numatics®

Vacuum Products

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Industrial Automation

numatics®

Numatics, Inc. is a leading manufacturer of pneumatic products and motion control products. Our broad spectrum of standard, custom developed products and application components, have made a significant impact on pneumatic innovation as well as pneumatic and motion control technology. Our company has an extensive history of generating innovative concepts and technological breakthroughs. Many of today's standard features in pneumatic technology were industry firsts from Numatics. We continue our innovative approach to product development by developing electric motion control solutions and enhancing our embedded Fieldbus and I/O products to continually meet and solve our customers' application requirements.

Today Numatics is proud to be a part of the Industrial Automation Division of Emerson Electric Co.

Emerson (NYSE:EMR), based in St. Louis, Missouri (USA), is a global leader in bringing technology and engineering together to provide innovative solutions for customers in industrial, commercial, and consumer markets through its network power, process management, industrial automation, climate technologies, and appliance and tools businesses. For more information, visit www.Emerson.com.

EMERSON™
Industrial Automation

numatics

Intro to Vacuum Products

Vacuum Generators (Ejectors, Electric Pumps)

Suction Cups

Mounting Elements

Specialty Grippers

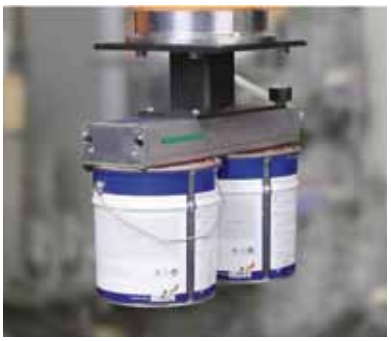
Vacuum Sensors/Switches and Regulators

Accessories

Vacuum Components and Gripping Systems

Vacuum components and vacuum gripping systems from Numatics permit decisive productivity improvements in automated processes. Be it in mechanical engineering or in the robot industry – Numatics customers in all areas of automation technology profit from our qualified system consultancy services and our innovative solutions. The range of workpieces which can be handled with vacuum extends from easily damaged, small parts such as electronic chips or CDs to furniture elements or heavy sheets of steel.

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 Components

- Vacuum suction cups
- Special grippers
- Mounting elements
- Vacuum generators
- Numatics valve technology
- Switches and system monitoring
- Filters and connections

Vacuum Gripping Systems

- Fully configured systems for industrial robots and portals, delivered ready for connection

Industry and Market Specific Solutions

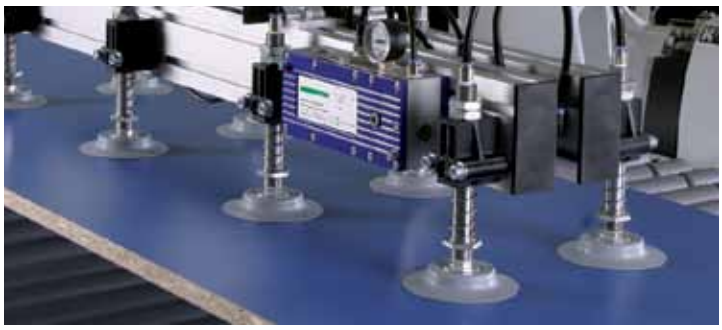
In all areas of automation technology, Numatics customers benefit from expert systems consulting and innovative solutions. Numatics vacuum components include everything they need to develop a fully operational vacuum system.

The extensive range of vacuum products corresponds to the specific requirements in a wide variety of industry sectors. The primary focus is on the industries described below.

Metal sheets /automotive

Fast cycle times and high operational reliability

- Special suction cups for highly dynamic metal sheet handling, even with oiled metal sheets or fragile components
- Vacuum generator with integrated system monitoring, condition monitoring and IO-Link technology for increasing process reliability and improving energy efficiency
- Optimized mounting elements for the requirements of the automotive industry



Wood

Handling of workpieces with a variety of surfaces under difficult operating conditions

- Comprehensive range of filters for protecting vacuum systems from contamination
- Large area vacuum gripping systems for moving wooden sheets, furniture parts, pallets or entire layers of boards

Industry and Market Specific Solutions Continued

Packaging

Packaging of goods and handling of packaged products with minimal cycle times

- Complete suction cup offering with a large variety of materials and sizes for a wide range of packaging and products
- Large range of vacuum generators for various process requirements
- Vacuum layer gripping systems for palletizing/de-palletizing and order picking of packaged products

Plastics

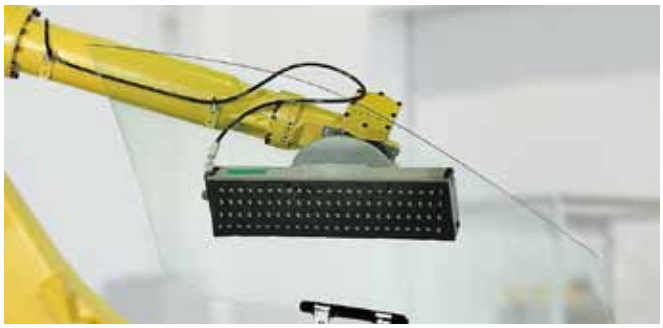
Removal of hot plastic parts leaving very few marks

- Special materials of the suction cups with temperature resistant materials.
- Vacuum generator minimized in size for highly dynamic handling

Glass

Secure gripping

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



Composite

Handling of porous composite materials

- Special grippers with integrated vacuum generation and high volume flow for secure gripping even in case of porous materials such as carbon composites

Table of Contents

Numatics Vacuum Products - Engineering Section

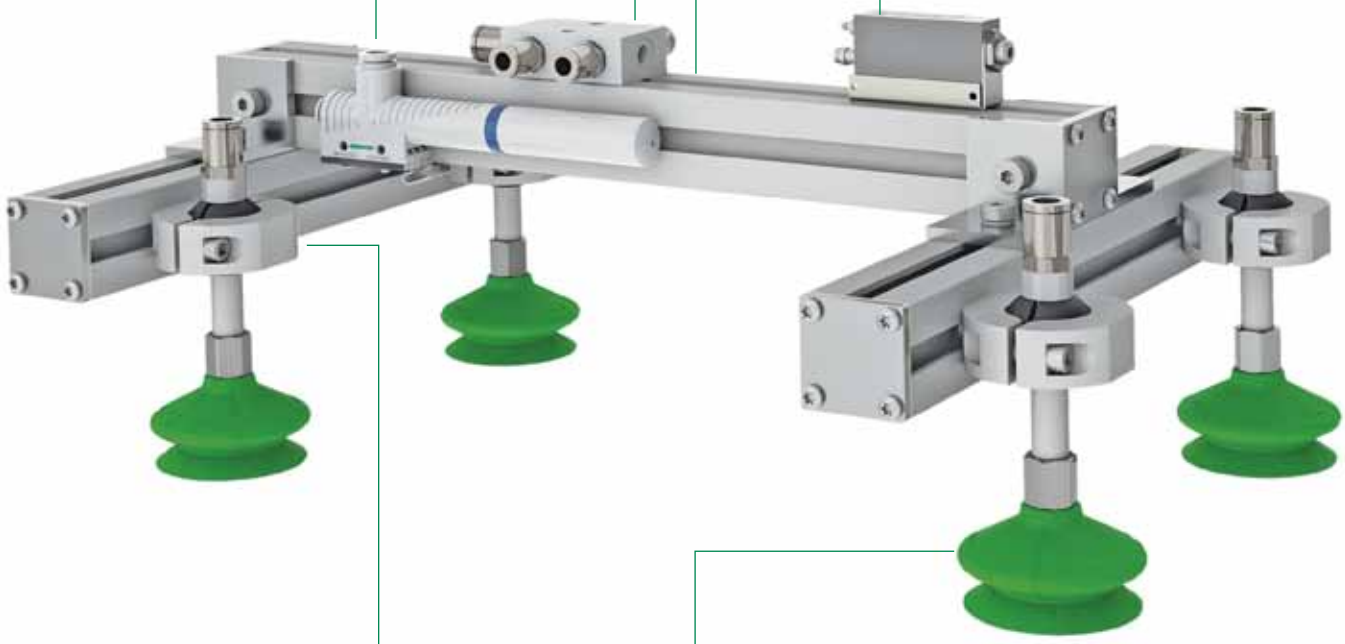
Overview of a Vacuum System

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

Filters and connectors
Filters protect the vacuum generator; hoses and connectors connect the componenets

Vacuum generators
Centralized or decentralized vacuum generation by means of ejectors, pumps or blowers.

Switches and system monitoring
Measuring and control components ensure safe operation of the vacuum system



Mounting elements
Fast and flexible connection of vacuum components to tooling systems

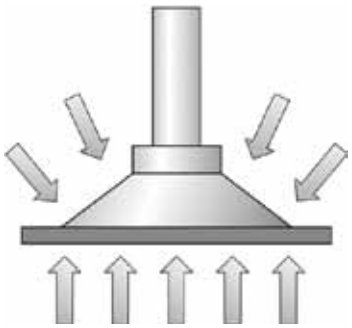
Vacuum suction cups or special grippers
Interface between vacuum system and workpiece

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

Vacuum gripping systems
Complete solutions, such as large-area gripping systems, layer grippers or vacuum spiders, are customized to meet customer needs

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 the pressure between the suction 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:

$F = \Delta p x A$

F = Holding force

Δp = Difference between ambient pressure and pressure of the system

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

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 Numatics 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 oily body panels in the sheet metal industry or of porous and structured workpieces in the wood industry.

Vacuum Suction Cups Continued

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 flat or slightly curved surface. 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 for 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

Both types of suction cups are available in a wide range of shapes and sizes. For additional details and ordering information, please refer to the chapter "Vacuum Suction Cups."

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.

Suction Cup Material and Compatibility Chart

	Abbreviation	NBR	SI	NK	ED	VUL
Description	Chemical designation / trade name	Nitrile caoutchuc	Silicone caoutchuc	Natural Rubber	Elastodur	Vulkollan
	Color / coding	black, gray, blue, light blue	white (translucid), green	light brown, black	green, blue	dark green
Chemical resistance	General weathering resistance	• •	• • •	• •	• • •	• • •
	Ozone resistance	•	• • • •	• •	• • •	• • •
	Oil resistance	• • • •	• •	•	• • •	• • •
	Fuel resistance	• •	•	•	• •	• •
	Alcohol resistance, ethanol 96%	• • • •	• • • •	• • • •	• • •	• • • •
	Solvents resistance	• •	• •	•	•	•
	General resistance to acids	•	•	• •	•	•
	Steam resistance	• •	• •	•	•	•
Mechanical characteristics	Wear resistance	• •	•	• •	• • • (•)	• • • •
	Resistance to perminent deformation	• •	• •	• • •	•	• •
	Tensile strength	• •	•	• •	• • • (•)	• • • •
	Specific resistance in [Ω x cm]	–	–	–	–	–
	Shore hardness to DIN ISO 7619	40 to 90 ± 5	30 to 85 ± 5**	30 to 90 ± 5	60 to 85 ± 5	72 ± 5
Temperature resistance*	Short-term in °C (<30 sec.)	-30° to +120°	-50° to +220°	-35° to +120°	-40° to +100°	-40° to +100°
	Longer-term in °C	-10° to +70°	-30° to +180°	-25° to +80°	-25° to +80°	-40° to +80°
Further characteristics	Target industry	Universal	Packaging, CD/DVD	Wood, Packaging	Packaging, Metal	Metal, Packaging, Glass, Wood
	Food grade according to CFR 21 § 177.2600 FDA		✔			
	Absence of PWIS (paint-wetting impairment substances)	NBR-60, NBR-45			ED-85, ED-60	

* Approximate value: depends on ambient temperature, application force, recovery time and wall thickness of suction cup
** After-bake of silicone 4 h/200 °C = ~+5 Shore A

• • • • Excellent • • • Very good • • Good • Poor to satisfactory

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.

