on flat glass or on damp surfaces



System design bellows suction cup SAB HT1 (1.5 folds)

### Design

- Robust and hard-wearing bellows suction cup made of HT1 with 1.5 folds, with special slot and inner support
- Suction cup is vulcanized to the connection nipple (for very high
- Special structure of the suction surface with high performance profile



Bellows suction cups SAB HT1 being used for handling glass

### Our Highlights...

- Non-marking material HT1
- High temperature resistance
- · Large, structured inner support
- 1.5 folds
- Very stiff top fold

#### Your Benefits...

- > Minimal chemical influence on the workpiece surface
- > Handling of hot workpieces without modification of the material properties
- > Capable of handling high lateral forces, especially in use with separating powder and wet workpieces
- > Optimum adaptation and sealing to curved workpieces, very good damping
- > Very good resistance to lateral forces and lateral acceleration



Bellows Suction Cups SAB HT1 (1.5 Folds)

Suction area (Ø) from 22 mm to 125 mm

#### Designation Code Bellows Suction Cups SAB HT1 (1.5 Folds)

Abbreviated designation	Suction area Ø in mm	Material and Shore hardness	Connection thread
Example SAB 30 HT1-60 G1/4-AG:			
SAB	30	HT1-60	G1/4-AG
SAB	22 to 125	HT1-60	G1/4-AG (AG = male (M)) G1/4-IG (IG = female (F)) G3/8-AG G3/8-IG RA rectangular adapter



#### Ordering Data Bellows Suction Cups SAB HT1 (1.5 Folds)

Suction cup SAB HT1, available in various diameters, is delivered with connection nipple vulcanized to elastomer part.

#### **Bellows Suction Cups SAB HT1 (1.5 Folds)**

Туре	Connection				
	G1/4"-M	G1/4"-F	G3/8"-M	G3/8"-F	Rectangular adapter
SAB 22 HT1-60	10.01.06.02753	10.01.06.02722	10.01.06.03015	10.01.06.03006	-
SAB 30 HT1-60	10.01.06.03048	10.01.06.02723	10.01.06.03049	10.01.06.03050	10.01.06.02755
SAB 40 HT1-60	10.01.06.03051	10.01.06.02724	10.01.06.03052	10.01.06.03053	10.01.06.02757
SAB 50 HT1-60	10.01.06.03057	10.01.06.02760	10.01.06.03058	10.01.06.02725	10.01.06.02759
SAB 60 HT1-60	10.01.06.03059	10.01.06.02779	10.01.06.03060	10.01.06.02726	10.01.06.02762
SAB 80 HT1-60	10.01.06.03061	10.01.06.02778	10.01.06.03062	10.01.06.02727	10.01.06.02764
SAB 100 HT1-60	10.01.06.02927	10.01.06.02961	10.01.06.03063	10.01.06.02728	10.01.06.02766
SAB 125 HT1-60	10.01.06.03065	10.01.06.03064	10.01.06.03066	10.01.06.02729	-



#### Technical Data Bellows Suction Cups SAB HT1 (1.5 Folds)

Туре	Suction force [N]*	Pull-off force [N]	Lateral force [N]**	Volume [cm³]	Min. curve radius [mm] (convex)	Recom. internal hose diameter d [mm]***
SAB 22 HT1-60	16	24	18	1.5	20	4
SAB 30 HT1-60	22	33	30	5.9	40	4
SAB 40 HT1-60	38	59	36	7.0	40	4
SAB 50 HT1-60	53	87	55	11.5	50	4
SAB 60 HT1-60	82	130	82	24.0	65	6
SAB 80 HT1-60	135	221	145	56.5	75	6
SAB 100 HT1-60	190	357	220	92.5	90	6
SAB 125 HT1-60	250	558	352	191.0	140	9

<sup>\*</sup>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 safety factors

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<sup>\*\*</sup>The specified lateral forces are values measured at a vacuum of -0.6 bar with a dry, smooth, flat workpiece surface. Depending on the workpiece surface and its quality, the actual values may deviate from these values.

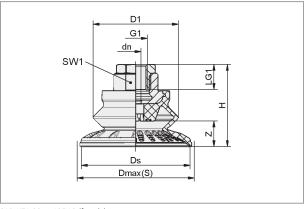
<sup>\*\*\*</sup>The recommended hose diameter refers to a hose length of approx. 2 m

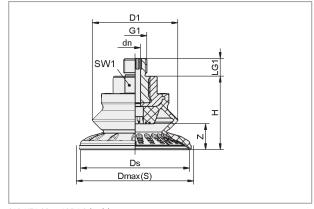
Bellows Suction Cups SAB HT1 (1.5 Folds)



Suction area (Ø) from 22 mm to 125 mm

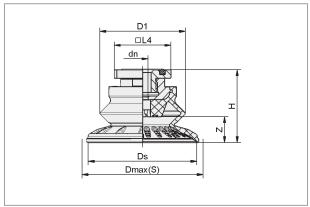
### Design Data Bellows Suction Cups SAB HT1 (1.5 Folds)





SAB HT1 22 to 125 IG (female)

SAB HT1 22 to 125 AG (male)



SAB HT1 22 to 125 RA

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Bellows Suction Cups SAB HT1 (1.5 Folds)

Suction area (Ø) from 22 mm to 125 mm

### Design Data Bellows Suction Cups SAB HT1 (1.5 Folds)

Туре	Dimension	ns in mm*								
	D1	dn	Ds	Dmax(S)**	G1	Н	LG1	L4	SW1	Z (Stroke)
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 G1/4-IG	22	3.5	21	24	G1/4"-F	25.0	12.0	-	16	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 22 HT1-60 G3/8-IG	22	3.5	21	24	G3/8"-F	41.0	9.5	-	22	5.8
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 G1/4-IG	32	4.0	31	34	G1/4"-F	28.0	12.0	-	17	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 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 RA	32	4.0	31	34	-	31.2	-	31.8	-	9.0
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 G1/4-IG	32	4.0	40	45	G1/4"-F	28.8	12.0	-	17	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 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 RA	32	4.0	40	45	-	31.2	-	31.8	-	10.0
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 G1/4-IG	40	6.0	50	56	G1/4"-F	42.0	20.0	-	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 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 RA	40	6.0	50	56	-	36.6	-	31.8	-	11.5
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 G1/4-IG	48	6.0	61	67	G1/4"-F	46.3	20.0	-	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 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 RA	48	6.0	61	67	-	41.0	-	31.8	-	14.5
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 G1/4-IG	64	6.0	81	89	G1/4"-F	54.9	20.0	-	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 G3/8-IG	64	6.0	81	89	G3/8"-F	49.9	15.0	-	22	22.1
SAB 80 HT1-60 RA	64	6.0	81	89	-	49.6	-	31.8	-	22.1
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 G1/4-IG	77	6.0	101	110	G1/4"-F	61.8	20.0	-	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 G3/8-IG	77	6.0	101	110	G3/8"-F	56.6	15.0	-	22	25.8
SAB 100 HT1-60 RA	77	6.0	101	110	-	56.3	-	31.8	-	25.8
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 G1/4-IG	94	6.0	126	135	G1/4"-F	72.8	20.0	-	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 G3/8-IG	94	9.0	126	135	G3/8"-F	67.8	15.0	-	22	32.0

<sup>\*</sup>Acceptable dimensional tolerances for rubber parts according to DIN ISO 3302-1 M3

 $<sup>{}^{\</sup>star\star}\textsc{External}$  dimension of the suction cup when it is pressed against the workpiece by the vacuum

Bellows Suction Cups SAOB HT1 (Oval, 1.5 Folds)

Suction area (LxW) from 60 x 30 mm to 140 x 70 mm





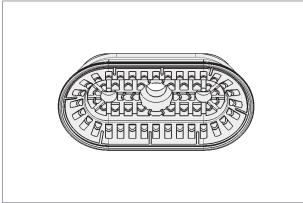
#### Suitable for Industry Specific Applications



Bellows Suction cup SAOB HT1 (oval, 1.5 folds)

### **Applications**

- Oval bellows suction cup with 1.5 folds for dynamic handling of elongated glass workpieces
- Handling of flat glass and also formed glass pieces
- Use in automated production lines for automotive glass such as windscreens and side windows, even after the bending process at temperatures up to 170° C
- Exact positioning in production processes without displacement
- High lateral forces in use with separation powder on flat glass or on wet glass surfaces



System design bellows suction cups SAOB HT1 (oval, 1.5 folds)

### Design

- Robust, wear-resistant oval bellows suction cup SAOB with 1.5 folds made of HT1, with single sealing lip, special slot and inner support
- Connection element glued to the reinforcing element of the suction cup (very high strength)
- Special structure of the suction surface for high resistance to lateral forces



Bellows Suction cups SAOB HT1 being used for handling hollow glass

#### Our Highlights...

- Non-marking material HT1
- High temperature resistance
- · Large, structured inner support
- 1.5 folds
- Very stiff top fold

#### Your Benefits...

- > Minimal chemical influence on the workpiece surface
- > Handling of hot workpieces without modification of the material properties
- > Capable of handling high lateral forces, especially in use with separating powder and wet workpieces
- > Optimum adaptation and sealing to curved workpieces, very good damping
- > Very good resistance to lateral forces and lateral acceleration



Bellows Suction Cups SAOB HT1 (Oval, 1.5 Folds)

Suction area (LxW) from 60 x 30 mm to 140 x 70 mm



#### Designation Code Bellows Suction Cups SAOB HT1 (Oval, 1.5 Folds)

Abbreviated designation	Suction area Ø	Material and Shore hardness	Connection thread
Example SAOB 110x55 HT1-60 G1/4-AG:		Shore naraness	
SAOB	110x55	HT1-60	G1/4-AG
SAOB	60x30	HT1-60	G1/4-AG (AG = male (M))
	80x40		G1/4-IG (IG = female (F))
	110x55		G3/8-AG
	140x70		G3/8-IG



#### Ordering Data Bellows Suction Cups SAOB HT1 (Oval, 1.5 Folds)

Suction cup SAOB HT1, available in various diameters, is delivered with connection nipple glued to elastomer part.

#### Bellows Suction Cups SAOB HT1 (Oval, 1.5 Folds)

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



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

Туре	Suction force [N]*	Pull-off force [N]	Lateral force [N]**	Volume [cm³]	Min. curve radius [mm] (convex)	Recom. internal hose diameter d [mm]***
SAOB 60x30 HT1-60	38	70	80	10.5	18	4
SAOB 80x40 HT1-60	65	132	153	21.8	25	6
SAOB 110x55 HT1-60	110	234	299	53.1	50	6
SAOB 140x70 HT1-60	165	352	459	106.0	70	6

<sup>\*</sup>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 safety factors

Suction Cups Knowledge

<sup>\*\*</sup>The specified lateral forces are values measured at a vacuum of -0.6 bar with a dry, smooth, flat workpiece surface. Depending on the workpiece surface and its quality, the actual values may deviate from these values.

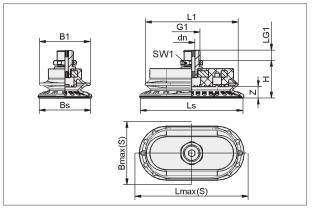
<sup>\*\*\*</sup>The recommended hose diameter refers to a hose length of approx. 2 m

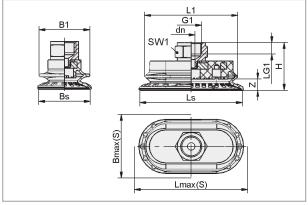


Suction area (LxW) from 60 x 30 mm to 140 x 70 mm



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





SAOB HT1 60x30 to 140x70 AG (male)

SAOB HT1 60x30 to 140x70 IG (female)

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

Dillicii	sions in mm*										
B1	Bmax(S)**	Bs	dn	G1	Н	L1	LG1	Lmax(S)**	Ls	SW1	Z (Stroke)
31	33	30.6	5.0	G1/4"-M	27.0	55.7	8.0	63.0	60.6	17	7.0
31	33	30.6	5.5	G1/4"-F	34.4	55.7	8.0	63.0	60.6	17	7.0
31	33	30.6	5.2	G3/8"-M	27.5	55.7	7.4	63.0	60.6	22	7.0
31	33	30.6	6.0	G3/8"-F	35.0	55.7	9.0	63.0	60.6	22	7.0
40	43	40.6	5.0	G1/4"-M	29.7	73.3	8.0	83.0	80.6	17	9.0
40	43	40.6	6.0	G1/4"-F	37.2	73.3	8.0	83.0	80.6	17	9.0
40	43	40.6	5.2	G3/8"-M	27.7	73.3	8.0	83.0	80.6	22	9.0
40	43	40.6	6.0	G3/8"-F	37.7	73.3	9.0	83.0	80.6	22	9.0
53	59	55.1	6.0	G1/4"-M	35.5	98.8	8.0	114.0	110.1	17	12.0
53	59	55.1	8.0	G1/4"-F	43.0	98.8	8.0	114.0	110.1	17	12.0
53	59	55.1	6.1	G3/8"-M	33.5	98.8	8.0	114.0	110.1	22	12.0
53	59	55.1	8.0	G3/8"-F	43.5	98.8	9.0	114.0	110.1	22	12.0
67	75	70.1	6.0	G1/4"-M	39.5	126.0	8.0	146.0	141.1	17	16.5
67	75	70.1	8.0	G1/4"-F	47.0	126.0	8.0	146.0	141.1	17	16.5
67	75	70.1	6.0	G3/8"-M	37.5	126.0	10.0	146.0	141.1	19	16.5
67	75	70.1	8.0	G3/8"-F	47.5	126.0	9.0	146.0	141.1	22	16.5
	31 31 31 31 40 40 40 53 53 53 67 67 67	31 33 33 31 33 31 33 31 33 40 43 40 43 40 43 53 59 53 59 53 59 67 75 67 75 67 75 67 75	31     33     30.6       31     33     30.6       31     33     30.6       31     33     30.6       40     43     40.6       40     43     40.6       40     43     40.6       53     59     55.1       53     59     55.1       53     59     55.1       53     59     55.1       67     75     70.1       67     75     70.1       67     75     70.1       67     75     70.1       67     75     70.1       67     75     70.1	31         33         30.6         5.0           31         33         30.6         5.5           31         33         30.6         5.2           31         33         30.6         6.0           40         43         40.6         5.0           40         43         40.6         6.0           40         43         40.6         6.0           53         59         55.1         6.0           53         59         55.1         8.0           53         59         55.1         8.0           67         75         70.1         6.0           67         75         70.1         8.0           67         75         70.1         8.0           67         75         70.1         8.0           67         75         70.1         8.0	31 33 30.6 5.0 G1/4"-M 31 33 30.6 5.5 G1/4"-F 31 33 30.6 5.2 G3/8"-M 31 33 30.6 6.0 G3/8"-F 40 43 40.6 5.0 G1/4"-M 40 43 40.6 5.2 G3/8"-M 40 43 40.6 5.2 G3/8"-F 53 59 55.1 6.0 G1/4"-M 53 59 55.1 8.0 G1/4"-F 53 59 55.1 6.1 G3/8"-F 53 59 55.1 8.0 G3/8"-F 67 75 70.1 6.0 G1/4"-M 67 75 70.1 8.0 G3/8"-M 67 75 70.1 8.0 G3/8"-F	31	31         33         30.6         5.0         G1/4"-M         27.0         55.7           31         33         30.6         5.5         G1/4"-F         34.4         55.7           31         33         30.6         5.2         G3/8"-M         27.5         55.7           40         43         40.6         5.0         G1/4"-M         29.7         73.3           40         43         40.6         6.0         G1/4"-F         37.2         73.3           40         43         40.6         5.2         G3/8"-M         27.7         73.3           40         43         40.6         6.0         G1/4"-F         37.7         73.3           53         59         55.1         6.0         G1/4"-M         35.5         98.8           53         59         55.1         8.0         G1/4"-F         43.0         98.8           53         59         55.1         8.0         G3/8"-F         43.5         98.8           53         59         55.1         8.0         G3/8"-F         43.5         98.8           67         75         70.1         6.0         G1/4"-M         39.5         126.0	31         33         30.6         5.0         G1/4"-M         27.0         55.7         8.0           31         33         30.6         5.5         G1/4"-F         34.4         55.7         8.0           31         33         30.6         5.2         G3/8"-M         27.5         55.7         7.4           31         33         30.6         6.0         G3/8"-F         35.0         55.7         9.0           40         43         40.6         5.0         G1/4"-M         29.7         73.3         8.0           40         43         40.6         6.0         G1/4"-F         37.2         73.3         8.0           40         43         40.6         6.0         G3/8"-M         27.7         73.3         8.0           40         43         40.6         6.0         G3/8"-F         37.7         73.3         8.0           53         59         55.1         6.0         G1/4"-M         35.5         98.8         8.0           53         59         55.1         8.0         G1/4"-F         43.0         98.8         8.0           53         59         55.1         8.0         G3/8"-M	31	31         33         30.6         5.0         G1/4"-M         27.0         55.7         8.0         63.0         60.6           31         33         30.6         5.5         G1/4"-F         34.4         55.7         8.0         63.0         60.6           31         33         30.6         5.2         G3/8"-M         27.5         55.7         7.4         63.0         60.6           31         33         30.6         6.0         G3/8"-F         35.0         55.7         9.0         63.0         60.6           40         43         40.6         5.0         G1/4"-M         29.7         73.3         8.0         83.0         80.6           40         43         40.6         6.0         G1/4"-F         37.2         73.3         8.0         83.0         80.6           40         43         40.6         6.0         G3/8"-M         27.7         73.3         8.0         83.0         80.6           53         59         55.1         6.0         G1/4"-M         35.5         98.8         8.0         114.0         110.1           53         59         55.1         8.0         G1/4"-F         43.0         98.	31

<sup>\*</sup>Acceptable dimensional tolerances for rubber parts according to DIN ISO 3302-1 M3

<sup>\*\*</sup>External dimension of the suction cup when it is pressed against the workpiece by the vacuum

Flat Suction Cups SAF HT2

Suction area (Ø) from 30 mm to 60 mm

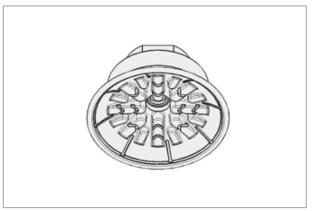
#### Suitable for Industry Specific Applications



Flat suction cups SAF HT2

#### **Applications**

- Round, flat suction cups for dynamic handling of hot metal sheets up to 250 °C (short cycle times)
- · Unloading of parts after forming
- Handling of thin aluminum sheets without deformation or deep
- For use e.g. in feeder systems for press lines in the automobile



System design flat suction cup SAF HT2

#### Design

- Robust and wear-resistant suction cup SAF made of HT2 with special inner support
- Suction cup SAF vulcanized to the connection nipple (very high strength)



Flat suction cup SAF HT2 for handling formed sheet metal parts

#### Our Highlights...

- Silicone-free special material HT2
- Large structured inner support
- Soft and flexible sealing lip

#### Your Benefits...

- > Absence of PWIS (paint wetting impairment substances), temperature resistance up to 250 °C long term
- > No deep drawing of the workpiece; capable of handling high lateral forces
- > Good sealing, even on slightly curved surfaces

## Flat Suction Cups SAF HT2

Suction area (Ø) from 30 mm to 60 mm

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Designation	Code	Flat	Suction	Cups	SAF	HT2

Abbreviated designation	Suction area Ø in mm	Material and Shore hardness	Connection thread
Example SAF 60 HT2-65 G3/8-IG:			
SAF	60	HT2-65	G3/8-IG
SAF	30	HT2-65	G1/4-AG (AG = male (M))
	to		G1/4-IG (IG = female (F))
	60		G3/8-IG

### **Ordering Data Flat Suction Cups SAF HT2**

Suction cup SAF HT2, available in various diameters, is delivered with connection nipple vulcanized to elastomer part.

#### Flat Suction Cups SAF HT2

Туре	Connection							
	G1/4"-M	G1/4"-F	G3/8"-F					
SAF 30 HT2-65	10.01.01.12349	10.01.01.12348	10.01.01.12350					
SAF 40 HT2-65	10.01.01.12353	10.01.01.12352	10.01.01.12354					
SAF 50 HT2-65	10.01.01.12357	10.01.01.12356	10.01.01.12358					
SAF 60 HT2-65	10.01.01.12361	10.01.01.12360	10.01.01.12362					

### Technical Data Flat Suction Cups SAF HT2

Туре	Suction force [N]*	Lateral force [N]**	Volume [cm³]	Min. curve radius [mm] (convex)	Recom. internal hose diameter d [mm]***
SAF 30 HT2-65	38	29	1.7	40	4
SAF 40 HT2-65	69	51	3.8	50	4
SAF 50 HT2-65	100	78	7.0	65	4
SAF 60 HT2-65	150	102	13.0	75	6

<sup>\*</sup>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 safety factors

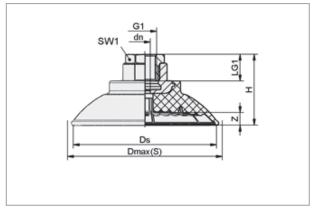
<sup>\*\*</sup>The specified lateral forces are values measured at a vacuum of -0.6 bar with a dry or oily, smooth, flat workpiece surface. Depending on the workpiece surface and its quality, the actual values may deviate from these values.

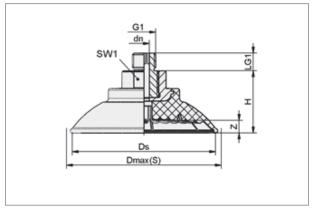
<sup>\*\*\*</sup>The recommended hose diameter refers to a hose length of approx. 2 m

## Flat Suction Cups SAF HT2

Suction area (Ø) from 30 mm to 60 mm

### **Design Data Flat Suction Cups SAF HT2**





SAF HT2 30 to 60 IG (female)

SAF HT2 30 to 60 AG (male)

Туре	Dimensions in	mm*						
	Dmax(S)**	dn	Ds	G1	Н	LG1	SW1	Z (Stroke)
SAF 30 HT2-65 G1/4-AG	34	4	31	G1/4"-M	20	10	17	3
SAF 30 HT2-65 G1/4-IG	34	4	31	G1/4"-F	20	12	17	3
SAF 30 HT2-65 G3/8-IG	34	4	31	G3/8"-F	36	9	22	3
SAF 40 HT2-65 G1/4-AG	46	4	41	G1/4"-M	22	10	17	4
SAF 40 HT2-65 G1/4-IG	46	4	41	G1/4"-F	22	12	17	4
SAF 40 HT2-65 G3/8-IG	46	4	41	G3/8"-F	38	9	22	4
SAF 50 HT2-65 G1/4-AG	56	6	50	G1/4"-M	28	10	22	5
SAF 50 HT2-65 G1/4-IG	56	6	50	G1/4"-F	33	15	22	5
SAF 50 HT2-65 G3/8-IG	56	6	50	G3/8"-F	28	15	22	5
SAF 60 HT2-65 G1/4-AG	67	6	61	G1/4"-M	31	10	22	6
SAF 60 HT2-65 G1/4-IG	67	6	61	G1/4"-F	36	15	22	6
SAF 60 HT2-65 G3/8-IG	67	6	61	G3/8"-F	31	15	22	6

<sup>\*</sup>Acceptable dimensional tolerances for rubber parts concerning to DIN ISO 3302-1 M3

Suction Cups

<sup>\*\*</sup>External dimension of the suction cup when it is pressed against the workpiece by the vacuum



Bellows Suction Cups SAB HT2 (1.5 Folds)

Suction area (Ø) from 22 mm to 80 mm

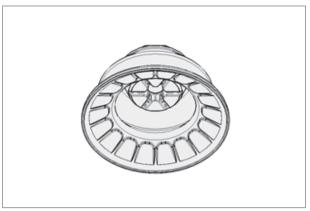
#### Suitable for Industry Specific Applications



Bellows suction cups SAB HT2 (1.5 folds)

## **Applications**

- Round bellows suction cup with 1.5 folds for dynamic handling of hot metal sheets up to 250 °C
- Handling of pre-shaped metal sheet parts, bellows shape permits optimum adaptation
- Unloading of parts after forming
- Handling of thin aluminum sheets without deformation or deep
- For use e.g. in feeder systems for press lines in the automobile industry



System design bellows suction cups SAB HT2 (1.5 folds)

#### Design

- Robust and wear resistant bellows suction cup SAB made of HT2 with 1.5 folds and special inner support
- Suction cup SAB vulcanized to the connection nipple (very high strength)



Bellows suction cups SAB HT2 for handling formed sheet metal parts

#### Our Highlights...

- Silicone-free special material HT2
- Large structured inner support
- Soft and flexible sealing lip
- 1.5 folds
- Stiff top fold

#### Your Benefits...

- > Absence of PWIS (paint wetting impairment substances), temperature resistance up to 250° C long term
- > No deep-drawing of the workpiece; capable of handling high lateral forces
- > Good sealing, even on slightly curved surfaces
- > Optimum adaptation and sealing to curved workpieces, very good damping
- > Good resistance to horizontal forces and lateral acceleration

Switches and Valve Vacuum Switches and Technology Generators

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Bellows Suction Cups SAB HT2 (1.5 Folds)

Suction area (Ø) from 22 mm to 80 mm



#### Designation Code Bellows Suction Cups SAB HT2 (1.5 Folds)

Abbreviated designation	Suction area Ø in mm	Material and Shore hardness	Connection thread
Example SAB 30 HT2-65 G1/4-AG:			
SAB	30	HT2-65	G1/4-AG
SAB	22	HT2-65	G1/4-AG (AG = male (M))
	to		G1/4-IG (IG = female (F))
	80		G3/8-IG



#### Ordering Data Bellows Suction Cups SAB HT2 (1.5 Folds)

Suction cup SAB HT2, available in various diameters, is delivered with connection nipple vulcanized to elastomer part.

#### **Bellows Suction Cups SAB HT2 (1.5 Folds)**

Туре	Connection	Connection							
	G1/4"-M	G1/4"-F	G3/8"-F						
SAB 22 HT2-65	10.01.06.02420	10.01.06.02419	10.01.06.02421						
SAB 30 HT2-65	10.01.06.02424	10.01.06.02423	10.01.06.02425						
SAB 40 HT2-65	10.01.06.02428	10.01.06.02427	10.01.06.02429						
SAB 50 HT2-65	10.01.06.03452	10.01.06.03451	10.01.06.03401						
SAB 60 HT2-65	10.01.06.03450	10.01.06.03449	10.01.06.03354						
SAB 80 HT2-65	10.01.06.03357	10.01.06.03356	10.01.06.03318						



#### Technical Data Bellows Suction Cups SAB HT2 (1.5 Folds)

Туре	Suction force [N]*	Pull-off force [N]	Lateral force [N]**	Volume [cm³]	Min. curve radius [mm] (convex)	Recommended internal hose diameter d [mm]***
SAB 22 HT2-65	16	24	17	1.5	20	4
SAB 30 HT2-65	22	33	29	5.6	40	4
SAB 40 HT2-65	38	59	34	7.0	40	4
SAB 50 HT2-65	53	91	102	18.9	25	6
SAB 60 HT2-65	82	136	126	32.0	30	6
SAB 80 HT2-65	135	238	217	75.4	40	6

<sup>\*</sup>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 safety factors

<sup>\*\*</sup>The specified lateral forces are values measured at a vacuum of -0.6 bar with a dry, smooth, flat workpiece surface. Depending on the workpiece surface and its quality, the actual values may deviate from these values.

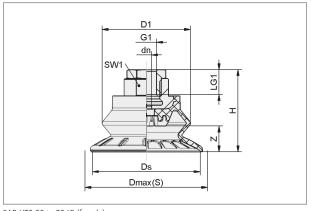
<sup>\*\*\*</sup>The recommended hose diameter refers to a hose length of approx. 2 m

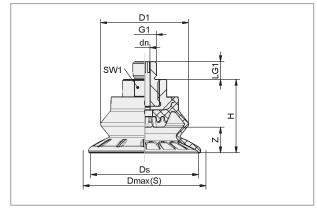


Bellows Suction Cups SAB HT2 (1.5 Folds)

Suction area (Ø) from 22 mm to 80 mm

### Design Data Bellows Suction Cups SAB HT2 (1.5 Folds)





SAB HT2 22 to 80 IG (female)

SAB HT2 22 to 80 AG (male)

Туре	Dimensions	in mm*							
	dn	D1	Dmax(S)**	Ds	G1	Н	LG1	SW1	Z (Stroke)
SAB 22 HT2-65 G1/4-AG	3.5	22	24	21	G1/4"-M	25.0	10.0	16	5.8
SAB 22 HT2-65 G1/4-IG	3.5	22	24	21	G1/4"-F	25.0	12.0	16	5.8
SAB 22 HT2-65 G3/8-IG	3.5	22	24	21	G3/8"-F	41.0	9.5	22	5.8
SAB 30 HT2-65 G1/4-AG	4.0	32	34	31	G1/4"-M	28.0	10.0	17	9.0
SAB 30 HT2-65 G1/4-IG	4.0	32	34	31	G1/4"-F	28.0	12.0	17	9.0
SAB 30 HT2-65 G3/8-IG	4.0	32	34	31	G3/8"-F	44.0	9.5	22	9.0
SAB 40 HT2-65 G1/4-AG	4.0	32	45	40	G1/4"-M	29.0	10.0	17	10.0
SAB 40 HT2-65 G1/4-IG	4.0	32	45	40	G1/4"-F	29.0	12.0	17	10.0
SAB 40 HT2-65 G3/8-IG	4.0	32	45	40	G3/8"-F	44.0	9.5	22	10.0
SAB 50 HT2-65 G1/4-AG	6.0	42	56	50	G1/4"-M	36.9	10.0	22	11.5
SAB 50 HT2-65 G1/4-IG	6.0	42	56	50	G1/4"-F	41.9	20.0	22	11.5
SAB 50 HT2-65 G3/8-IG	6.0	42	56	50	G3/8"-F	36.9	15.0	22	11.5
SAB 60 HT2-65 G1/4-AG	6.0	50	67	61	G1/4"-M	41.3	10.0	22	14.5
SAB 60 HT2-65 G1/4-IG	6.0	50	67	61	G1/4"-F	46.3	20.0	22	14.5
SAB 60 HT2-65 G3/8-IG	6.0	50	67	61	G3/8"-F	41.3	15.0	22	14.5
SAB 80 HT2-65 G1/4-AG	6.0	65	88	81	G1/4"-M	49.8	15.0	22	22.0
SAB 80 HT2-65 G1/4-IG	6.0	65	88	81	G1/4"-F	54.8	15.0	22	22.0
SAB 80 HT2-65 G3/8-IG	6.0	65	88	81	G3/8"-F	49.8	15.0	22	22.0

<sup>\*</sup>Acceptable dimensional tolerances for rubber parts according to DIN ISO 3302-1 M3

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 $<sup>\</sup>ensuremath{^{**}}\textsc{External}$  dimension of the suction cup when pressed against the workpiece by the vacuum

Flat Suction Cups SAOF HT2 (Oval)

Suction area (LxW) from 60 x 23 mm to 100 x 50 mm

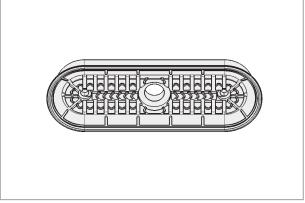
#### Suitable for Industry Specific Applications



Flat suction cups SAOF HT2 (oval)

### **Applications**

- Oval flat suction cup for dynamic handling of hot metal sheets up to 250° C
- · Unloading e.g. of elongated workpieces after forming
- Handling of thin aluminum sheets without deformation or deep
- For use e.g. in feeder systems for press lines in the automobile



System design flat suction cups SAOF HT2 (oval)

#### Design

- Robust, wear-resistant oval flat suction cup SAOF made of HT2 with single sealing lip and inner support
- Connection nipple glued to the reinforcing element of the suction cup (very high strength and temperature resistance)



Flat suction cups SAOF HT2 for handling formed sheet metal parts

#### Our Highlights...

- Silicone-free special material HT2
- Large, structured inner support
- Soft and flexible sealing lip

#### Your Benefits...

- > Absence of PWIS (paint wetting impairment substances), temperature resistance up to 250° C long term
- > No deep-drawing of the workpiece; capable of handling high lateral forces
- > Good sealing, even on slightly curved surfaces

## Flat Suction Cups SAOF HT2 (Oval)

Suction area (LxW) from 60 x 23 mm to 100 x 50 mm

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### **Designation Code Flat Suction Cups SAOF HT2 (Oval)**

Abbreviated designation	Suction area LxW in mm	Material and Shore hardness	Connection thread
Example SAOF 80x40 HT2-65 G1/4-IG: SAOF	80x40	HT2-65	G1/4-IG
SAOF	60x23 to 100x50	HT2-65	G1/4-AG (AG = male (M)) G1/4-IG (IG = female (F)) G3/8-IG

### Ordering Data Flat Suction Cups SAOF HT2 (Oval)

Suction cup SAOF HT2, available in various dimensions, is delivered with connection nipple glued to elastomer part.