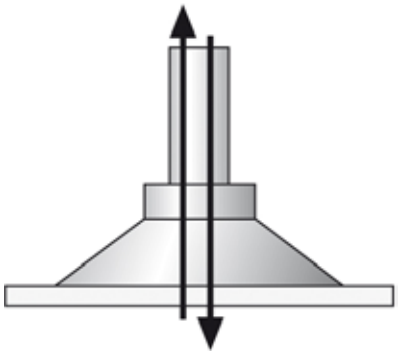
Clean suction cups with soap and warm water, and dry them at room temperature.

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.

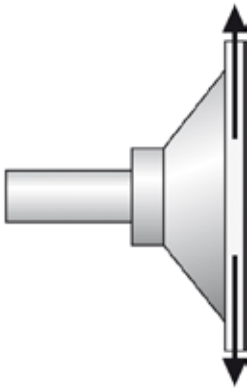
Theoretical suction force



The theoretical suction force is the force acting perpendicular to the surface.

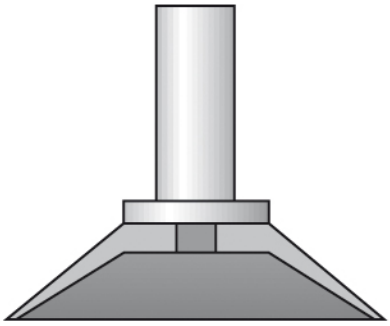
The specifications in the catalog are calculated values in newtons.

Shear force



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

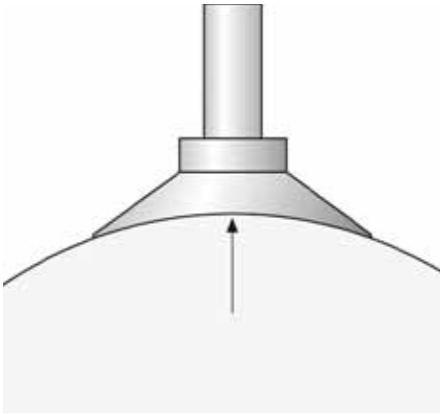
Inner volume



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.

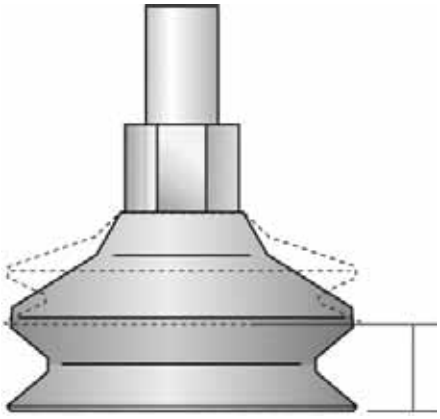
The Vacuum System and its Components

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.

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.

Table of typical values Workpiece surface	Friction coefficient approx. μ
Glass, stone, plastic (dry)	approx. 0.5
Sandpaper (dry)	1.1
Moist or oily surface	0.1 – 0.4

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. 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)
Δp = Difference between ambient pressure and pressure of the system
A = Effective suction area (the effective area of a suction cup under vacuum)

Suction Cups Continued

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:

$$d = 1.12 \times \sqrt{\frac{m \times S}{P_u \times n}}$$

For vertical pick-up:

$$d = 1.12 \times \sqrt{\frac{m \times S}{P_u \times n \times \mu}}$$

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

m = Weight of the workpiece in kg
P_u = Vacuum in bar
n = Number of suciton cups
μ = Friction coefficient
S = Safety factor

Calculation example for horizontal pick-up:

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

d = 8.85 cm

Plastic sheet:	m = 50 kg
Vacuum:	P_u = – 0.4 bar
Number of suction cups:	n = 4
Measured friction coefficient:	μ = 0.5
Safety factor:	S = 2

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

Calculation example for vertical pick-up:

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

d = 12.5 cm

Plastic sheet:	m = 50 kg
Vacuum:	P_u = – 0.4 bar
Number of suction cups:	n = 4
Measured friction coefficient:	μ = 0.5
Safety factor:	S = 2

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

Suction rate or required volume flow [$\dot{V}$]

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.

Important:
Conduct suction trials for porous parts.

Typical value (with smooth, air-tight surfaces)			
Suction cup Ø	Suction area A	Volume flow	
	(cm^2)	(m^3/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

Specialty 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.

- Numatics separates special grippers into the following series:
- Floating suction grippers
- Magnetic grippers

Large Area Grippers

The NFX Series large area gripper is designed to handle work-pieces with a wide range of dimensions and/or undefined positions. It provides customers with a reliable means of handling work-pieces that have several gaps.
Applications include palletizing/depalletizing, in addition to order picking and sorting of a wide range of work-pieces with a single gripper. Typical work-piece materials include cardboard, wood, metal or plastic.

Floating Suction Gripper

Floating suction grippers 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 gripper 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 grippers:

- 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

Magnetic Gripper

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 or 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

Mounting Elements

Numatics 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:

- Holders and adapters
- Spring plunger
- Jointed mountings

For additional information and ordering details, refer to the chapter "Mounting Elements."

Mounting Elements Continued

Holders and adapters

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

Spring plungers

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 NFLK and ball joint NKGL that can be swiveled in all directions.

Suction cups

(chapter “Vacuum Suction Cups” or “Special Grippers”)

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 when very high suction capacities are required.

Pneumatic vacuum generators

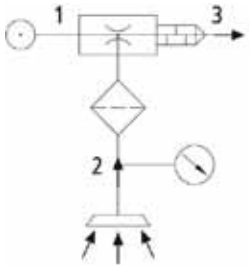
- Ejectors

Electrical vacuum generators

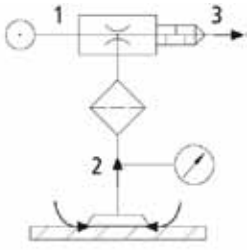
- Pumps

Important

The nominal suction rate of all vacuum generators is given in l/min or m3/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



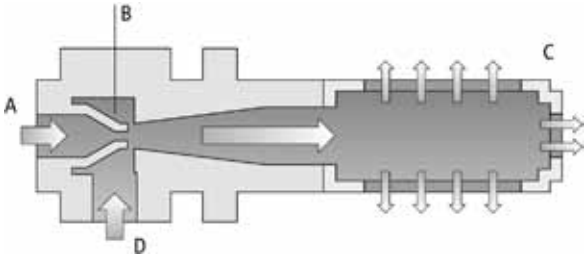
Additional suction while workpiece is picked up

Vacuum Generators Continued

Ejectors work on the Venturi principle. They are divided into single-stage and multi-stage ejectors depending on the number of nozzle pairs.

The compressed air is supplied through the connection (A) to the single-stage ejectors. It flows through the Venturi nozzle (B). The air is accelerated and compressed during this process.

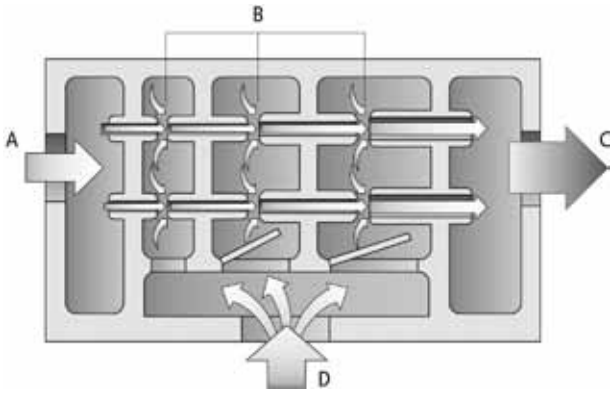
After passing through the nozzle, the accelerated air expands once again and a vacuum is created. Air is drawn in this way through the vacuum connection (D). The air that was drawn in and the compressed air escape through the silencer (C).



Principle of operation of a single-stage ejector

The Numatics basic ejectors, inline ejectors and compact ejectors are based on the single-stage Venturi principle.

In addition to the single-stage Venturi principle, there are ejectors in which the vacuum is created by several Venturi nozzles arranged in a row. Compressed air is supplied to the ejector through con- nection (A). It passes through several Venturi nozzles (B) arranged in a row. A vacuum is created and the air is drawn in through the vacuum connection (D). The suction volumes of the individual nozzles add up to form a total suction rate D. The air that was drawn in and the compressed air escape through the silencer (C).



Principle of operation of a multi-stage ejector

Compared to single-stage ejectors, multi-stage ejectors create a much higher suction rate in the lower vacuum range using the same amount of compressed air.

The Numatics multi-stage ejectors are based on the multi-stage Venturi principle.

Advantages of ejectors:

- Compact
- 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

Vacuum Generators Continued

We distinguish between three basic types of ejectors:

Basic and inline ejectors

- Vacuum generators without valve control and system monitoring with high maximum vacuum level (85% vacuum)
- Used mainly to handle air-tight workpieces

Multi-stage ejectors

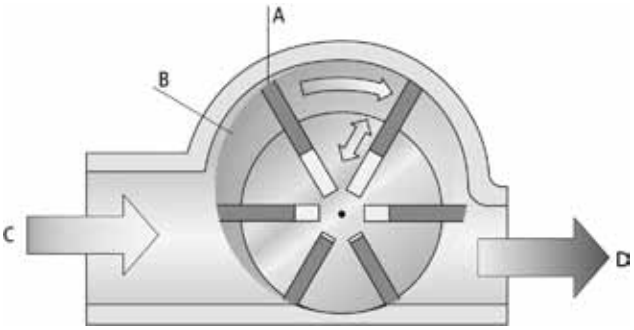
- Vacuum generators with several nozzle chambers arranged in a row with a very high suction rate.
- Used mainly for handling porous workpieces, such as cardboard, chipboards, OSB or MDF sheets

Compact ejectors

- Vacuum generators with integrated valve technology and system monitoring, NSCP*I* series are equipped with IO-Link technology
- 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)

Vacuum Pumps

Vacuum pumps include an eccentrically mounted impeller with carbon vanes (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

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

Switches and System Monitoring

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

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

- Vacuum switches
- Pressure switches
- Combined vacuum/pressure switches
- Connection cable and adapter for vacuum 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.

Vacuum Switches

Vacuum switches are available in mechanical and electronic types. In the mechanical versions, the existing vacuum is measured by using a membrane, 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.

Vacuum Switches Continued

Vacuum switches are used in the measuring range from -1 to 0 bar. There are the following types of vacuum switches:

Mechanical vacuum switches

Mechanical vacuum switches are characterized by their sturdy design and their universal operating principle. The pneumatic design (PM), does not require electrical connections. It works purely with pneumatics. You can set the switching points (with fixed hysteresis) to adapt these switches individually to the process parameters.

Electronic vacuum switches

Electronic vacuum switches have a high switching accuracy and repeatability with a very compact design. Vacuum switches with digital display offer a high level of convenience, because the switching points and hysteresis are fully programmable using a foil keypad. To program the switching point in a process rather quickly and simply, use vacuum switches with teach button. You can program the switching points with this version using a key in a matter of seconds. Vacuum switches with analog and digital output and vacuum switches in miniature form round off the program.

Pressure Switches

Electronic pressure switches are used in the measuring range from 0 to 10 bar. Pressure switches with digital display are easy to operate. The switching points and hysteresis are fully programmable using a foil keypad. They are used when there are high requirements for switching accuracy and repeatability as well as implementation of short switching times. Pressure switches with teach button are particularly suited to program switching points quickly and easily. Pressure switches with analog and digital output can also be used as pressure sensors due to their two outputs.

Combined Vacuum/Pressure Switches

Combined vacuum/pressure switches are used in the measuring range from -1 to 10 bar. The switching accuracy is reduced by the large measuring range. They are available with two switching outputs (digital and analog) and can also be used as a vacuum sensor or a pressure sensor for this reason.

Connections and Adapters for Vacuum Switches

Matching connection cables and adapters are available for the different types of switches. The cables and connectors are adapted to meet the customer-specific requirements and local standards.

Measuring and Control Components

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

Filters and Connectors

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

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.

Definition of Vacuum

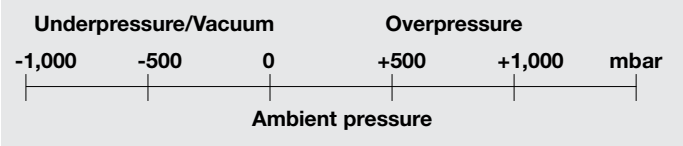
Vacuum is the term for air pressures which lie below normal atmospheric pressure. The ambient pressure is 1,013 mbar (14.7 PSI) at sea level and decreases with elevation.