### Flat Suction Cups SAOF HT2 (Oval)

Туре	Connection		
	G1/4"-M	G1/4"-F	G3/8"-F
SAOF 60x23 HT2-65	10.01.05.00743	10.01.05.00742	10.01.05.00741
SAOF 80x40 HT2-65	10.01.05.00751	10.01.05.00750	10.01.05.00749
SAOF 90x30 HT2-65	10.01.05.00747	10.01.05.00746	10.01.05.00745
SAOF 100x50 HT2-65	10.01.05.00755	10.01.05.00754	10.01.05.00753



#### Technical Data Flat Suction Cups SAOF HT2 (Oval)

Туре	Suction force [N]*	Lateral force [N]**	Volume [cm³]	Min. curve radius [mm] (convex)	
SAOF 60x23 HT2-65	57	36	3.0	20	4
SAOF 80x40 HT2-65	140	108	10.7	50	4
SAOF 90x30 HT2-65	122	94	7.0	40	4
SAOF 100x50 HT2-65	217	177	20.0	75	6

<sup>\*</sup>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

<sup>\*\*</sup>The specified lateral forces are values measured at a vacuum of -0.6 bar with a dry, smooth, flat workpiece surface. Depending on the workpiece surface and its quality, the actual values may deviate from these values.

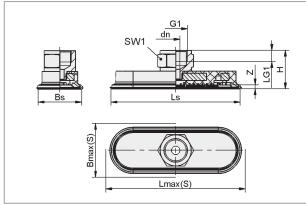
<sup>\*\*\*</sup>The recommended hose diameter refers to a hose length of approx. 2 m

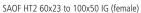


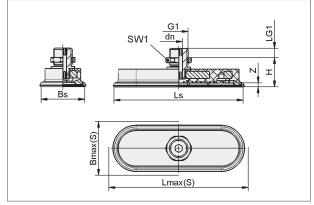
Flat Suction Cups SAOF HT2 (Oval)

Suction area (LxW) from 60 x 23 mm to 100 x 50 mm

### Design Data Flat Suction Cups SAOF HT2 (Oval)







SAOF HT2 60x23 to 100x50 AG (male)

Туре	Dimensions in r	nm*								
	Bmax(S)**	Bs	dn	G1	Н	LG1	Lmax(S)**	Ls	SW1	Z (Stroke)
SAOF 60x23 HT2-65 G1/4-AG	25	21.6	5	G1/4"-M	18	8	64	60.6	17	3
SAOF 60x23 HT2-65 G1/4-IG	25	21.6	6	G1/4"-F	26	8	64	60.6	17	3
SAOF 60x23 HT2-65 G3/8-IG	25	21.6	6	G3/8"-F	26	8	64	60.6	22	3
SAOF 80x40 HT2-65 G1/4-AG	43	38.6	5	G1/4"-M	20	8	85	80.6	17	4
SAOF 80x40 HT2-65 G1/4-IG	43	38.6	6	G1/4"-F	28	8	85	80.6	17	4
SAOF 80x40 HT2-65 G3/8-IG	43	38.6	6	G3/8"-F	28	9	85	80.6	22	4
SAOF 90x30 HT2-65 G1/4-AG	34	30.6	5	G1/4"-M	19	8	94	90.6	17	3
SAOF 90x30 HT2-65 G1/4-IG	34	30.6	6	G1/4"-F	26	8	94	90.6	17	3
SAOF 90x30 HT2-65 G3/8-IG	34	30.6	6	G3/8"-F	27	9	94	90.6	22	3
SAOF 100x50 HT2-65 G1/4-AG	54	48.1	6	G1/4"-M	22	8	106	101.1	17	5
SAOF 100x50 HT2-65 G1/4-IG	54	48.1	8	G1/4"-F	30	8	106	101.1	17	5
SAOF 100x50 HT2-65 G3/8-IG	54	48.1	8	G3/8"-F	31	9	106	101.1	22	5

<sup>\*</sup>Acceptable dimensional tolerances for rubber parts according to DIN ISO 3302-1 M3

Vacuum
Suction Cups Knowledge

<sup>\*\*</sup>External dimension of the suction cup when it is pressed against the workpiece by the vacuum



Bellows Suction Cups SAOB HT2 (Oval, 1.5 Folds)

Suction area (LxW) 60 x 30 mm and 80 x 40 mm



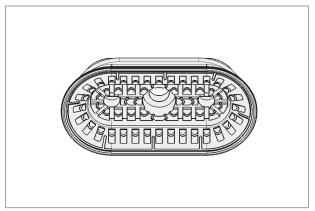
#### Suitable for Industry Specific Applications



Bellows suction cups SAOB HT2 (oval, 1.5 folds)

# **Applications**

- Oval bellows suction cup with 1.5 folds for most dynamic handling of hot metal sheets up to 250° C
- Unloading e.g. of elongated workpieces after forming, e.g. reinfored ribs and plates
- Handling of formed sheet metal parts; fold structure allows optimal adjustment
- Handling of thin aluminum sheets without deformation or deep drawing
- For use e.g. in feeder systems for press lines in the automobile industry



System design bellows suction cup SAOB HT2 (oval, 1.5 folds)

#### Design

- Robust, wear-resistant oval bellows suction cup SAOB with 1.5 folds made of HT2, single sealing lip and inner support
- Connection nipple glued to the reinforcing element of the suction cup (very high strength and temperature resistance)



Bellows suction cups SAOB HT2 for handling formed sheet metal parts

#### Our Highlights...

- Silicone-free special material HT2
- Large, structured inner support
- Soft and flexible sealing lip
- 1.5 folds
- Stiff top fold

#### Your Benefits...

- > Absence of PWIS (paint wetting impairment substances), up to 250° C temperature resistance long term
- > No deep-drawing of the workpiece; capable of handling high lateral forces
- > Good sealing of even slightly curved surfaces
- > Optimum adaptation to curved workpieces, very good damping
- > Resistance to lateral forces and high horizontal accelerations

Switches and Valve Vacuum Monitoring Technology Generators

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Bellows Suction Cups SAOB HT2 (Oval, 1.5 Folds)

Suction area (LxW) 60 x 30 mm and 80 x 40 mm

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#### Designation Code Bellows Suction Cups SAOB HT2 (Oval, 1.5 Folds)

Abbreviated designation	Suction area LxW in mm	Material and Shore hardness	Connection thread
Example SAOB 60x30 HT2-65 G3/8-IG:			
SAOB	60x30	HT2-65	G3/8-IG
SAOB	60x30	HT2-65	G1/4-AG (AG = male (M))
	80x40		G1/4-IG (IG = female (F))
			G3/8-IG



#### Ordering Data Bellows Suction Cups SAOB HT2 (Oval, 1.5 Folds)

Suction cup SAOB HT2, available in various dimensions, is delivered with connection nipple glued to elastomer part.

#### Bellows Suction Cups SAOB HT2 (Oval, 1.5 Folds)

Туре	Connection		
	G1/4"-M	G1/4"-F	G3/8"-F
SAOB 60x30 HT2-65	10.01.06.02443	10.01.06.02442	10.01.06.02441
SAOB 80x40 HT2-65	10.01.06.02447	10.01.06.02446	10.01.06.02445

#### Technical Data Bellows Suction Cups SAOB HT2 (Oval, 1.5 Folds)

Туре	Suction force [N]*	Pull-off force [N]	Lateral force [N]**	Volume [cm³]	Min. curve radius [mm] (convex)	Recom. internal hose diameter d [mm]***
SAOB 60x30 HT2-65	38	55	56	9.6	30	4
SAOB 80x40 HT2-65	65	100	98	20.6	40	6

<sup>\*</sup>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 safety factors

Suction Cups Knowledge

<sup>\*\*</sup>The specified lateral forces are values measured at a vacuum of -0.6 bar with a dry, smooth, flat workpiece surface. Depending on the workpiece surface and its quality, the actual values may deviate from these values.

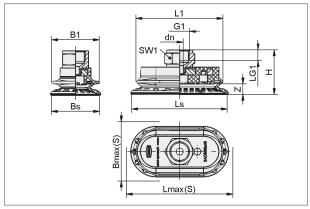
<sup>\*\*\*</sup>The recommended hose diameter refers to a hose length of approx. 2 m

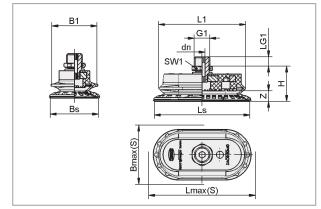


Bellows Suction Cups SAOB HT2 (Oval, 1.5 Folds)

Suction area (LxW) 60 x 30 mm and 80 x 40 mm

### Design Data Bellows Suction Cups SAOB HT2 (Oval, 1.5 Folds)





SAOB HT2 60x30 and 80x40 IG

SAOB HT2 60x30 and 80x40 AG

Туре	Dimen	sions in mm*										
	B1	Bmax(S)**	Bs	dn	G1	Н	L1	LG1	Lmax(S)**	Ls	SW1	Z (Stroke)
SAOB 60x30 HT2-65 G1/4-AG	31	33	30.6	5	G1/4"-M	27.0	56	8	63	60.6	17	7
SAOB 60x30 HT2-65 G1/4-IG	31	33	30.6	6	G1/4"-F	34.4	56	8	63	60.6	17	7
SAOB 60x30 HT2-65 G3/8-IG	31	33	30.6	6	G3/8"-F	35.0	56	9	63	60.6	22	7
SAOB 80x40 HT2-65 G1/4-AG	40	43	40.6	5	G1/4"-M	29.7	73	8	83	80.6	17	9
SAOB 80x40 HT2-65 G1/4-IG	40	43	40.6	6	G1/4"-F	37.2	73	8	83	80.6	17	9
SAOB 80x40 HT2-65 G3/8-IG	40	43	40.6	6	G3/8"-F	37.7	73	9	83	80.6	22	9

<sup>\*</sup>Acceptable dimensional tolerances for rubber parts according to DIN ISO 3302-1 M3

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 $<sup>\</sup>star\star$ External dimension of the suction cup when it is pressed against the workpiece by the vacuum



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

Suction area (Ø) 90 mm to 190 mm





#### Suitable for Industry Specific Applications



• Robust and wear-resistant suction plate SPL-HT FPM-F with

single sealing lip, consisting of suction plate SPL and large-area

High-temperature suction plates SPL-HT FPM-F

• Suction plate screwed to mounting

### **Applications**

- Round suction plate for handling of very hot workpieces
- · Removing of hot cathode ray tubes from molds
- · Handling of hot glass

#### Our Highlights...

- Special materials fluorocaoutchouc FPM-F with felt coating
- Suction plate screwed to mounting
- Large-area metal mounting for the suction plate

#### Your Benefits...

- > Resistance to very high temperatures (up to 400 °C for short periods) and little marking of the workpieces
- > Suction plate can be replaced separately when worn
- > Good heat dissipation, short cooling times

Design

metal mounting

#### 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	FPM-F-65	G1/4- $AG(AG = male (M))$
	120		G1/2-AG
	190		



#### 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 SPL-HT FPM-F

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

Suction area (Ø) 90 mm to 190 mm

### 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

<sup>\*</sup>Additional material specifications at beginning of the section "Vacuum Suction Cups"

#### 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

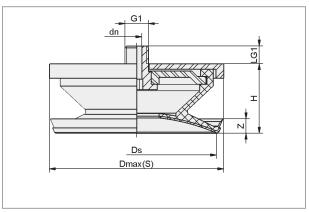
<sup>\*</sup>Additional material specifications at beginning of the section "Vacuum Suction Cups"

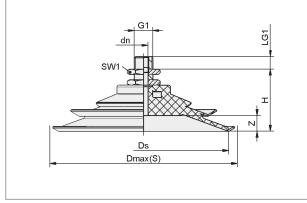
#### Technical Data Suction Plates for High-Temperature SPL-HT FPM-F

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

<sup>\*</sup>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 Suction Plates for High-Temperature SPL-HT FPM-F





SPL-HT 90 and 120 FPM-F

SPL-HT 190 FPM-F

Туре	Dimensions i	Dimensions in mm*								
	Dmax(S)**	dn	Ds	G1	Н	LG1	SW1	Z (Stroke)		
SPL-HT 90 FPM-F-65 G1/4-AG	98	6	90	G1/4"-M	39	11	-	16.5		
SPL-HT 120 FPM-F-65 G1/4-AG	130	6	120	G1/4"-M	46	11	8	25.0		
SPL-HT 190 FPM-F-65 G1/2-AG	209	10	190	G1/2"-M	66	18	32	8.0		

<sup>\*</sup>Acceptable dimensional tolerances for rubber parts concerning to DIN ISO 3302-1 M3

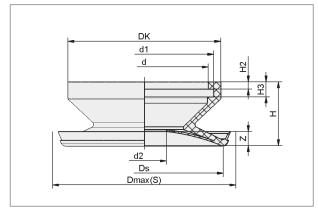
 $<sup>\</sup>star\star$ External dimension of the suction cup when it is pressed against the workpiece by the vacuum

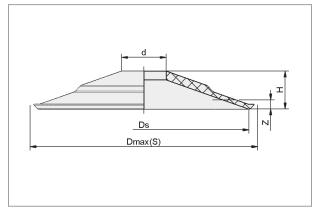


Suction Plates for High-Temperature SPL-HT FPM-F

Suction area (Ø) 90 mm to 190 mm

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





SPL-HT 90 and 120 FPM-F

SPL-HT 190 FPM-F

Туре	Dimensions in mm*									
	d	d1	d2	Dk	Dmax(S)**	Ds	Н	H2	Н3	Z (Stroke)
SPL-HT 90 FPM-F-65	72	78	15	86	98	90	36	4	9.5	16.5
SPL-HT 120 FPM-F-65	88	96	-	105	130	120	43	5	10.0	25.0
SPL-HT 190 FPM-F-65	40	-	-	-	209	190	17	-	-	8.0

<sup>\*</sup>Acceptable dimensional tolerances for rubber parts concerning to DIN ISO 3302-1 M3

Vacuum Suction Cups K

<sup>\*\*</sup>External dimension of the suction cup when it is pressed against the workpiece by the vacuum



## Suction Plates for High-Temperature SPL-HT

Suction area (Ø) from 35 mm to 140 mm





#### Suitable for Industry Specific Applications



High-temperature suction plates SPL-HT

#### **Applications**

- Round suction plate for handling of workpieces with smooth
- Usage in manufacturing of float glass or in tempering processes in the glass industry
- Hot forming in the metal industry

#### Design

- Robust stainless-steel body
- · Seal clamped into the body and quickly replaceable
- Seal made of special textile material for handling hot workpieces

#### Our Highlights...

- Stainless-steel body; seal made of special textile materials
- Withstanding temperatures of up to 600 °C
- Seal quickly and easily replaceable

#### Your Benefits...

- > Very high temperature resistance (even for long periods)
- > Safe and gentle gripping of hot workpieces with vacuum
- > Seal can be replaced separately when worn or damaged

#### Designation Code Suction Plates for High-Temperature SPL-HT

Abbreviated designation	Suction area Ø	Material and	Connection thread
	in mm	Shore hardness	
Example SPL-HT 90 ST G1/4-IG:			
SPL-HT	90	ST	G1/4-IG
SPL-HT	35	ST woven silicate	G1/8-IG (IG = female (F))
	60	material	G1/4-IG
	90		G3/8-IG
	140		

#### 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 DR-SPL-HT



# Suction Plates for High-Temperature SPL-HT

Suction area (Ø) from 35 mm to 140 mm

#### Suction Plates for High-Temperature SPL-HT

Туре	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

Туре	Sealing ring DR-SPL-HT
SPL-HT 35 ST G1/8-IG	10.01.23.00022
SPL-HT 60 ST G1/4-IG	10.01.23.00001
SPL-HT 90 ST G1/4-IG	10.01.23.00016
SPL-HT 140 ST G3/8-IG	10.01.23.00018

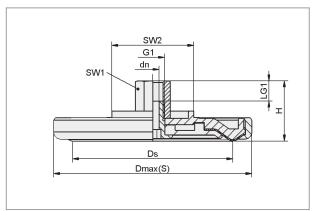


#### Technical Data Suction Plates for High-Temperature SPL-HT

Туре	Suction force [N]*	Volume [cm³]	Min. curve radius [mm] (convex)	Required evacuation rate 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	28	440	78	375	6
SPL-HT 90 ST G1/4-IG	320	36	1060	100	675	6
SPL-HT 140 ST G3/8-IG	740	36	1700	120	1390	9

<sup>\*</sup>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.

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



SPL-HT 35 to 140 ST

Туре	Dimensions in	mensions in mm*							
	dn	Dmax(S)**	Ds	G1	Н	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	

<sup>\*</sup>Acceptable dimensional tolerances for rubber parts concerning to DIN ISO 3302-1 M3

Suction Cups Knowledge

<sup>\*\*</sup>The recommended suction capacity is based on an average workpiece temperature of about 300°C. We recommend testing with original workpieces.

<sup>\*\*\*</sup>The recommended hose diameter refers to a hose length of approx. 2 m  $\,$ 

<sup>\*\*</sup>External dimension of the suction cup when it is pressed against the workpiece by the vacuum

### Suction Plates SPL POM-NBR

Suction area (Ø) from 40 mm to 115 mm





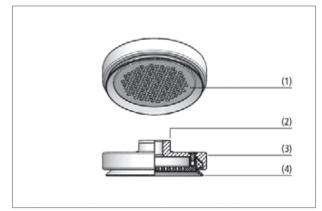
#### Suitable for Industry Specific Applications



Suction plates SPL POM-NBR

#### **Applications**

- Suction plates for handling flexible materials e.g. prepregs or semi-finished products made of fiber composite material such as
- · Handling of sensitive workpieces that must not be deformed such
- Prevention of fiber displacement by "sucking in" (no influence on the fiber orientation)
- Handling free of permanent mechanical marks



System design suction plates SPL POM-NBR

### Design

- Robust body made of aluminium (3); low construction height with spanner flat (2) for assembly
- Sealing ring (4) made of NBR
- Internal support made of POM with suction openings for evenly vacuum distribution (1)



Suction plate SPL POM-NBR being used for handling composite textiles

#### Our Highlights...

- Round suction plate with inner support for flat handling of flexible materials
- Evenly vacuum distribution due to air extraction holes
- · Large air extraction holes for high flow rates
- Sealing ring for good sealing and increased friction

#### Your Benefits...

- > No "sucking in" of workpieces into the suction plate (no permanent deformation)
- > Reduced energy consumption and higher resistance to lateral forces
- > Evenly flow and low surface pressure; no damage of sensitive workpieces
- > Use with electric or pneumatic vacuum generators

# **Suction Cups for Handling Composites**



### Suction Plates SPL POM-NBR

Suction area (Ø) from 40 mm to 115 mm

### **Designation Code Suction Plates SPL POM-NBR**

Abbreviated designation	Suction area Ø in mm	Material	Connection thread	
Example SPL 40 POM-NBR G1/8-IG:				
SPL	40	POM-NBR	G1/8-IG	
SPL	40	POM-NBR	G1/8-IG (IG = female (F))	
	70		G1/4-IG	
	115			



### **Ordering Data Suction Plates SPL POM-NBR**

Suction plate SPL POM-NBR (sealing ring + support plate) is available with different diameters and is delivered as a ready to connect product.

### **Suction Plates SPL POM-NBR**

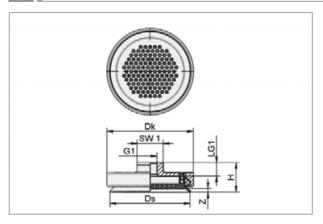
Туре	Part Number
SPL 40 POM-NBR G1/8-IG	10.01.01.13104
SPL 70 POM-NBR G1/4-IG	10.01.01.13107
SPL 115 POM-NBR G1/4-IG	10.01.01.13110

### Technical Data Suction Plates SPL POM-NBR

Туре	Suction force [N]*	Volume [cm³]	Recom. internal hose diameter d
			[mm]**
SPL 40 POM-NBR G1/8-IG	70	5	4
SPL 70 POM-NBR G1/4-IG	217	24	6
SPL 115 POM-NBR G1/4-IG	600	91	9

<sup>\*</sup>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 safety factors

### Design Data Suction Plates SPL POM-NBR



Туре	Dimensions in n	Dimensions in mm*					
	Dk	Ds	G1	Н	LG1	SW1	Z (Stroke)
SPL 40 POM-NBR G1/8-IG	42	39	G1/8"-F	20.5	9.5	17	2
SPL 70 POM-NBR G1/4-IG	73	68	G1/4"-F	24.5	11.5	22	3
SPL 115 POM-NBR G1/4-IG	118	113	G1/4"-F	30.5	12.0	22	4

<sup>\*</sup>Acceptable dimensional tolerances for rubber sealings according to DIN 3302-1 M3

Suction Cups Knowledge

<sup>\*\*</sup>The recommended hose diameter refers to a hose length of approx. 2 m

# **Suction Cups for Handling CDs/DVDs**

## Suction Cups SGR and SGH

Suction area (Ø) from 17 mm to 36 mm





### **Suitable for Industry Specific Applications**



Suction cups SGR and SGH

### **Applications**

- Suction cups for handling of CDs or DVDs in fast-running, fully automatic systems
- Handling of CDs and DVDs in all processing steps of the production and further processing

### Design

- Circular suction cup with closed version (SGR) or semi-circular
- Suction cup shaped for direct insertion into various mountings



System design suction cups SGR and SGH

## **Overview of Technical Data**

Diameter	Material	Versions	Additional Functions	Dimensions	Weight
in mm				in mm	in g
17 to 36	Silicone SI	Annular	Spring-mounted version	Ø: 17 to 36	1.1 to 4.2
		Semi-annular		Height max. 20	

### Sealing Cords DI-SCHN

Diameter from 6 mm to 12 mm





### Suitable for Industry Specific Applications



Sealing cords DI-SCHN

### **Applications**

- Sealing cord for production of special, self-made suction plates
- Adaptation of suction plates to the dimensions of special workpieces
- Handling of chipboard and MDF panels with cut-outs

### Design

• Wear-resistant sealing cords made of silicon-free foam rubber in various diameters and cross-sections

### Our Highlights...

- Profiled sealing cord in any desired length
- Wide range of diameters

### Your Benefits...

- > Self-construction of "vacuum grippers" in any desired shape and size to match special workpieces
- > Suitable for a wide range of workpiece sizes and shapes

### **Designation Code Sealing Cords DI-SCHN**

Dimensions in mm	Material and Shore hardness*	Product addition
8	MOS EPDM-20	SL
6 to 12	MOS EPDM-20	SL slot
	in mm	in mm Shore hardness*  8 MOS EPDM-20

<sup>\*</sup>Average Shore hardness



### Ordering Data Sealing Cords DI-SCHN

Sealing cord DI-SCHN is delivered in the desired length. Accounting unit 1 m.

### Sealing Cords DI-SCHN

Туре	Part Number
DI-SCHN 6 MOS EPDM-20	10.07.04.00001
DI-SCHN 8 MOS EPDM-20	10.07.04.00002
DI-SCHN 8 MOS EPDM-20 SL	10.07.04.00005
DI-SCHN 10 MOS EPDM-20	10.07.04.00003
DI-SCHN 12 MOS EPDM-20	10.07.04.00004

## Sealing Cords DI-SCHN

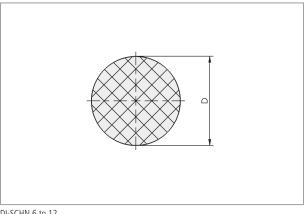
Diameter from 6 mm to 12 mm

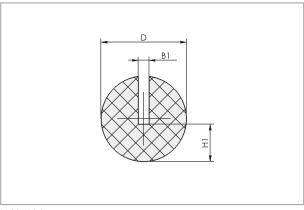
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## **Technical Data Sealing Cords DI-SCHN**

Туре	Min. installation radius [mm]	Operating temperature [°C]	Recommended slot width x slot depth [mm]	Length (max) [m]
DI-SCHN 6 MOS EPDM-20	10	-25 70	6 x 4.2	200
DI-SCHN 8 MOS EPDM-20	10	-25 70	8 x 5.6	200
DI-SCHN 8 MOS EPDM-20 SL	10	-25 70	8 x 5.6	50
DI-SCHN 10 MOS EPDM-20	10	-25 70	10 x 7	100
DI-SCHN 12 MOS EPDM-20	10	-25 70	12 x 8.4	100

### **Design Data Sealing Cords DI-SCHN**





DI-SCHN 6 to 12

DI-SCHN 8 SL

Туре	Dimensions in mm*		
	B1	D	H1
DI-SCHN 6 MOS EPDM-20	-	6	-
DI-SCHN 8 MOS EPDM-20	-	8	-
DI-SCHN 8 MOS EPDM-20 SL	1	8	3.5
DI-SCHN 10 MOS EPDM-20	-	10	-
DI-SCHN 12 MOS EPDM-20	-	12	-

<sup>\*</sup>Acceptable dimensional tolerances for rubber parts concerning to DIN ISO 3302-1 M3

### Sealing Profiles DI-PROF

Dimensions from 5.5x8 mm to 30x25 mm





### Suitable for Industry Specific Applications



Sealing profiles DI-PROF

### **Applications**

- Sealing profile made of two component section for production of self-made, individual suction plates
- · Sealing profile for rough or structured surfaces
- · Handling of barrels, sacks and similar objects with irregular

### Design

- Robust and wear-resistant sealing profiles in various cross-sections
- Profile 2K-MOS-20: sealing strip made of foam rubber, vulcanized to support strip (supporting and sealing section made of Chloroprene CR)
- Profile 2K-SWG-20: sealing strip made of foam rubber, glued to support strip (supporting section NBR, sealing section natural rubber NK)
- High-strength supporting-section material with profile on the sides for plugging into a corresponding mounting plate

### Our Highlights...

- Sealing strip in any desired length
- Sealing profile made of two-component section

### Your Benefits...

- > Self-construction of "vacuum grippers" in any desired shape and size to match specific workpieces
- > High-strength support strip with foam rubber vulcanized or glued to it, for sealing to very rough or structured surfaces (such as ornamental glass, rough natural stone, concrete blocks, etc.)

### Designation Code Sealing Profiles DI-PROF

Abbusisted designation	Dimensions	Metavial and	Product addition
Abbreviated designation	Dimensions	Material and	Product addition
	in mm	Shore hardness*	
Example DI-PROF 5.5x8 2K-MOS CR-20/60:			
DI-PROF	5.5x8	2K-MOS CR-20/60	
DI-PROF	5.5x8	2K-MOS CR-20/60	DL sealing lip
	to	2K-SWG NK-20/55	HR half-round
	30x25	MOS NK-20	
		MOS EPDM-20	
		MOS CR-20	

<sup>\*</sup>Average Shore hardness



### Ordering Data Sealing Profiles DI-PROF

Sealing profile DI-PROF is delivered in the desired length. Accounting unit 1 m.

## Sealing Profiles DI-PROF

Dimensions from 5.5x8 mm to 30x25 mm



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### **Sealing Profiles DI-PROF**

Туре	Part Number
DI-PROF 5.5x8 2K-MOS CR-20/60	10.01.01.10554
DI-PROF 9x9.7 2K-MOS CR-20/60	10.01.01.10527
DI-PROF 20x15 2K-SWG NK-20/55	10.07.04.00040
DI-PROF 30x25 2K-SWG NK-20/55	10.07.04.00041
DI-PROF 6x8 MOS NK-20 HR	10.07.04.00014
DI-PROF 8x14 MOS NK-20 DL	10.07.04.00012
DI-PROF 10x6 MOS EPDM-20	10.07.04.00006
DI-PROF 10x20 MOS EPDM-20 HR	10.07.04.00010
DI-PROF 11x23 MOS CR-20 DL	10.07.04.00015
DI-PROF 12x17 MOS EPDM-20 HR	10.07.04.00011
DI-PROF 25x20 MOS EPDM-20	10.07.04.00007

### **Technical Data Sealing Profiles DI-PROF**

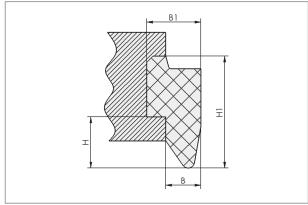
Туре	Min. installation radius	Operating temperature	Recommended slot width	Length (max) [m]
	[mm]	[°C]	x slot depth [mm]	
DI-PROF 5.5x8 2K-MOS CR-20/60	65	-30.0 90.0	-	15
DI-PROF 9x9.7 2K-MOS CR-20/60	85	-30.0 90.0	-	15
DI-PROF 20x15 2K-SWG NK-20/55	120	-35.0 70.0	-	30
DI-PROF 30x25 2K-SWG NK-20/55	200	-35.0 70.0	-	30
DI-PROF 6x8 MOS NK-20 HR	10	-25.0 60.0	7 x 4	50
DI-PROF 8x14 MOS NK-20 DL	20	-25.0 60.0	9 x 6.5	100
DI-PROF 10x6 MOS EPDM-20	10	-25.0 70.0	11 x 3	50
DI-PROF 10x20 MOS EPDM-20 HR	10	-25.0 70.0	11 x 10	50
DI-PROF 11x23 MOS CR-20 DL	20	-25.0 70.0	12 x 11.5	50
DI-PROF 12x17 MOS EPDM-20 HR	10	-25.0 70.0	13 x 10	50
DI-PROF 25x20 MOS EPDM-20	30	-25.0 70.0	26 x 10	25

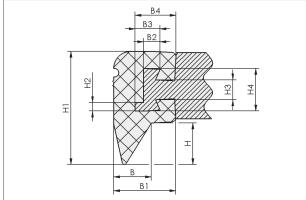
## Sealing Profiles DI-PROF

Dimensions from 5.5x8 mm to 30x25 mm



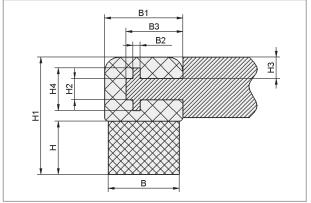
### **Design Data Sealing Profiles DI-PROF**

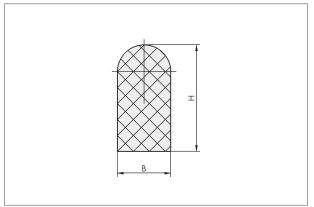




DI-PROF 5.5x8

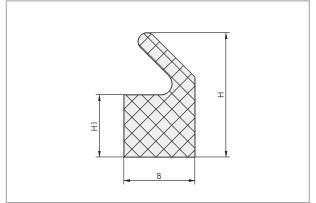
DI-PROF 9x9.7

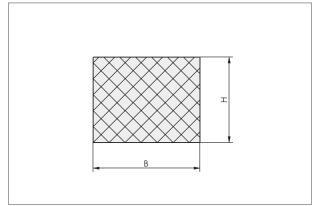




DI-PROF 20x15 and DI-PROF 30x25

DI-PROF 6x8 HR to DI-PROF 12x17 HR





DI-PROF 8x14 DL

DI-PROF 10x6 and DI-PROF 25x20

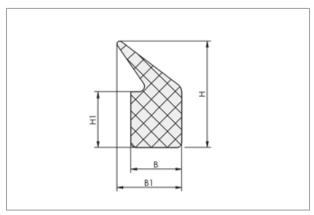
## Sealing Profiles DI-PROF

Dimensions from 5.5x8 mm to 30x25 mm



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DI-PROF 11x23 DL

Туре	Dimensions in mm*									
	В	B1	B2	В3	B4	Н	H1	H2	Н3	H4
DI-PROF 5.5x8 2K-MOS CR-20/60	5.5	8.5	-	-	-	8.0	17.5	-	-	-
DI-PROF 9x9.7 2K-MOS CR-20/60	9.0	14.5	3.9	5.9	9.6	9.7	26.5	2	4.7	10
DI-PROF 20x15 2K-SWG NK-20/55	20.0	22.0	2.0	16.0	-	15.0	33.0	6	6.0	12
DI-PROF 30x25 2K-SWG NK-20/55	30.0	32.0	2.0	24.0	-	25.0	53.0	8	10.0	17
DI-PROF 6x8 MOS NK-20 HR	6.0	-	-	-	-	8.0	-	-	-	-
DI-PROF 8x14 MOS NK-20 DL	8.0	-	-	-	-	14.0	7.0	-	-	-
DI-PROF 10x6 MOS EPDM-20	10.0	-	-	-	-	6.0	-	-	-	-
DI-PROF 10x20 MOS EPDM-20 HR	10.0	-	-	-	-	20.0	-	-	-	-
DI-PROF 11x23 MOS CR-20 DL	11.0	14.0	-	-	-	23.0	12.0	-	-	-
DI-PROF 12x17 MOS EPDM-20 HR	12.0	-	-	-	-	17.0	-	-	-	-
DI-PROF 25x20 MOS EPDM-20	25.0	-	-	-	-	20.0	-	-	-	-

<sup>\*</sup>Acceptable dimensional tolerances for rubber parts concerning to DIN ISO 3302-1 M3

### Filter Discs FD

Diameter (Ø) from 16 mm to 55 mm









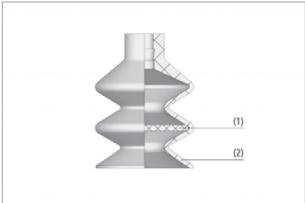
### **Suitable for Industry Specific Applications**



Filter discs FD

# **Applications**

- Filter disc to protect the vacuum system from dust and dirt, without changing the flow resistance
- Filter disc prevents the workpiece from being pilled into the suction cup



System design filter discs FD

# Design

- Filter disc (1) made of porous polyethylene (sinter PE)
- Filtration grade 120 µm
- Can be placed directly into the suction cup (2)



Bellows suction cups with filter discs FD being used for handling wooden boards

### Our Highlights...

- Placed directly in a fold of the suction cup
- Wide variety of diameters
- Stable filter disc

### Your Benefits...

- > Dirt and dust is filtered out directly at the workpiece
- > Wide range of application possibilities for suction cup series FGA and FG
- > High intrinsic stability of the suction cup; stops the workpiece from being sucked in



### Filter Discs FD

Diameter (Ø) from 16 mm to 55 mm

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Abbreviated designation	Diameter in mm	Porosity in µm
Example FD 16 120: FD	16	120
FD	16	120
	to	
	55	

### Ordering Data Filter Discs FD

Filter discs FD is delivered in the desired diameter.