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 (0.015 PSI) to 1,013 mbar (14.7 PSI); at sea level (ambient pressure)

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 (mbar)	Relative Vacuum	Bar	N/cm²	kPa	atm, kp/cm²	mm H_2O	Torr; mm Hg	in Hg
8.00	6.62	5.64	4.74	3.81	3.01	2.28	1.42	0.40
16.10	13.60	11.37	9.03	7.25	5.63	3.97	2.65	1.10
37.70	33.20	30.10	26.70	23.00	18.60	14.90	9.80	5.20
71.00	65.00	60.10	52.00	44.00	36.50	29.00	20.50	11.40
127.00	117.80	106.00	94.20	79.10	65.30	49.87	35.99	23.00
215.00	172.00	156.10	138.70	118.50	99.10	79.36	58.90	37.24

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

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

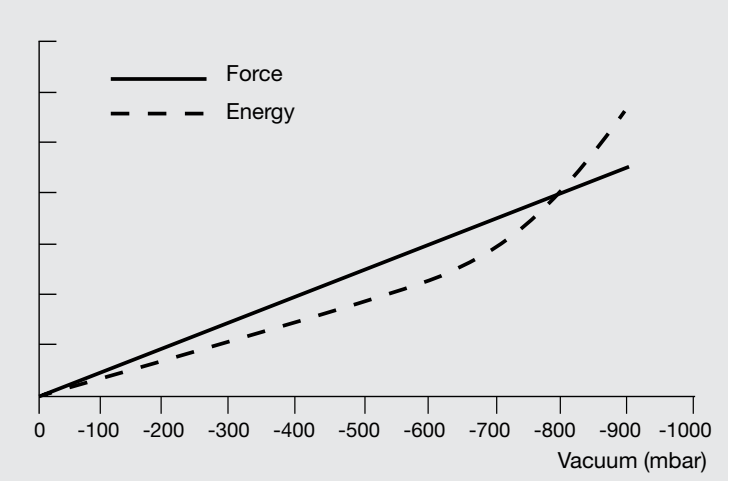
	Bar	N/cm²	kPa	atm, kp/cm²	mm H_2O	Torr; mm Hg	in Hg
Bar	1.00000	10.00000	100.0000	1.01970	10,197.00	750.0600	29.5400
N/cm²	0.10000	1.00000	10.0000	0.10190	1,019.70	75.0060	2.9540
kPa	0.01000	0.10000	1.0000	0.01020	101.97	7.5006	0.2954
atm, kp/cm²	0.98070	9.80700	98.0700	1.00000	10,332.00	735.5600	28.9700
mm H_2O	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 dispropor- tionately 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

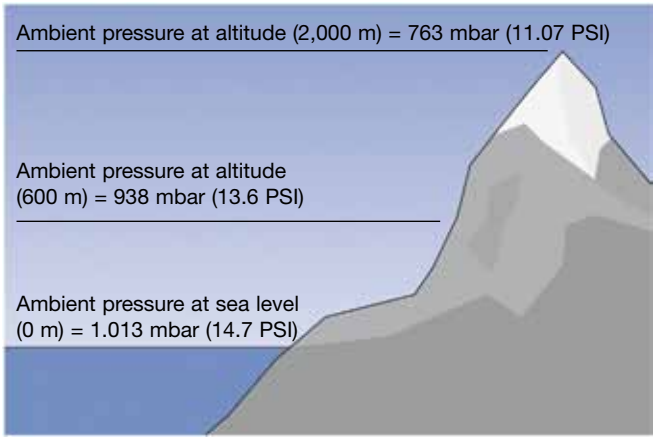
- for air-tight surface (e.g. metal, plastics, etc.): -600 to -800 mbar vacuum
- for porous materials (e.g. cardboard boxes, particle boards, MDF sheets, etc.): -200 to -400 mbar vacuum; in this range the necessary holding force is generated by increasing the suction rate and the suction area.

Important:

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

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 (14.7 PSI). Elevation of 600 m air pressure is reduced to 938 mbar (13.6 PSI). At a height of 2,000 m, the air pressure is only 763 mbar (11.07 PSI).



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 (0.18 PSI).

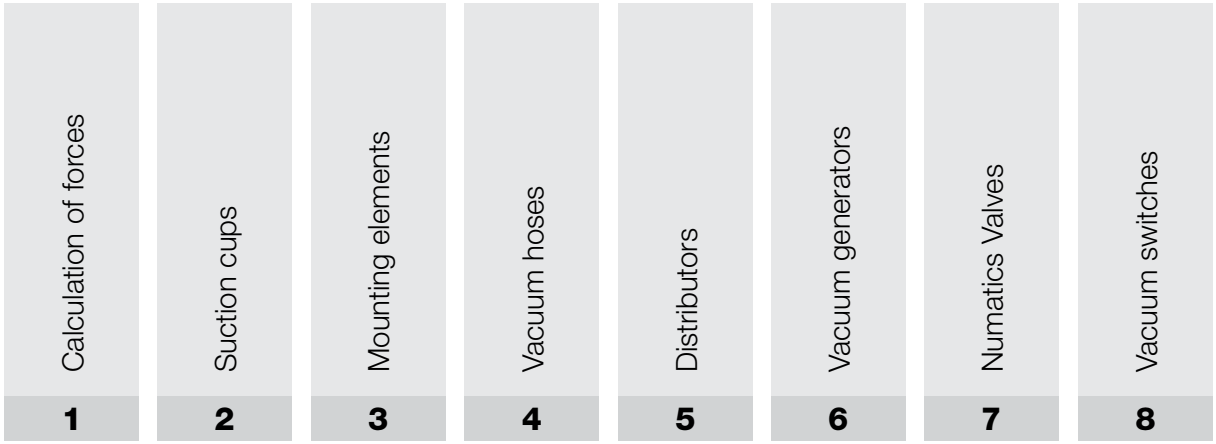
A vacuum generator that generates an 80% vacuum, achieves a vacuum value of -810 mbar at sea level (ambient pressure = 1,013 mbar); at 2,000 m (ambient pressure = 763 mbar) a vacuum generator only achieves -610 mbar. The possible holding force of a vacuum suction cup drops proportionally to the vacuum 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 (14.7 PSI) and an ambient temperature of 20 °C.

Approach to System Design

The implementation from theory to practice is shown with a system design based on an example.



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^2
	Z axis:	5 m/s^2
Cycle time:	30 s	
Scheduled time:	for pick-up:	< 1s
	for releasing:	< 1s

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 ρ

m = Weight (kg)
L = Length (m)
B =Width (m)
H = Height (m)
ρ = Density (kg/m3)

Our example:

m = 2.5mx1.25mx0.0025mx7,850kg/m^3
m = 61.33kg

Theoretical Holding Force of a Suction Cup

The suction cups not only have to be able to carry the weight of the workpiece but must also be capable of handling the acceleration forces. These may never be neglected in a fully automated process.

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

Important:

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.

The safety factor is a minimum value of 1.5 for smooth and dense workpieces. A safety factor of 2.0 or greater must be used for cri tical, diverse or varied, porous or rough workpieces. If factors such as acceleration or friction coefficient are not known or cannot be deter- mined precisely, a value of 2.0 or higher should also be used.

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

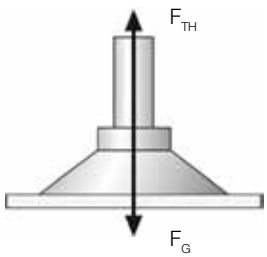
The workpiece (in this case the steel sheet with the dimensions 2.5 x 1.25 m) is lifted from a pallet. The workpiece is lifted with an acceleration of 5 m/s2 (no transverse movement).

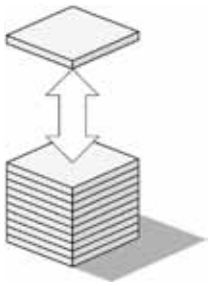
F_{TH} = m x (g + a) x S

F_{TH} = theoretical holding force (N)
m = Weight (kg)
g = Gravity (9.81 m/s^2)
a = Acceleration (m/s^2) of the system
S = Safety factor (minimum value 1.5 times safety;
for critical, diverse or varied or porous materials or rough surfaces 2.0 or even higher)

Our example:

F_{TH} = 61.33 kg x (9.81 m/s^2+ 5 m/s^2) x 1.5
F_{TH} = 1,363 N





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

Theoretical Holding Force of a Suction Cup Continued

Load case II – Suction cup horizontal, direction of force horizontal

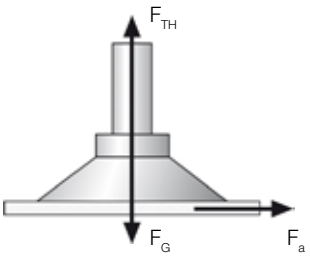
The workpiece (in this case the steel sheet with the dimensions 2.5 x 1.25 m) is lifted up vertically and transported horizontally. The acceleration is 5 m/s^2.

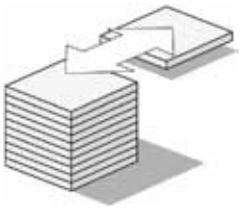
$F_{TH} = m \times (g + a/\mu) \times S$

F_{TH} = theoretical holding force (N)
F_a = Acceleration force = m · a
m = Weight (kg)
g = Gravity (9.81 m/s^2)
a = Acceleration (m/s^2) of the system (keep in mind Emergency Stop situations!)
μ = Friction coefficient
= 0.1 for oily surfaces
= 0.2 to 0.3 for wet surfaces
= 0.5 for wood, metal, glass, stone etc.
= 0.6 for rough surfaces

Caution! The specified values for friction coefficient are averaged and must be checked for the individual workpiece!

S = Safety (minimum value 1.5 times safety, for critical, diverse or varied or porous materials or rough surfaces 2.0 or even higher)





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

Our example:

F_{TH} = 61.33 kg x (9.81 m/s^2+ 5 m/s^2) x 1.5
F_{TH} = 1,822 N

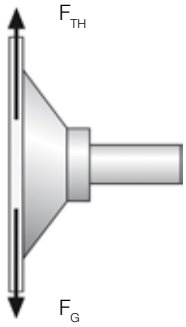
Load case III – Suction cup vertical, direction of force vertical

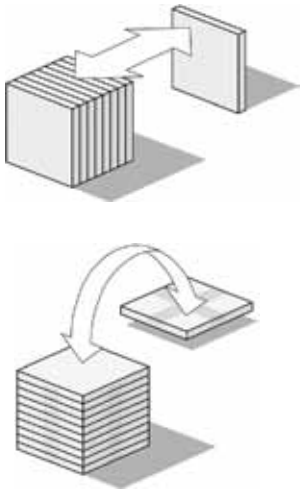
Description of load case: The workpiece (in this case the steel sheet with the dimensions 2.5 x 1.25 m) is picked up from a pallet and moved with a rotary motion at an acceleration of 5 m/s^2.

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

F_{TH} = theoretical holding force (N)
m = Weight (kg)
g = Gravity (9.81 m/s^2)
a = Acceleration (m/s^2) of the plant (keep in mind Emergency Stop situations!)
μ = Friction coefficient
= 0.1 for oily surfaces
= 0.2 to 0.3 for wet surfaces
= 0.5 for wood, metal, glass, stone etc.
= 0.6 for rough surfaces

S = Safety (minimum value 2.0 times safety, forcritical, diverse or varied or porous materials or rough surfaces even higher)





Our example:

F_{TH} = 61.33 kg x (9.81 m/s^2+ 5 m/s^2) x 1.5
F_{TH} = 1,822 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_{TH}) 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.

Suction Cup Selection

The calculated theoretical holding force corresponds to the force that the suction cups must create to safely handle the workpiece. 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: The operating conditions on site are crucial for the selection of the suction cup, such as multi-shift operation, service life, chemically aggressive environment, temperature.

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. The selection of the suitable suction cup material for handling of workpieces is described in a comprehensive table in the chapter “Vacuum Suction Cups”.

Surface: Depending on the condition of the surface, we recom- mend 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. An overview of the different suction cups and the specific advantages of the individual suction cup types is included in the chapter “Vacuum Suction Cups”.

For this example we choose:
Flat suction cup of the type NPFYN made of Nitrile (NBR)

This suction cup is a cost-efficient solution for handling smooth, level workpieces. Data for this type is available on the respective pages in the chapter “Vacuum Suction Cups”.

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 suctions 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

Our example: $F_S = 1{,}822$ N/6

$F_S = 304$ N

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

$F_S = 1{,}822$ N/8

$F_S = 228$ N

According to the technical data for the suction cup NPFYN, one needs 8 x NPFYN 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.

Important:

- The suction force of the individual suction cups is listed in the table “Technical data” for the respective suction cup in the chapter “Vacuum Suction Cups”.
- The suction force of the suction cup must exceed the calculated theoretical holding force.

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 NFLK 1/4" – 1/4" female thread
Optimum flexibility of suction cups for inclined workpiece surfaces.

Spring plunger NFSTE 1/4" – 75 stroke
Greatest stroke because of sheets hanging down from pallet, 1/4" thread for connection to selected joint mounting Flexolink NFLK.

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 Generator Selection

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

- Type of workpieces: Porous, air-tight
- Energy supply options: a lower case electricity, compressed air
- Restrictions for size and weight
- Maintaining cycle times
  Short cycle times: Ejector
  Long transport distances: Pump

For this example we choose:
Ejector 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.

Selection table for generator type by application								
	Materials		Cycle times		Power Supply		Transport Path	
	Air-tight	Porous	Very Short <0.5 sec	Short >0.5 sec	Compr. air	Electricity	Short	Long
Ejector	X		X		X		X	(X)*
Pump	X			X		X		X
Blower		X		X		X		X

* Only with automatic air-saver (LSP) and air-tight materials

Vacuum Generator Selection Continued

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. The suitable suction rate is described in the table “Technical data” of the respective vacuum generator.

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_s**		
Up to 60 mm	0.5 m³/h	8.3 l/min	.29 SCFM
Up to 120 mm	1.0 m³/h	16.6 l/min	.58 SCFM
Up to 215 mm	2.0 m³/h	33.3 l/min	1.16 SCFM
Up to 450 mm	4.0 m³/h	66.6 l/min	2.33 SCFM

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

$V = n \times V_s$

n = Number of suction cups

V_s = Required suction rate for an individual suction cup (m3/h, l/min)

Example: **V = 6 x 16.6 l/min**
V = 99.6 l/min

For this example we choose:
Compact ejector NSCPI 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 NSCPI 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 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. Refer to the valves section of the Numatics catalog if external valves are required.

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

$V = n \times V_s$

n = Number of suction cups

V_s = Required suction rate for an individual suction cup (m3/h, l/min)

The nominal flow is listed in the “Technical data” of the respective valve and the suction rate is listed in the “Technical data” of the respective vacuum generator.

Example: **V_v = 116 l/min = 7 m³/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.

Switches/Sensors 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-F, M8-F, 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 "Sensors, Switches and Regulators".

For this example we choose:

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

You can use vacuum switches or manometers for vacuum generators without system monitoring.

Calculation of Evacuation Times

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

$V_G = V_1 + V_2 + V_3 + V_4 + V_5 + ...$

V_G = Volume to be evacuated (m^3)
V_1 = Volume of suction cups (m^3)
V_2 = Volume of mounting elements (m^3)
V_3 = Volume of vacuum hoses (m^3)
V_4 = Volume of distributor (m^3)
V_5 = Volume of prefilter (if necessary) (m^3)
V_6 = Volume of solenoid valve (if necessary) (m^3)
...

Example:

$V_G = 6 \times 32\ cm^3 + 6 \times 9.5\ cm^3 + 6 \times 43\ cm^3 + 1 \times 38.5\ cm^3$

$V_G = 546\ cm^3 = 0.000546\ m^3$

Calculation of evacuation time t (h)

$t = (V_G \times \ln (P_a/P_e) \times 1.3)/V$

V_G = Volume to be evacuated (m^3)
ln = Natural logarithm
P_a = Absolute start pressure (1,013 mbar)
P_e = Absolute final pressure (mbar)
V = Suction rate of vacuum generator (m3/h)

Example: **60% = 400 mbar absolute**

$t = (0.000546\ m^3 \times \ln (1{,}013\ mbar / 400\ mbar) \times 1.3) / 6.95\ m^3$

$t = 0.0000949\ h = 0.34\ sec$

The evacuation time of the entire system is 0.34 seconds. The system is cost-optimized and efficient, shorter cycle times are possible.

Test with Original Parts

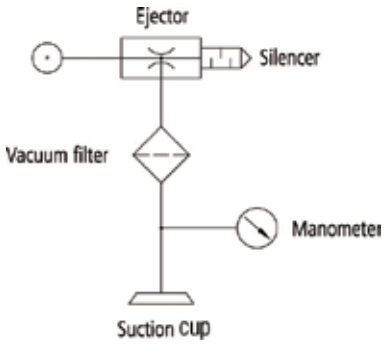
The example listed above provides a recommendation ratio on a theoretical system design. It is recommended to perform testing using actual work pieces. If required, we will assist and and provicde test analysis

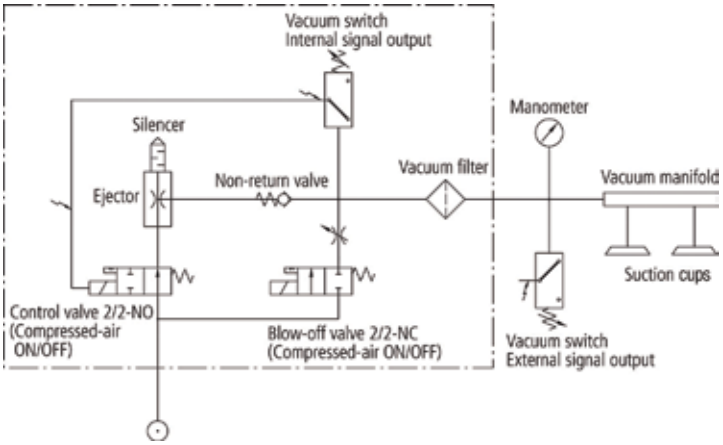
Symbols in Vacuum Technology

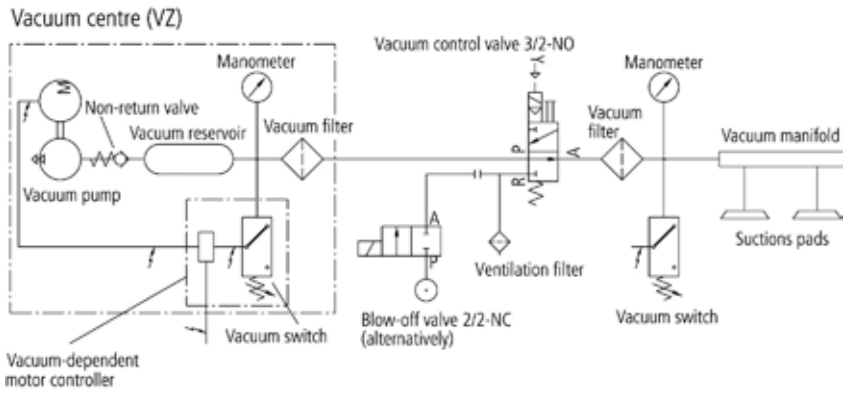
Circuit diagrams and function charts are used in vacuum technology to visualize vacuum systems. These diagrams/charts include symbols for certain components or modules. The following overview represents the most important and common symbols of vacuum components from Numatics.

	Valve (general)		Vacuum/pressure switch		Special suction cup		Ejector, single-stage
	Ball cock, two-way		Check valve		Flat suction cup with single lip		Ejector, multi-stage
	Ball cock, three-way				Flat suction cup with double lip		
	Manual slide valve, three-way		Pressure-limiter valve		Flat suction cup with sealing profile		Silencer
	Solenoid valve, 3/2-way		Non-return valve		Bellows suction cup	M	Vacuum blower
	Solenoid valve, 3/2-way, pneumatic pilot operation				Spring plunger	M	Vacuum pump
	Filter		Sensing valve		Flexolink, ball joint		Vacuum regulator
	Manometer		Flow resistor		Sealing cord		Hose
					Adapter nipple		Reservoir

Circuit diagrams for all relevant vacuum components are available upon request.







Units and Symbols

Force

Parameter	Symbol	Unit in Numatics catalog
Length	l	mm, m
Width	b	mm, m
Height	h	mm, m
Diameter	d	mm, m
Volume	V	m^3, l

Weight

Parameter	Symbol	Unit in Numatics catalog
Mass	m	g, kg
Density	ρ	kg/m^3

Force

Parameter	Symbol	Unit in Numatics catalog
Force	F	N, kg x m/s^2
Theoretical holding force	F_{TH}	N
Acceleration	F_a	N
Tear-off force	F_A	N
Weight	G	N
Friction coefficient	μ	-

Time

Parameter	Symbol	Unit in Numatics catalog
Duration, evacuation time	t	ms, s, min, h
Speed	v	m/s
Acceleration	a, g	m/s^2, g

Temperature

Parameter	Symbol	Unit in Numatics catalog
Temperature	t	°C

Electrical magnetic values

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

Vacuum values

Parameter	Symbol	Unit in Numatics catalog
Pressure, absolute	p	mbar, bar
Pressure difference	Δp	mbar, bar
Initial pressure	P_a	mbar, bar
Final pressure	P_e	mbar, bar
Negative pressure / vacuum	P_u	mbar, bar
Suction rate	V	l/min, m^3/h
Required suction rate	V_s	l/min, m^3/h
Nominal flow of solenoid valve	V_v	l/min, m^3/h
Present suction rate of vacuum generator	V_{ve}	l/min, m^3/h
Total volume to be evacuated	V_g	m^3, l

Other information

Parameter	Symbol	Unit in Numatics catalog
Safety factor	S	-
Quantity of suction cups	n	-
Natural logarithm	ln	-
Noise level / sound pressure level	Lp	dB

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

	m^3/s	l/s	m^3/h	l/min
m^3/s	1	1,000	3,600	60,000
l/s	10^{-3}	1	3.6	60
m^3/h	2.78×10^{-4}	0.278	1	16.67
l/min	1.67×10^{-5}	1.67×10^{-2}	0.06	1

Pressure

	bar	N/cm^2	kPa	mbar
1 bar	1	10	100	10^3
1 N/cm^2	0.1	1	10	100
1 kPa	0.01	0.1	1	10
1 mbar	10^{-3}	0.01	0.1	1

Volume

	m^3	cm^3	l
m^3	1	1×10^6	1,000
cm^3	1×10^{-6}	1	1×10^{-3}
l	1×10^{-3}	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	$1 - 10^{-3}$	0.1 mm – 100 mm
High vacuum	$10^{-3} - 10^{-7}$	100 mm – 1 km
Ultra high vacuum	$< 10^{-7}$	> 1 km

Thread

Thread designation	External diameter in mm	Bead wire diameter	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			
G⅛	9.73	8.5	0.91
G¼	13.16	11.4	1.34
G⅜	16.66	14.9	1.34
G½	21.00	18.6	1.81
G¾	26.44	24.1	1.81
G1	33.25	30.3	2.31
G1¼	41.91	39.0	2.31
G1½	47.80	44.8	2.31
G2	59.61	56.6	2.31
G2½	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. 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 gene- ration 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 [μ] 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 abso- lute pressure of 10-7 to 10-3 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 pres- sure 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 res- pective 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).

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).

Vacuum Glossary Continued

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 l/min or m3/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 opera- ting 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].

Vacuum Glossary Continued

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 stan- dard conditions. In both technology and the natural sciences, this is 1,013 mbar at 0°C. The values in the Numatics catalog refer to a temperature of 20 °C

Standard temperature
Standard temperature is the temperature under standard conditions. The values in the Numatics 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 m3/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 atmospheri- cally 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.