### Filter Discs FD

Туре	Part Number
FD 16 120	10.01.06.02565
FD 18 120	10.01.06.02567
FD 22 120	10.01.06.02566
FD 27 120	10.01.06.02571
FD 30 120	10.01.06.02568
FD 34 120	10.01.06.02572
FD 38 120	10.01.06.02569
FD 44 120	10.01.06.02573
FD 55 120	10.01.06.02570

### **Technical Data Filter Discs FD**

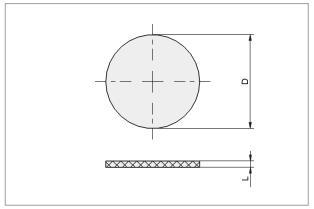
Туре	Porosity [µm]	For suction cup type
FD 16 120	120	FG20/FGA20
FD 18 120	120	FG25/FGA25
FD 22 120	120	FGA22
FD 27 120	120	FG32
FD 30 120	120	FGA33
FD 34 120	120	FG42
FD 38 120	120	FGA43
FD 44 120	120	FG52
FD 55 120	120	FGA53



Filter Discs FD

Diameter (Ø) from 16 mm to 55 mm

### Design Data Filter Discs FD



Filter disc FD

Туре	Dimensions in mm	
	D	L
FD 16 120	16	1.5
FD 18 120	18	1.5
FD 22 120	22	1.5
FD 27 120	27	1.5
FD 30 120	30	1.5
FD 34 120	34	1.5
FD 38 120	38	1.5
FD 44 120	44	1.5
FD 55 120	55	1.5

## Suction Cup Inserts SPI PEEK



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Suction area (Ø) from 6 mm to 32 mm



### Suitable for Industry Specific Applications



Suction cup inserts SPI PEEK for bellows suction cups

### **Applications**

- Suction cup inserts for gentle and mark-free gripping and depositing of smooth workpieces
- Application with crystalline solar cells, thin-film modules and wafers / substrates in the semiconductor area
- Handling of glass such as display glass, thin glass with thickness < 0.1 mm or coated glass without leaving a chemical fingerprint by elastomers
- Use in combination with bellows suction cups FGA (1.5 folds) and FG (2.5 folds)

### Design

- Suction cup inserts made of PEEK with support structure and vacuum channels
- Inserts are tool-free clipped into the lower suction cup fold of bellows suction cups

### Our Highlights...

- Suction cup inserts made of **PEEK**
- Structure with defined contact area, flow grooves and vacuum channels
- Smart vacuum distribution on the suction surface
- Clip-in assembly in suction cups without tools
- Even sealing surface

### Your Benefits...

- > Non-marking and gentle handling of thin, flat workpieces without leaving chemical fingerprints
- > Defined and low surface pressure on the workpiece surface
- > High leakage compensation for high effective suction forces
- > Quick and easy installation and replacement
- > Low stress in the workpiece

## **Designation Code Suction Cup Inserts SPI PEEK**

Abbreviated designation	Diameter in mm	Material
Example SPI 9 PEEK:		
SPI	9	PEEK
SPI	6	PEEK Polyetheretherketon
	to	
	32	

## **Ordering Data Suction Cup Inserts SPI PEEK**

Suction cup insert SPI PEEK is delivered with the desired diameter.



## Suction Cup Inserts SPI PEEK

Suction area (Ø) from 6 mm to 32 mm

### **Suction Cup Inserts SPI PEEK**

Туре	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*	For suction cup type**
SPI 6 PEEK	FG5/FGA6
SPI 9 PEEK	FG9
SPI 11 PEEK	FGA11
SPI 14 PEEK	FG12/FG14/FGA14
SPI 17 PEEK	FG18/FGA16
SPI 18 PEEK	FGA20
SPI 21 PEEK	FG20/FGA22
SPI 25 PEEK	FG25/FGA25
SPI 32 PEEK	FG32/FGA33

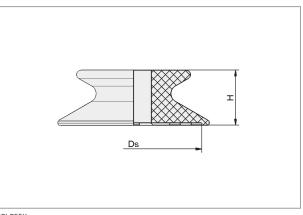
<sup>\*</sup>Suction capacity of min. 2 I/min is recommended. An experiment has to be carried out with the original workpiece and suction cups to define the required suction power for the application. Frictional force is reduced during vertical applications. \*\*Suitable suction cups are to find in chapter 3.



## Suction Cup Inserts SPI PEEK

Suction area (Ø) from 6 mm to 32 mm

### **Design Data Suction Cup Inserts SPI PEEK**



SPI PEEK

Туре	Dimensions in mm	
	Ds	н
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

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## Suction Cup Covers SU

Diameter (Ø) from 30 mm to 360 mm







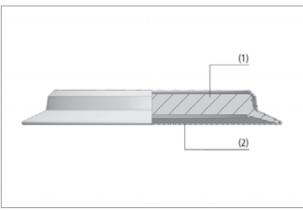
### Suitable for Industry Specific Applications



Suction cup covers SU

### **Applications**

- Suction cup cover for handling sensitive, flat and smooth workpieces (coated, processed or painted) to prevent marks and
- For use in manufacturing, processing and transportation, for example in the glass and solar industry
- Used in combination with suction cups and suction plates



System design suction cup covers SU

### Design

- Suction cup cover SU is made of a robust fleece material that is highly tear-resistant as well as extremely resistant to chemicals
- The material is abrasion-free and enables gentle handling of workpieces
- The cover (2) can be easily slid over the suction cup or the suction plate (1) and fastened with the integrated rubber band
- With diameters from 30 to 360 mm, the covers are designed to match the corresponding diameter ranges of the suction plates and suction cups



Suction cup covers SU being used for handling sensitive glass sheets

### Our Highlights...

- Suction cup cover made of special fleece material (PP/PE)
- Integrated rubber band
- Large range of diameters

### Your Benefits...

- > No marks on sensitive workpieces (e.g. glass), highly tear-resistant
- > Quick and easy installation on suction plates and suction cups
- > Installation on flat suction cups, bellows suction cups and suction plates



### Suction Cup Covers SU

Diameter (Ø) from 30 mm to 360 mm

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# **Designation Code Suction Cup Covers SU**

Abbreviated designation	Diameter .
	in mm
Example SU 120:	
SU	120
SU	30
	to
	360

### **Ordering Data Suction Cup Covers SU**

Suction cup cover SU is delivered in the desired diameter.

### **Suction Cup Covers SU**

_	S
Туре	Part Number
SU 30	10.01.01.12889
SU 40	10.01.01.12856
SU 50	10.01.01.12837
SU 70	10.01.01.12838
SU 80	10.01.01.12839
SU 100	10.01.01.12840
SU 120	10.01.01.12437
SU 160	10.01.01.12438
SU 210	10.01.01.12439
SU 230	10.01.01.12440
SU 280	10.01.01.12485
SU 300	10.01.01.12843
SU 360	10.01.01.12842

## **Technical Data Suction Cup Covers SU**

Type*	Weight [g]	Clamping range
SU 30	0.9	27 - 35 mm
SU 40	1.2	35 - 45 mm
SU 50	1.3	45 - 60 mm
SU 70	1.7	65 - 80 mm
SU 80	2.0	80 - 100 mm
SU 100	2.0	100 - 115 mm
SU 120	2.0	115 - 130 mm
SU 160	4.0	150 - 180 mm
SU 210	4.0	210 - 220 mm
SU 230	5.0	230 - 250 mm
SU 280	9.0	270 - 300 mm
SU 300	17.0	300 - 330 mm
SU 360	23.0	360 - 400 mm
	·	· · · · · · · · · · · · · · · · · · ·

<sup>\*</sup>In vertical applications with a suction plate or cup, the lateral force sinks by up to 70%. The vacuum generator must be able to provide 10% more suction power.

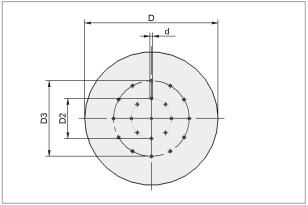


## Suction Cup Covers SU

Diameter (Ø) from 30 mm to 360 mm

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### **Design Data Suction Cup Covers SU**



SU 30 to 360

Туре	Dimensions in mm			
	d	D	D2	D3
SU 30	3	30	-	-
SU 40	3	40	-	-
SU 50	5	50	30	-
SU 70	5	70	30	-
SU 80	5	80	30	-
SU 100	6	100	50	-
SU 120	6	120	50	-
SU 160	6	160	50	-
SU 210	6	210	50	-
SU 230	6	230	50	-
SU 280	6	280	50	-
SU 300	6	300	90	170
SU 360	6	360	90	170

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### Protection Covers PC



## Diameters (Ø) 125 mm to 400 mm



### Suitable for Industry Specific Applications



Suction cup protection covers PC

### **Applications**

- High quality protection cover for suction plates during storage or when not in use
- Protection against pollution (dust or moisture) and aging (by ozone or UV impact) in outdoor areas
- Use with suction plates and suction cups such as SPU and SGF
- Use with manual glass lifting devices indoors and outdoors during storage and transport

### Design

- Robust and tear-resistant material, resistant to external environmental influences
- Mounted tool-free to suction cups/suction plates and fastened with the integrated elastic band
- Diameters of the covers are designed to match the corresponding diameter ranges of the suction plates and suction cups

### Our Highlights...

- High quality protection cover for suction plates
- Integrated elastic band
- Large range of diameters

### Your Benefits...

- > Reduced risk of contamination and damage of the sealing lip during storage
- > Fast and easy installation on suction plates and suction cups
- > Installation on flat suction cups, bellows suction cups and suction plates

### **Designation Code Protection Covers PC**

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



### **Ordering Data Protection Covers PC**

Protection cover PC is delivered with the desired diameter.



### Protection Covers PC

Diameters (Ø) 125 mm to 400 mm

### **Protection Covers PC**

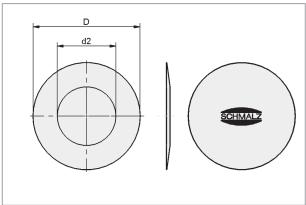
Туре	Part Number
PC 125	10.01.01.13086
PC 150	10.01.01.13087
PC 175	10.01.01.13088
PC 200	10.01.01.13089
PC 250	10.01.01.13090
PC 300	10.01.01.13091
PC 350	10.01.01.13092
PC 400	10.01.01.13093

### **Technical Data Protection Covers PC**

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

<sup>\*</sup>Suction cup protection covers PC are designed for the use with suction cups and suction plates that are out of use. They cannot be used during handling.

### **Design Data Protection Covers PC**



PC 125 to 300

Туре	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

Vacuum Vacuum Suction Cups Knowledge

## Sealing Rings DR-MOS SI

Diameter (Ø) from 20 mm to 88 mm

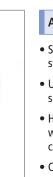




### Suitable for Industry Specific Applications

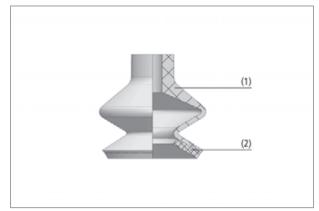


Sealing rings DR-MOS SI



**Applications** 

- Sealing ring made from special foam for an optimum sealing on structured surfaces
- Used on structured surfaces (studded, rippled or rough) where suction cups hardly seal or cannot seal at all
- Handling of packaging materials and flat or uneven workpieces with structured surfaces such as foil packed products or plastic components
- Can be used as an accessory for suction cup series FG and FGA made from silicone



System design sealing rings DR-MOS SI

### Design

- Sealing ring of high-quality silicone foam (2) for gluing onto the silicone suction cup (1)
- Available in a variety of diameters and thicknesses, suitable for standard suction cup series FGA (1.5 folds) and FG (2.5 folds)
- Material connection with silicone adhesive



Standard suction cup with sealing ring DR-MOS SI being used for handling structured

### Our Highlights...

- Foam rings for gluing onto bellows suction cup
- Available in a variety of diameters and thicknesses
- Silicone adhesive available as accessory

### Your Benefits...

- > Optimal sealing on structured surfaces
- > Wide range of application possibilities for standard suction cup series FGA (1.5 folds) and FG (2.5 folds)
- > Secure mounting and connection to the suction cup



## Sealing Rings DR-MOS SI

Diameter (Ø) from 20 mm to 88 mm

	V.
	4
$N_{4}$	

### **Designation Code Sealing Rings DR-MOS SI**

Abbreviated designation	Dimensions in mm	Height in mm	Material and Shore hardness
Example DR 20/10x2 MOS SI-15: DR	20/10	x2	MOS SI-15
DR	20/10 to 88/64 outside/inside	x2 x5	MOS SI-15 silicone



### **Ordering Data Sealing Rings DR-MOS SI**

Sealing profile DR-MOS SI is delivered with the desired characteristics.

Available accessories: silicone adhesive

### **Sealing Rings DR-MOS SI**

Туре	Part Number
DR 20/10x2 MOS SI-15	10.01.06.02618
DR 22.5/13x2 MOS SI-15	10.01.06.02614
DR 32/19x2 MOS SI-15	10.01.06.02615
DR 42/20x5 MOS SI-15	10.01.06.02616
DR 52/33x5 MOS SI-15	10.01.06.02548
DR 62/42x5 MOS SI-15	10.01.06.02617
DR 78/54x5 MOS SI-15	10.01.06.02619
DR 88/64x5 MOS SI-15	10.01.06.02620



### Ordering Data Accessories Sealing Rings DR-MOS SI

Туре	Part Number
Silicone adhesive (90 ml tube)	27.03.04.00003



### Technical Data Sealing Rings DR-MOS SI

Туре	For suction cup type*	Material-Type	Temperature resistance [°C]	Colour
DR 20/10x2 MOS SI-15	FGA 20	Foam rubber	180	beige
DR 22.5/13x2 MOS SI-15	FGA-22, FGA-25, FG-25	Foam rubber	180	beige
DR 32/19x2 MOS SI-15	FGA-33, FG-32	Foam rubber	180	beige
DR 42/20x5 MOS SI-15	FGA-43, FG-42	Foam rubber	180	beige
DR 52/33x5 MOS SI-15	FGA-53, FG-52	Foam rubber	180	beige
DR 62/42x5 MOS SI-15	FGA-63, FG-62	Foam rubber	180	beige
DR 78/54x5 MOS SI-15	FGA-78	Foam rubber	180	beige
DR 88/64x5 MOS SI-15	FG-88	Foam rubber	180	beige

<sup>\*</sup>Suitable for the silicone suction cup types listed

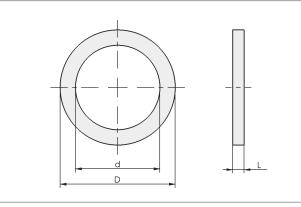
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## Sealing Rings DR-MOS SI

Diameter (Ø) from 20 mm to 88 mm

### Design Data Sealing Rings DR-MOS SI



DR-MOS SI

Туре	Dimensions in mm		
	d	D	L
DR 20/10x2 MOS SI-15	10	20.0	2
DR 22.5/13x2 MOS SI-15	13	22.5	2
DR 32/19x2 MOS SI-15	19	32.0	2
DR 42/20x5 MOS SI-15	20	42.0	5
DR 52/33x5 MOS SI-15	33	52.0	5
DR 62/42x5 MOS SI-15	42	62.0	5
DR 78/54x5 MOS SI-15	54	78.0	5
DR 88/64x5 MOS SI-15	64	88.0	5

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# **Special Grippers**

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### Overview of Section 4

## **Special Grippers**

At a Glance



### **Selection Aid** Page



### Selection by Workpiece

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# **Floating Suction Cups**



### Floating Suction Cups SBS







Floating suction cup for low-contact handling of fragile workpieces such as paper, film, printed circuit boards or wafers and solar cells.

• Diameter: 20 to 120 mm

• Holding force: 2.0 to 104.0 N

 Rubber buffer on the bottom side of the suction cup

### **Magnetic Grippers**



### **Magnetic Grippers SGM**



Special gripper with permanent magnet for safe handling of magnetic workpieces such as perforated metal sheets.

• Holding force: 35 to 290 N

• Diameter: 30 to 70 mm

### **Needle Grippers**



### **Needle Grippers SNGi-AE**



• Needle diameter: 0.8 mm or 1.2 mm

• No. of needles: 10

• Needle stroke: 3 mm to 20 mm (variable)

Electrical needle gripper in compact, maintenance friendly design with automatic, continuously adjustable stroke and IO-Link interface for handling materials that are difficult to grip using vacuum such as composite textiles, etc.



### **Needle Grippers SNG-AP**



• Needle diameter: 0.8 mm or 1.2 mm

• No. of needles: 10 • Needle stroke: 3 mm to 20 mm (variable) Pneumatic needle gripper in compact, maintenancefriendly design with manual, continuously adjustable stroke for handling materials that are difficult to grip using vacuum such as composite textiles, etc.



### **Needle Grippers SNG-V**



• Needle diameter: 1.2 mm • Number of needles: 10

• Needle stroke: 0 mm to 7 mm (variable)

Needle gripper with intersecting needles and manual, continuously adjustable stroke for materials that are difficult to grip like composite textiles and much more.

## **Overview of Section 4**

## **Special Grippers**

At a Glance



### **Needle Grippers SNG-M**



Needle gripper with a compact design for materials which are difficult to handle with vacuum.

### · Number of needles: 4 Needle stroke: 3.0 mm

Needle diameter: 0.8 mm

### Wafer Grippers



### Wafer Grippers SWGm



Wafer gripper for extremely quick and gentle handling of

wafers and solar cells with maximum process reliability.

 Dimensions: 125 x 125 mm and 156 x 156 mm

- Selectable base model with axial exhaust air or sideways exhaust air

### Material suction plate: PEEK

### **Composite Grippers**



### **Composite Grippers SCG**









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- Suction rate: 270 l/min to 650 l/min
- · Diameter suction plate: 40 mm and
- Material suction plate: POM

Special gripper with integrated vacuum generation and high flow rate for handling fragile workpieces with unstable shapes.

### Flow Grippers SCG



• Flow gripper with axial or sideways

- Suction cup with 1.5 folds made of fda compliant material silicone
- Diameter suction cup: 50 mm

Modular flow gripper with suction cup made of fda-compliant material for handling dry food products such as cookies, cakes and waffles.

### Thin glass grippers



### Thin Glass Grippers STGG





Area gripper for gentle, contamination-free and extremely dynamic handling of sensitive workpieces such as thinnest display glass in fully-automated or semiautomated processes.

### Suction area: 100 x 55 mm and

- 170 x 105 mm Integrated vacuum generator or connec-
- tion to external vacuum generator Material suction area: PEEK
- Suction rate: 31 to 235 l/min

### **Feed Ejectors**



### Feed Ejectors SEC



• Suction capacity up to 8,640 l/min

• Diameter 6 to 75 mm

Ejector with high evacuation volume for applying suction to very porous parts and for transportation of bulk materials.

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# **Overview of Section 4**

## **Special Grippers**

At a Glance



### Vacuum Lifting Cylinders HS



### **Vacuum Lifting Cylinders HS**



- Body of aluminium with integrated lifting cylinder
- Connection thread M5 and G1/8" for suction cups

Vacuum-actuated automatic lifting cylinder for fast separation of films and paper.

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# **Special Grippers**

## Selection Aid



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### **Selection by Workpiece**

For workpieces that are difficult or impossible to handle with suction cups, the "Special Grippers" section offers alternatives. There follow some examples of applications to assist selection of the appropriate special grippers:

Applications	Workpiece	Schmalz Special Gripper Type	rs Product Properties
METAL	Ferromagnetic sheet metal, perforated plate	Magnetic grippers SGM	Handling using a permanent magnet     Absorption of lateral forces by friction ring
GUSS	Thin, delicate glass such as display glass	Thin glass gripper STGG	<ul> <li>Large contact surface for delicate handling</li> <li>With integrated vacuum generation as an option</li> <li>High flow rate for a secure grip</li> </ul>
BECTRONIS	Delicate components such as blank circuit boards	Floating suction cup SBS	Low-contact handling     Integrated vacuum generation     Effective leakage compensation
anos.	Solar components such as wafers and solar cells	Wafer gripper SWGm	<ul> <li>Extremely fast and precise handling</li> <li>Integrated vacuum generation with high suction rate</li> <li>Product dimensions especially for wafer sizes 125 x 125 mm and 156 x 156 mm</li> </ul>
		Floating suction cup SBS	Low-contact handling     Integrated vacuum generation
PASTICS	Thin workpieces such as plastic film and paper	Floating suction cup SBS	<ul> <li>Low-contact handling</li> <li>Integrated vacuum generation</li> <li>Effective leakage compensation</li> <li>Absorption of lateral forces by elastomer cushions on the underside</li> </ul>
PACKAGING		Composite grippers SCG	<ul> <li>Integrated vacuum generation</li> <li>High flow rate for a secure grip on even porous workpieces</li> <li>Large contact surface for delicate handling</li> </ul>
SOLAR		Wafer gripper SWGm	Extremely fast and precise handling     Integrated vacuum generation with high suction rate
		Thin glass gripper STGG	<ul><li> Large contact surface for delicate handling</li><li> With integrated vacuum generation as an option</li><li> High flow rate for a secure grip</li></ul>
COMPOSITE	Porous, flexible workpieces such as technical fiber composites, textiles, foam, construction materials and non-wovens	Needle grippers SNG/SNGi	Needle grippers with variable needle stroke and different needle diameters that can be adjusted for individual workpiece geometries     Electrical version with infinitely adjustable stroke
		Floating suction cup SBS	Low-contact handling     Integrated vacuum generation     Effective leakage compensation
		Composite grippers SCG	<ul> <li>Integrated vacuum generation</li> <li>High flow rate for a secure grip on even porous workpieces</li> <li>Large contact surface for delicate handling</li> </ul>

## Floating Suction Cups SBS

Diameter (Ø) from 20 mm to 120 mm









### Suitable for Industry Specific Applications

• Floating suction cup for handling and separation of extremely thin workpieces without permanent deformation (e.g. film, paper,

• Handling of very porous workpieces (e.g. printed circuit board) • Handling of highly sensitive workpieces (e.g. wafer, solar cells)

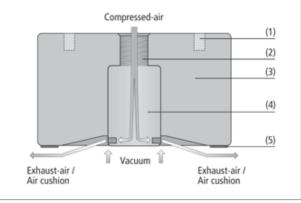


Floating suction cups SBS

### Design

**Applications** 

- · Connection directly via four mounting threads on the top side of the gripper (1)
- Vertical (2) and horizontal compressed-air connections (closed with a plug)
- Anodized aluminum body with integrated Bernoulli nozzle (3)
- Streaming element (4) in two versions: Standard Flow SF for airtight workpieces and High Flow HF with higher leakage compensation for porous workpieces
- Mark-free rubber buffer of special material HT1 on the bottom side of the suction cup (5)
- Optional available with central support



System design floating suction cups SBS



Floating suction cups SBS being used for handling thin wood veneer

### Our Highlights...

- Integrated vacuum generation on the Bernoulli principle
- Suction cup "floats" on an air cushion
- High volume flow rate at a low vacuum
- No air is drawn through the workpiece
- Elastomer buffer made of HT1 on the bottom side
- · Optional with central support (additional HT1 buffer)

### Your Benefits...

- > Operating without ejector
- > Low-contact handling
- > Very good compensation of leakages
- > Reliable separation of thin, porous workpieces
- > Absorption of lateral forces
- > Safe handling of wafer and solar cells

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### Floating Suction Cups SBS

Diameter (Ø) from 20 mm to 120 mm



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### **Designation Code Floating Suction Cups SBS**

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



### **Ordering Data Floating Suction Cups SBS**

Floating suction cup SBS is delivered assembled. The assembly consists of:

- Floating suction cup of type SBS available in various diameters
- Elastomer buffer made of the material HT1
- Optional product addition: central support

Available spare parts: rubber buffer

### **Floating Suction Cups SBS**

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

### **Ordering Data Spare Parts Floating Suction Cups SBS**

Туре	Rubber buffer	Central support
SBS 20 SF M5-IG	10.01.01.12585	-
SBS 20 HF M5-IG	10.01.01.12585	-
SBS 30 SF M5-IG	10.01.01.12585	-
SBS 30 HF M5-IG	10.01.01.12585	-
SBS 40 SF G1/8-IG	10.01.01.12593	-
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 40 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	-

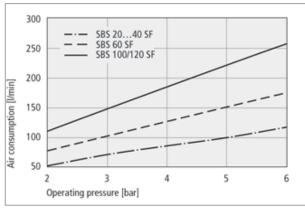
## Floating Suction Cups SBS

Diameter (Ø) from 20 mm to 120 mm

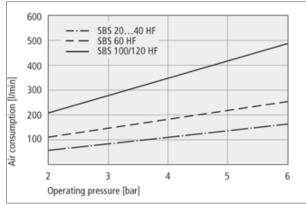




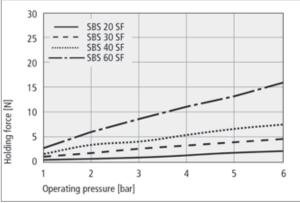
### **Performance Data Floating Suction Cups SBS**



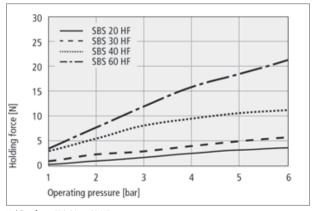




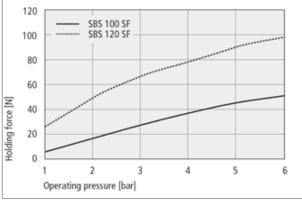
Air consumption SBS 20 to 120 HF



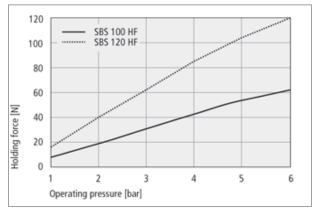
Holding force SBS 20 to 60 SF



Holding force SBS 20 to 60 HF



Holding force SBS 100 and 120 SF



Holding force SBS 100 and 120 HF

Special Grippers

## Floating Suction Cups SBS



Special Grippers

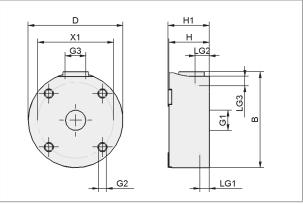
Diameter (Ø) from 20 mm to 120 mm

### **Technical Data Floating Suction Cups SBS**

Туре	Holding force	Air consumption	Pressure range	Operating temperature	Weight
	[N]*	[l/min]*	(operatingressure)bar]	[°C]	[g]
SBS 20 SF M5-IG	2.0	100	1.0 6.0	0 80	12
SBS 20 HF M5-IG	3.0	140	1.0 6.0	0 80	12
SBS 30 SF M5-IG	4.0	100	1.0 6.0	0 80	31
SBS 30 HF M5-IG	5.0	140	1.0 6.0	0 80	31
SBS 40 SF G1/8-IG	6.5	100	1.0 6.0	0 80	51
SBS 40 SF G1/8-IG CS	6.5	100	1.0 6.0	0 80	53
SBS 40 HF G1/8-IG	10.5	190	1.0 6.0	0 80	51
SBS 60 SF G1/8-IG	13.0	150	1.0 6.0	0 80	118
SBS 60 SF G1/8-IG CS	13.0	150	1.0 6.0	0 80	120
SBS 60 HF G1/8-IG	18.5	225	1.0 6.0	0 80	118
SBS 100 SF G1/8-IG	46.0	225	1.0 6.0	0 80	295
SBS 100 HF G1/8-IG	55.5	420	1.0 6.0	0 80	295
SBS 120 SF G1/8-IG	89.0	225	1.0 6.0	0 80	390
SBS 120 HF G1/8-IG	104.0	420	1.0 6.0	0 80	390

<sup>\*</sup>The values provided are based on an operating pressure of 5 bar, measured on a suction-tight workpiece. The actual values may differ depending on the properties of the

### **Design Data Floating Suction Cups SBS**



SBS 20 to 120

Туре	Dimension	s in mm									
	В	D	G1	G2	G3	Н	H1	LG1	LG2	LG3	X1
SBS 20 SF M5-IG	22.2	20	M5-F	M3-F	M5-F	17	17.5	5	6	6	15
SBS 20 HF M5-IG	22.2	20	M5-F	M3-F	M5-F	17	17.5	5	6	6	15
SBS 30 SF M5-IG	32.0	30	M5-F	M4-F	M5-F	17	17.5	5	6	6	22
SBS 30 HF M5-IG	32.0	30	M5-F	M4-F	M5-F	17	17.5	5	6	6	22
SBS 40 SF G1/8-IG	41.0	40	G1/8"-F	M4-F	G1/8"-F	17	17.5	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 40 HF G1/8-IG	41.0	40	G1/8"-F	M4-F	G1/8"-F	17	17.5	5	6	6	32
SBS 60 SF G1/8-IG	61.6	60	G1/8"-F	M4-F	G1/8"-F	17	17.5	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 60 HF G1/8-IG	61.6	60	G1/8"-F	M4-F	G1/8"-F	17	17.5	5	6	6	45
SBS 100 SF G1/8-IG	101.0	100	G1/8"-F	M4-F	G1/8"-F	17	17.5	5	6	6	75
SBS 100 HF G1/8-IG	101.0	100	G1/8"-F	M4-F	G1/8"-F	17	17.5	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

### Magnetic Grippers SGM

Suction area (Ø) from 30 mm to 70 mm



### Suitable for Industry Specific Applications

 Magnetic gripper for handling of perforated metal sheets, complex laser-cut workpieces and metal sheets with holes and



Magnetic grippers SGM

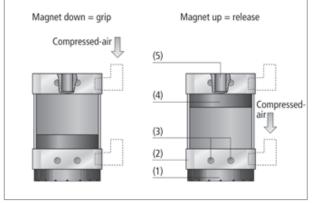
### Design

**Applications** 

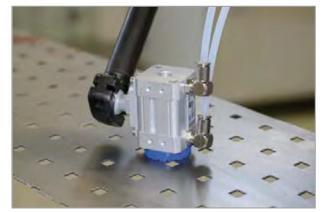
- Robust aluminum housing (2) with permanent magnet (4)
- Clip-on, easy to replace friction ring (1)

Handling of ferromagnetic workpieces

- Bistable design: the magnet settings "grip" and "release" are maintained in case of power loss
- Standard connection threads (5) in top cover
- Mounting threads (3) for holder systems HTS on three sides
- The holder system HTS offers several options for mounting a gripper onto the gripping apparatus; HTS...D version for interlocking and mounting two grippers
- SGM-S with piston control for sensor recognition of piston position of the magnetic gripper



System design magnetic grippers SGM



Magnetic grippers SGM being used for handling perforated metal sheets

### Our Highlights...

- Safe gripping by a permanent magnet
- Compact and lightweight design
- · Easily replaceable friction ring
- Optional side connection for tooling
- · Option to interlock two magnetic grippers (HTS...D)
- Piston control (only in series SGM-S in PNP or NPN version with IO-Link)