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

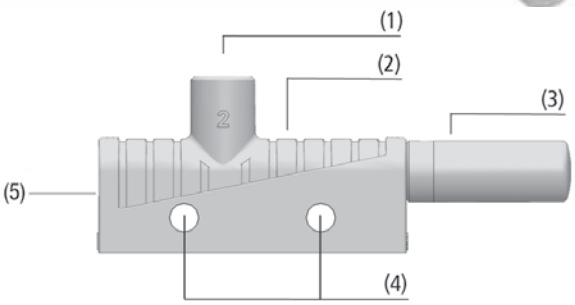
Table of Contents

Vacuum Generators

Basic Ejectors – NSBPX Series

Suction rate from 0.3 SCFM to 7.5 SCFM

The basic ejectors are typically used for high-speed handling of air-tight work pieces, especially in systems with decentralized vacuum generation; Handling of electronic component; Separation systems for plastic and sheet metal machining. This type of ejector is typically used if the user is just looking for the base ejector unit with no additional features. If additional features are required, refer to Numatics “NSBPC Series”.



Design Features

Suction capacity up to 7.5 SCFM; Nozzle diameter: 0.5 to 2.5mm; Maximum vacuum 85%; One-piece impact resistant plastic body; Silencer (standard). Port Size: M5 to G3/8

Design

- Ejector with single stage nozzle: available in six power ratings
- One-piece housing (2) made of light, impact-resistant plastic
- Connection of compressed air (5) and vacuum (1) with threaded holes
- Open silencer (3)
- Can be fixed horizontal with mounting holes (4) or vertical with the base on a mounting plate
- Optional mounting with mounting plate and mounting kit on DIN top-hat rails

Technical Data Basic Ejectors NSBPX Series

Type	Nozzle-Ø (mm)	Degree of evacuation (%)	Max. suction rate (l/min)	Max. suction rate (m^3/h)	Air consumpt. during evac. (l/min)*	Air consumpt. during evac. (m^3/h)*	Noise level workp. gripped (dB)
NSBPX 05	0.5	85	8.0	0.5	14	0.8	53
NSBPX 07	0.7	85	16.0	1.0	22	1.3	59
NSBPX 10	1.0	85	37.7	2.3	48	2.9	59
NSBPX 15	1.5	85	71.0	4.3	105	6.3	65
NSBPX 20	2.0	85	127.0	7.6	197	11.8	68
NSBPX 25	2.5	85	215.0	12.9	311	18.7	70

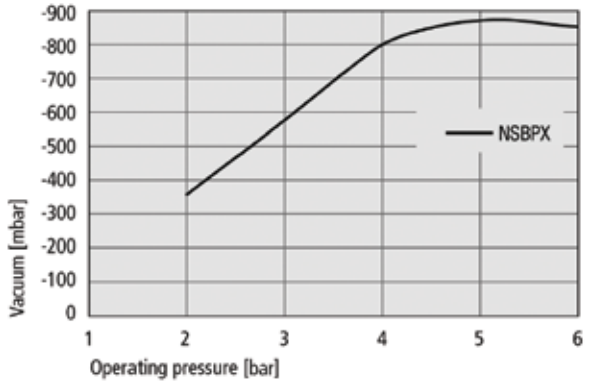
*At optimal operating pressure
**For max. length 2 m

Technical Data Basic Ejectors NSBPX Series

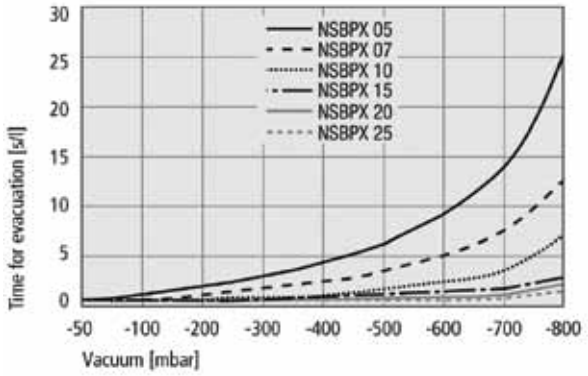
Type	Noise level free (dB)	Operating pressure (bar)	Recomm. int. hose diameter compr. air (mm)**	Recomm. int. hose diameter vacuum (mm)**	Weight (kg)	Operating temperature (°C)
NSBPX 05	58	3 - 6	2	2	.0075	0 - 60
NSBPX 07	65	3 - 6	2	2	.0075	0 - 60
NSBPX 10	65	3 - 6	4	6	.022	0 - 60
NSBPX 15	72	3 - 6	4	6	.022	0 - 60
NSBPX 20	77	3 - 6	6	7	.05	0 - 60
NSBPX 25	78	3 - 6	6	7	.05	0 - 60

*At optimal operating pressure
**For max. length 2 m

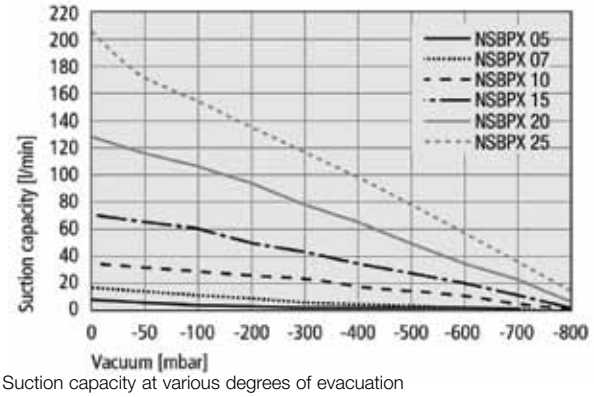
Performance Data Basic Ejectors NSBPX Series



Achievable vacuum at various operating pressures



Evacuation times for various vacuum ranges



Suction capacity at various degrees of evacuation

Suction Capacity in l/min at Various Degrees of Evacuation

Type	Degree of evacuation in mbar									
	0	-50	-100	-200	-300	-400	-500	-600	-700	-800
NSBPX005XXXSDG1	8.00	6.62	5.64	4.74	3.81	3.01	2.28	1.42	0.40	0.10
NSBPX007XXXSDG1	16.10	13.60	11.37	9.03	7.25	5.63	3.97	2.65	1.10	0.30
NSBPX010XXXSDG2	37.70	33.20	30.10	26.70	23.00	18.60	14.90	9.80	5.20	1.61
NSBPX015XXXSDG1	71.00	65.00	60.10	52.00	44.00	36.50	29.00	20.50	11.40	2.18
NSBPX020XXXSDG3	127.00	117.80	106.00	94.20	79.10	65.30	49.87	35.99	23.00	8.36
NSBPX025XXXSDG3	215.00	172.00	156.10	138.70	118.50	99.10	79.36	58.90	37.24	16.24

Performance Data Basic Ejectors NSBPX Series Continued

Evacuation Time in s/l for Various Vacuum Ranges

Type	Degree of evacuation in mbar								
	-50	-100	-200	-300	-400	-500	-600	-700	-800
NSBPX005XXXSDG1	0.34	0.68	1.56	2.66	4.02	5.84	8.54	13.22	25.54
NSBPX007XXXSDG1	0.20	0.38	0.84	1.46	2.24	3.26	4.66	6.84	12.56
NSBPX010XXXSDG2	0.06	0.14	0.30	0.52	0.82	1.30	1.98	3.26	6.56
NSBPX015XXXSDG1	0.05	0.08	0.16	0.26	0.40	0.60	0.86	1.30	2.54
NSBPX020XXXSDG3	0.03	0.05	0.09	0.16	0.24	0.34	0.49	0.80	1.74
NSBPX025XXXSDG3	0.03	0.04	0.07	0.09	0.14	0.20	0.28	0.42	0.99

How to Order

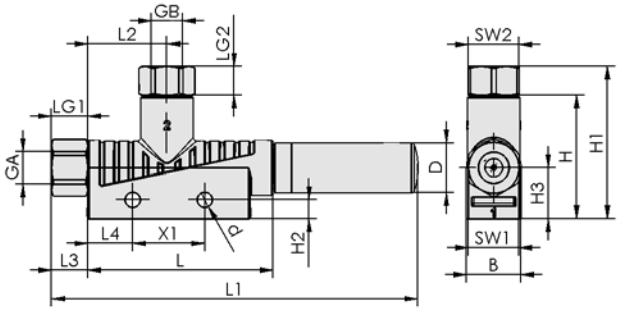
NSBPX Series

Part Number	Nozzle Size (mm)	Thread Type / Port Size		Numatics Description
		Pressure	Vacuum	
NSBPX005XXXSDG1	0.7	M5 - F	M5 - F	Basic Ejectors - Single Stage
NSBPX007XXXSDG1	0.7	M5 - F	M5 - F	
NSBPX010XXXSDG2	1.0	G1/8 - F	G1/8 - F	
NSBPX015XXXSDG1	1.5	G1/8 - F	G1/8 - F	
NSBPX020XXXSDG3	2.0	G1/4 - F	G3/8 - F	
NSBPX025XXXSDG3	2.5	G1/4 - F	G3/8 - F	

Product Family Name	Part Number	Description
Accessories	NBEPL1111453SBP	Mtg Plate NSBP EJT
	NSETSBPX0056CFN	Mtg. Set NSBP/NSBPC M4F
	NSDXXXXXXX24BMM	Silencer Replacement NSBPX 05
	NSDXXXXXXX401MG	Silencer Replacement NSBPX 07 to 10
	NSDXXXXXXX763MG	Silencer Replacement NSBPX 20 to 25

Dimensions: mm

NSBPX Series



Type	B	d	D	GA	GB	H	H1	H2	H3	L	L1	L2	L3	L4	LG1	LG2	SW1	SW2	X1
NSBPX005XXXSDG1	10	4.2	9	M5-F	M5-F	26	31	5.2	12	45	74	18	5	12.5	5	5	8	8	20
NSBPX007XXXSDG1	10	4.2	9	M5-F	M5-F	26	31	5.2	12	45	74	18	5	12.5	5	5	8	8	20
NSBPX010XXXSDG2	15	4.2	14	G1/8-F	G1/8-F	34	42	5.2	14	51.5	102	22	10	12.5	8	8	14	14	20
NSBPX015XXXSDG1	15	4.2	14	G1/8-F	G1/8-F	34	42	5.2	14	51.5	102	22	10	12.5	8	8	14	14	20
NSBPX020XXXSDG3	20	4.2	20	G1/4-F	G3/8-F	39	53.5	5.2	17	86.5	176	24.5	13	12.5	9	10	17	19	20
NSBPX025XXXSDG3	20	4.2	20	G1/4-F	G3/8-F	39	53.5	5.2	17	86.5	176	24.5	13	12.5	9	10	17	19	20

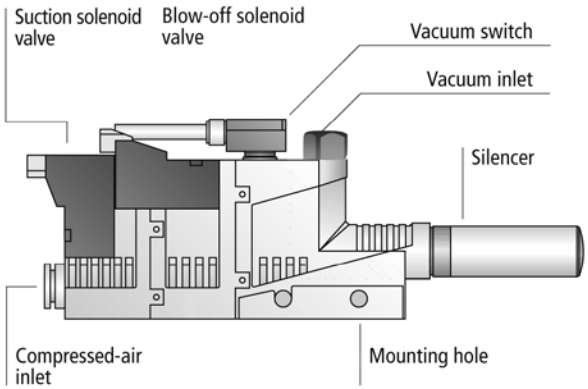
Basic Ejectors – NSBPC Series

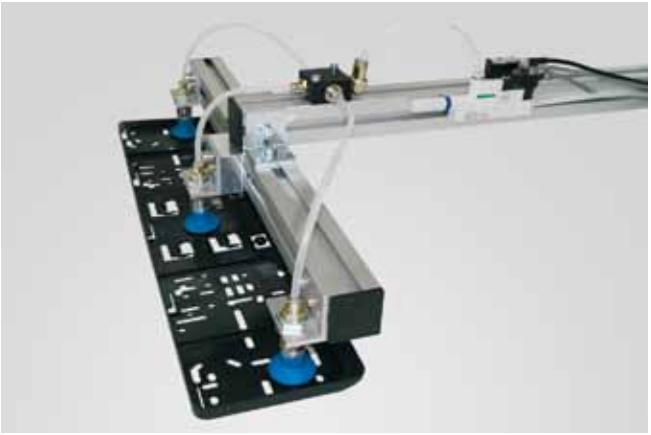
Suction rate from 0.2 SCFM to 7.5 SCFM

The basic ejectors are typically used for high-speed handling of suction-tight work pieces, especially in systems with decentralized vacuum generation; Handling of electronic components; Separation systems for plastic and sheet metal machining.