### Your Benefits...

- > No electric power required
- > Minimal space requirements, low total weight
- > High shear forces can be achieved
- > Flexible mounting options
- > Optimal for oblong workpiecs
- > Recognition of piston position via Hall effect sensor



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## Magnetic Grippers SGM

Suction area (Ø) from 30 mm to 70 mm



Special Grippers



### **Designation Code Magnetic Grippers SGM**

Abbreviated designation	Product addition	Diameter in mm	Connection mecanical	Switching function sensor
Example SGM-S 30 G1/8-IG PNP:				
SGM-S	S	30	G1/8-IG	PNP
SGM	S with piston control	30	G1/8-IG (IG = female (F))	NPN switches to minus
	HD Heavy Duty	40	G1/4-IG	PNP switches to plus
		50		
		70		



### **Ordering Data Magnetic Grippers SGM**

Magnet gripper SGM is delivered assembled. The assembly consists of:

- Gripper of type SGM available in various diameters
- Gripper of type SGM-HD stainless-steel grip surface for robust applications available in various diameters
- Friction ring made of the material PU
- Optional product addition: piston control (type SGM-S)

Available spare parts: friction ring Available accessories: holder system

### **Magnetic Grippers SGM**

Part Number
10.01.17.00162
10.01.17.00163
10.01.17.00164
10.01.17.00165
10.01.17.00200
10.01.17.00201
10.01.17.00202
10.01.17.00203
10.01.17.00216
10.01.17.00217
10.01.17.00218
10.01.17.00219
10.01.17.00184
10.01.17.00185
10.01.17.00273
10.01.17.00272

<sup>\*</sup>Note: suitable screw in push fittings can be found under "Screw in push fittings" in section "Filters and Connections"

### **Ordering Data Spare Parts Magnetic Grippers SGM**

Туре	Friction ring	Proximity switch PNP	Proximity switch NPN
SGM 30 / SGM-HD 30	10.01.17.00136	-	-
SGM 40 / SGM-HD 40	10.01.17.00137	-	-
SGM 50 / SGM-HD 50	10.01.17.00138	-	-
SGM 70 / SGM-HD 70	10.01.17.00139	-	-
SGM-S 30	10.01.17.00136	10.01.17.00199	10.01.17.00215
SGM-S 40	10.01.17.00137	10.01.17.00199	10.01.17.00215
SGM-S 50	10.01.17.00138	10.01.17.00199	10.01.17.00215
SGM-S 70	10.01.17.00139	10.01.17.00199	10.01.17.00215

# **Magnetic Grippers**

## Magnetic Grippers SGM

Suction area (Ø) from 30 mm to 70 mm



### Ordering Data Accessories Holder System (single) Magnetic Grippers SGM

Туре	Holder System HTS-A2*	Holder System HTS-A3*
SGM 30 / SGM-S 30 / SGM-HD 30	10.01.17.00169	10.01.17.00170
SGM 40 / SGM-S 40 / SGM-HD 40	10.01.17.00169	10.01.17.00170
SGM 50 / SGM-S 50 / SGM-HD 50	10.01.17.00172	10.01.17.00173
SGM 70 / SGM-S 70 / SGM-HD 70	10.01.17.00172	10.01.17.00173

<sup>\*</sup>Mounting screws included



### Ordering Data Accessories Holder System (double) Magnetic Grippers SGM

Туре	Holder System HTS-A2 D*	Holder System HTS-A3 D*
SGM 30 / SGM-S 30 / SGM-HD 30	10.01.17.00175	10.01.17.00176
SGM 40 / SGM-S 40 / SGM-HD 40	10.01.17.00175	10.01.17.00176
SGM 50 / SGM-S 50 / SGM-HD 50	10.01.17.00178	10.01.17.00179
SGM 70 / SGM-S 70 / SGM-HD 70	10.01.17.00178	10.01.17.00179

<sup>\*</sup>Mounting screws included



### **Technical Data Magnetic Grippers SGM**

Туре	Holding force	Remaining force	Pressure range	Installation	Principle of	Operating	Weight
	[N]*	[N]	(operating	position	operation	temperature	[g]
			pressure) [bar]			[°C]	
SGM 30	35	0.3	3.5 6.0	Any	Bistable	5 50	130
SGM 40	100	0.3	3.5 6.0	Any	Bistable	5 50	240
SGM 50	180	0.3	3.5 6.0	Any	Bistable	5 50	440
SGM 70	290	0.3	3.5 6.0	Any	Bistable	5 50	715
SGM-S 30	35	0.3	3.5 6.0	Any	Bistable	5 70	145
SGM-S 40	100	0.3	3.5 6.0	Any	Bistable	5 70	255
SGM-S 50	180	0.3	3.5 6.0	Any	Bistable	5 70	445
SGM-S 70	290	0.3	3.5 6.0	Any	Bistable	5 70	730
SGM-HD 30	35	0.3	3.5 6.0	Any	Bistable	5 70	191
SGM-HD 40	100	0.3	3.5 6.0	Any	Bistable	5 70	342
SGM-HD 50	180	0.3	3.5 6.0	Any	Bistable	5 70	594
SGM-HD 70	290	0.3	3.5 6.0	Any	Bistable	5 70	975

<sup>\*</sup>Note: The value given is a static value with no safety factor; based on a plate with a thickness of 2 mm. For system configurations with magnetic grippers SGM, a safety factor of S = 3 must be applied.

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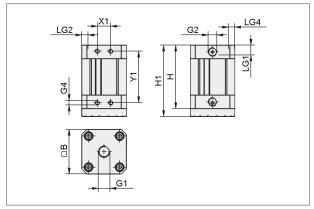
Special Grippers

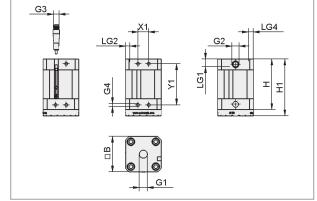
## Magnetic Grippers SGM



Suction area (Ø) from 30 mm to 70 mm

### **Design Data Magnetic Grippers SGM**





SGM 30 to 70 / SGM-HD 30 to 70

SGM-S 30 to 70

Туре	Dimensions in mm											
	B*	G1	G2	G3	G4	Н	H1	LG1	LG2	LG4	X1	Y1
SGM 30 G1/8-IG	30.0	G1/8"-F	G1/8"-F	-	M4-F	61.4	70.2	7	6	5	12	46
SGM 40 G1/4-IG	40.6	G1/4"-F	G1/8"-F	-	M4-F	61.4	70.2	11	6	7	12	46
SGM 50 G1/4-IG	50.6	G1/4"-F	G1/8"-F	-	M5-F	71.4	80.2	11	6	7	15	58
SGM 70 G1/4-IG	68.7	G1/4"-F	G1/8"-F	-	M5-F	71.4	80.2	11	6	8	15	58
SGM-S 30 G1/8-IG PNP	30.0	G1/8"-F	G1/8"-F	M12x1-M	M4-F	61.4	70.2	7	6	5	12	46
SGM-S 40 G1/4-IG PNP	40.6	G1/4"-F	G1/8"-F	M12x1-M	M4-F	61.4	70.2	11	6	7	12	46
SGM-S 50 G1/4-IG PNP	50.6	G1/4"-F	G1/8"-F	M12x1-M	M5-F	71.4	80.2	11	6	7	15	58
SGM-S 70 G1/4-IG PNP	68.7	G1/4"-F	G1/8"-F	M12x1-M	M5-F	71.4	80.2	11	6	8	15	58
SGM-S 30 G1/8-IG NPN	30.0	G1/8"-F	G1/8"-F	M12x1-M	M4-F	61.4	70.2	7	6	5	12	46
SGM-S 40 G1/4-IG NPN	40.6	G1/4"-F	G1/8"-F	M12x1-M	M4-F	61.4	70.2	11	6	7	12	46
SGM-S 50 G1/4-IG NPN	50.6	G1/4"-F	G1/8"-F	M12x1-M	M5-F	71.4	80.2	11	6	7	15	58
SGM-S 70 G1/4-IG NPN	68.7	G1/4"-F	G1/8"-F	M12x1-M	M5-F	71.4	80.2	11	6	8	15	58
SGM-HD 30 G1/8-IG	30.0	G1/8"-F	G1/8"-F	-	M4-F	61.4	70.2	7	6	5	12	46
SGM-HD 40 G1/4-IG	40.6	G1/4"-F	G1/8"-F	-	M4-F	61.4	70.2	11	6	7	12	46
SGM-HD 50 G1/4-IG	50.6	G1/4"-F	G1/8"-F	-	M5-F	71.4	80.2	11	6	7	15	58
SGM-HD 70 G1/4-IG	68.7	G1/4"-F	G1/8"-F	-	M5-F	71.4	80.2	11	6	8	15	58

<sup>\*</sup>Contact surface of the grippers (round) corresponds to dimension B

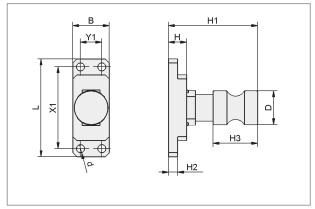
# **Magnetic Grippers**

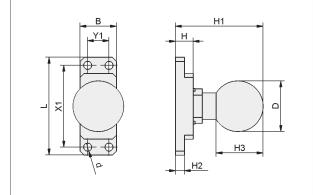
# Magnetic Grippers SGM

Suction area (Ø) from 30 mm to 70 mm

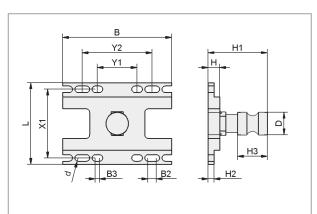


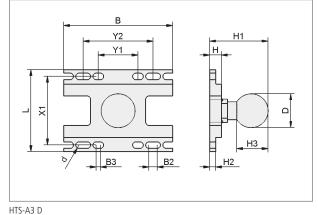
# **Design Data Accessories Magnetic Grippers SGM**





HTS-A2





HTS-A2 D

Туре	Dimensi	ons in mr	n										
	В	B2	В3	d	D	Н	H1	H2	Н3	L	X1	Y1	
HTS-A2 SGM 30/40*	20.5	-	-	4.6	19.0	10	49.9	5.2	25.0	55.0	46.0	12.0	
HTS-A3 SGM 30/40*	20.5	-	-	4.6	28.5	10	49.4	5.2	26.4	55.0	46.0	12.0	
HTS-A2 SGM 50/70**	26.0	-	-	5.6	19.0	10	49.9	5.2	25.0	69.0	58.0	15.0	
HTS-A3 SGM 50/70**	26.0	-	-	5.6	28.5	10	49.2	5.2	26.4	69.0	58.0	15.0	

HTS-A2 SGM 30/40*	20.5	-	-	4.6	19.0	10	49.9	5.2	25.0	55.0	46.0	12.0	-
HTS-A3 SGM 30/40*	20.5	-	-	4.6	28.5	10	49.4	5.2	26.4	55.0	46.0	12.0	-
HTS-A2 SGM 50/70**	26.0	-	-	5.6	19.0	10	49.9	5.2	25.0	69.0	58.0	15.0	-
HTS-A3 SGM 50/70**	26.0	-	-	5.6	28.5	10	49.2	5.2	26.4	69.0	58.0	15.0	-
HTS-A2 D SGM 30/40***	59.0	7.5	-	4.5	19.0	10	50.0	5.2	25.0	59.0	46.0	21.5	-
HTS-A3 D SGM 30/40***	59.0	7.5	-	4.5	28.5	10	49.3	5.2	26.4	59.0	46.0	21.5	-
HTS-A2 D SGM 50/70****	92.0	7.0	3.5	5.5	19.0	10	50.0	5.2	25.0	69.0	58.0	33.5	59.0
HTS-A3 D SGM 50/70****	92.0	7.0	3.5	5.5	28.5	10	49.3	5.2	26.4	69.0	58.0	33.5	59.0
* 1 11 6													

HTS-A3

Special Grippers

<sup>\*</sup>suitable for 1 SGM 30 or 1 SGM 40

<sup>\*\*</sup>suitable for 1 SGM 50 or 1 SGM 70

<sup>\*\*\*</sup>suitable for 2 SGM 30 or 2 SGM 40; not suitable for SGM-S 30  $\,$ 

<sup>\*\*\*\*</sup>suitable for 2 SGM 50 or 2 SGM 70  $\,$ 



### Suitable for Industry Specific Applications

• Needle gripper for handling non-rigid and highly porous materials

• Handling materials that are difficult to grip using vacuum such as textiles, fleece, filter materials, insulation and foam materials, and

• Flexible handling of materials with changing stacking height due





## Design

**Applications** 

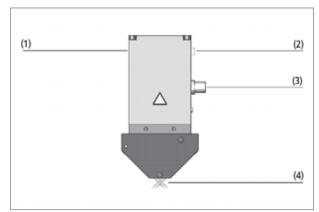
(primary textiles)

much more

• Electrically driven gripper

to free selectable stroke adjustment

- High-strength housing with lightweight design (1)
- Three sizes with needle strokes of max. 3 mm, 10 mm or 20 mm
- Ten needles (4) with diameters of 0.8 mm or 1.2 mm (depending on the model)
- Insertion angle of 30° or 45° (depending on the model)
- LED status display (2)
- IO-Link interface with M12 plug connection, 5-pin (3)
- Can also be mounted with the Schmalz holder system HTS



System design needle grippers SNGi-AE

Needle grippers SNGi-AE being used for handling composite textiles

## Our Highlights...

- Intersecting needles and small gripping area
- Needle stroke adjustable using definable process profiles
- Stroke can be adapted for each cycle; unlimited number of stroke sequences possible
- Blow-off function for fast and exact release of the workpiece
- · Continuous stroke monitoring
- IO-Link interface
- Quick and toolfree cleaning of the needles and replacing the needle modules
- Low power consumption

### Your Benefits...

- > Safe handling, even of small and very unstable workpieces
- > Individual adaptation to different workpiece geometries
- > Allows handling of single layers and complete stacks with just one gripper
- > High level of process reliability; short cycle times
- > Comprehensive process control available
- > Optimized start of operations and set-up times
- > Low maintenance
- > Easy connection to bus systems



# Needle Grippers SNGi-AE

Needle stroke max. 3 mm to max. 20 mm (variable)





## **Designation Code Needle Grippers SNGi-AE**

Abbreviated designation	Number of needles	Needle diameter in mm	Product addition	Needle stroke in mm	Product addition
Example SNGi-AE 10 0.8 V 3 IOL: SNGi-AE	10	0.8	v	3	IOL
SNGi-AE	10	0.8 1.2	V variable needle stroke	3 10 20	IOL IO-Link compatible



### **Ordering Data Needle Grippers SNGi-AE**

Needle gripper SNGi-AE is delivered assebled. The product consists of:

• Gripper of type SNGi-AE – available with various needle diameters and strokes

Available spare parts: needle modules, maintenance cover

Available accessories: mounting plate, holder system, connection cable, distributor

### **Needle Grippers SNGi-AE**

Туре	Part Number
SNGi-AE 10 0.8 V 3 IOL	10.01.29.00390
SNGi-AE 10 1.2 V 3 IOL	10.01.29.00394
SNGi-AE 10 0.8 V 10 IOL	10.01.29.00392
SNGi-AE 10 1.2 V 10 IOL	10.01.29.00396
SNGi-AE 10 1.2 V 20 IOL	10.01.29.00393



## Ordering Data Accessories Needle Grippers SNGi-AE

Туре	Туре	Part Number
HTS-A2 AP SNG	Holder system	10.01.29.00402
HTS-A3 AP SNG	Holder system	10.01.29.00322
BEF-PL 38x15x11.5 G1/4-IG SNG*	Mounting plate	10.01.29.00403
ASK B-M12-5 5000 PUR GE**	Connection cable	21.04.05.00080
ASK-S B-M12-5 1000 M12-5 PUR***	Connection cable	21.04.05.00158
ASK-S B-M12-5 2000 M12-5 PUR****	Connection cable	21.04.05.00211
ASV IO-L-A 2xM12-4****	Distributor	10.02.02.04336

<sup>\*</sup>Incl. mounting screws

<sup>\*\*\*\*\*</sup>Class A, 1 m + 0,3 m



### Ordering Data Spare Parts Needle Grippers SNGi-AE

Туре	Needle modules*	Maintenance over**
SNGi-AE 10 0.8 V 3 IOL	10.01.29.00405	10.01.29.00419
SNGi-AE 10 1.2 V 3 IOL	10.01.29.00406	10.01.29.00419
SNGi-AE 10 0.8 V 10 IOL	10.01.29.00407	10.01.29.00420
SNGi-AE 10 1.2 V 10 IOL	10.01.29.00408	10.01.29.00420
SNGi-AE 10 1.2 V 20 IOL	10.01.29.00409	10.01.29.00421

<sup>\*</sup>Set of two needle housings with needles

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company

acuum

action Cups

rippers

ping Systems

elements

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Valve

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<sup>\*\*</sup>Confectionable, 5 m

<sup>\*\*\*</sup>Class B, 1 m

<sup>\*\*\*\*</sup>Class B, 2 m

<sup>\*\*</sup>Set of 2 coverages

# Needle Grippers SNGi-AE

Needle stroke max. 3 mm to max. 20 mm (variable)



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Suction Cups

Special Grippers

Vacuum Grip

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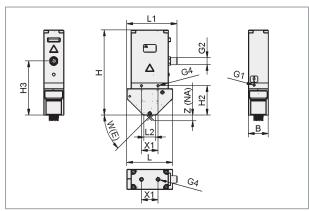
Products

# Technical Data Needle Grippers SNGi-AE

Туре	Number of needles	Needle diameter [mm]	Stroke [mm]*	Operating tempera- ture [°C]	Weight [g]	Electrical connection	Protection IP	Voltage	Current consumption [mA]**
SNGi-AE 10 0.8 V 3 IOL	10	0.8	3 mm	5 50	500	Male connect M12, 5 pol	IP 53	24V - DC	900
SNGi-AE 10 1.2 V 3 IOL	10	1.2	3 mm	5 50	500	Male connect M12, 5 pol	IP 53	24V - DC	900
SNGi-AE 10 0.8 V 10 IOL	10	8.0	10 mm	5 50	515	Male connect M12, 5 pol	IP 53	24V - DC	900
SNGi-AE 10 1.2 V 10 IOL	10	1.2	10 mm	5 50	515	Male connect M12, 5 pol	IP 53	24V - DC	900
SNGi-AE 10 1.2 V 20 IOL	10	1.2	20 mm	5 50	600	Male connect M12, 5 pol	IP 53	24V - DC	900

<sup>\*</sup>Needle speed approx. 8 mm/s per stroke

# Design Data Needle Grippers SNGi-AE



SNGi-AE

Туре	Dimensi	ons in mr	n										
	В	G1	G2	G4	Н	H2	Н3	L	L1	L2	W (E)	X1	Z (NA)
SNGi-AE 10 0.8 V 3 IOL	35	M5-F	M12-M	M5-F	140.0	40.2	83.2	65	80.0	28	30	29	3
SNGi-AE 10 1.2 V 3 IOL	35	M5-F	M12-M	M5-F	140.0	40.2	83.2	65	80.0	28	30	29	3
SNGi-AE 10 0.8 V 10 IOL	35	M5-F	M12-M	M5-F	151.5	51.5	94.5	80	87.5	22	45	29	10
SNGi-AE 10 1.2 V 10 IOL	35	M5-F	M12-M	M5-F	151.5	51.5	94.5	80	87.5	22	45	29	10
SNGi-AE 10 1.2 V 20 IOL	35	M5-F	M12-M	M5-F	178.0	78.2	121.0	120	107.5	22	45	29	20

<sup>\*\*</sup>Max. power consumption during normal operation 600 mA

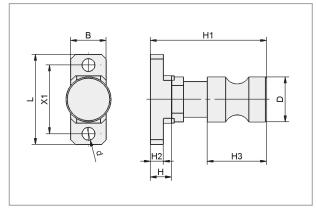
# Needle Grippers SNGi-AE

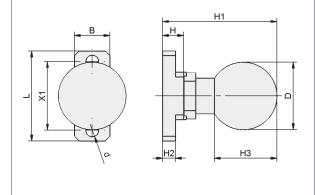
Needle stroke max. 3 mm to max. 20 mm (variable)



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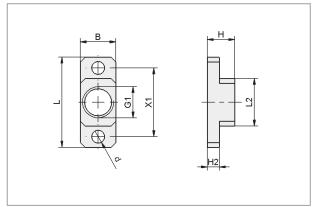
# **Design Data Accessories Needle Grippers SNGi-AE**





HTS-A2 AP SNG





BEF-PL

Туре	Dimensio	nensions in mm										
	В	d	D	G1	Н	H1	H2	Н3	L	L2	X1	
HTS-A2 AP SNG	15	5.5	19.0	-	9	49	5.5	25.0	38.0	-	29	
HTS-A3 AP SNG	15	5.5	28.5	-	9	48	5.5	26.4	38.0	-	29	
BEF-PL 38x15x11.5 G1/4-IG SNG	15	5.5	-	G1/4"-F	12	-	5.0	-	38.0	20.0	29	

Needle stroke max. 3 mm to max. 20 mm (variable)



# Needle Grippers SNG-AP



### Suitable for Industry Specific Applications

• Needle gripper for handling non-rigid and highly porous materials

• Handling materials that are difficult to grip using vacuum such as composite textiles, fleece, filter materials, insulation and foam

• Flexible handling of materials with changing stacking height due



Needle grippers SNG-AP



## Design

**Applications** 

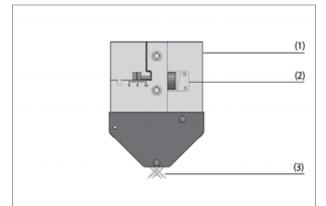
(primarily textiles)

materials etc.

· Driven by double-acting pneumatic cylinders

to free selectable stroke adjustment

- High-strength housing with lightweight design (1)
- Three sizes with needle strokes of max. 3 mm, 10 mm or 20 mm
- Adjustment wheel (2) with scale for continuous, simultaneous stroke adjustment
- Ten needles (3) with diameters of 0.8 mm or 1.2 mm (depending on the model)
- Insertion angle of 30° or 45° (depending on the model)
- Optional sensors for monitoring the needle end positions
- Can also be mounted with the Schmalz holder system HTS



System design needle grippers SNG-AP



Needle grippers SNG-AP being used for handling composite textiles

# Our Highlights...

- Intersecting needles and small gripping area
- Low weight and doubleacting pneumatic cylinders
- Tool-free simultaneous needle stroke adjustment up to a maximum of 20 mm
- One central pneumatic drive
- · Blow off function for fast and reliable load release
- Quick and tool-free cleaning of the needles and replacing the needle modules

#### Your Benefits...

- > Safe handling, even of small and very unstable workpieces
- > High acceleration for minimized cycle times
- > Individual adaptation to different workpiece geometries; fast start of operations and set-up time
- > Synchronous extension and retraction of the needles; reduces the need for couplings and hoses
- > High level of process reliability and exact positioning; short cycle times
- > Low maintenance

# Needle Grippers SNG-AP

Needle stroke max. 3 mm to max. 20 mm (variable)



## **Designation Code Needle Grippers SNG-AP**

Abbreviated designation	Number of needles	Needle diameter in mm	Product addition	Needle stroke in mm
Example SNG-AP 10 0.8 V 3: SNG-AP	10	0.8	v	3
SNG-AP	10	0.8	V variable needle stroke	3
		1.2	Stroke	20



## **Ordering Data Needle Grippers SNG-AP**

Needle gripper SNG-AP is delivered assembled. The product consists of:

• Gripper of type SNG-AP – available with various needle diameters and strokes

Available spare parts: needle modules, maintenance cover

Available accessories: mounting plate, holder system, add-on kit sensor

### **Needle Grippers SNG-AP**

Туре	Part Number
SNG-AP 10 0.8 V 3	10.01.29.00340
SNG-AP 10 1.2 V 3	10.01.29.00377
SNG-AP 10 0.8 V 10	10.01.29.00361
SNG-AP 10 1.2 V 10	10.01.29.00381
SNG-AP 10 1.2 V 20	10.01.29.00362



## Ordering Data Accessories Needle Grippers SNG-AP

Туре	Mounting plate*	Holder system A2*	Holder system A3*	Add-on kit sensor**	STV-W***
SNG-AP 10 0.8 V 3	10.01.29.00403	10.01.29.00402	10.01.29.00322	10.01.29.00400	10.08.02.00296
SNG-AP 10 1.2 V 3	10.01.29.00403	10.01.29.00402	10.01.29.00322	10.01.29.00400	10.08.02.00296
SNG-AP 10 0.8 V 10	10.01.29.00403	10.01.29.00402	10.01.29.00322	10.01.29.00400	10.08.02.00296
SNG-AP 10 1.2 V 10	10.01.29.00403	10.01.29.00402	10.01.29.00322	10.01.29.00400	10.08.02.00296
SNG-AP 10 1.2 V 20	10.01.29.00403	10.01.29.00402	10.01.29.00322	10.01.29.00400	10.08.02.00296

<sup>\*</sup>complete with mounting screws

## Ordering Data Spare Parts Needle Grippers SNG-AP

Туре	Needle modules*	Maintenance coverage**
SNG-AP 10 0.8 V 3	10.01.29.00405	10.01.29.00419
SNG-AP 10 1.2 V 3	10.01.29.00406	10.01.29.00419
SNG-AP 10 0.8 V 10	10.01.29.00407	10.01.29.00420
SNG-AP 10 1.2 V 10	10.01.29.00408	10.01.29.00420
SNG-AP 10 1.2 V 20	10.01.29.00409	10.01.29.00421

<sup>\*</sup>Set of two needle housings with needles

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<sup>\*\*</sup>Set of sensor and mounting element

<sup>\*\*\*</sup>Note: suitable screw in push fittings can be found under "Screw in push fittings" in section "Filters and Connections"

<sup>\*\*</sup>Set of two coverages

# Needle Grippers SNG-AP

Needle stroke max. 3 mm to max. 20 mm (variable)



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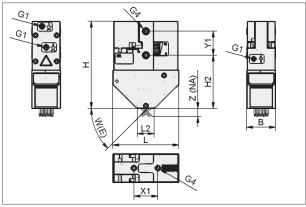
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# **Technical Data Needle Grippers SNG-AP**

Туре	Number of needles	Needle diameter	Additional function	(operating pressure)	temperature	Installation position	Weight [g]
		[mm]		[bar]	[°C]		
SNG-AP 10 0.8 V 3	10	0.8	Variable stroke	3.0 6.0	5 75	Any	190
SNG-AP 10 1.2 V 3	10	1.2	Variable stroke	3.0 6.0	5 75	Any	190
SNG-AP 10 0.8 V 10	10	8.0	Variable stroke	3.0 6.0	5 75	Any	225
SNG-AP 10 1.2 V 10	10	1.2	Variable stroke	3.0 6.0	5 75	Any	225
SNG-AP 10 1.2 V 20	10	1.2	Variable stroke	3.0 6.0	5 75	Any	400

## **Design Data Needle Grippers SNG-AP**



SNG-AP

Туре	Dimension	s in mm									
	В	G1	G4	Н	H2	L	L2	W (E)	X1	Y1	Z (NA)
SNG-AP 10 0.8 V 3	35	M5-F	M5-F	80.2	46.1	65	28	30	29	29	3
SNG-AP 10 1.2 V 3	35	M5-F	M5-F	80.2	46.1	65	28	30	29	29	3
SNG-AP 10 0.8 V 10	35	M5-F	M5-F	105.5	64.4	80	22	45	29	29	10
SNG-AP 10 1.2 V 10	35	M5-F	M5-F	105.5	64.4	80	22	45	29	29	10
SNG-AP 10 1.2 V 20	35	M5-F	M5-F	160.0	104.9	120	22	45	29	29	20

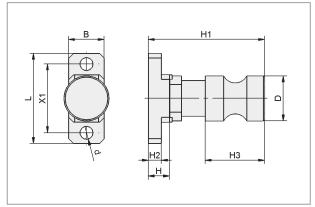
# Needle Grippers SNG-AP

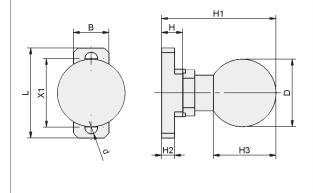
Needle stroke max. 3 mm to max. 20 mm (variable)



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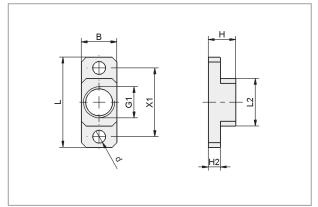
# **Design Data Accessories Needle Grippers SNG-AP**





HTS-A2 AP SNG





BEF-PL

Туре	Dimensio	Dimensions in mm									
	В	d	D	G1	Н	H1	H2	Н3	L	L2	X1
HTS-A2 AP SNG	15	5.5	19.0	-	9	49	5.5	25.0	38.0	-	29
HTS-A3 AP SNG	15	5.5	28.5	-	9	48	5.5	26.4	38.0	-	29
BEF-PL 38x15x11.5 G1/4-IG SNG	15	5.5	-	G1/4"-F	12	-	5.0	-	38.0	20.0	29

# Needle Grippers SNG-V

Needle stroke 0 mm to 7 mm (variable)



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### Suitable for Industry Specific Applications

composite textiles, fleece, filter materials, insulation and foam



Needle grippers SNG-V



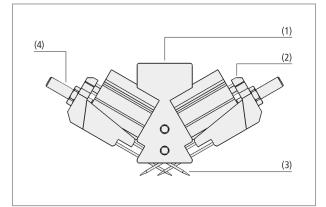
# Design

**Applications** 

materials etc.

(primarily textiles)

- Robust aluminum housing (1)
- Drive via double-acting pneumatic cylinders (2)
- 10 needles with diameter 1.2 mm (3)
- Insertion angle 30°
- Continuously variable stroke adjustment (4)
- Optional mounting with holder system HTS



System design needle gripper SNG-V



Needle grippers SNG-V being used for handling composite textiles

### Our Highlights...

- Intersecting needles
- Minimized active contact surface
- Double-acting pneumatic cylinders
- Variable needle stroke
- One pneumatic connection point for both pneumatic cylinders

### Your Benefits...

- > High holding force, even for flexible, non-rigid workpieces
- > Handling of small workpieces possible
- > Very short cycle times
- > Individual adjustment for different workpiece thicknesses, sizes and shapes
- > Saves pneumatic tubes and connectors; ensures synchronous movement of needles

# Needle Grippers SNG-V

Needle stroke 0 mm to 7 mm (variable)



## **Designation Code Needle Grippers SNG-V**

Abbreviated designation	Number of needles	Needle diameter in mm	Product addition	Needle stroke in mm
Example SNG-V 10 1.2 V 7: SNG-V	10	1.2	V	7
SNG-V	10	1.2	V variable needle stroke V-HT variable needle stroke and high- temperature	7



## Ordering Data Needle Grippers SNG-V

Needle gripper SNG-V is delivered assembled.

Available spare parts: needle module Available accessories: mounting plate

## **Needle Grippers SNG-V**

Туре	Part Number
SNG-V 10 1.2 V 7	10.01.29.00176
SNG-V 10 1.2 V-HT 7*	10.01.29.00428

<sup>\*</sup>For operating temperatures from 5 to 150 °C and a maximum workpiece temperature of 260 °C



## Ordering Data Accessories Needle Grippers SNG-V

Type*	Mounting plate**
SNG-V 10 1.2 V 7	10.01.29.00093
SNG-V 10 1.2 V-HT 7	10.01.29.00093

<sup>\*</sup>Note: suitable screw in push fittings can be found under "Screw in push fittings" in section "Filters and Connections"

<sup>\*\*</sup>Including mounting screws



## Ordering Data Spare Parts Needle Grippers SNG-V

Туре	Needle module*
SNG-V 10 1.2 V 7	10.01.29.00238
SNG-V 10 1.2 V-HT 7	10.01.29.00464

<sup>\*</sup>Set of 2 needle modules with needles



### **Technical Data Needle Grippers SNG-V**

Type	Number of needles	Needle diameter [mm]	Additional function	Pressure range (operating pressure) [bar]	Operating temperature [°C]	Installation position	Weight [g]
SNG-V 10 1.2 V 7	10	1.2	Variable stroke	3.0 7.0	5 60	Any	265
SNG-V 10 1.2 V-HT 7	10	1.2	Variable stroke,	3.0 7.0	5 150	Any	255
			high temperature				

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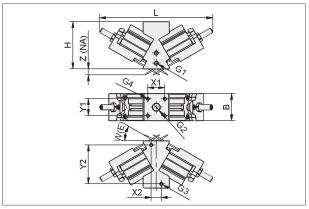
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# Needle Grippers SNG-V

Needle stroke 0 mm to 7 mm (variable)

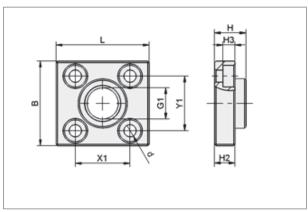
# Design Data Needle Grippers SNG-V



SNG-V 10 1.2 V

Туре	Dimensio	Dimensions in mm											
	В	G1	G2	G3	G4	н	L	W (E)	X1	X2	Y1	Y2	Z (NA)
SNG-V 10 1.2 V 7	32	M5-F	G1/8"-F	M4-F	M4-F	56	149	30	20	12	20	46	7
SNG-V 10 1.2 V-HT 7	32	M5-F	G1/8"-F	M5-F	M4-F	56	149	30	20	12	20	29	7

# Design Data Accessories Needle Grippers SNG-V



BEF-PL SNG

Туре	Dimensions	Dimensions in mm								
	В	d	G1	Н	H2	Н3	L	X1	Y1	
Mounting plate BEF-PL SNG	31	4.5	G1/4"-F	11.5	7.5	4.4	34	20	20	

# Needle Grippers SNG-M

Needle Stroke 3 mm





## Suitable for Industry Specific Applications

carbon-fibre, woven aramide, foam materials, etc.

• Needle gripper for handling of flexible, non-rigid components • Handling of materials which are difficult to grip with vacuum, such as composite textiles, fleece, filters, woven fibreglass or



Needle grippers SNG-M

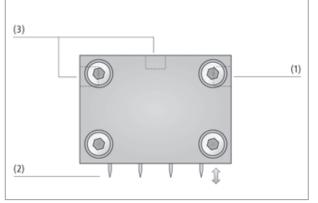


## Design

- · Robust aluminum housing
- Four needles (2)

**Applications** 

- Activated by compressed air, needles retracted by springs on the right (1) or optional above (3)
- Insertion angle 30°
- The needle gripper can be optionally connected using a mounting



System design needle grippers SNG-M



Needle grippers SNG-M being used for handling structured foam materials

### Our Highlights...

- Very small size
- Needles retracted by springs
- Synchronised extension of the needles
- Optionally available with adapter flange plate

### Your Benefits...

- > Optimal for installation in restricted spaces
- > Only one control signal
- > Safe handling of the workpieces
- > Perfect adaptation to other mounting components

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# Needle Grippers SNG-M

Needle Stroke 3 mm



Vacuum Grip- Special ping Systems Grippers

# **Designation Code Needle Grippers SNG-M**

Abbreviated designation	Number of needles	Needle diameter in mm
Example SNG-M 4 0.8:		
SNG-M	4	0.8
SNG-M	4	0.8



## **Ordering Data Needle Grippers SNG-M**

Needle gripper SNG-M is delivered assembled. The assembly consists of:

Gripper of type SNG-M

Available spare parts: needle piston Available accessories: mounting plate

### **Needle Grippers SNG-M**

Type*	Part Number
SNG-M 4 0.8	10.01.29.00001

\*Note: suitable screw in push fittings can be found under "Screw in push fittings" in section "Filters and Connections"

### Ordering Data Spare Parts And Accessories Needle Grippers SNG-M

Туре	Needle piston*	Туре	Mounting plate*	STV-W**						
SNG-M 4 0.8	10.01.29.00094	SNG-M 4 0.8	10.01.29.00093	10.08.02.00296						
*Set of 4 needles with guide pistons and	d springs	*Complete with mount	*Complete with mounting screws							

\*Set of 4 needles with guide pistons and springs

 $\ensuremath{^{\star\star}}\xspace$  Note: suitable screw in push fittings can be found under "Screw in push fittings" in section "Filters and Connections"

# Technical Data Needle Grippers SNG-M

Туре	Number of needles	Needle diameter [mm]	Pressure range (operating pressure) [bar]	Operating temperature [°C]	Installation position	Weight [g]
SNG-M 4 0.8	4	0.8	4.0 6.0	5 60	Any	80

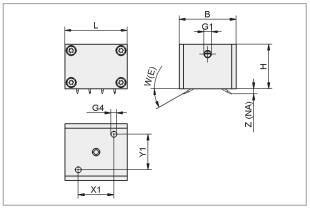
# Needle Grippers SNG-M

Needle Stroke 3 mm



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# Design Data Needle Grippers SNG-M

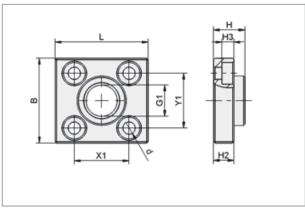


SNG-M 4 0.8

Туре	Dimensions in mm											
	В	G1	G4	Н	L	W (E)	X1	Y1	Z (NA)			
SNG-M 4 0.8	32	M5-F	M4-F	25	35	30	20	20	3			

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# Design Data Accessories Needle Grippers SNG-M



BEF-PL SNG

Туре	Dimensions	Dimensions in mm											
	В	d	G1	Н	H2	Н3	L	X1	Y1				
Mounting plate BEF-PL SNG	31	4.5	G1/4"-F	11.5	7.5	4.4	34	20	20				

Two suction areas suitable for wafer sizes 125 x 125 mm and 156 x 156 mm



### Suitable for Industry Specific Applications

and solar cells in the production processes

• Wafer gripper for extremely fast and gentle handling of wafers

• Fully or partially automated production of PV cells with maximum

process stability, production line uptime, cell efficiency and line

 Loading and unloading from stacks and conveyor belts • Exact positioning during the visual inspection and position measurement allow for on-the-fly breakage detection during the



Wafer grippers SWGm

# Design

output

**Applications** 

handling process

- Base model version with discharging exhaust air (3) in axial (A) or lateral (S) direction
- Suction area geometries available in common cell sizes 125 mm and 156 mm (5" and 6")
- Optional component (II) for controlled discharging of exhaust air
- Modular design with accessories for the mounting of sensors and modules for suction and damping (I) and a selection of flange modules (III)
- Minimal overall height through reduced-weight plastic design
- Replaceable contact surfaces

# (III)(II) (II) (A) (1)

System design wafer grippers SWGm

Wafer grippers SWGm being used for handling solar cells

### Our Highlights...

- · Low overall height and operating weight
- Optimum allocation and dimension of the suction points
- High suction rate even for partial coverage or leakages
- Exhaust air channels for controlled air discharge
- · Quick object release
- Gripper surface made of PEEK (Polyetheretherketone)

### Your Benefits...

- > High speed, high accuracy handling for cycle times below one second
- > Less operating cost
- > Reliable gripping and handling, even for deformed, broken or perforated wafers
- > No contamination of process
- > Precise positioning and very short cycle times
- > Minimal surface contamination of the wafer and reduction of blind spots

# Wafer Grippers SWGm

Two suction areas suitable for wafer sizes 125 x 125 mm and 156 x 156 mm





## **Designation Code Wafer Grippers SWGm**

Abbreviated designation	Wafer/cell size in inch	Design	Dimensions in mm	Performance class of ejector	Blow off function	Material suction area
Example SWGm-5A 115x115x40 1xE100 A PEEK:						
SWGm	5	Α	115x115x40	1xE100	Α	PEEK
SWGm	5	A axial axhaust air S lateral exhaust air	115x115x40 115x115x65 146x146x40 146x146x65	1xE100	A blow off function	PEEK Poly- ether- ether- keton



## **Ordering Data Wafer Grippers SWGm**

Wafer gripper SWGm is delivered assembled. The assembly consists of:

• Wafer gripper of type SWGm – available in various dimensions, with axial or side exhaust

Available spare parts: suction surface

Available accessories: component for discharging exhaust air, holder, suction-/absorption module, floating suction cup module, exhaust duct, solenoid valves, flange plate

#### Wafer Grippers SWGm

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



## **Ordering Data Accessories Wafer Grippers SWGm**

Туре	SWGm-5A	SWGm-6A	SWGm-5S	SWGm-6S
Exhaust set ABL-SET 14 SWG/SCG	-	-	10.01.30.00059	10.01.30.00059
Holder HTR-UNI SWGm	10.01.30.00117	10.01.30.00117	10.01.30.00117	10.01.30.00117
Holder HTR M8x1-IG SWGm	10.01.30.00118	10.01.30.00118	10.01.30.00118	10.01.30.00118
Holder HTR M12x1-IG SWGm	10.01.30.00119	10.01.30.00119	10.01.30.00119	10.01.30.00119
Suction/damping module SD-MOD 4 32x15x35 FG 9 SWGm	10.01.30.00121	10.01.30.00121	10.01.30.00121	10.01.30.00121
Floating suction cup module SBSm 14 90-3 S1	10.01.01.12912	10.01.01.12912	10.01.01.12912	10.01.01.12912
Exhasut duct ABL-FUEHR 19.5x46 SWGm/SCG	10.01.30.00087	10.01.30.00087	-	-
Solenoid valve EMV 1.5 24V-DC 3/2 NC K-2P*	10.05.01.00288	10.05.01.00288	10.05.01.00288	10.05.01.00288
Solenoid valve EMV 2.5 24V-DC 3/2 NC K-2P**	10.05.01.00289	10.05.01.00289	10.05.01.00289	10.05.01.00289
Flange plate FLAN-PL 55x7.5-AB1	-	-	10.01.30.00015	10.01.30.00015
Flange plate FLAN-PL 63x10.5-AD1	10.01.30.00016	10.01.30.00016	10.01.30.00016	10.01.30.00016
Flange plate FLAN-PL 63x11.5-UNI	10.01.30.00017	10.01.30.00017	10.01.30.00017	10.01.30.00017
Flange plate FLAN-PL 80x9-ST1	10.01.30.00167	10.01.30.00167	10.01.30.00167	10.01.30.00167
Flange plate FLAN-PL 55x9.5-JP1	10.01.30.00194	10.01.30.00194	10.01.30.00194	10.01.30.00194
Flange plate FLAN-PL 55x7.5-EL1	-	-	10.01.30.00208	10.01.30.00208

<sup>\*</sup>Suitable for compressed-air connection "Blow off"

<sup>\*\*</sup>Suitable for compressed-air connection "Suction"



### Ordering Data Spare Parts Wafer Grippers SWGm

Type Wafer Grippers	Type Spare Part	Suction plate
SWGm-5A 115x115x40 1xE100 A PEEK	SAUG-FL SWGm-5 110x110 PEEK	10.01.30.00125
SWGm-6A 146x146x40 1xE100 A PEEK	SAUG-FL SWGm-6 141x141 PEEK	10.01.30.00126
SWGm-5S 115x115x65 1xE100 A PEEK	SAUG-FL SWGm-5 110x110 PEEK	10.01.30.00125
SWGm-6S 146x146x65 1xE100 A PEEK	SAUG-FL SWGm-6 141x141 PEEK	10.01.30.00126

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Valve

Switches and Monitoring

Connections

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# Wafer Grippers SWGm



Special Grippers

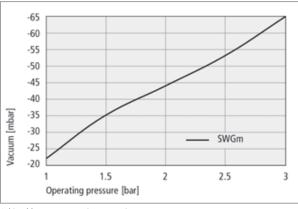
Switches and Valve Monitoring Technology

Services

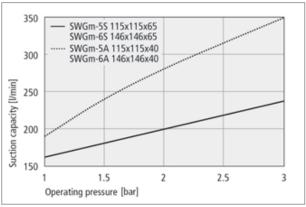
Two suction areas suitable for wafer sizes 125 x 125 mm and 156 x 156 mm



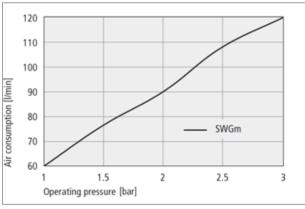
# Performance Data Wafer Grippers SWGm



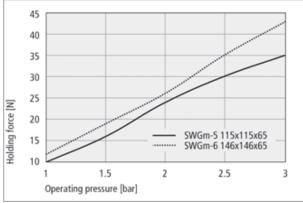
Achievable vacuum at various operating pressures



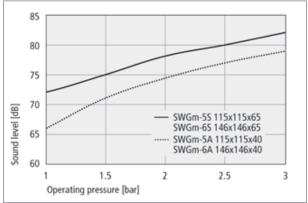
Suction capacity at various operating pressures



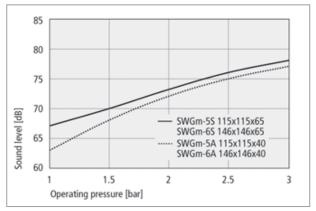
Air consumption at various operating pressures



Holding force at various operating pressures



Noise level free at various operating pressures



Noise level workp. gripped at various operating pressures

# Wafer Grippers SWGm

Two suction areas suitable for wafer sizes 125 x 125 mm and 156 x 156 mm



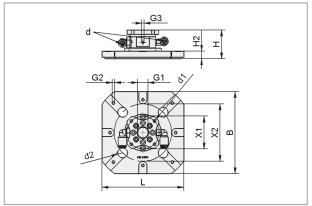


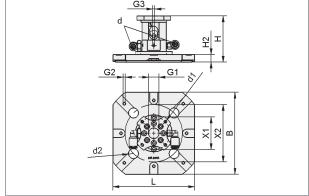
# **Technical Data Wafer Grippers SWGm**

Туре	Holding force [N]	Suction rate [I/min]	Air consumption [l/min]	Pressure range (operating pressure) [bar]	Operating temperature [°C]	Weight [g]
SWGm-5A 115x115x40 1xE100 A PEEK	10 35	190 350	60 120	1.0 3.0	5 75	210
SWGm-6A 146x146x40 1xE100 A PEEK	12 43	190 350	60 120	1.0 3.0	5 75	275
SWGm-5S 115x115x65 1xE100 A PEEK	10 35	160 350	60 120	1.0 3.0	5 75	235
SWGm-6S 146x146x65 1xE100 A PEEK	12 43	160 350	60 120	1.0 3.0	5 75	300

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# Design Data Wafer Grippers SWGm



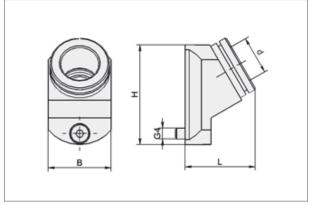


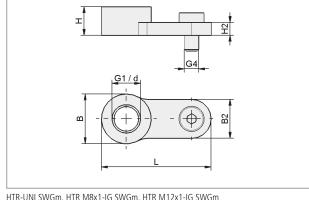
SWGm-5A... and SWGm-6A...

SWGm-5S... and SWGm-6S...

Туре	Dimensions in mm													
	В	d	d1	d2	G1	G2	G3	Н	H2	L	X1	X2		
SWGm-5A 115x115x40 1xE100 A PEEK	115	6	4.0	14	G3/8"-F	M4-F	M4-F	40	10.5	115	46	80.6		
SWGm-6A 146x146x40 1xE100 A PEEK	146	6	4.0	14	G3/8"-F	M4-F	M4-F	40	10.5	146	46	110.6		
SWGm-5S 115x115x65 1xE100 A PEEK	115	6	4.0	14	G3/8"-F	M4-F	M4-F	65	10.5	115	46	80.6		
SWGm-6S 146x146x65 1xE100 A PEEK	146	6	4.0	14	G3/8"-F	M4-F	M4-F	65	10.5	146	46	110.6		

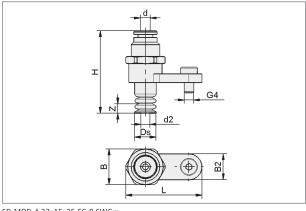
# **Design Data Accessories Wafer Gripper SWGm**

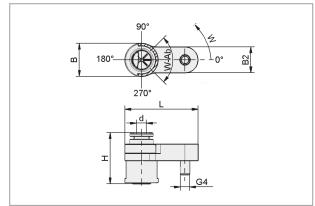




ABL-SET 14 SWG

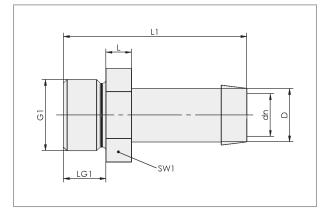
HTR-UNI SWGm, HTR M8x1-IG SWGm, HTR M12x1-IG SWGm

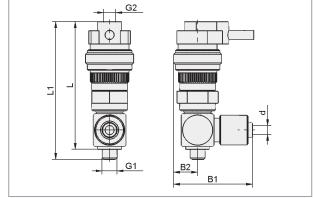




SD-MOD 4 32x15x35 FG 9 SWGm

SBSm 14 90-3 4/2...



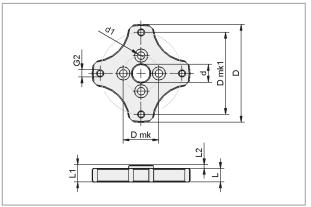


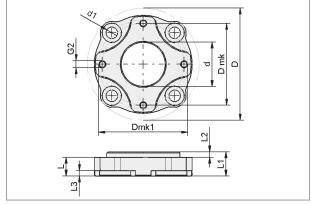
ABL-FUEHR 19.5x46 SWGm/SCG

# Wafer Grippers SWGm

Two suction areas suitable for wafer sizes 125 x 125 mm and 156 x 156 mm

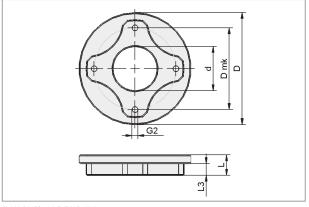


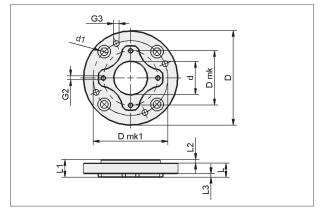




FLAN-PL 55x7.5-AB1

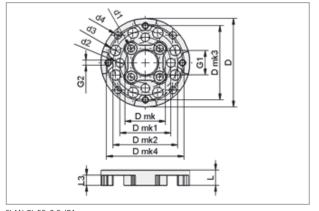
FLAN-PL 63x10.5-AD1

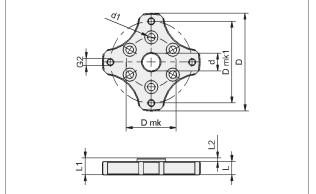




FLAN-PL 63x11.5 SWG-UNI

FLAN-PL 80x9-ST1





FLAN-PL 55x9.5-JP1

FLAN-PL 55x7.5-EL1

# Wafer Grippers SWGm

Two suction areas suitable for wafer sizes 125 x 125 mm and 156 x 156 mm



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Knowledge

Vacuum Suction Cups

Special Grippers

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# Design Data Accessories Wafer Gripper SWGm

Туре	Dime	nsions	in mm	1												
	В	B1	B2	d	d1	d2	d3	d4	dn	D	D mk	D mk1	D mk2	D mk3	D mk4	Ds
ABL-SET 14 SWG/SCG	23	-	-	14	-	-	-	-	-	-	-	-	-	-	-	-
HTR-UNI SWGm	14	-	11	2	-	-	-	-	-	-	-	-	-	-	-	-
HTR SWGm	14	-	11	-	-	-	-	-	-	-	-	-	-	-	-	-
HTR SWGm	14	-	11	-	-	-	-	-	-	-	-	-	-	-	-	-
SD-MOD 4 32x15x35 FG 9 SWGm	15	-	11	4	-	4.1	-	-	-	-	-	-	-	-	-	9
SBSm 14 90-3 4/2 0	14	-	11	4	-	-	-	-	-	-	-	-	-	-	-	-
ABL-FUEHR 19.5x46 SWGm/SCG	-	-	-	-	-	-	-	-	12.5	19.5	-	-	-	-	-	-
EMV 1.5 24V-DC 3/2 NC K-2P	-	26.6	8	4	-	-	-	-	-	-	-	-	-	-	-	-
EMV 2.5 24V-DC 3/2 NC K-2P	-	31.7	11	4	-	-	-	-	-	-	-	-	-	-	-	-
FLAN-PL 55x7.5-AB1	-	-	-	10	4.3	-	-	-	-	55.0	20	46	-	-	-	-
FLAN-PL 63x10.5-AD1	-	-	-	21	6.6	-	-	-	-	63.0	46	50	-	-	-	-
FLAN-PL 63x11.5-UNI	-	-	-	25	-	-	-	-	-	63.0	46	-	-	-	-	-
FLAN-PL 80x9-ST1	-	-	-	28	7.0	-	-	-	-	80.0	46	63	-	-	-	-
FLAN-PL 55x9.5-JP1	-	-	-	-	4.5	5.5	6.6	4.5	-	55.0	25	32	40	46	48	-
FLAN-PL 55x7.5-EL1	-	-	-	10	4.3	-	-	-	-	55.0	28	46	-	-	-	-

Туре	Dimensions	in mm													
	G1	G2	G3	G4	Н	Н2	L	L1	L2	L3	LG1	SW1	W	W-Ab	Z
ABL-SET 14 SWG/SCG	-	-	-	M4-M	36.5	-	25.5	-	-	-	-	-	-	-	-
HTR-UNI SWGm	-	-	-	M4-M	8.0	3.6	30.9	-	-	-	-	-	-	-	-
HTR SWGm	M8x1-F	-	-	M4-M	8.0	3.6	30.9	-	-	-	-	-	-	-	-
HTR SWGm	M12x1-F	-	-	M4-M	8.0	3.6	30.9	-	-	-	-	-	-	-	-
SD-MOD 4 32x15x35 FG 9 SWGm	-	-	-	M4-M	35.0	-	32.0	-	-	-	-	-	-	-	3
SBSm 14 90-3 4/2 0	-	-	-	M4-M	21.6	-	30.9	-	-	-	-	-	0	90	-
ABL-FUEHR 19.5x46 SWGm/SCG	G3/8"-M	-	-	-	-	-	5.0	46.0	-	-	7.5	19	-	-	-
EMV 1.5 24V-DC 3/2 NC K-2P	M5-M	M5-F	-	-	-	-	43.1	46.5	-	-	-	-	-	-	-
EMV 2.5 24V-DC 3/2 NC K-2P	G1/8"-M	M5-F	-	-	-	-	51.7	56.5	-	-	-	-	-	-	-
FLAN-PL 55x7.5-AB1	-	M4-F	-	-	-	-	7.5	9.5	2.0	-	-	-	-	-	-
FLAN-PL 63x10.5-AD1	-	M4-F	-	-	-	-	10.5	13.5	3.0	3.0	-	-	-	-	-
FLAN-PL 63x11.5-UNI	-	M4-F	-	-	-	-	11.5	-	-	6.5	-	-	-	-	-
FLAN-PL 80x9-ST1	-	M4-F	M6-F	-	-	-	9.0	12.0	3.0	3.0	-	-	-	-	-
FLAN-PL 55x9.5-JP1	G3/8"-F	M4-F	-	-	-	-	9.5	-	-	6.3	-	-	-	-	-
FLAN-PL 55x7.5-EL1	-	M4-F	-	-	-	-	7.5	9.5	2.0	-	-	-	-	-	-

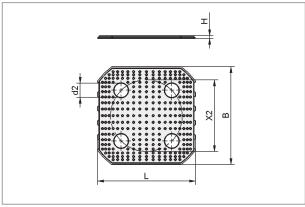
# Wafer Grippers SWGm

Two suction areas suitable for wafer sizes 125 x 125 mm and 156 x 156 mm





# Design Data Spare Parts Wafer Gripper SWGm



SAUG-FL SWGm-...

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

# Composite Grippers SCG

Suction capacity from 270 l/min to 650 l/min



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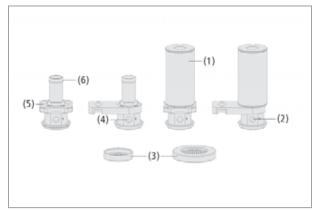
## Suitable for Industry Specific Applications



Composite grippers SCG

### **Applications**

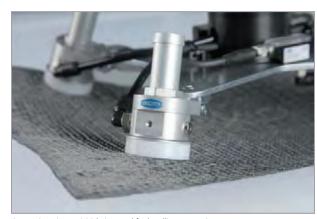
- Gripper for handling of composites
- · Handling of non-rigid and flexible workpieces
- · Handling of extremely thin, sensitive foils
- Handling of blank circuit boards



System design composite grippers SCG

### Design

- Quick-change contact surfaces (3) with various diameters
- Anodised aluminum main body with integrated vacuum generation (2)
- Base model with capability for axial mounting (MA) or sideways mounting (MS) (5)
- Controlled exhaust air (6)
- Two compressed air connections for suction and blow off (2/4)
- Silencer (1)



Composite grippers SCG being used for handling composites

### Our Highlights...

- Suction surface with suction openings placed close to each other
- Integrated vacuum generation
- · Very high suction rate
- High suction rate with minimum air consumption
- · Controlled air discharge
- Axial or sideways mounting of gripper

#### Your Benefits...

- > Prevents the workpiece from being sucked in or damaged
- > Compact, ready-to-connect gripper unit
- > Safe gripping, even with porous materials
- > Low operating costs
- > No contamination of process
- > Flexible mounting possibilities

# Composite Grippers SCG

Suction capacity from 270 l/min to 650 l/min



## **Designation Code Composite Grippers SCG**

Abbreviated designation	Performance class of ejector	Blow off function	Possibility for mounting	Product addition
Example SCG 1xE100 A MA: SCG	1xE100	A	MA	
SCG	1xE100	A blow off function	MA mounting axial MS mounting sideways	SDA silencer axial



### **Ordering Data Composite Grippers SCG**

Composite-Gripper SCG is supplied as an individual part (without suction surface). In order to receive a complete gripper the following ordering steps are required:

- Composite-Gripper SCG (step 1) available for axial or sideways mounting
- Suction surface of type SAUG-FL (step 2) available in various dimensions

Available accessories: silencer, screw in push fitting (right-angle)

#### Step 1: Composite Grippers SCG

Туре	Part Number
SCG 1xE100 A MA	10.01.30.00092
SCG 1xE100 A MA SDA	10.01.30.00359
SCG 1xE100 A MS	10.01.30.00170
SCG 1xE100 A MS SDA	10.01.30.00360

### Step 2: Suction area Composite Grippers SCG

Туре	Part Number
SAUG-FL SCG 40 POM	10.01.30.00030
SAUG-FL SCG 60 POM	10.01.30.00031



## **Ordering Data Accessories Composite Grippers SCG**

Туре	Part Number
SD G3/8-AG 40x80 SCG	10.01.30.00352
STV-W G1/8-AG 6*	10.08.02.00288
STV-W M5-AG 6**	10.08.02.00296

<sup>\*</sup>Suitable for compressed-air connection "Suction"

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<sup>\*\*</sup>Suitable for compressed-air connection "Blow off"

# Composite Grippers SCG

Suction capacity from 270 l/min to 650 l/min

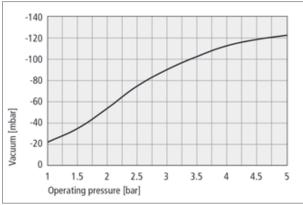


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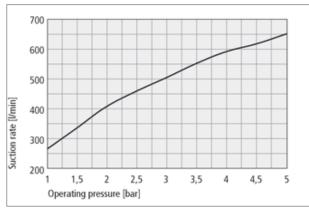
Special Grippers

Services

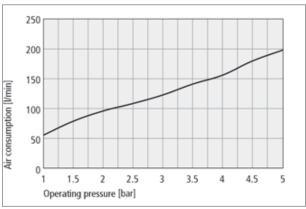
# **Performance Data Composite Grippers SCG**



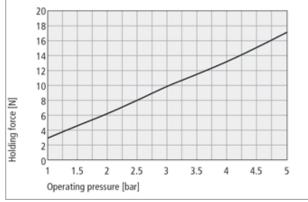
Achievable vacuum at various operating pressures



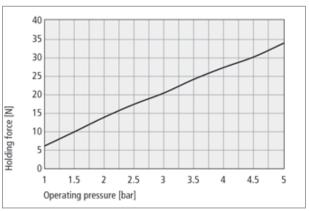
Suction rate at various operating pressures



Air consumption at various operating pressures



Holding force with suction area 40 at various operating pressures (measured on a suction-tight workpiece)



Holding force with suction area 60 at various operating pressures (measured on a suction-tight workpiece)

# Composite Grippers SCG

Suction capacity from 270 l/min to 650 l/min





# Technical Data Composite Grippers SCG

Туре	Suction rate [I/min]	Aiconsumption [I/min]	Pressure range (operating pressure) [bar]**	Operating temperature [°C]	Recom. internal hose diameter, suction [mm]	Recom. internal hose diameter, blow off [mm]	Weight [g]
SCG 1xE100 A MA	270 650	60 200	1.0 5.0	5 75	4	4	85
SCG 1xE100 A MA SDA*	270 590	60 200	1.0 5.0	5 75	4	4	164
SCG 1xE100 A MS	270 650	60 200	1.0 5.0	5 75	4	4	109
SCG 1xE100 A MS SDA*	270 590	60 200	1.0 5.0	5 75	4	4	188

<sup>\*</sup>Using the silencer reduces the suction flow specified above by approx. 9% and noise emissions by up to 12 dBA.

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<sup>\*\*</sup>The specified value can be equal for suction and blow-off. Operating pressures below 1 bar are possible but have to be tested individually.