Design Features

Suction rates up to 7.5 SCFM; Nozzle diameter: 1 to 2.5mm; Silencer (standard); Maximum vacuum 85%; One-piece impact resistant plastic body. Optional features include suction solenoid valve (N.O.), blow-off solenoid valve, and vacuum switch with teach button (PNP).





Central vacuum generation by means of basic ejector NSBPC for handling plastic injection molded parts

Design

- Ejector with single stage nozzle, available in 4 power ratings, from 1.0 to 2.5 mm nozzle diameter
- Basic housing with connection facility for a vacuum switch
- Optionally available with suction or blow-off and vacuum switch
- Can be fixed horizontal with mounting holes or vertical with the base on a mounting plate
- Optional mounting with mounting plate and mounting kit on DIN top-hat rails

Technical Data Basic Ejectors NSBPC

Type	Nozzle-Ø (mm)	Degree of evacuation (%)	Max. suction rate (l/min)	Max. suction rate (m^3/h)	Air consumpt. during evac. (l/min)*	Air consumpt. during evac. (m^3/h)*	Noise level workp. gripped (dB)
NSBPC 10	1.0	85	38	2.3	48	2.9	59
NSBPC 15	1.5	85	70	4.2	118	7.1	65
NSBPC 20	2.0	85	123	7.4	208	12.5	68
NSBPC 25	2.5	85	215	12.9	311	18.7	70

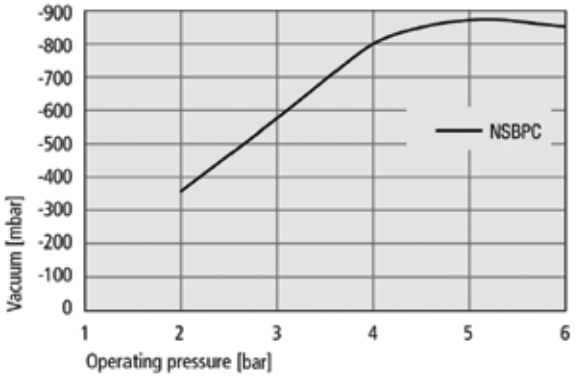
!The supply voltage for vacuum switches and solenoid valves is 24 VDC
*On version with solenoid valves NSBP-C 25 (320) and optimal operating pressure **For max. length 2 m

Technical Data Basic Ejectors NSBPC Series

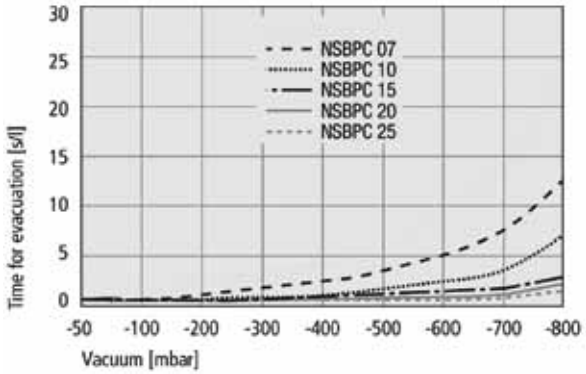
Type	Noise level free (dB)	Operating pressure (bar)	Recomm. int. hose diameter compr. air (mm)**	Recomm. int. hose diameter vacuum (mm)**	Weight (g)	Operating temperature (°C)
NSBPC 10	65	3 - 6	4	6	105	0 - 50
NSBPC 15	72	3 - 6	4	6	105	0 - 50
NSBPC 20	77	3 - 6	6	7	143	0 - 50
NSBPC 25	78	3 - 6	6	7	143	0 - 50

!The supply voltage for vacuum switches and solenoid valves is 24 VDC
*On version with solenoid valves NSBP-C 25 (320) and optimal operating pressure
**For max. length 2 m

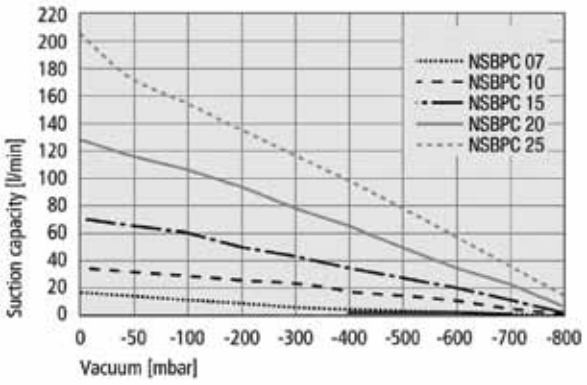
Performance Data Basic Ejectors NSBPC Series



Achievable vacuum at various operating pressures



Evacuation times for various vacuum ranges



Suction capacity at various degrees of evacuation

Suction Capacity in l/min at Various Degrees of Evacuation

Type	Degree of evacuation in mbar									
	0	-50	-100	-200	-300	-400	-500	-600	-700	-800
NSBPC 10	38.00	33.20	30.10	26.70	23.00	18.60	14.90	9.80	5.20	1.61
NSBPC 15	70.00	65.00	60.10	52.00	44.00	36.50	29.00	20.50	11.40	2.18
NSBPC 20	123.00	115.00	104.00	93.00	78.00	64.00	49.00	35.50	23.00	8.00
NSBPC 25	215.00	175.00	157.50	139.50	119.00	99.50	79.60	59.00	37.30	16.30

Evacuation Time in s/l for Various Vacuum Ranges

Type	Degree of evacuation in mbar								
	-50	-100	-200	-300	-400	-500	-600	-700	-800
NSBPC 10	0.06	0.14	0.30	0.52	0.82	1.30	1.98	3.26	6.56
NSBPC 15	0.05	0.08	0.16	0.26	0.40	0.60	0.86	1.30	2.54
NSBPC 20	0.03	0.05	0.09	0.16	0.24	0.34	0.49	0.80	1.74
NSBPC 25	0.02	0.03	0.06	0.09	0.14	0.20	0.28	0.42	0.99

How to Order

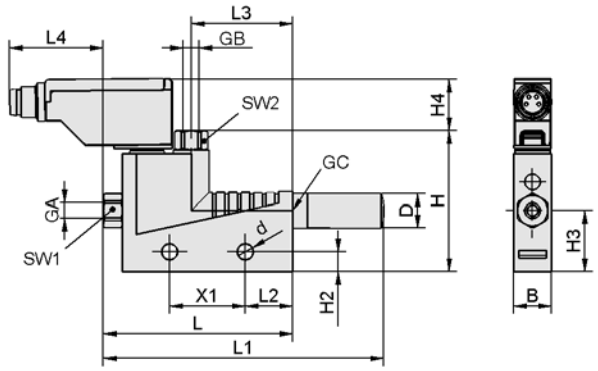
NSBPC Series

Product Family Name	Part number	Nozzle Size (mm)	Thread Type / Port Size		Description - Features
			Pressure	Vacuum	
Basic ejectors - single stage with additional features	NSBPC010XXXVTG2	1.0	G1/8 - F	G1/8 - F	Basic ejector; vacuum switch (PNP)
	NSBPC010ANOXXG2	1.0	G1/8 - F	G1/8 - F	Basic ejector; suction valve; blow off valve
	NSBPC010ANOVTG2	1.0	G1/8 - F	G1/8 - F	Basic ejector; suction valve; blow off valve; vacuum switch (PNP)
	NSBPC015XXXVTG2	1.5	G1/8 - F	G1/8 - F	Basic ejector; vacuum switch (PNP)
	NSBPC015ANOXXG2	1.5	G1/8 - F	G1/8 - F	Basic ejector; suction valve; blow off valve
	NSBPC015ANOVTG2	1.5	G1/8 - F	G1/8 - F	Basic ejector; suction valve; blow off valve; vacuum switch (PNP)
	NSBPC020XXXVTG3	2.0	G1/4 - F	G3/8 - F	Basic ejector; vacuum switch (PNP)
	NSBPC020ANOXXG3	2.0	G1/4 - F	G3/8 - F	Basic ejector; suction valve; blow off valve;
	NSBPC020ANOVTG3	2.0	G1/4 - F	G3/8 - F	Basic ejector; suction valve; blow off valve; vacuum switch (PNP)
	NSBPC025XXXVTG3	2.5	G1/4 - F	G3/8 - F	Basic ejector; vacuum switch (PNP)
	NSBPC025ANOXXG3	2.5	G1/4 - F	G3/8 - F	Basic ejector; suction valve; blow off valve
	NSBPC025ANOVTG3	2.5	G1/4 - F	G3/8 - F	Basic ejector; suction valve; blow off valve; vacuum switch (PNP)

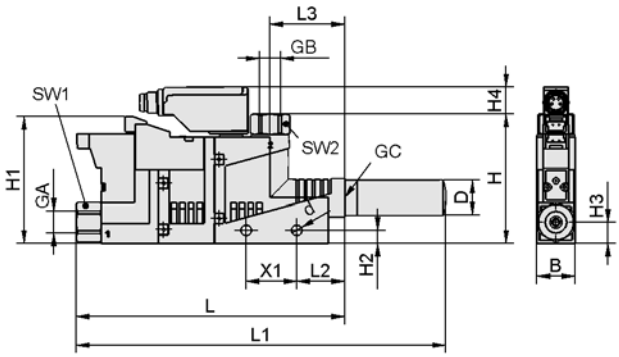
Product Family Name	Part Number	Description
Accessories	NBEPL1111453SBP	Mtg Plate NSBP EJT
	NSETSBPX0056CFN	Mtg. Set NSBP/NSBPC M4F
	NSDXXXXXXX401MG	Silencer Replacement NSBPC 07 to 10
	NSDXXXXXXX763MG	Silencer Replacement NSBPC 20 to 25
	NASKMIC1030PUGE	3 meter connection cable for solenoid valve
	NASKBM8450PURGE	Cable M8 4 5M PUR GE - Straight Connection
	NASKBM8450PURWX	Cable M8 4 5M PUR W - Right-angle connection

Dimensions: mm, Weight in kg

NSBPC 010/015 (VT) G2 and 020/025 (VT) G3

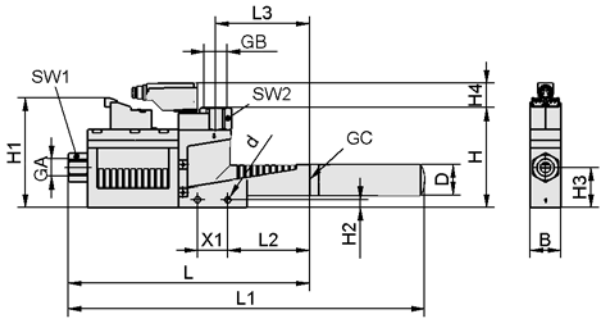


NSBPC 010/015 ANO(VT)G2



Type	B	d	D	GA	GB
NSBPC010XXXVTG2	15	4.2	13.5	G1/8-F	G1/8-F
NSBPC015XXXVTG2	15	4.2	13.5	G1/8-F	G1/8-F
NSBPC020XXXVTG3	20	4.2	20	G1/4-F	G3/8-F
NSBPC025XXXVTG3	20	4.2	20	G1/4-F	G3/8-F
NSBPC010ANOXXG2	15	4.2	13.5	G1/8-F	G1/8-F
NSBPC015ANOXXG2	15	4.2	13.5	G1/8-F	G1/8-F
NSBPC020ANOXXG3	20	4.2	20	G1/4-F	G3/8-F
NSBPC025ANOXXG3	20	4.2	20	G1/4-F	G3/8-F
NSBPC010ANOVTG2	15	4.2	13.5	G1/8-F	G1/8-F
NSBPC015ANOVTG2	15	4.2	13.5	G1/8-F	G1/8-F
NSBPC020ANOVTG3	20	4.2	20	G1/4-F	G3/8-F
NSBPC025ANOVTG3	20	4.2	20	G1/4-F	G3/8-F