# Composite Grippers SCG

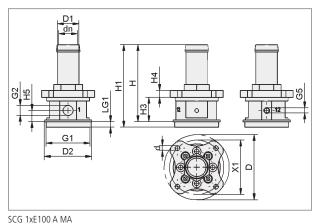
Suction capacity from 270 l/min to 650 l/min

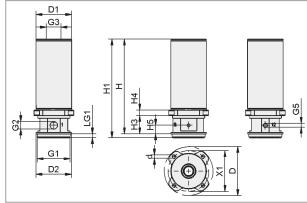


VacuumSchmalz - TheSuction CupsKnowledgeCompany

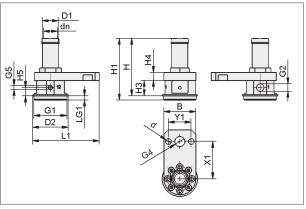
Special Grippers

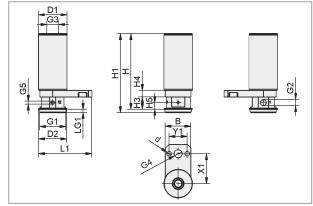
# **Design Data Composite Grippers SCG**





SCG 1xE100 A MA SDA





SCG 1xE100 A MS SCG 1xE100 A MS SDA

Туре	Dimensions	in mm								
	В	d	dn	D	D1	D2	G1	G2	G3	G4
SCG 1xE100 A MA	-	4.0	12.5	55	18	39.8	M37x1-M	G1/8"-F	-	-
SCG 1xE100 A MA SDA	-	4.0	-	55	40	39.8	M37x1-M	G1/8"-F	G3/8"-F	-
SCG 1xE100 A MS	36	6.6	12.5	-	18	39.8	M37x1-M	G1/8"-F	-	G1/4"-F
SCG 1xE100 A MS SDA	36	6.6	-	-	40	39.8	M37x1-M	G1/8"-F	G3/8"-F	G1/4"-F

Туре	Dimensions	Dimensions in mm									
	G5	Н	H1	Н3	H4	H5	L1	LG1	Y1	X1	
SCG 1xE100 A MA	M5-F	65	69.6	20.6	6	9.5	-	4.5	-	46	
SCG 1xE100 A MA SDA	M5-F	107	111.1	20.6	6	9.6	-	4.5	-	46	
SCG 1xE100 A MS	M5-F	65	69.6	17.6	9	9.5	74.9	4.5	25.5	42	
SCG 1xE100 A MS SDA	M5-F	107	111.1	17.6	9	9.6	74.9	4.5	25.5	42	

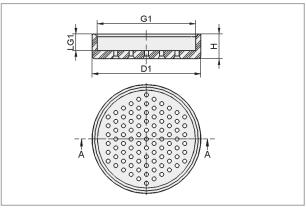
# Composite Grippers SCG

Suction capacity from 270 l/min to 650 l/min



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# **Design Data Suction Area for Composite Gripper SCG**

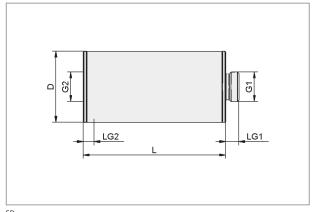


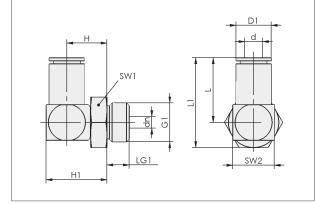
SAUG-FL

Туре	Dimensions in mm				
	D1	G1	Н	LG1	Weight [g]
SAUG-FL SCG 40 POM	40	M37x1-F	9.5	6.5	6.5
SAUG-FL SCG 60 POM	60	M37x1-F	9.5	6.8	16.0

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# **Design Data Accessories Composite Gripper SCG**





Screw in push fitting STV-W

Туре	Dime	Dimensions in mm												
	d	D	dn	D1	G1	G2	Н	H1	L	L1	LG1	LG2	SW1	SW2
SD G3/8-AG 40x80 SCG	-	40	-	-	G3/8"-M	G3/8"-F	-	-	80.0	-	8	6	-	-
STV-W G1/8-AG 6	6	-	4	11.5	G1/8"-M	-	12.5	16.5	20.8	27.5	6	-	13	8
STV-W M5-AG 6	6	-	4	11.5	M5-M	-	13.0	16.5	20.8	25.5	4	-	8	8

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elements

Suction capacity from 270 l/min to 650 l/min





### Suitable for Industry Specific Applications

Gripper solution for handling dry food products such as cookies,

• Handling of products that require a high suction flow rate due to

• The contact element made from FDA-compliant material allows

for direct, repeated contact with food products



Flow gripper SCG

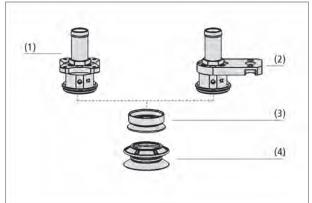
# Design

**Applications** 

cakes and waffles

their surface or geometry

- Main body made from anodized aluminum with integrated compressed air-operated vacuum generation
- Base model available for axial (1) or side mounting (2)
- Suction cup connection nipple made from POM (material: FDA-compliant) (3)
- Suction cup (4) with 1.5 folds (suction area Ø 50 mm) made from silicone (material: FDA-compliant); large shaft diameter for high flow rates
- · Customer-specific suction areas on request



System Design Flow gripper SCG



Flow gripper SCG for handling bakery products

# Our Highlights...

- Contact element made from FDA-compliant silicone material
- Very high suction flow rate
- Compact suction bellows with 1.5 folds
- · Suction area with soft and flexible sealing lip
- Dirt-resistant vacuum generator
- Suction cup can be disassembled without tools

#### Your Benefits...

- > Suitable for direct use in the food product industry
- > Secure gripping even of porous, highly textured workpieces
- > High lateral stability even with rapid acceleration
- > Excellent sealing and damping on textured surfaces such as cookies with frosting
- > Long service intervals
- > Easy to clean

# **Designation Code Flow Grippers SCG**

Abbreviated designation	Performance class of ejector	Blow off function	Possibility for mounting
Example SCG 1xE100 A MA: SCG	1xE100	A	MA
SCG	1xE100	A blow off function	MA mounting axial MS mounting sideways



## **Ordering Data Flow Grippers SCG**

The flow gripper SCG für dry food is is supplied as an individual part (without suction cup). In order to receive a complete gripper the following ordering steps are required:

- Flow gripper (step1) available for axial or sideways mounting
- Suction cup (step 2)

Available accessories: screw in push fitting (right-angle)

### **Step 1: Flow Grippers SCG**

Туре	Part Number
SCG 1xE100 A MA	10.01.30.00092
SCG 1xE100 A MS	10.01.30.00170

#### **Step 2: Suction Cups**

Туре	Туре	Part Number
SAUG-SCG 50 SI-HD	Suction cup (round)	10.01.30.00593



## **Ordering Data Accessories Flow Grippers SCG**

Туре	Part Number
STV-W G1/8-AG 6*	10.08.02.00288
STV-W M5-AG 6**	10.08.02.00296

<sup>\*</sup>Suitable for compressed-air connection "Suction"

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 $<sup>\</sup>hbox{$^*$Suitable for compressed-air connection "Blow off"}\\$ 

# Flow Grippers SCG

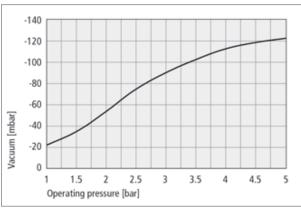
Suction capacity from 270 l/min to 650 l/min

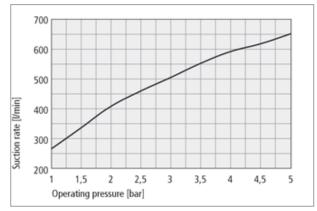


Special Grippers

Filters and Switches and Valve Vacuum
Connections Monitoring Technology Generators

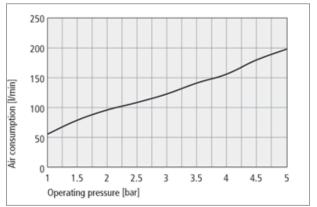
## **Performance Data Flow Grippers SCG**





Achievable vacuum at various operating pressures

Suction rate at various operating pressures



Air consumption at various operating pressures

## **Technical Data Flow Grippers SCG**

Туре	Suction rate	Air consump-	Pressure range	Operating	Recom. internal	Recom. internal	Weight
	[l/min]	tion	(operating	temperature	hose diameter,	hose diameter,	[g]
		[l/min]	pressure)	[°C]	suction	blow off	
			[bar]**		[mm]	[mm]	
SCG 1xE100 A MA	270 650	60 200	1.0 5.0	5 75	4	4	85
SCG 1xE100 A MS*	270 650	60 200	1.0 5.0	5 75	4	4	109

<sup>\*</sup>Using the silencer reduces the suction flow specified above by approx. 9% and noise emissions by up to 12 dBA.

<sup>\*\*</sup>The specified value can be equal for suction and blow-off. Operating pressures below 1 bar are possible but have to be tested individually.

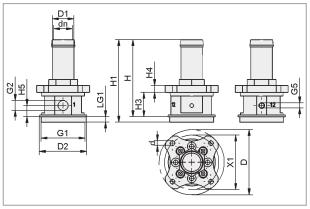
# Flow Grippers SCG

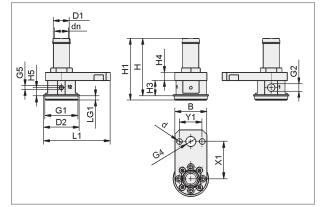
Suction capacity from 270 l/min to 650 l/min



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# **Design Data Flow Grippers SCG**





SCG 1xE100 A MA

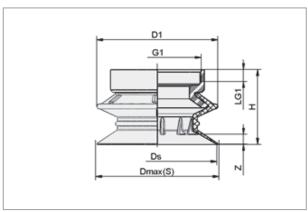
SCG 1xE100 A MS

Туре	Dimensions	Dimensions in mm								
	В	d	dn	D	D1	D2	G1	G2	G4	G5
SCG 1xE100 A MA	-	4.0	12.5	55	18	39.8	M37x1-M	G1/8"-F	-	M5-F
SCG 1xE100 A MS	36	6.6	12.5	-	18	39.8	M37x1-M	G1/8"-F	G1/4"-F	M5-F

Туре	Dimensions in mm								
	H	H1	Н3	H4	H5	L1	LG1	Y1	X1
SCG 1xE100 A MA	65	69.6	20.6	6	9.5	-	4.5	-	46
SCG 1xE100 A MS	65	69.6	17.6	9	9.5	74.9	4.5	25.5	42

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## **Design Data Suction Cups**



SAUG-SCG 50 SI-HD

Туре	Dimensions in n	Dimensions in mm							
	D1	Dmax(S)*	Ds	G1	Н	LG1	Z		
SAUG-SCG 50 SI-HD	51.0	51.5	50.3	M37x1-F	31.5	5.0	4.2		

<sup>\*</sup>External dimension of the suction cup when it is pressed against the workpiece by the vacuum

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# Flow Grippers SCG

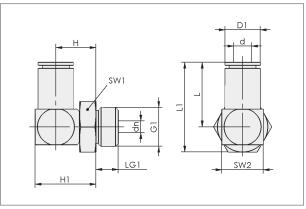
Suction capacity from 270 l/min to 650 l/min



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# **Design Data Accessories Composite Gripper SCG**



Туре	Dimensions in mm										
	d	dn	D1	G1	Н	H1	L	L1	LG1	SW1	SW2
STV-W G1/8-AG 6	6	4	11.5	G1/8"-M	12.5	16.5	20.8	27.5	6	13	8
STV-W M5-AG 6	6	4	11.5	M5-M	13.0	16.5	20.8	25.5	4	8	8

# Thin glass grippers

# Thin Glass Grippers STGG

Two suction areas 100 x 55 mm and 170 x 105 mm



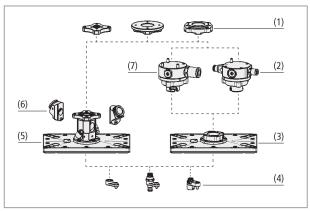




## Suitable for Industry Specific Applications



Thin glass grippers STGG (left QCFA with QCMV, right E100)



System design thin glass grippers STGG



Thin glass gripper STGG being used for handling display glass

#### **Applications**

- Special gripper for gentle handling of thinnest glass
- Use in the manufacturing 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 blowoff function (type E100)
- Basic body (3) made of lightweight plastic and aluminium with integrated vacuum generator (type QCMV) (2); alternatively for connection to an external vacuum generator (type QCM) (7)
- PEEK 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 (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...

- Suction area made of the mark-free material PEEK
- · High suction capacity and large effective suction area
- Active blow off function
- Full-surface gripping with a low vacuum level
- Low compressed air consumption
- Optional use of Bernoulli modules and suction cups

#### Your Benefits...

- > No contamination of the glass surface
- > Safe and precise handling in high dynamic processes
- > Fast and exact depositing
- > Minimum surface pressure for a very gentle handling process
- > Minimum operating costs
- > High engagement distance



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# Thin Glass Grippers STGG



Special Grippers

# Two suction areas 100 x 55 mm and 170 x 105 mm

# **Designation Code Thin Glass Grippers STGG**

Abbreviated designation	Design	Dimensions in mm	Vacuum generation	Blow off function
Example STGG S 100x55 1xE100 A: STGG	S	100x55	1xE100	A
STGG	S lateral exhaust air	100x55 170x105	1xE100 integrated QCMV HV 2 13 integrated QCM 51 external	A blow off function



## **Ordering Data Thin Glass Grippers 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: exhaust set, holder, suction / damping module, floating suction cup module, flange plate

## Thin Glass Grippers STGG

Туре	Part Number
STGG S 100x55 1xE100 A	10.01.30.00469
STGG S 170x105 1xE100 A	10.01.30.00473
STGG 100x55 QCMV HV 2 13	10.01.30.00517
STGG 170x105 QCMV HV 2 13	10.01.30.00518
STGG 100x55 QCM 51	10.01.30.00519
STGG 170x105 QCM 51	10.01.30.00520

## **Ordering Data Accessories Thin Glass Grippers STGG**

Туре	STGG S 100x55	STGG S 170x105 1xE100 A	STGG 100x55 QCMV HV 2 13	STGG 170x105 QCMV HV 2 13	STGG 100x55 QCM 51	STGG 170x105 QCM 51
	1xE100 A					
Exhaust set ABL-SET	10.01.30.00059	10.01.30.00059	-	-	-	-
Holder HTR-UNI	10.01.30.00117	10.01.30.00117	10.01.30.00117	10.01.30.00117	10.01.30.00117	10.01.30.00117
Holder HTR M8x1-IG	10.01.30.00118	10.01.30.00118	10.01.30.00118	10.01.30.00118	10.01.30.00118	10.01.30.00118
Holder HTR M12x1-IG	10.01.30.00119	10.01.30.00119	10.01.30.00119	10.01.30.00119	10.01.30.00119	10.01.30.00119
Suction/damping module SD-MOD	10.01.30.00121	10.01.30.00121	10.01.30.00121	10.01.30.00121	10.01.30.00121	10.01.30.00121
Floating suction cup module SBSm*	-	10.01.01.12912	-	10.01.01.12912	-	10.01.01.12912
Floating suction cup module SBSm**	10.01.01.13171	-	10.01.01.13171	-	10.01.01.13171	-
Flange plate FLAN-PL 55x7.5-AB1	10.01.30.00015	10.01.30.00015	10.01.30.00015	10.01.30.00015	10.01.30.00015	10.01.30.00015
Flange plate FLAN-PL 63x10.5-AD1	10.01.30.00016	10.01.30.00016	10.01.30.00016	10.01.30.00016	10.01.30.00016	10.01.30.00016
Flange plate FLAN-PL 63x11.5-UNI	10.01.30.00017	10.01.30.00017	10.01.30.00017	10.01.30.00017	10.01.30.00017	10.01.30.00017
Flange plate FLAN-PL 80x9-ST1	10.01.30.00167	10.01.30.00167	10.01.30.00167	10.01.30.00167	10.01.30.00167	10.01.30.00167
Flange plate FLAN-PL 55x9.5-JP1	10.01.30.00194	10.01.30.00194	10.01.30.00194	10.01.30.00194	10.01.30.00194	10.01.30.00194
Flange plate FLAN-PL 55x9.5-EL1	10.01.30.00208	10.01.30.00208	10.01.30.00208	10.01.30.00208	10.01.30.00208	10.01.30.00208

<sup>\*</sup>Order max. 4x per STGG

<sup>\*\*</sup>Order 2x per STGG

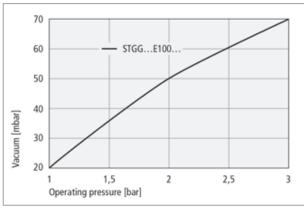
### Thin Glass Grippers STGG

Two suction areas 100 x 55 mm and 170 x 105 mm

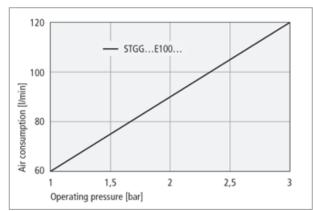




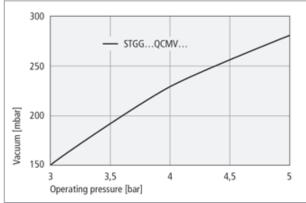
#### Performance Data Thin Glass Grippers STGG



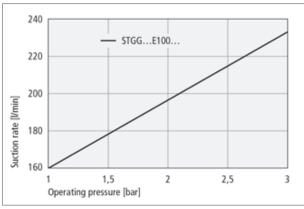
Vacuum STGG...E100...



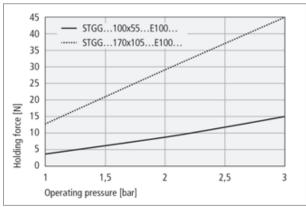
Air consumption STGG...E100...



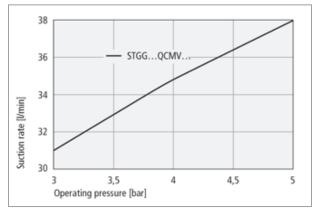
Vacuum STGG...QCMV...



Suction rate STGG...E100...



Holding force STGG...100x55...E100/STGG...170x105...E100



Suction rate STGG...QCMV...

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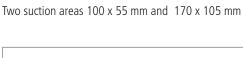
Droducts

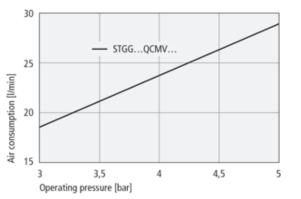
## Thin Glass Grippers STGG

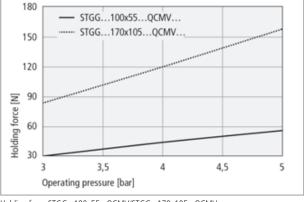


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Air consumption STGG...QCMV...

Holding force STGG...100x55...QCMV/STGG...170x105...QCMV

#### Technical Data STGG...1xE100/QCMV (with integrated vacuum generation)

Туре	Holding force	Suction rate	Air consumption	Pressure range	Operating	Weight
	[N]	[l/min]	[l/min]	(operating	temperature	[g]
				pressure)[bar]	[°C]	
STGG S 100x55 1xE100 A	4 15	160 235	60 120	1.0 3.0	5 60	215
STGG S 170x105 1xE100 A	13 45	160 235	60 120	1.0 3.0	5 60	360
STGG 100x55 QCMV HV 2 13	30 56	31 38	18 28	3.0 5.0	5 60	300
STGG 170x105 QCMV HV 2 13	85 160	31 38	18 28	3.0 5.0	5 60	450



#### Technical Data STGG...QCM (with connection to external vacuum generation)

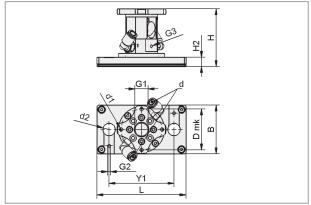
Туре	Max. flow rate [m³/h]	Operating temperature [°C]	Weight [g]
STGG 100x55 QCM 51	20	5 60	325
STGG 170x105 OCM 51	20	5 60	475

# Thin Glass Grippers STGG

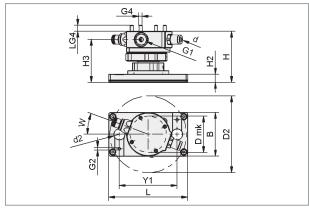
Two suction areas 100 x 55 mm and 170 x 105 mm



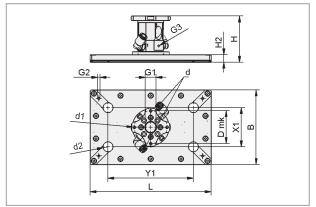
### **Design Data Thin Glass Grippers STGG**



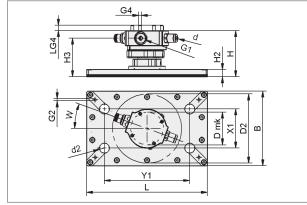




STGG 100x55 QCM...



STGG S 170x105 1xE100 A



STGG 170x105 QCM...

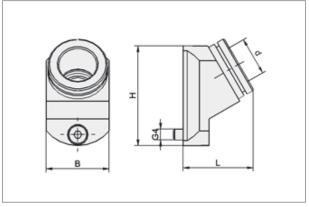
Туре	Dime	ensio	nsions in mm															
	В	d	d1	d2	D2	D mk	G1	G2	G3	G4	Н	H2	Н3	L	LG4	W	X1	Y1
STGG S 100x55 1xE100 A	55	6	4.0	14	-	46	G3/8"-F	M4-F	M4-F	-	65	11	-	100	-	-	-	73
STGG S 170x105 1xE100 A	105	6	4.0	14	-	46	G3/8"-F	M4-F	M4-F	-	65	11	-	170	-	-	55	120
STGG 100x55 QCMV HV 2 13	55	6	-	14	97	46	G1/8"-F	M4-F	-	M4-M	67	11	54	100	7.6	20	-	73
STGG 170x105 QCMV HV 2 13	105	6	-	14	97	46	G1/8"-F	M4-F	-	M4-M	67	11	54	170	7.6	20	55	120
STGG 100x55 QCM 51	55	12	-	14	112	46	G1/8"-F	M4-F	-	M4-M	67	11	54	100	7.6	20	-	73
STGG 170x105 QCM 51	105	12	-	14	112	46	G1/8"-F	M4-F	-	M4-M	67	11	54	170	7.6	20	55	120



Two suction areas 100 x 55 mm and 170 x 105 mm

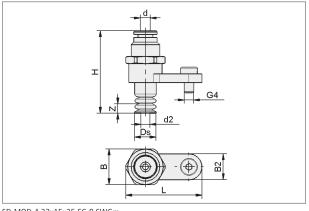


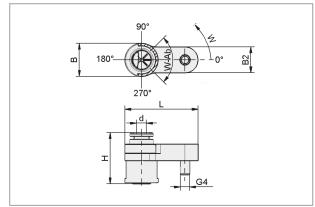
### **Design Data Accessories Thin Glass Grippers STGG**



ABL-SET 14 SWG

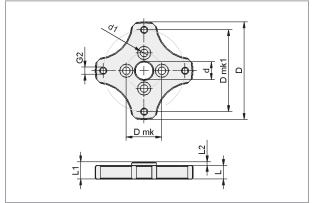
HTR-UNI SWGm, HTR M8x1-IG SWGm, HTR M12x1-IG SWGm

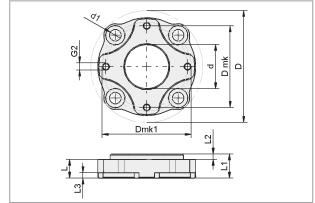




SD-MOD 4 32x15x35 FG 9 SWGm

SBSm 14 90-3 4/2...





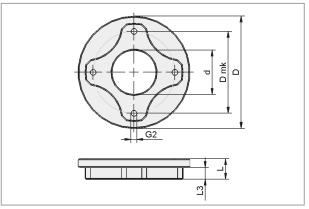
FLAN-PL 55x7.5-AB1

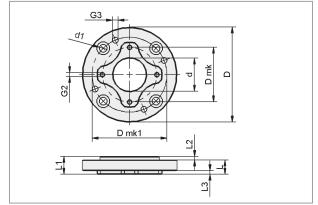
FLAN-PL 63x10.5-AD1

# Thin Glass Grippers STGG

Two suction areas 100 x 55 mm and 170 x 105 mm

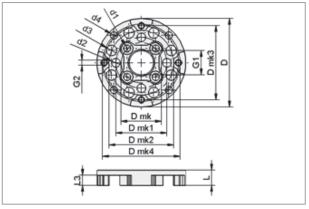


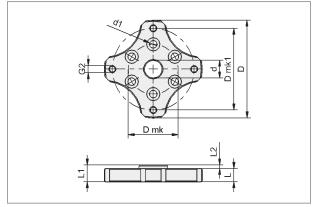




FLAN-PL 63x11.5 SWG-UNI

FLAN-PL 80x9-ST1





FLAN-PL 55x9.5-JP1

FLAN-PL 55x7.5-EL1

Туре	Dimens	ions in	mm											
	В	В2	d	d1	d2	d3	d4	D	D mk	D mk1	D mk2	D mk3	D mk4	Ds
ABL-SET 14 SWG/SCG	23	-	14	-	-	-	-	-	-	-	-	-	-	-
HTR-UNI SWGm	14	11	2	-	-	-	-	-	-	-	-	-	-	-
HTR SWGm	14	11	-	-	-	-	-	-	-	-	-	-	-	-
HTR SWGm	14	11	-	-	-	-	-	-	-	-	-	-	-	-
SD-MOD 4 32x15x35 FG 9 SWGm	15	11	4	-	4.1	-	-	-	-	-	-	-	-	9
SBSm 14 90-3 4/2 0	14	11	4	-	-	-	-	-	-	-	-	-	-	-
SBSm 14 90-3 4/2 90	14	11	4	-	-	-	-	-	-	-	-	-	-	-
FLAN-PL 55x7.5-AB1	-	-	10	4.3	-	-	-	55	20	46	-	-	-	-
FLAN-PL 63x10.5-AD1	-	-	21	6.6	-	-	-	63	46	50	-	-	-	-
FLAN-PL 63x11.5-UNI	-	-	25	-	-	-	-	63	46	-	-	-	-	-
FLAN-PL 80x9-ST1	-	-	28	7.0	-	-	-	80	46	63	-	-	-	-
FLAN-PL 55x9.5-JP1	-	-	-	4.5	5.5	6.6	4.5	55	25	32	40	46	48	-
FLAN-PL 55x7.5-EL1	-	-	10	4.3	-	-	-	55	28	46	-	-	-	-

## Thin Glass Grippers STGG

Two suction areas 100 x 55 mm and 170 x 105 mm



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Туре	Dimensions	in mm											
	G1	G2	G3	G4	Н	H2	L	L1	L2	L3	W	W-Ab	Z (Stroke)
ABL-SET 14 SWG/SCG	-	-	-	M4-M	36.5	-	25.5	-	-	-	-	-	-
HTR-UNI SWGm	-	-	-	M4-M	8.0	3.6	30.9	-	-	-	-	-	-
HTR SWGm	M8x1-F	-	-	M4-M	8.0	3.6	30.9	-	-	-	-	-	-
HTR SWGm	M12x1-F	-	-	M4-M	8.0	3.6	30.9	-	-	-	-	-	-
SD-MOD 4 32x15x35 FG 9 SWGm	-	-	-	M4-M	35.0	-	32.0	-	-	-	-	-	3
SBSm 14 90-3 4/2 0	-	-	-	M4-M	21.6	-	30.9	-	-	-	0	90	-
SBSm 14 90-3 4/2 90	-	-	-	M4-M	21.6	-	30.9	-	-	-	90	90	-
FLAN-PL 55x7.5-AB1	-	M4-F	-	-	-	-	7.5	9.5	2.0	-	-	-	-
FLAN-PL 63x10.5-AD1	-	M4-F	-	-	-	-	10.5	13.5	3.0	3.0	-	-	-
FLAN-PL 63x11.5-UNI	-	M4-F	-	-	-	-	11.5	-	-	6.5	-	-	-
FLAN-PL 80x9-ST1	-	M4-F	M6-F	-	-	-	9.0	12.0	3.0	3.0	-	-	-
FLAN-PL 55x9.5-JP1	G3/8"-F	M4-F	-	-	-	-	9.5	-	-	6.3	-	-	-
FLAN-PL 55x7.5-FL1	_	M4-F	_	_	_	-	7.5	9.5	2.0	-	_	_	_

Suction rate from 215 l/min to 8,640 l/min



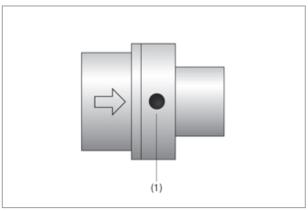
#### Suitable for Industry Specific Applications



Feed ejectors SEC

# Applications Gripping of ver

- Gripping of very porous materials such as foams, textiles, paper and various recycling materials
- Conveyance of light solids, such as polystyrene, plastic granulates, rice or other filling materials
- Exhaust of non-aggressive vapors and gases



System design feed ejectors SEC

#### Design

- · Body made of anodized aluminum or stainless steel
- Straight vacuum passage
- Compressed air enters at the side (1), through an annular gap



Vacuum generation with feed ejector SEC for transporting granulates

#### Our Highlights...

- Special ejector with straight vacuum passage for very high volume flow rates at low vacuum values
- Various models with different performance figures

#### Your Benefits...

- > Handling of very porous materials and low-loss transport of bulk goods; high efficiency
- > Optimum range of sizes for all applications

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Suction rate from 215 l/min to 8,640 l/min

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Vacuum Suction Cups

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Vacuum Generators

Valve Technology

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### **Designation Code Feed Ejectors SEC**

Abbreviated designation	Nozzle size
Example SEC-100:	
SEC	100
SEC	60=6.0 mm
	100 =10.0 mm
	200 =20.0 mm
	400 =40.0 mm
	750 =75.0 mm

### **Ordering Data Feed Ejectors SEC**

Ejector SEC is delivered as a ready to connect product.

### Feed Ejectors SEC

Туре	Part Number
SEC-60	10.02.01.01079
SEC-60 A2	10.02.01.01155
SEC-100	10.02.01.00078
SEC-100 A2	10.02.01.01691
SEC-200	10.02.01.00079
SEC-200 A2	10.02.01.01326
SEC-400	10.02.01.00080
SEC-400 A2	10.02.01.01620
SEC-750	10.02.01.00081

#### **Technical Data Feed Ejectors SEC**

Туре	Nozzle-Ø [mm]	Max. vacuum [mbar]	Max. suction rate [l/min]*	Max. suction rate [m³/h]*	Airconsumpt. during evac. [l/min]*	Airconsumpt. during evac. [m³/h]*	Pressure range (operating pressure) [bar]	Weight [kg]	Operating temperature [°C]
SEC-60	6	-245	215	12.9	110	6.6	2.0 5.0	0.040	-20 80
SEC-60 A2	6	-245	215	12.9	110	6.6	2.0 5.0	0.091	-20 80
SEC-100	10	-185	610	36.6	135	8.1	2.0 6.0	0.070	-20 80
SEC-100 A2	10	-185	610	36.6	135	8.1	2.0 6.0	0.206	-20 80
SEC-200	20	-85	1375	82.5	290	17.4	2.0 6.0	0.180	-20 80
SEC-200 A2	20	-85	1375	82.5	290	17.4	2.0 6.0	0.511	-20 80
SEC-400	40	-35	2250	135.0	445	26.7	2.0 6.0	0.525	-20 80
SEC-400 A2	40	-35	2250	135.0	445	26.7	1.9 5.9	1,475	-20 80
SEC-750	75	-5	8640	518.4	770	46.2	2.0 6.0	2.350	-20 80

<sup>\*</sup>At optimal operating pressure of approx. 4.5 bar

# **Feed ejectors**

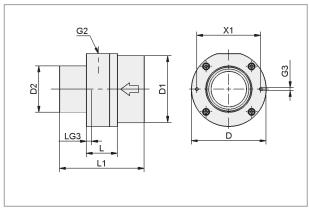
# Feed Ejectors SEC

Suction rate from 215 l/min to 8,640 l/min



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### Design Data Feed Ejectors SEC



SEC 60 to 750

Туре	Dimensions in	mm							
	D	D1	D2	G2	G3	L	L1	LG3	X1
SEC-60	32	12.5	12.5	M5-F	M3-F	14	44.0	5	25
SEC-60 A2	32	12.5	12.5	M5-F	M3-F	14	44.0	5	25
SEC-100	37	19.0	19.0	G1/8"-F	M4-F	21	70.0	8	29
SEC-100 A2	37	19.0	19.0	G1/8"-F	M4-F	21	70.0	8	29
SEC-200	50	38.0	32.0	G1/4"-F	M4-F	30	90.0	12	42
SEC-200 A2	50	38.0	32.0	G1/4"-F	M4-F	30	90.0	12	42
SEC-400	84	75.0	52.0	G3/8"-F	M4-F	35	95.0	14	72
SEC-400 A2	84	75.0	52.0	G3/8"-F	M4-F	35	95.0	14	72
SEC-750	140	125.0	100.0	G1/2"-F	M6-F	65	180.0	6	126

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### Vacuum Lifting Cylinders HS

Stroke 15 mm and 30 mm



Special Grippers



#### Suitable for Industry Specific Applications

• Vacuum lifting cylinder for handling and separation of paper, veneer and similar thin, porous workpieces when mounted

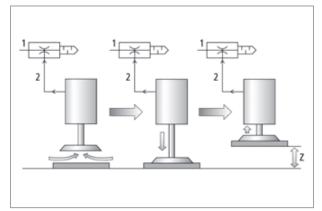


Vacuum lifting cylinders HS

### Design

**Applications** 

- Lifting suction cup consisting of a piston rod and anodized aluminum housing
- In idle position, the piston rod is retracted
- Piston rod is extended, when vacuum is applied
- As soon as the suction cup touches the workpiece, the piston rod is retracted, lifting the workpiece before the "suck-through" effect is generated
- Delivery without suction cup



System design vacuum lifting cylinders HS



Vacuum lifting cylinders HS being used for handling adhesive paper

#### Our Highlights...

• Vacuum-actuated, automatic lifting

#### Your Benefits...

> Reliable separation of thin, porous workpieces

# **Vacuum Lifting Cylinders**

# Vacuum Lifting Cylinders HS

Stroke 15 mm and 30 mm



### **Designation Code Vacuum Lifting Cylinders HS**

Abbreviated designation	Stroke in mm	Spring plunger length in mm	Connection thread
Example HS 15-22 M5-IG:			
HS	15	22	M5-IG
HS	15	22	M5-IG (IG = female (F))
	30	32	G1/8-IG



#### Ordering Data Vacuum Lifting Cylinders HS

Vacuum lifting cylinder HS is delivered as a ready to connect product with the desired properties. The delivery does not include a suction cup.

#### **Vacuum Lifting Cylinders HS**

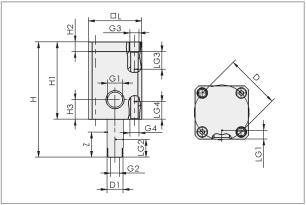
Туре	Part Number
HS 15-22 M5-IG	10.01.07.00014
HS 30-32 G1/8-IG	10.01.07.00001

#### **Technical Data Vacuum Lifting Cylinders HS**

Туре	Lifting force	Air consumption	Air consumption	Cycle time	Weight
	(pu = 0.8 bar) [N]	[l/min]	[m³/h]	[s]	[kg]
HS 15-22 M5-IG	3.5	33.3	2	0.8	0.130
HS 30-32 G1/8-IG	9.0	66.7	4	0.8	0.360

# 7

#### **Design Data Vacuum Lifting Cylinders HS**



HS 15-22 to 30-32

Туре	Dimer	Dimensions in mm														
	D	D1	G1	G2	G3	G4	Н	H1	H2	Н3	L	LG1	LG2	LG3	LG4	Z (Stroke)
HS 15-22 M5-IG	31	9	G1/8"-F	M5-F	M5-F	M5-F	65.5	43.5	5.5	11	30	5	10	10	10	14
HS 30-32 G1/8-IG	50	14	G1/8"-F	G1/8"-F	M8-F	M8-F	97.0	67.0	10.0	10	50	8	10	12	12	28

Special Grippers Schmalz - The Company

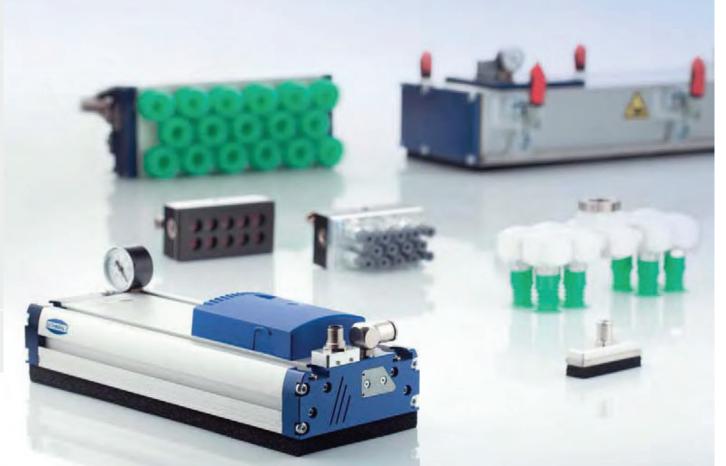
Vacuum Knowledge

Vacuum Suction Cups

Vacuum Grip- Special ping Systems Grippers

Switches and Monitoring

# **Vacuum Area Gripping Systems** and Vacuum End Effectors



## **Overview of Section 5**



## Vacuum Area Gripping Systems and Vacuum End Effectors

#### **Area Gripping Systems** Page



#### **Vacuum Area Gripping Systems FXP / FMP**



Universal gripper for handling workpieces regardless of size, geometry, material and surface.

1,432 x 130 mm\* • Sealing element: sealing foam,

• Dimensions: 442 x 130 to



#### **Vacuum Area Gripping Systems** FX / FM



Small and flexible universal gripper for handling work-



#### • Dimensions: 76 x 22 to 120 x 60 mm\*

· Sealing element: sealing foam, suction cups



pieces regardless of size, geometry, material and surface.



# **Vacuum Area Gripping Systems**

• Dimensions: 1.040 x 200 to 1,250 x 400 mm\*

• Sealing element: sealing foam

Robust gripper for powerful handling of lumber, planed or glued timber, sheet materials, construction timber, pallets and crate elements.

#### **Vacuum End Effectors**



#### **Vacuum End Effectors VEE**



• Dimensions: 38 x 38 to System components for quick and cost-effective 300 x 200 mm designing of vacuum end effectors for highspeed • Sealing element: suction cups packaging processes

374

388

390

394

Vacuum Grip- Special ping Systems Grippers

<sup>\*</sup>Customer-specific gripper dimensions on request

### Flexibility and Power



Special Grippers

Vacuum Grip-ping Systems



Powerful handling of heavy wooden beams

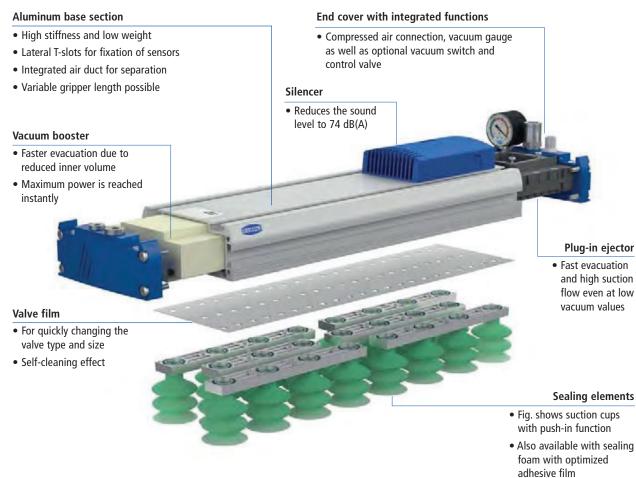
#### **Application**

- Universal gripper for handling workpieces regardless of size, geometry, material and surface
- Handling of workpieces made from various materials, such as wood (coated or unplaned), packaging (boxes, bags or cans), metal sheets, glass, plastics, CFRP, etc.
- Handling of porous workpieces and workpieces with gaps
- Handling of workpieces with an undefined pick-up position
- Ideal for use on robots due to its low weight

### Design

#### **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. With comparatively low maximum vacuum, the ejector generates a high volume flow and thus provides high holding forces, especially for applications with porous workpieces.



### Flexibility and Power



### **FMP: External Vacuum Generation**

The area gripping system FMP is equipped with a connection piece for external vacuum generators and is therefore suitable for use in combination with powerful pumps and blowers.



#### **Your Benefits**



#### 86 % More Power

In a benchmark test, the FXP / FMP generates an 86 % higher suction force on average than comparable grippers on the market



#### **Minimal Maintenance**

Easy retooling of flow technology and fast replacement of sealing elements



#### **Unique Flexibility**

Handling of workpieces wider than 20 mm, regardless of material, geometry, surface and position



#### **High Energy Efficiency**

Optimization of the flow ensures that energy is used more efficiently, which permanently reduces operating costs



#### **Low Weight**

Maximum acceleration within the process and reducing system costs by use of smaller robots



#### **Low Sound Level**

Low-noise operation with a sound level of only 74 dB(A)

#### **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 including vacuum generation, hoses and controller)	✓	
Minimal operating costs (because of the option of electrical vacuum generation),		✓
especially for applications with multiple grippers		
Handling of highly porous workpieces		✓

Innovative Valve Technology



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Knowledge

Special Vacuum Grippers Suction Cups

Vacuum Gripping Systems

Mounting

alve Vac

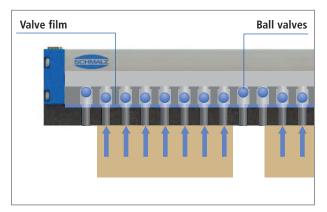
Switches and Monitoring

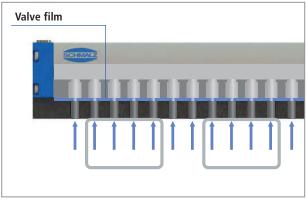
Products

innovative valve rechnolog



Valve type and size can be changed easily and quickly in case of changing requirements





#### **Check Valves SVK**

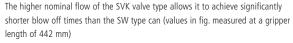
- Ball valves integrated in the base section for closing off uncovered suction cells
- Integrated leak-free, resulting in a higher vacuum as well as improved energy efficiency and holding force
- Valve film with clover shape for high flow rate and quick picking up and blowing off
- Proper functioning ensured even with unplaned surfaces

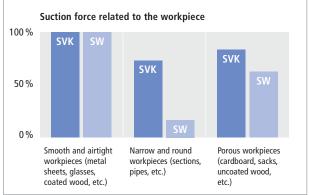
#### Flow Restrictors SW

- 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 valve type SVK achieves a higher suction force than the SW in case of porous workpieces and low degree of gripper coverage

Application features	SVK	SW
Smooth and airtight workpieces (e.g. metal sheets, glass, coated wood)	✓	✓
Porous workpieces (e.g. boxes, sacks, uncoated wood)	✓	
Structured surfaces	✓	
Workpieces with low gripper coverage (e.g. pipes, sections)	✓	
Minimum cycle times (active blow off)	✓	
Optimization of energy efficiency	✓	
Swiveling movements > 45°		✓



Flexible, Quick-Change Sealing Elements



Sealing foam and suction cups can be changed quickly and easily due to the optimized adhesive film and the push-in function





#### Sealing Foam with Quick-Change Adhesive Film

- Optimal adjustment capabilities
- Quick rebound for short cycle times
- Replaceable without adhesive residue and without the need to clean the sheet
- Intended for workpieces wider than 20 mm (in the design with 5 suction rows, on request)
- With optional filter mat

#### **Suction Cups with Push-in Function**

- · Optimal height compensation and damping effect
- Quick replacement due to the push-in mechanism
- Diameters 20 mm and 40 mm
- Made from FDA-compliant silicone
- · With optional insert filter

#### **Selection Aid**

Application features	Sealing foam	Suction cups
Rigid workpieces such as sheets, metal sheets, boards, sections and pallets	✓	
Flexible workpieces such as cardboard boxes, sacks, bags and trays		✓
Elongated workpieces such as strips, sections, boards	✓	
Workpieces with rough and structured surface	✓	
Handling of smaller product layers such as jars (open or closed) and cans with a continuous edge	✓	

#### Additional Functions, Compactly Integrated



#### **End Cover with Integrated Functions**

Minimization of system costs and installation times through integration of:

- Compressed air connection for ejector supply (type FXP)
- Control valves for switching the suction and blow off functions on/off (optional for type FXP-S)
- Connection for the blow off and separation functions
- Option to attach a vacuum gauge or vacuum switch

#### Accessories



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Suction Cu

Vacuum Grip- Special ping Systems Grippers

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Vacuum

Switches and Valv Monitoring Tech

Connections

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Contact

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#### Vacuum Switch

- Detection of the required vacuum and start of cycle by part present signal
- Optimization of cycle times
- Part number 10.06.02.00343



#### **Separation Function**

- Separation of porous workpieces (e.g. boxes, MDF/particle boards) during destacking
- Active initiation of an adjustable, targeted compressed air pulse
- Part number on request



#### Sensor Kit

- For workpiece and position detection
- Optimization of cycle times and increase in process reliability
- Includes attachment bracket
- Part number on request



#### **Attachment Kit Sliding Block**

- 4 sliding blocks
- 4 screws (M8x16)
- Part number 10.01.21.00243



#### Attachment Kit Flange Plate

- 1 flange plate
- Includes sliding block attachment kit
- Part number 10.01.21.01291



# Attachment Kit Double Flange Plate

- 1 double flange plate
- Includes sliding block attachment kit
- Part number 10.01.21.00244



#### Attachment Kit Spring-Loaded Level Compensation

- 1 spring plunger (50 mm stroke) with jointed mounting
- Includes flange plate attachment kit
- Part number 10.01.21.02407



#### Attachment Kit Flexible Level Compensation

- 1 spring plunger (50 mm stroke) with spherical bearing
- Maximum flexibility for uneven workpieces
- Self-centering and therefore no jamming
- Part number on request



#### **Cover Strip for T-Slots**

- Positive-locking cover for the T-slots
- Easy cleaning
- Cable duct possible
- Available by the meter
- Part number 26.07.03.00002



# Integrated Control Valves (for Type FXP-S)

- For switching vacuum and blow off on/off
- Minimum suction and blow off times
- Electrical connection via M12 plug (4-pole)
- Part number on request



#### Solenoid Valve (for FMP Type)

- For switching blow off on/off
- Fast evacuation and minimization of cycle times
- Can be flange-mounted on the gripper
- Part number 10.01.21.02405



## **Product Specifications**



#### **Note on Configuration**



Tests with the original workpieces are necessary to ensure that the area gripping system functions properly. We will gladly conduct these for you in our test center in order to find the best solution for your application.

#### **Designation Code**

Designation code explained using the example of: FXP-S-SVK 442 5R36 SPB2-20P

FXP	_S*	_SVK	<b>-442</b>	5R	36	SPB2-20P
Туре	Version	Valve technology	Length [mm]	Number of suction rows	Suction cell grid distance [mm]	Sealing element [mm]
FXP (Integrated vacuum generation)	S Control valves	SVK Check valves	442	5R 5 suction rows	36	SPB2-20P
FXP (Integrated vacuum generation)	S Control valves	SVK Check valves	442 640 838 1,234	3R 3 suction rows	18	Sealing foam (Height = 20)
FMP (External vacuum generation)		SW Flow restrictors	1,432	5R 5 suction rows	18	Sealing foam (Height = 20)
				5R 5 suction rows	36	SPB2-20P Suction cup (Ø 20)
				3R 3 suction rows	54	SPB2-40P Suction cup (Ø 40)

#### \*Integrated control valves at FXP-S and integrated vacuum valve at FMP-S (optional)

- Control of vacuum on/off (24V DC, normally open) and blow off on/off (24V DC, normally closed) on version FXP-S
- Control of vacuum on/off (24V DC, normally open) and blow off on/off (24V DC, normally closed) as well as hose storage pretensioning
  and blower ventilation function on version FMP-S
- Integrated in the end cover
- Electrical connection: M12 plug (4-pole)
- Part number on request

#### **Service and Practical Tips**

- Lift capacity and handling safety can be increased for uneven workpieces and rough surfaces by pressing down on them firmly (foam and suction cups should ideally be compressed by 50 %) and by using jointed and spring-loaded level compensation for the area gripping system
- The service life of the sealing foam is 3 to 12 months (depending on the application, when setting down and lifting linearly)
- The service life of the suction cup is 6 to 12 months (depending on the application, when setting down and lifting linearly)
- Six-month maintenance intervals of the area gripping system are recommended

Design with Sealing Foam (3 Suction Rows)



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Knowledge

Vacuum Suction Cu

Vacuum Grip- Sp ping Systems Gr

Mounting

Valve \

Switches an Monitoring

Services Fil-

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#### Ordering Data for Area Gripping Systems FXP / FMP

Туре*	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

#### **Ordering Data for Sealing Foam (Spare Part)**

Туре	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 1432x128 3R18	10.01.38.00406	10.01.38.00410

Note: A special foam for vacuum applications is used. Other foam heights and types (e.g. oil-resistant and temperature-resistant foams) on request

#### **Technical Data FXP / FMP**

Туре	Number	Air consumption*	Max. suction flow	Max. degree of	Suction force**	Weight
	of suction cells	[l/min]	[l/min]	evacuation [%]	[N]	[kg]
FXP-SVK 442 3R18	66	250	1,050	55	550	2.2
FXP-SVK 640 3R18	99	375	1,350	55	820	3.0
FXP-SVK 838 3R18	132	500	1,600	55	1,090	3.8
FXP-SVK 1234 3R18	198	875	2,940	55	1,650	5.3
FXP-SVK 1432 3R18	231	1,000	3,180	55	1,910	5.9
FXP-SW 442 3R18	66	250	1,050	55	440	2.1
FXP-SW 640 3R18	99	375	1,350	55	660	2.9
FXP-SW 838 3R18	132	500	1,600	55	870	3.7
FXP-SW 1234 3R18	198	875	2,940	55	1,310	5.2
FXP-SW 1432 3R18	231	1,000	3,180	55	1,530	5.8
Sound level: 74 dB(A)						

Number	Required suction flow***	Suction force**	Weight
of suction cells	[l/min]	[N]	[kg]
66	300	550	2.1
99	450	820	2.9
132	600	1,090	3.7
198	900	1,650	5.1
231	1,050	1,910	5.7
66	300	440	2.0
99	450	660	2.8
132	600	870	3.6
198	900	1,310	5.0
231	1,050	1,530	5.6
	of suction cells 66 99 132 198 231 66 99 132	of suction cells         [I/min]           66         300           99         450           132         600           198         900           231         1,050           66         300           99         450           132         600           198         900	of suction cells         [I/min]         [N]           66         300         550           99         450         820           132         600         1,090           198         900         1,650           231         1,050         1,910           66         300         440           99         450         660           132         600         870           198         900         1,310

<sup>\*</sup>For compressed air with 5.5 bar input pressure

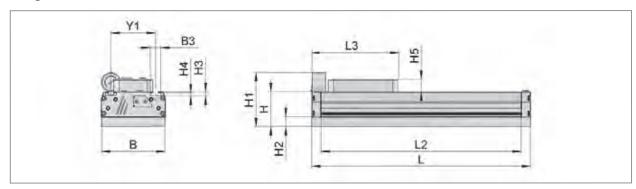
<sup>\*</sup>Customer-specific gripper dimensions on request

<sup>\*\*</sup>At -0.25 bar and with the gripper fully covered by a workpiece typical for the application (wooden board with structured surface)

<sup>\*\*\*</sup>The external vacuum generator used must supply at least the specified suction flow (at the vacuum connection piece of the FMP) at -0.25 bar but max. 135 % of the specified suction flow

Design with Sealing Foam (3 Suction Rows)

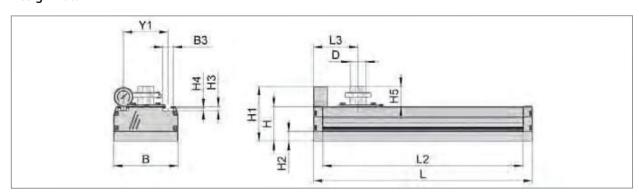
### **Design Data FXP**



Туре	Dimen	sions [mm]										
	В	B3	Н	H1	H2	Н3	H4	H5	L	L2	L3	Y1
FXP-SVK 442 3R18	130	21.6	70	111	20	7.7	5.5	28	442	404	154	90
FXP-SVK 640 3R18	130	21.6	70	111	20	7.7	5.5	28	640	602	154	90
FXP-SVK 838 3R18	130	21.6	70	116	20	7.7	5.5	28	838	800	154	90
FXP-SVK 1234 3R18	130	21.6	70	116	20	7.7	5.5	28	1,234	1,196	154	90
FXP-SVK 1432 3R18	130	21.6	70	116	20	7.7	5.5	28	1,432	1,394	154	90
FXP-SW 442 3R18	130	21.6	70	111	20	7.7	5.5	28	442	404	154	90
FXP-SW 640 3R18	130	21.6	70	111	20	7.7	5.5	28	640	602	154	90
FXP-SW 838 3R18	130	21.6	70	116	20	7.7	5.5	28	838	800	154	90
FXP-SW 1234 3R18	130	21.6	70	116	20	7.7	5.5	28	1,234	1,196	154	90
FXP-SW 1432 3R18	130	21.6	70	116	20	7.7	5.5	28	1,432	1,394	154	90

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

#### **Design Data FMP**



Туре	Dimensio	ns [mm]											
	В	В3	D	H	H1	H2	Н3	H4	H5	L	L2	L3	Y1
FMP-SVK 442 3R18	130	21.6	32	70	111	20	7.7	5.5	41	442	404	90	90
FMP-SVK 640 3R18	130	21.6	32	70	111	20	7.7	5.5	41	640	602	90	90
FMP-SVK 838 3R18	130	21.6	60	70	116	20	7.7	5.5	46	838	800	90	90
FMP-SVK 1234 3R18	130	21.6	60	70	116	20	7.7	5.5	46	1,234	1,196	90	90
FMP-SVK 1432 3R18	130	21.6	60	70	116	20	7.7	5.5	46	1,432	1,394	90	90
FMP-SW 442 3R18	130	21.6	32	70	111	20	7.7	5.5	41	442	404	90	90
FMP-SW 640 3R18	130	21.6	32	70	111	20	7.7	5.5	41	640	602	90	90
FMP-SW 838 3R18	130	21.6	60	70	116	20	7.7	5.5	46	838	800	90	90
FMP-SW 1234 3R18	130	21.6	60	70	116	20	7.7	5.5	46	1,234	1,196	90	90
FMP-SW 1432 3R18	130	21.6	60	70	116	20	7.7	5.5	46	1,432	1,394	90	90

Note: Vacuum hose with internal diameter equal to dimension D required

Vacuum Grip-Specialping SystemsGrippers

Design with Sealing Foam (5 Suction Rows)



Vacuum Grip-ping Systems

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#### Ordering Data for Area Gripping Systems FXP / FMP

Type*	Part number	
	Without filter	With filter
FXP-SVK 442 5R18	10.01.38.00695	10.01.38.00700
FXP-SVK 640 5R18	10.01.38.00696	10.01.38.00701
FXP-SVK 838 5R18	10.01.38.00697	10.01.38.00702
FXP-SVK 1234 5R18	10.01.38.00698	10.01.38.00703
FXP-SVK 1432 5R18	10.01.38.00699	10.01.38.00704
FXP-SW 442 5R18	10.01.38.00705	10.01.38.00710
FXP-SW 640 5R18	10.01.38.00706	10.01.38.00711
FXP-SW 838 5R18	10.01.38.00707	10.01.38.00712
FXP-SW 1234 5R18	10.01.38.00708	10.01.38.00713
FXP-SW 1432 5R18	10.01.38.00709	10.01.38.00714

Type*	Part number	
	Without filter	With filter
FMP-SVK 442 5R18	10.01.38.00324	10.01.38.00651
FMP-SVK 640 5R18	10.01.38.00643	10.01.38.00652
FMP-SVK 838 5R18	10.01.38.00644	10.01.38.00653
FMP-SVK 1234 5R18	10.01.38.00645	10.01.38.00654
FMP-SVK 1432 5R18	10.01.38.00646	10.01.38.00655
FMP-SW 442 5R18	10.01.38.00642	10.01.38.00656
FMP-SW 640 5R18	10.01.38.00647	10.01.38.00657
FMP-SW 838 5R18	10.01.38.00648	10.01.38.00658
FMP-SW 1234 5R18	10.01.38.00649	10.01.38.00659
FMP-SW 1432 5R18	10.01.38.00650	10.01.38.00660

#### Ordering Data for Sealing Foam (Spare Part)

Туре	Part number	
	Without filter	With filter
DI-PL 442x128 5R18	10.01.38.00864	10.01.38.00622
DI-PL 640x128 5R18	10.01.38.00865	10.01.38.00627
DI-PL 838x128 5R18	10.01.38.00866	10.01.38.00628
DI-PL 1234x128 5R18	10.01.38.00867	10.01.38.00629
DI-PL 1432x128 5R18	10.01.38.00868	10.01.38.00630

Note: A special foam for vacuum applications is used. Other foam heights and types (e.g. oil-resistant and temperature-resistant foams) on request

#### **Technical Data FXP / FMP**

Туре	Number of suction cells	Air consumption*	Max. suction flow [I/min]	Max. degree of evacuation [%]	Suction force** [N]	Weight [kg]
FXP-SVK 442 5R18	110	250	1,050	55	430	2.2
FXP-SVK 640 5R18	165	375	1,350	55	630	3.0
FXP-SVK 838 5R18	220	500	1,600	55	840	3.8
FXP-SVK 1234 5R18	330	875	2,940	55	1,270	5.3
FXP-SVK 1432 5R18	385	1,000	3,180	55	1,470	5.9
FXP-SW 442 5R18	110	250	1,050	55	340	2.1
FXP-SW 640 5R18	165	375	1,350	55	510	2.9
FXP-SW 838 5R18	220	500	1,600	55	670	3.7
FXP-SW 1234 5R18	330	875	2,940	55	1,010	5.2
FXP-SW 1432 5R18	385	1,000	3,180	55	1,180	5.8

Sound	level.	74	$dR(\Delta)$

Туре	Number	Required	Suction force**	Weight
71	of suction cells	suction flow*** [I/min]	[N]	[kg]
FMP-SVK 442 5R18	110	300	430	2.1
FMP-SVK 640 5R18	165	450	630	2.9
FMP-SVK 838 5R18	220	600	840	3.7
FMP-SVK 1234 5R18	330	900	1,270	5.1
FMP-SVK 1432 5R18	385	1,050	1,470	5.7
FMP-SW 442 5R18	110	300	340	2.0
FMP-SW 640 5R18	165	450	510	2.8
FMP-SW 838 5R18	220	600	670	3.6
FMP-SW 1234 5R18	330	900	1,010	5.0
FMP-SW 1432 5R18	385	1,050	1,180	5.6

<sup>\*</sup>Customer-specific gripper dimensions on request

<sup>\*</sup>For compressed air with 5.5 bar input pressure

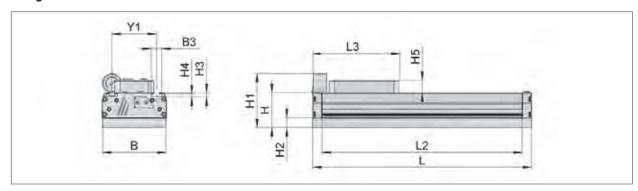
\*\*At -0.25 bar and with the gripper fully covered by a workpiece typical for the application (wooden board with structured surface)

<sup>\*\*\*</sup>The external vacuum generator used must supply at least the specified suction flow (at the vacuum connection piece of the FMP) at -0.25 bar but max. 135 % of the specified suction flow

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Design with Sealing Foam (5 Suction Rows)

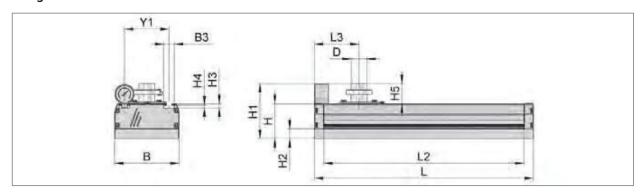
### **Design Data FXP**



Туре	Dimension	ıs [mm]										
	В	B3	Н	H1	H2	Н3	H4	H5	L	L2	L3	Y1
FXP-SVK 442 5R18	130	21.6	70	111	20	7.7	5.5	28	442	404	154	90
FXP-SVK 640 5R18	130	21.6	70	111	20	7.7	5.5	28	640	602	154	90
FXP-SVK 838 5R18	130	21.6	70	116	20	7.7	5.5	28	838	800	154	90
FXP-SVK 1234 5R18	130	21.6	70	116	20	7.7	5.5	28	1,234	1,196	154	90
FXP-SVK 1432 5R18	130	21.6	70	116	20	7.7	5.5	28	1,432	1,394	154	90
FXP-SW 442 5R18	130	21.6	70	111	20	7.7	5.5	28	442	404	154	90
FXP-SW 640 5R18	130	21.6	70	111	20	7.7	5.5	28	640	602	154	90
FXP-SW 838 5R18	130	21.6	70	116	20	7.7	5.5	28	838	800	154	90
FXP-SW 1234 5R18	130	21.6	70	116	20	7.7	5.5	28	1,234	1,196	154	90
FXP-SW 1432 5R18	130	21.6	70	116	20	7.7	5.5	28	1,432	1,394	154	90

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

#### **Design Data FMP**



Туре	Dimensio	ns [mm]											
	В	B3	D	H	H1	H2	Н3	H4	H5	L	L2	L3	Y1
FMP-SVK 442 5R18	130	21.6	32	70	111	20	7.7	5.5	41	442	404	90	90
FMP-SVK 640 5R18	130	21.6	32	70	111	20	7.7	5.5	41	640	602	90	90
FMP-SVK 838 5R18	130	21.6	60	70	116	20	7.7	5.5	46	838	800	90	90
FMP-SVK 1234 5R18	130	21.6	60	70	116	20	7.7	5.5	46	1,234	1,196	90	90
FMP-SVK 1432 5R18	130	21.6	60	70	116	20	7.7	5.5	46	1,432	1,394	90	90
FMP-SW 442 5R18	130	21.6	32	70	111	20	7.7	5.5	41	442	404	90	90
FMP-SW 640 5R18	130	21.6	32	70	111	20	7.7	5.5	41	640	602	90	90
FMP-SW 838 5R18	130	21.6	60	70	116	20	7.7	5.5	46	838	800	90	90
FMP-SW 1234 5R18	130	21.6	60	70	116	20	7.7	5.5	46	1,234	1,196	90	90
FMP-SW 1432 5R18	130	21.6	60	70	116	20	7.7	5.5	46	1,432	1,394	90	90

Note: Vacuum hose with internal diameter equal to dimension D required

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Design with Suction Cups ( $\emptyset = 20 \text{ mm}$ )



Vacuum Grip-ping Systems

#### Ordering Data for Area Gripping Systems FXP / FMP

Type*	Part number	
	Without filter	With filter
FXP-SVK 442 5R36 SPB2-20P	10.01.38.00735	10.01.38.00740
FXP-SVK 640 5R36 SPB2-20P	10.01.38.00736	10.01.38.00741
FXP-SVK 838 5R36 SPB2-20P	10.01.38.00737	10.01.38.00742
FXP-SVK 1234 5R36 SPB2-20P	10.01.38.00738	10.01.38.00743
FXP-SVK 1432 5R36 SPB2-20P	10.01.38.00739	10.01.38.00744
FXP-SW 442 5R36 SPB2-20P	10.01.38.00745	10.01.38.00750
FXP-SW 640 5R36 SPB2-20P	10.01.38.00746	10.01.38.00751
FXP-SW 838 5R36 SPB2-20P	10.01.38.00747	10.01.38.00752
FXP-SW 1234 5R36 SPB2-20P	10.01.38.00748	10.01.38.00753
FXP-SW 1432 5R36 SPB2-20P	10.01.38.00749	10.01.38.00754

Type*	Part number	
	Without filter	With filter
FMP-SVK 442 5R36 SPB2-20P	10.01.38.00323	10.01.38.00479
FMP-SVK 640 5R36 SPB2-20P	10.01.38.00475	10.01.38.00480
FMP-SVK 838 5R36 SPB2-20P	10.01.38.00476	10.01.38.00481
FMP-SVK 1234 5R36 SPB2-20P	10.01.38.00477	10.01.38.00482
FMP-SVK 1432 5R36 SPB2-20P	10.01.38.00478	10.01.38.00483
FMP-SW 442 5R36 SPB2-20P	10.01.38.00484	10.01.38.00489
FMP-SW 640 5R36 SPB2-20P	10.01.38.00485	10.01.38.00490
FMP-SW 838 5R36 SPB2-20P	10.01.38.00486	10.01.38.00491
FMP-SW 1234 5R36 SPB2-20P	10.01.38.00487	10.01.38.00492
FMP-SW 1432 5R36 SPB2-20P	10.01.38.00488	10.01.38.00493

#### Ordering Data for Suction Cups (Spare Parts)

Туре	Part number	
	Without filter	With filter
SPB2 20 SI-40 P	10.01.06.03125	10.01.38.00465

Note: Other suction cup types (construction, material, diameter) available on request

#### **Technical Data FXP / FMP**

Туре	Number of suction cups	Air consumption*	Max. suction flow [I/min]	Max. degree of evacuation [%]	Suction force**	Weight [kg]
FXP-SVK 442 5R36 SPB2-20P	55	250	1.050	55	180	2.7
FXP-SVK 640 5R36 SPB2-20P	82	375	1,350	55	270	3.7
			,			
FXP-SVK 838 5R36 SPB2-20P	110	500	1,600	55	360	4.5
FXP-SVK 1234 5R36 SPB2-20P	165	875	2,940	55	540	6.3
FXP-SVK 1432 5R36 SPB2-20P	193	1,000	3,180	55	630	7.1
FXP-SW 442 5R36 SPB2-20P	55	250	1,050	55	140	2.6
FXP-SW 640 5R36 SPB2-20P	82	375	1,350	55	210	3.6
FXP-SW 838 5R36 SPB2-20P	110	500	1,600	55	280	4.4
FXP-SW 1234 5R36 SPB2-20P	165	875	2,940	55	420	6.2
FXP-SW 1432 5R36 SPB2-20P	193	1,000	3,180	55	490	7.0

Sound level: 74 dB(A)

Туре	Number of	Required suction	Suction force**	Weight
	suction cups	flow*** [l/min]	[N]	[kg]
FMP-SVK 442 5R36 SPB2-20P	55	300	180	2.6
FMP-SVK 640 5R36 SPB2-20P	82	450	270	3.6
FMP-SVK 838 5R36 SPB2-20P	110	600	360	4.4
FMP-SVK 1234 5R36 SPB2-20P	165	900	540	6.1
FMP-SVK 1432 5R36 SPB2-20P	193	1,050	630	6.9
FMP-SW 442 5R36 SPB2-20P	55	300	140	2.5
FMP-SW 640 5R36 SPB2-20P	82	450	210	3.5
FMP-SW 838 5R36 SPB2-20P	110	600	280	4.3
FMP-SW 1234 5R36 SPB2-20P	165	900	420	6.0
FMP-SW 1432 5R36 SPB2-20P	193	1,050	490	6.8

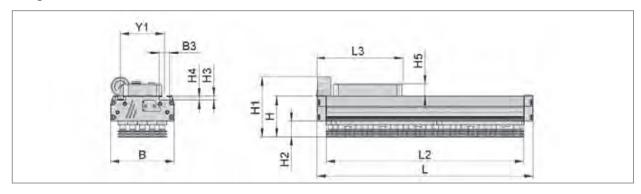
<sup>\*</sup>For compressed air with 5.5 bar input pressure

<sup>\*</sup>Customer-specific gripper dimensions on request

<sup>\*\*</sup>At a vacuum of -0.25 bar and with the gripper fully covered by a workpiece typical for the application (cardboard box, corrugated with structured surface)
\*\*\*The external vacuum generator used must supply at least the specified suction flow (at the vacuum connection piece of the FMP) at -0.25 bar but max. 135 % of the specified suction flow

Design with Suction Cups ( $\emptyset = 20 \text{ mm}$ )