NSBPC 020/025 ANO(VT)G3



Type	GC	H	H1	H2	H3	H4	L	L1	L2	L3	L4	SW1	SW2	X1	kg
NSBPC010XXXVTG2	G1/8-F	51	-	5.2	18	11.8	61.5	101.5	19	29.5	19.8	14	14	20	0.105
NSBPC015XXXVTG2	G1/8-F	51	-	5.2	18	11.8	61.5	101.5	19	29.5	19.8	14	14	20	0.105
NSBPC020XXXVTG3	G3/8-F	65.5	-	5.2	18	17.3	99.5	175.5	54	62	17.8	17	19	20	0.143
NSBPC025XXXVTG3	G3/8-F	65.5	-	5.2	18	17.3	99.5	175.5	54	62	17.8	17	19	20	0.143
NSBPC010ANOXXG2	G1/8-F	51	50	5.2	8.5	-	106	146	19	29.5	-	14	14	20	0.07
NSBPC015ANOXXG2	G1/8-F	51	50	5.2	8.5	-	106	146	19	29.5	-	14	14	20	0.07
NSBPC020ANOXXG3	G3/8-F	65.5	72	5.2	8.5	-	159.5	235.5	54	62	-	17	19	20	0.144
NSBPC025ANOXXG3	G3/8-F	65.5	72	5.2	8.5	-	159.5	235.5	54	62	-	17	19	20	0.144
NSBPC010ANOVTG2	G1/8-F	49	50	5.2	8.5	14.2	101.5	141.5	12.5	29.5	-	-	-	20	0.14
NSBPC015ANOVTG2	G1/8-F	49	50	5.2	8.5	14.2	101.5	141.5	12.5	29.5	-	-	-	20	0.14
NSBPC020ANOVTG3	G3/8-F	65.5	72	5.2	26	17.3	159.5	235.5	54	62	-	17	19	20	0.22
NSBPC025ANOVTG3	G3/8-F	65.5	72	5.2	26	17.3	159.5	235.5	54	62	-	17	19	20	0.22

Basic Ejectors – NSEGX Series

Suction Rate from 0.3 SCFM to 8.5 SCFM

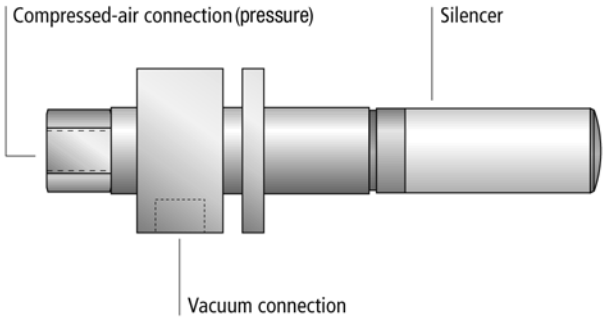
Basic ejector that is robust for universal use in various industries and applications. Examples include sheet metal handling in automotive related applications, wood, food and packing.

Design Features

Suction capacity up to 8.5 SCFM; Nozzle diameter 0.5 to 3mm; Silencer (standard); Maximum vacuum 85%; Anodized aluminum body with brass nozzle and plastic impact resistant silencer. Port sizes: G1/8 to G1/2

Note: Nozzle size of 3mm has silencer internal port size of G3/4

Decentral vacuum generation by means of basic ejectors NSEGX for handling plastic parts



Design

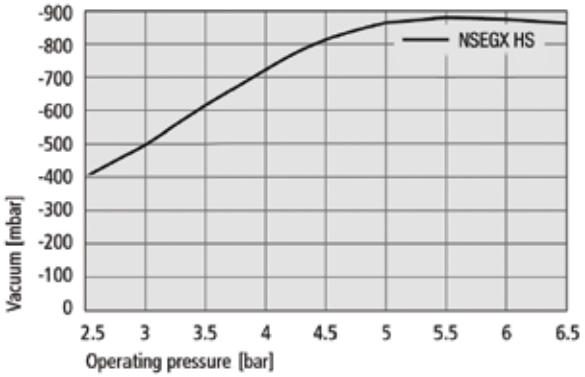
- Ejector with single stage nozzle, available in seven power ratings

Technical Data Basic Ejectors NSEGX

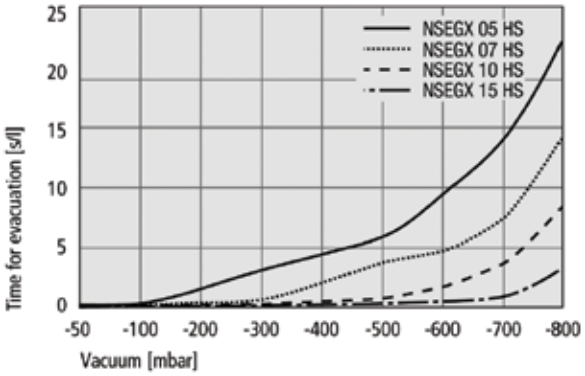
Type	Nozzle diam-eter	Degree of evacuation [%]	Suction rate (l/min)	Suction rate (m³/h)	Air con-sumption (l/min)	Air con-sumption (m³/h)	Recommended hose diameter compressed-air (mm)	Recommended hose diameter vacuum (mm)	Operating pressure (bar)	Operating tempera-ture (°C)	Weight (kg)
NSEG 05	0.5	82	7	0.4	13	0.8	2	2	5	-10 - 80	0.011
NSEG 07	0.7	85	14	0.8	21	1.3	2	4	5	-10 - 80	0.045
NSEG 10	1	85	34	2	49	2.9	2	4	5	-10 - 80	0.05
NSEG 15	1.5	85	69	4.1	102	6.1	4	6	5	-10 - 80	0.11
NSEG 20	2	85	124	7.4	186	11.2	4	9	5	-10 - 80	0.13
NSEG 25	2.5	55	170	10.2	186	11.2	4	9	5	-10 - 80	0.295
NSEG 30	3	85	240	14.4	392	23.5	6	12	5	-10 - 80	0.404

*At optimal operating pressure
**For max. length 2 m

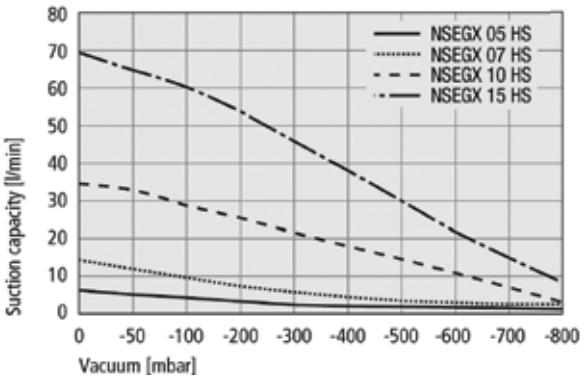
Performance Data Basic Ejectors NSEGX Series



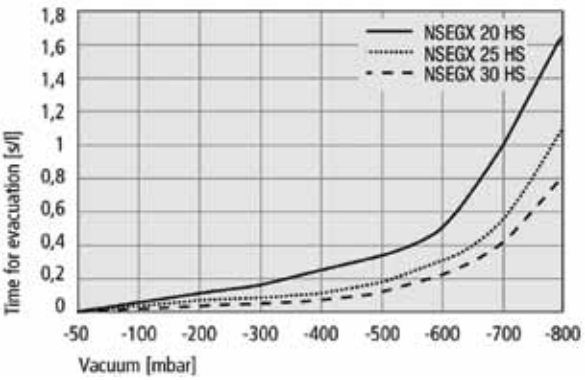
Achievable vacuum at various operating pressures



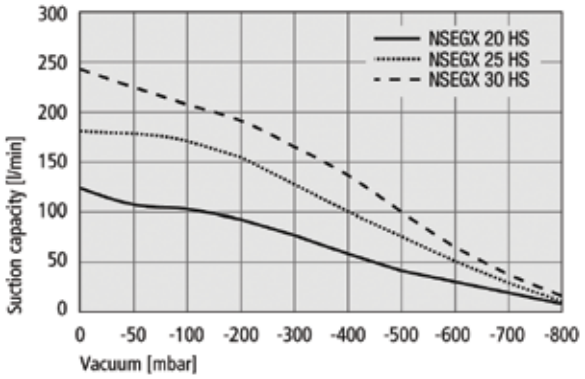
Evacuation times for various vacuum ranges



Suction capacity at various degrees of evacuation



Evacuation times for various vacuum ranges



Suction capacity at various degrees of evacuation

Suction Capacity in l/min at Various Degrees of Evacuation

Type	Degree of evacuation in mbar									
	0	-50	-100	-200	-300	-400	-500	-600	-700	-800
NSEGX005HSNSSDA	7.0	5.9	5.1	4.3	3.4	2.6	1.9	1.4	0.5	0.2
NSEGX007HSHVSDA	14.0	11.7	10.3	8.6	6.8	5.3	3.9	2.8	1.1	0.4
NSEGX010HSHVSDA	34.0	33.0	29.0	25.0	22.0	18.0	15.0	9.0	6.0	3.0
NSEGX015HSHVSDA	69.0	64.0	60.0	53.0	43.0	36.0	30.0	22.0	16.0	8.0
NSEGX020HSHVSDA	124.0	116.0	104.0	92.0	78.0	64.0	48.0	32.0	23.0	10.0
NSEGX025HSHVSDA	184.0	180.0	17.0	146.0	120.0	96.0	72.0	47.0	28.0	13.0
NSEGX030HSHVSDA	240.0	225.0	215.0	198.0	165.0	130.0	100.0	64.0	36.0	16.0

Evacuation Time in s/l for Various Vacuum Ranges

Type	Degree of evacuation in mbar								
	-50	-100	-200	-300	-400	-500	-600	-700	-800
NSEGX005HSNSSDA	0.34	0.76	1.80	3.02	4.55	6.57	9.58	14.80	22.40
NSEGX007HSHVSDA	0.17	0.36	0.85	1.45	2.18	3.25	4.67	7.34	14.60
NSEGX010HSHVSDA	0.09	0.16	0.34	0.59	0.96	1.42	2.03	3.30	7.36
NSEGX015HSHVSDA	0.05	0.07	0.19	0.31	0.48	0.72	1.12	1.70	3.60
NSEGX020HSHVSDA	0.03	0.05	0.11	0.16	0.24	0.35	0.50	1.08	1.65
NSEGX025HSHVSDA	0.03	0.04	0.07	0.09	0.14	0.20	0.30	0.49	1.10
NSEGX030HSHVSDA	0.01	0.02	0.04	0.06	0.10	0.15	0.21	0.42	0.80

How to Order

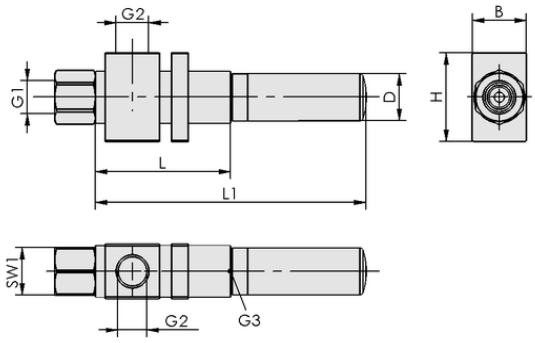
NSEGX Series

Product Family Name	Part number	Nozzle Size (mm)	Thread Type / Port Size		Description - Features
			Pressure	Vacuum	
Basic ejectors - single stage (aluminum)	NSEGX005HSNSSDA	0.5	M5 - F	M5 - F	High Speed and Narrow Shape
	NSEGX007HSHVSDA	0.7	G1/8 - F	G1/8 - F	High Speed (High Vacuum)
	NSEGX010HSHVSDA	1.0	G1/8 - F	G1/8 - F	High Speed (High Vacuum)
	NSEGX015HSHVSDA	1.5	G1/4 - F	G1/4 - F	High Speed (High Vacuum)
	NSEGX020HSHVSDA	2.0	G1/4 - F	G1/4 - F	High Speed (High Vacuum)
	NSEGX025HSHVSDA	2.5	G3/8 - F	G1/2 - F	High Speed (High Vacuum)
	NSEGX030HSHVSDA	3.0	G3/8 - F	G1/2 - F	High Speed (High Vacuum)