#### **Design Data FXP**

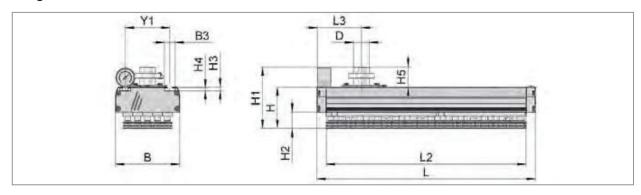


Туре	Dimen	sions [mm	n]									
	В	В3	H	H1	H2*	Н3	H4	H5	L	L2	L3	Y1
FXP-SVK 442 5R36 SPB2-20P	130	21.6	83	124	33	7.7	5.5	28	442	404	154	90
FXP-SVK 640 5R36 SPB2-20P	130	21.6	83	124	33	7.7	5.5	28	640	602	154	90
FXP-SVK 838 5R36 SPB2-20P	130	21.6	83	129	33	7.7	5.5	28	838	800	154	90
FXP-SVK 1234 5R36 SPB2-20P	130	21.6	83	129	33	7.7	5.5	28	1,234	1,196	154	90
FXP-SVK 1432 5R36 SPB2-20P	130	21.6	83	129	33	7.7	5.5	28	1,432	1,394	154	90
FXP-SW 442 5R36 SPB2-20P	130	21.6	83	124	33	7.7	5.5	28	442	404	154	90
FXP-SW 640 5R36 SPB2-20P	130	21.6	83	124	33	7.7	5.5	28	640	602	154	90
FXP-SW 838 5R36 SPB2-20P	130	21.6	83	129	33	7.7	5.5	28	838	800	154	90
FXP-SW 1234 5R36 SPB2-20P	130	21.6	83	129	33	7.7	5.5	28	1,234	1,196	154	90
FXP-SW 1432 5R36 SPB2-20P	130	21.6	83	129	33	7.7	5.5	28	1,432	1,394	154	90

<sup>\*</sup>Permissible dimensional tolerances for elastomer parts according to DIN ISO 3302-1 M3

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

#### **Design Data FMP**



Туре	Dimensi	ons [mm	]										
	В	В3	D	Н	H1	H2*	Н3	H4	H5	L	L2	L3	Y1
FMP-SVK 442 5R36 SPB2-20P	130	21.6	32	83	124	33	7.7	5.5	41	442	404	90	90
FMP-SVK 640 5R36 SPB2-20P	130	21.6	32	83	124	33	7.7	5.5	41	640	602	90	90
FMP-SVK 838 5R36 SPB2-20P	130	21.6	60	83	129	33	7.7	5.5	46	838	800	90	90
FMP-SVK 1234 5R36 SPB2-20P	130	21.6	60	83	129	33	7.7	5.5	46	1,234	1,196	90	90
FMP-SVK 1432 5R36 SPB2-20P	130	21.6	60	83	129	33	7.7	5.5	46	1,432	1,394	90	90
FMP-SW 442 5R36 SPB2-20P	130	21.6	32	83	124	33	7.7	5.5	41	442	404	90	90
FMP-SW 640 5R36 SPB2-20P	130	21.6	32	83	124	33	7.7	5.5	41	640	602	90	90
FMP-SW 838 5R36 SPB2-20P	130	21.6	60	83	129	33	7.7	5.5	46	838	800	90	90
FMP-SW 1234 5R36 SPB2-20P	130	21.6	60	83	129	33	7.7	5.5	46	1,234	1,196	90	90
FMP-SW 1432 5R36 SPB2-20P	130	21.6	60	83	129	33	7.7	5.5	46	1,432	1,394	90	90

<sup>\*</sup>Permissible dimensional tolerances for elastomer parts according to DIN ISO 3302-1 M3 Note: Vacuum hose with internal diameter equal to dimension D required

Design with Suction Cups ( $\emptyset = 40 \text{ mm}$ )



Special Grippers

Vacuum Grip-ping Systems

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#### Ordering Data for Area Gripping Systems FXP / FMP

Type*	Part number Without filter	With filter
FXP-SVK 442 3R54 SPB2-40P	10.01.38.00715	10.01.38.00720
FXP-SVK 640 3R54 SPB2-40P	10.01.38.00716	10.01.38.00721
FXP-SVK 838 3R54 SPB2-40P	10.01.38.00717	10.01.38.00722
FXP-SVK 1234 3R54 SPB2-40P	10.01.38.00718	10.01.38.00723
FXP-SVK 1432 3R54 SPB2-40P	10.01.38.00719	10.01.38.00724
FXP-SW 442 3R54 SPB2-40P	10.01.38.00725	10.01.38.00730
FXP-SW 640 3R54 SPB2-40P	10.01.38.00726	10.01.38.00731
FXP-SW 838 3R54 SPB2-40P	10.01.38.00727	10.01.38.00732
FXP-SW 1234 3R54 SPB2-40P	10.01.38.00728	10.01.38.00733
FXP-SW 1432 3R54 SPB2-40P	10.01.38.00729	10.01.38.00734

Type*	Part number	
	Without filter	With filter
FMP-SVK 442 3R54 SPB2-40P	10.01.38.00311	10.01.38.00446
FMP-SVK 640 3R54 SPB2-40P	10.01.38.00439	10.01.38.00447
FMP-SVK 838 3R54 SPB2-40P	10.01.38.00443	10.01.38.00448
FMP-SVK 1234 3R54 SPB2-40P	10.01.38.00444	10.01.38.00449
FMP-SVK 1432 3R54 SPB2-40P	10.01.38.00445	10.01.38.00450
FMP-SW 442 3R54 SPB2-40P	10.01.38.00451	10.01.38.00458
FMP-SW 640 3R54 SPB2-40P	10.01.38.00453	10.01.38.00459
FMP-SW 838 3R54 SPB2-40P	10.01.38.00455	10.01.38.00460
FMP-SW 1234 3R54 SPB2-40P	10.01.38.00456	10.01.38.00461
FMP-SW 1432 3R54 SPB2-40P	10.01.38.00457	10.01.38.00462

#### **Ordering Data for Suction Cups (Spare Parts)**

Туре	Part number	
	Without filter	With filter
SPB2 40 SI-55 P	10.01.06.03126	10.01.38.00452

Note: Other suction cup types (construction, material, diameter) available on request

#### **Technical Data FXP / FMP**

Туре	Number of	Air consumption*	Max. suction	Max. degree of	Suction force**	Weight
	suction cups	[l/min]	flow [l/min]	evacuation [%]	[N]	[kg]
FXP-SVK 442 3R54 SPB2-40P	23	250	1,050	55	250	2.8
FXP-SVK 640 3R54 SPB2-40P	33	375	1,350	55	360	3.8
FXP-SVK 838 3R54 SPB2-40P	44	500	1,600	55	480	4.7
FXP-SVK 1234 3R54 SPB2-40P	66	875	2,940	55	720	6.5
FXP-SVK 1432 3R54 SPB2-40P	77	1,000	3,180	55	840	7.3
FXP-SW 442 3R54 SPB2-40P	23	250	1,050	55	200	2.7
FXP-SW 640 3R54 SPB2-40P	33	375	1,350	55	290	3.7
FXP-SW 838 3R54 SPB2-40P	44	500	1,600	55	390	4.6
FXP-SW 1234 3R54 SPB2-40P	66	875	2,940	55	580	6.4
FXP-SW 1432 3R54 SPB2-40P	77	1,000	3,180	55	680	7.2

Sound level: 74 dB(A)

Туре	Number of suction cups	Required suction flow*** [I/min]	Suction force**	Weight [kg]
		110W [I/IIIII]		
FMP-SVK 442 3R54 SPB2-40P	23	300	250	2.7
FMP-SVK 640 3R54 SPB2-40P	33	450	360	3.7
FMP-SVK 838 3R54 SPB2-40P	44	600	480	4.6
FMP-SVK 1234 3R54 SPB2-40P	66	900	720	6.3
FMP-SVK 1432 3R54 SPB2-40P	77	1,050	840	7.1
FMP-SW 442 3R54 SPB2-40P	23	300	200	2.6
FMP-SW 640 3R54 SPB2-40P	33	450	290	3.6
FMP-SW 838 3R54 SPB2-40P	44	600	390	4.5
FMP-SW 1234 3R54 SPB2-40P	66	900	580	6.2
FMP-SW 1432 3R54 SPB2-40P	77	1,050	680	7.0

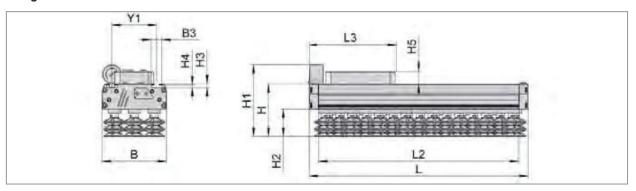
<sup>\*</sup>For compressed air with 5.5 bar input pressure

<sup>\*</sup>Customer-specific gripper dimensions on request

<sup>\*\*</sup>At a vacuum of -0.25 bar and with the gripper fully covered by a workpiece typical for the application (cardboard box, corrugated with structured surface)
\*\*\*The external vacuum generator used must supply at least the specified suction flow (at the vacuum connection piece of the FMP) at -0.25 bar but max. 135 % of the specified suction flow

Design with Suction Cups ( $\emptyset = 40 \text{ mm}$ )

#### **Design Data FXP**

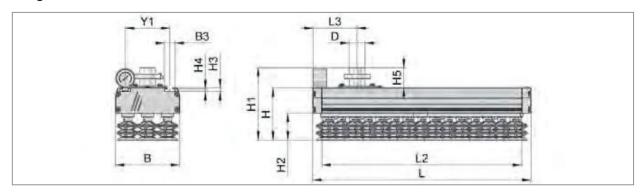


Туре	Dimen	sions [mm	]									
	В	B3	H	H1	H2*	Н3	H4	Н5	L	L2	L3	Y1
FXP-SVK 442 3R54 SPB2-40P	130	21.6	105	146	55	7.7	5.5	28	442	404	154	90
FXP-SVK 640 3R54 SPB2-40P	130	21.6	105	146	55	7.7	5.5	28	640	602	154	90
FXP-SVK 838 3R54 SPB2-40P	130	21.6	105	151	55	7.7	5.5	28	838	800	154	90
FXP-SVK 1234 3R54 SPB2-40P	130	21.6	105	151	55	7.7	5.5	28	1,234	1,196	154	90
FXP-SVK 1432 3R54 SPB2-40P	130	21.6	105	151	55	7.7	5.5	28	1,432	1,394	154	90
FXP-SW 442 3R54 SPB2-40P	130	21.6	105	146	55	7.7	5.5	28	442	404	154	90
FXP-SW 640 3R54 SPB2-40P	130	21.6	105	146	55	7.7	5.5	28	640	602	154	90
FXP-SW 838 3R54 SPB2-40P	130	21.6	105	151	55	7.7	5.5	28	838	800	154	90
FXP-SW 1234 3R54 SPB2-40P	130	21.6	105	151	55	7.7	5.5	28	1,234	1,196	154	90
FXP-SW 1432 3R54 SPB2-40P	130	21.6	105	151	55	7.7	5.5	28	1,432	1,394	154	90

<sup>\*</sup>Permissible dimensional tolerances for elastomer parts according to DIN ISO 3302-1 M3

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

#### **Design Data FMP**



Туре	Dimensi	ons [mm	]										
	В	В3	D	H	H1	H2*	Н3	H4	H5	L	L2	L3	Y1
FMP-SVK 442 3R54 SPB2-40P	130	21.6	32	105	146	55	7.7	5.5	41	442	404	90	90
FMP-SVK 640 3R54 SPB2-40P	130	21.6	32	105	146	55	7.7	5.5	41	640	602	90	90
FMP-SVK 838 3R54 SPB2-40P	130	21.6	60	105	151	55	7.7	5.5	46	838	800	90	90
FMP-SVK 1234 3R54 SPB2-40P	130	21.6	60	105	151	55	7.7	5.5	46	1,234	1,196	90	90
FMP-SVK 1432 3R54 SPB2-40P	130	21.6	60	105	151	55	7.7	5.5	46	1,432	1,394	90	90
FMP-SW 442 3R54 SPB2-40P	130	21.6	32	105	146	55	7.7	5.5	41	442	404	90	90
FMP-SW 640 3R54 SPB2-40P	130	21.6	32	105	146	55	7.7	5.5	41	640	602	90	90
FMP-SW 838 3R54 SPB2-40P	130	21.6	60	105	151	55	7.7	5.5	46	838	800	90	90
FMP-SW 1234 3R54 SPB2-40P	130	21.6	60	105	151	55	7.7	5.5	46	1,234	1,196	90	90
FMP-SW 1432 3R54 SPB2-40P	130	21.6	60	105	151	55	7.7	5.5	46	1,432	1,394	90	90

<sup>\*</sup>Permissible dimensional tolerances for elastomer parts according to DIN ISO 3302-1 M3 Note: Vacuum hose with internal diameter equal to dimension D required

Design with Sealing Foam (Height = 10 mm)



Special Grippers Vacuum Gripping Systems



#### The Small and Flexible Gripper

- For use in packaging processes for handling a wide range of products, e.g. filling boxes
- Ideal for integration in packaging machines (e.g. case packers) due to its compact dimensions and low weight
- For use on vacuum suction spiders for handling bending workpieces such as metal sheets and veneer
- FX type with integrated vacuum generation (ejector)
- FM type with connection for external vacuum generation

#### Ordering Data FX / FM

Туре	Part number Gripping system	Sealing foam (spare part)**
FX-SW 120x60	10.01.11.01802	10.01.10.00874
FX-SW 120x60 SEA*	10.01.11.01800	10.01.10.00874

FX-SW 120x60 SEA*	10.01.11.01800	10.01.10.00874	FM-SW 120x60					
*Cripping system with blow off function for fort depositing of workpieces								

<sup>\*</sup>Gripping system with blow off function for fast depositing of workpieces
\*\*Other foam heights and types on request

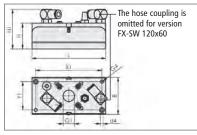
Note: Noise reduction possible by using an additional silencer (FX 120x60)

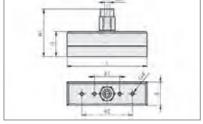
Туре	Part number	
	Gripping system	Sealing foam
		(spare part)**
FM-SW 76x22	10.01.11.00851	10.01.11.01388
FM-SW 120x60	10.01.11.01823	10.01.10.00874

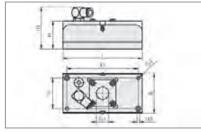
#### Technical Data FX / FM

Туре	Number	Air consumption*	Max. suction	Max. degree of	Suction force**	Weight
	of suction cells	[l/min]	flow [l/min]	evacuation [%]	[N]	[kg]
FX-SW 120x60	10	117	69	80	98	0.70
FX-SW 120x60 SEA	10	117	69	80	98	0.80
FM-SW 76x22	26	_***	_***	_***	40	0.06
FM-SW 120x60	10	_***	_***	_***	98	0.50

#### **Design Data**







FX-SW 120x60 SEA

FM-SW 76x22

FM-SW 120x60

Туре	Dimensi	ons [mm]									
	В	d4	dn	G1	G4	Н	H1	L	X1	X2	Y1
FX-SW 120x60	60	4.5	-	G <sup>1</sup> /2"-F	M6 -F	42	63	120	108	-	46
FX-SW 120x60 SEA	60	4.5	-	G <sup>1</sup> /2"-F	M6-F	42	63	120	108	-	46
FM-SW 76x22	22	-	8	-	M3-F	24	35	76	24	48	-
FM-SW 120x60	60	4.5	-	G <sup>1</sup> /2"-F	M6 -F	42	63	120	108	-	46

Note: The type FX requires an 8/6 mm compressed air hose; the type FM requires an 8/6 mm vacuum hose

<sup>\*</sup>For compressed air with 5 bar input pressure
\*\*At -0.6 bar and with the gripper fully covered by a rigid workpiece

<sup>\*\*\*</sup>Depending on the external vacuum generation





#### Ordering Data FX / FM

Туре	Part number Gripping system	Suction cup (spare part)**
FX-SW 120x60 20 FSG12	10.01.11.02009	10.01.06.00558
FX-SW 120x60 20 FSG12 SEA*	10.01.11.02008	10.01.06.00558

Туре	Part number	
	Gripping system	Suction cup
		(spare part)**
FM-SW 120x60 20 FSG12	10.01.11.02010	10.01.06.00558

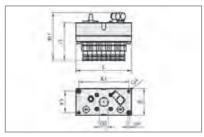
<sup>\*</sup>Gripping system with blow off function for fast depositing of workpieces

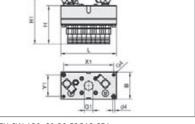
#### **Technical Data FX / FM**

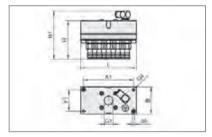
Туре	Number of suction cups	Air consumption* [I/min]	Max. suction flow [l/min]	Max. degree of evacuation [%]		Weight [kg]
FX-SW 120x60 20 FSG12	14	117	69	80	12.6	1.0
FX-SW 120x60 20 FSG12 SEA	14	117	69	80	12.6	1.1
FM-SW 120x60 20 FSG12	14	-***	_***	_***	12.6	0.8

<sup>\*</sup>For compressed air with 5 bar input pressure

#### **Design Data**







FX-SW 120x60 20 FSG12

FX-SW 120x60 20 FSG12 SEA

FM-SW 120x60 20 FSG12

Туре	Dimensions	Dimensions [mm]							
	В	d4	G1	G4	Н	H1	L	X1	Y1
FX-SW 120x60 20 FSG12	60	4.5	G1/2"-F	M6 -F	82	103	120	108	46
FX-SW 120x60 20 FSG12 SEA	60	4.5	G <sup>1</sup> /2"-F	M6 -F	82	103	120	108	46
FM-SW 120x60 20 FSG12	60	4.5	G <sup>1</sup> /2"-F	M6 -F	82	103	120	108	46
				_					

Note: The FX type requires an 8/6 mm compressed air hose; the FM type requires an 8/6 mm vacuum hose

<sup>\*\*</sup>Other suction cup types (construction, material) available on request Note: Noise reduction possible by using an additional silencer (FX 120x60)

<sup>\*\*</sup>At -0.6 bar and with the gripper fully covered by a rigid workpiece
\*\*\*Depending on the external vacuum generation



Very Robust Grippers for the Timber and Woodworking Industry

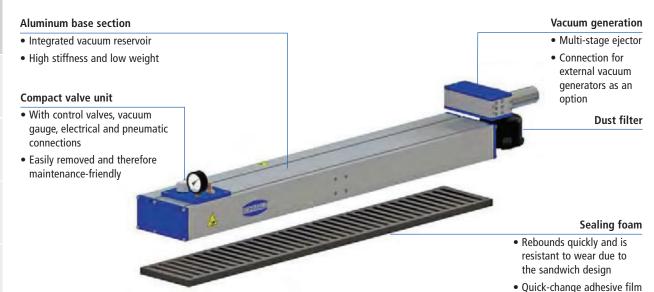


Vacuum area gripping system SBX

#### **Application**

- Robust gripper for powerful handling of lumber, planed or glued timber, sheet materials, construction timber, pallets and crate
- Handling of naturally growing materials with knots or cracks or with warped, rough surfaces
- Ideal for the rough application conditions in saw mills or in woodworking and furniture construction
- Also suitable for unstacking and transporting workpieces in layers when in the double gripper configuration
- Ideal for operation with industrial robots and gantries due to its low weight and compact dimensions

#### Design





Vacuum area gripping systems SBX on an industrial gantry for handling unplaned wooden boards

#### **Your Benefits**

- Extra high holding force for extremely porous and warped workpieces
- Automatic switching off of uncovered suction cells in order to sustain maximum system pressure
- Fast vacuum generation to minimize cycle times
- Maintenance-friendly due to compact valve unit and quickchange sealing foam
- Easy system integration due to pluggable connections
- Adaptation of the area gripper to the particular application case

Types







#### SBX 200 with Vacuum Generation

- Multi-stage ejector SEM 150 with dust filter
- Vacuum generation directly at the gripper ensures fast evacuation
- Easy mounting and installation without the need to connect additional hoses
- Ejector and dust filter can be optionally integrated into the base section

#### SBX 200 for External Vacuum Generation

- Connection piece for external vacuum generator
- Use of electrical vacuum generators (blower or pump) to achieve high flow rates and vacuum up to -0.8 bar
- Low operating costs due to electrical vacuum generation



#### SBX 400 for External Vacuum Generation

- Double gripper design for maximum holding forces
- Increased hit rate due to offset suction cell grid, thus particularly suited for thin workpieces
- Use of electrical vacuum generators (blower or pump) to achieve high flow rates and vacuums up to -0.8 bar



Vacuum Grip- Special ping Systems Grippers

## **Product Specifications**



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Vacuum Grip- Special ping Systems Grippers

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Filters and Switches and Valve Connections Monitoring Technology

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#### **Quick-Change Plate**

- Quick and easy changing of the sealing plate using quick-release clamp
- Allows soaked or frozen sealing plates to be used again after drying



#### Water Removal System

- Reliably removes any water that is sucked into the gripper
- Increased process reliability for wet workpieces
- Basic version: manually operated valve
- Advanced version: electrically operated valve



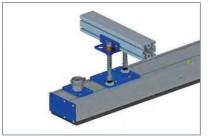
#### **Heating System**

- The area gripper is slightly heated by a heating system
- Prevents moisture from freezing on the gripper when temperatures are low in outdoor applications



#### **Gripper Segmentation**

- Sectioning of the gripper into multiple suction zones that can be adjusted as needed and asynchronously controlled
- Prevents intermediate layers from being picked up inadvertently
- Min. zone size of 315 mm (for standard grid)



#### **Spring-Loaded Level Compensation**

- Quick mounting on beams and gantries
- Jointed / spring-loaded design for optimal height compensation and gentle setting down on the workpiece



#### Flexible Level Compensation

- Spring plunger with spherical bearing
- Maximum flexibility for extremely uneven layers of workpieces
- Responsive in all directions
- Self-centering and therefore no jamming

#### **Designation Code**

Designation code explained using the example of: SBX-C 1040x200 35 25 SEM-150

SBX	C	1040x200	35	25	SEM-150
Туре	Version	Length x width [mm]	Suction cell grid distance [mm]	Foam height [mm]	Vacuum generation
SBX	C With compact valve unit	1,040 x 200	35	25	SEM-150 Multi-stage ejector
SBX	C With compact valve unit	1,040 x 200 1,250 x 200 1,040 x 400 1,250 x 400	35 Moderate (standard) 28 Fine (on request)	25	SEM-150 Multi-stage ejector  External vacuum generation (pump or blower)

www.schmalz.com/sbx

## **Product Specifications**



#### **Ordering Data SBX**

Type*	Part number	
	Gripping system	Sealing plate** (spare part)
SBX-C 1040x200 35 25 SEM-150	10.01.20.01000	10.01.20.01006
SBX-C 1250x200 35 25 SEM-150	10.01.20.01001	10.01.20.00438
SBX-C 1040x200 35 25	10.01.20.01002	10.01.20.01006
SBX-C 1250x200 35 25	10.01.20.01003	10.01.20.00438
SBX-C 1040x400 35 25	10.01.20.01004	10.01.20.01007
SBX-C 1250x400 35 25	10.01.20.01005	10.01.20.00440

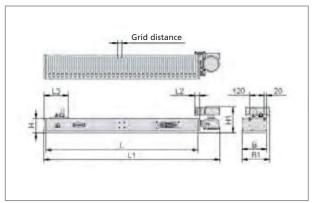
<sup>\*</sup>Customer-specific gripper dimensions on request

#### **Technical Data SBX**

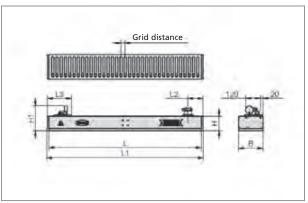
Туре	Vacuum	Number of	Air consump-	Max. suction	Max. degree of	Suction	Weight
	generation	suction cells	tion [l/min]	flow [l/min]	evacuation [%]	force**[N]	[kg]
SBX-C 1040x200 35 25 SEM-150*	Ejector	29	640	1,400	80	2,400	25
SBX-C 1250x200 35 25 SEM-150*	Ejector	35	640	1,400	80	3,000	28
SBX-C 1040x200 35 25	Blower / Pump	29	-***	_***	_***	2,400	23
SBX-C 1250x200 35 25	Blower / Pump	35	-***	_***	_***	3,000	26
SBX-C 1040x400 35 25	Blower / Pump	57	-***	_***	_***	4,500	46
SBX-C 1250x400 35 25	Blower / Pump	69	_***	_***	_***	5,900	52

<sup>\*</sup>Sound level 78 dB(A)

#### **Design Data**







SBX with connection for external vacuum generator

Туре	Dimensions [	mm]						
	Н	H1	В	B1	L	L1	L2	L3
SBX-C 1040x200 35 25 SEM-150	125	217.0	200	225.5	1040	1234	41	185
SBX-C 1250x200 35 25 SEM-150	125	217.0	200	225.5	1250	1444	41	185
SBX-C 1040x200 35 25	125	207.5	200	-	1040	1075	123	185
SBX-C 1250x200 35 25	125	207.5	200	-	1250	1285	123	185
SBX-C 1040x400 35 25	125	207.5	400	-	1040	1075	123	185
SBX-C 1250x400 35 25	125	207.5	400	-	1250	1285	123	185

Note: Type SBX requires compressed air hose 15/9 mm

<sup>\*\*</sup>Other foam heights and foam types on request

<sup>\*\*</sup>At -0.25 bar and with full gripper coverage
\*\*\*Depending on the external vacuum generation

### Configuring Rather than Designing



Suction Cups

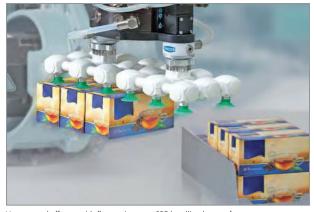
#### Suitability for industry-specific applications



The vacuum end effector with vacuum module and bellows suction cups SPB4f handling flexible packages

#### **Application**

- Fast and cost-effective design of vacuum end effectors for highspeed packaging processes
- Pick-and-place applications with Delta, SCARA and articulated
- Fully automated filling of cardboard boxes and case packers
- Mainly used in primary and secondary packaging processes
- Transporting products into top-loading machines, and cardboard box and tray erectors
- Use in flexible packaging machines with frequent format



Vacuum end effector with flat suction cups SPF handling boxes of tea



The vacuum end effector with bellows suction cups SPB4f handling pouches with strong wrinkling and low filling degree

#### Our highlights ...

- Perfectly coordinated individual components
- Online configurator with generation of CAD data and parts list
- Light weight (ready-to-connect end effectors starting at 150 g)
- FDA and BfR-compliant (German Federal Institute for Risk Assessment) high performance thermoplastic
- With optional integrated vacuum generation using the Schmalz eco nozzle technology
- Assembly service

#### Your benefits ...

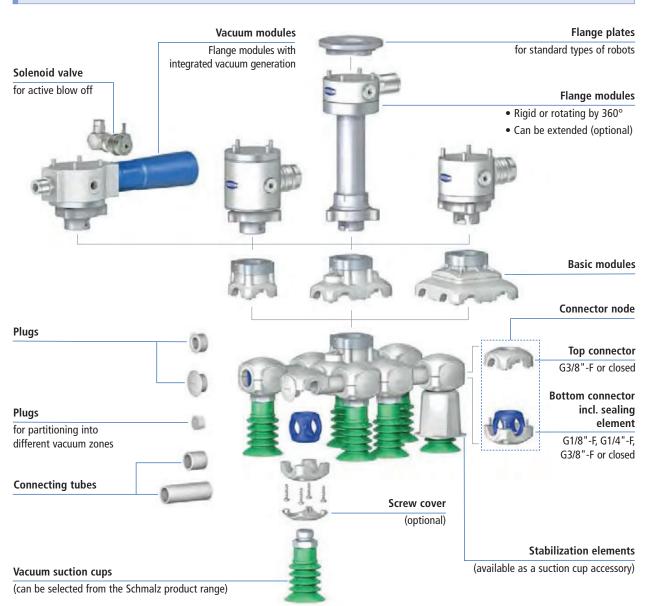
- > Flexible gripper configurations with variable suction cup number and positioning
- > Minimizes configuration and setup times by more than 80 %
- > Designed for high-speed applications with accelerations of up to 10 g (100 m/s<sup>2</sup>)
- > Excellent resistance to alkaline cleaning agents
- > Fast, energy-efficient vacuum generation right at the gripper
- > Delivery of entire assembled, ready-to-connect vacuum end effectors

### **Vacuum End Effectors VEE**

## Configuring Rather than Designing



### Design



#### VEE online configurator

- Live 3D preview of the configuration
- Creation of a 3D PDF data sheet including a parts list and CAD data
- Simple importing in your consisting construction
- Quick request for proposal (RFP)



Online Configurator for Vacuum End Effectors VEE

Company

Knowledge

Suction Cups

Grippers

vacuum Gripping Systems

Elements

enerators

Techinologyts

SWItches and

Connections

Services

Contact

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### Vacuum End Effectors VEE

### Configuring Rather than Designing



Vacuum Suction Cups

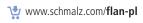
Special Grippers

Vacuum Grip-ping Systems



#### Flange plates FLAN-PL

Quick and easy connection of the flange module to the robot; available for connectional robot types and as an universal flange.





#### Flange modules VEE-QCM

Quick-change adapters and vacuum connection; either horizontal or vertical (max. flow rate 60 m³/h). Rotary unit VEE-RU for continuous rotation of the end effector without decreasing the flow or winding up the hose available as an alternative.

www.schmalz.com/vee-qcm .../vee-ru



#### Vacuum modules VEE-QCMV

Quick-change adapters with space-saving integrated, energy-efficient vacuum generation using the Schmalz ecoPump (max. suction rate: 10.5 m<sup>3</sup>/h); with silencer or holder cap.





#### Solenoid valve EMV for active blow off

Minimal cycle times with active blow off through a controlled compressed air pulse; available as an accessory for vacuum module VEE-QCMV.

www.schmalz.com/emv



#### Flange extensions VEE-FE

Option for flange modules for dipping into cardboard boxes or trays; available in three lengths. Can be swapped quickly thanks to the bayonet mount.





#### **Basic modules VEE-QCF**

Tool-free connection of the end effector to the flange module and central vacuum feed; available as a 1-, 2-, or 4-connection module.





#### Top connector VEE-CO-U

Top half-shell for assembly of connection nodes; available in closed design or with connection for additional vacuum feed (G3/8"-F).





#### Bottom connector VEE-CO-L

Bottom half-shell including sealing element and screws for assembly of connecting nodes; either closed or with connection for suction cup (G1/8"-F, G1/4"-F, G3/8"-F); optional screw cover available.





#### Connection tubes VEE-TU

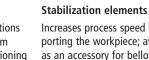
Vacuum guide and variable connection of nodes; available in 18 mm and 200 mm lengths. Pipe scissors for quick and safe cutting available as accessory.





#### Plugs VEE-PL

For sealing unused connections on connector nodes, vacuum feed on the side and partitioning into different vacuum zones.



#### www.schmalz.com/vee-pl www.schmalz.com/spse



#### Stabilization elements SPSE

Increases process speed by supporting the workpiece; available as an accessory for bellows suction cups.



#### Tool center point VEE-TCP

For determining the robot tool position with a center point that can be flange mounted directly; suitable for the quick-change interfaces of the flange modules or vacuum modules.





### **Vacuum End Effectors VEE**

### Configuring Rather than Designing



#### **VEE-Starterset**

Whether for use directly in a robotic system or as handy design tool — with the VEE Starter Set you have all of the most important components for quickly assembling your effector right at your fingertips.

#### Content

120-piece starter set with all of the components necessary for installing up to two VEE vacuum end effectors, including:

- 8 vacuum suction cups SPB4f-30 for bags and flexible packaging
- Lockable quick-change adapter with bayonet mount Supplied in a sturdy plastic case with detailed assembly instructions Part no.: 10.01.36.00030



VEE-Starterset



#### **Technical Data**

Specification	Vacuum end effectors from the VEE system
Max. rated flow	60 m³/h
Max. vacuum value	-980 mbar
Overpressure resistance	up to 3 bar
Temperature range	-25 °C to +80 °C (QCMV from 0 °C to +60 °C
Material	High performance thermoplastic (compliant with FDA guidelines)
Max. load capacity	2,000 g



#### **Design Data**

Vacuum end effectors VEE can be freely configured within the framework values. When used in connection with our wide selection of suction cups, the possibilities are practically endless.

Specifications	Vacuum end effectors from the VEE system	
	Minimum configuration	Maximum configuration
Basic module	1-connection	4-connection
Suction cups connection thread	G1/8"-F, G1/4"-F, G3/8"-F	G1/8"-F, G1/4"-F, G3/8"-F
Gripper size (L/W)	38 x 38 mm	300 x 200 mm
Weight*	65 g	500 g
Qty. of suction cups	1	12
Workpiece sizes (L/W)	15 x 15 mm	400 x 300 mm

<sup>\*</sup>without flange module and suction cup

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