Product Family Name	Part Number	Description
Accessories	NSDXXXXXXX24BMM	Silencer Replacement NSEG 05
	NSDXXXXXXX401MG	Silencer Replacement NSEG 07 to 10

Dimensions: mm

NSEG 05 to 30 SDA



Type	G1	G2	G3	SW1	L	B	H	L1	D
NSEGX005HSNSSDA	M5-F	M5-F	M5-F	8	32	10	20	56	9
NSEGX007HSHVSDA	G1/8-F	G1/8-F	G1/8-F	14	40	16	26	80	13.6
NSEGX010HSHVSDA	G1/8-F	G1/8-F	G1/8-F	14	45	16	26	85	13.6
NSEGX015HSHVSDA	G1/4-F	G1/4-F	G1/4-F	17	60	22	38	106	20
NSEGX020HSHVSDA	G1/4-F	G1/4-F	G3/8-F	17	75	26	38	131	20
NSEGX025HSHVSDA	G3/8-F	G1/2-F	G1/2-F	17	75	26	38	131	20
NSEGX030HSHVSDA	G3/8-F	G1/2-F	G3/4-F	22	110	42	50	200	31

Multi-Stage Ejectors – NSEMX Series

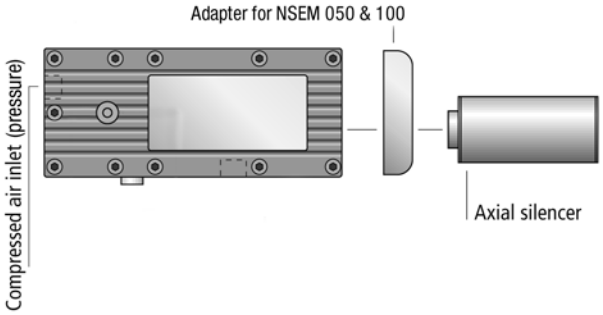
Suction rate from 13.6 SCFM to 34 SCFM

Multi-stage ejector that is designed to handle porous work-pieces, such as cardboard, insulating materials, packing and other porous type materials. This series works well for applications that require a large suction capacity, but low air consumption.

NSEMX

Design Features

Suction capacity up to 34 SCFM; maximum vacuum 85%; anodized aluminum body and nozzle; Silencer (standard); Gaskets and flaps made of nitrile.



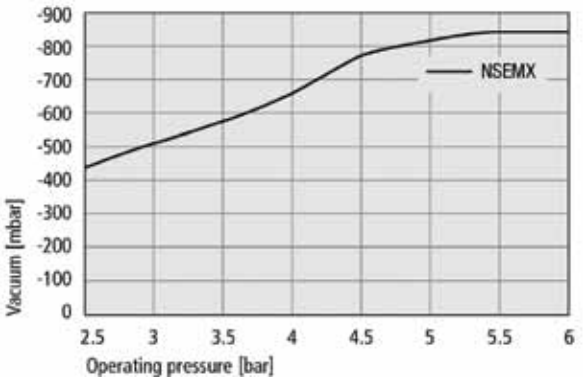
Technical Data Multi-Stage Ejectors NSEMX Series

Type	Degree of evacuation (%)	Max. suction rate (l/min)	Max. suction rate (m^3/h)	Air consumpt. during evac. (l/min)*	Air consumpt. during evac. (m^3/h)*	Noise level free (dB)
NSEMX025SDAXXXX	85	393	23.6	101	6.1	77
NSEMX050SDAXXXX	85	704	42.2	197	11.8	80
NSEMX100SDAXXXX	85	976	58.6	376	22.6	81

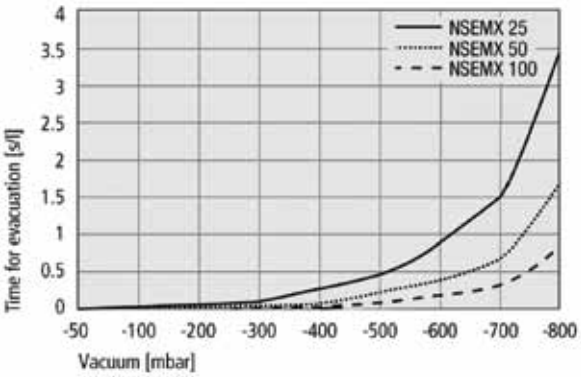
Type	Noise level free (dB)	Operating pressure (bar)	Recomm. int. hose diameter compr. air (mm)**	Recomm. int. hose diameter vacuum (mm)**	Weight (kg)	Operating temperature (°C)
NSEMX025SDAXXXX	64	5	4	20	1.1	0 - 50
NSEMX050SDAXXXX	66	5	6	25	1.4	0 - 50
NSEMX100SDAXXXX	60	5	6	32	1.7	0 - 50

*At optimal operating pressure
**For max. length 2 m

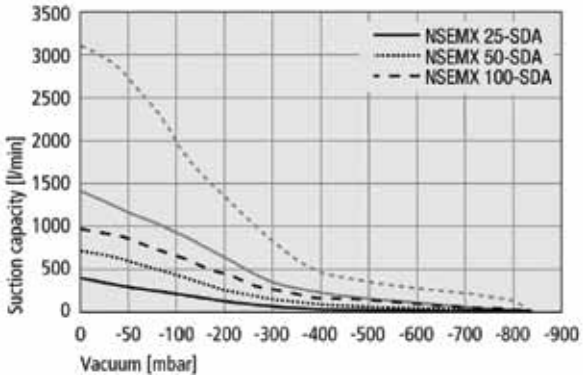
Performance Data Basic Ejectors NSEMX Series



Achievable vacuum at various operating pressures



Evacuation times for various vacuum ranges (averaged for SDA)



Suction capacity at various degrees of evacuation

Suction Capacity in l/min at Various Degrees of Evacuation

Type	Degree of evacuation in mbar									
	0	-50	-100	-200	-300	-400	-500	-600	-700	-800
NSEMX025SDAXXXX	393	319	227	122	72	37	27	15	7	2
NSEMX050SDAXXXX	704	611	452	269	173	91	56	37	19	6
NSEMX100SDAXXXX	976	884	669	476	278	158	119	77	36	11

Evacuation Time in s/l for Various Vacuum Ranges

Type	Degree of evacuation in mbar								
	-50	-100	-200	-300	-400	-500	-600	-700	-800
NSEMX025SDAXXXX	0.02	0.04	0.07	0.14	0.27	0.46	0.81	1.51	3.37
NSEMX050SDAXXXX	0.02	0.03	0.05	0.08	0.14	0.23	0.38	0.67	1.69
NSEMX100SDAXXXX	0.01	0.02	0.04	0.07	0.10	0.14	0.21	0.34	0.82

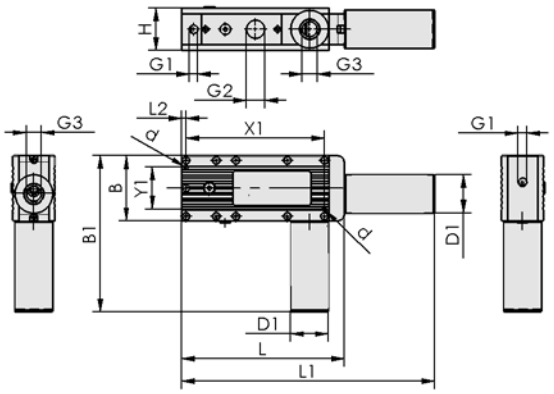
How to Order

NSEMX Series

Product Family Name	Part number	Nozzle Size (mm)	Thread Type / Port Size		Description - Features
			Pressure	Vacuum	
Multi-stage ejectors	NSEMX025SDAXXXX	25	G1/4 - F	G1/2 - F	Multi-stage ejector nozzle - High suction capacity
	NSEMX050SDAXXXX	50	G1/4 - F	G3/4 - F	Multi-stage ejector nozzle - High suction capacity
	NSEMX100SDAXXXX	100	G1/4 - F	G 1 - F	Multi-stage ejector nozzle - High suction capacity

Dimensions: mm

NSEMX 25 to 100 SDA



Type	B	B1	d	D1	G1	G2	G3	H	L	L1	L2	X1	Y1
NSEMX025SDAXXXX	85	-	5.5	40	G1/4"-F	G1/2"-F	G1/2"-F	48	195	275	6	183	55
NSEMX050SDAXXXX	85	-	5.5	50	G1/4"-F	G3/4"-F	G3/4"-F	58	215	335	6	183	55
NSEMX100SDAXXXX	85	-	5.5	50	G1/4"-F	G1"-F	G3/4"-F	68	215	335	6	183	55

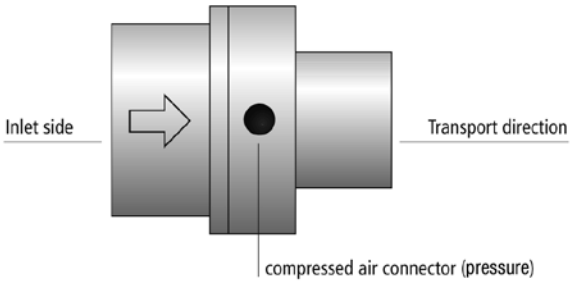
Feed Ejectors – NSECX Series

Suction rate from 21.3 SCFM to 78.8 SCFM

The NSEC Feed Ejector is designed for applications that required high flow. This type of ejector is used for handling of porous materials, such as foams, paper, textiles and recycling materials. In addition, this product is very effective for handling for conveying bulk materials, such as polystyrene, plastic granules, rice and other filling materials.

Design Features

Suction capacity up to 78.8 SCFM; Nozzle diameter: 10 to 40mm; High flow, low vacuum; Anodized aluminum body; Straight vacuum passage



Vacuum generation by means of feed ejector NSEC for transporting granulates

Technical Data Feed Ejectors NSECX Series

Type	Nozzle-Ø (mm)	Max. vacuum (mbar)	Max. suction rate (l/min)	Max. suction rate (m^3/h)	Air consumpt. during evac. (l/min)*	Air consumpt. during evac. (m^3/h)*	Operating Pressure (bar)	Weight (kg)	Operating temperature (ºC)
NSECX 100	10	-185	610	36.6	135	8.1	59	0.070	-20 - 80
NSECX 200	20	-85	1375	82.5	290	17.4	59	0.180	-20 - 80
NSECX 400	40	-35	2250	135.0	445	26.7	65	0.525	-20 - 80

*At optimal operating pressure of approx. 4.5 bar

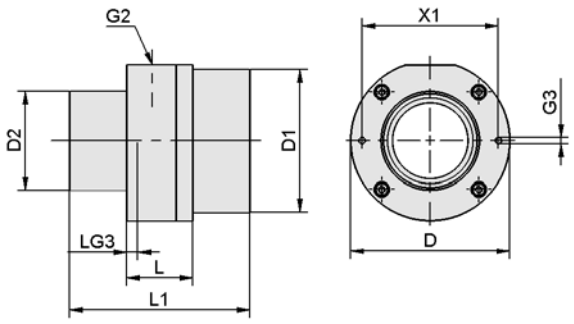
How to Order

NSECX Series

Product Family Name	Part number	Nozzle Size (mm)	Thread Type / Port Size		Description - Features
			Pressure	Vacuum	
Feed ejectors	NSECX100XXXXXXX	10	G1/8 - F	M4 - F	Aluminum body - High volume flow; low vacuum
	NSECX200XXXXXXX	20	G1/4 - F	M4 - F	Aluminum body - High volume flow; low vacuum
	NSECX400XXXXXXX	40	G3/8 - F	M4 -F	Aluminum body - High volume flow; low vacuum

Dimensions: mm

NSEC 100 to 400



Type	D	D1	D2	G2	G3	L	L1	LG3	X1
NSECX100XXXXXXX	37	19	19	G1/8-F	M4-F	21	70	8	29
NSECX200XXXXXXX	50	38	32	G1/4-F	M4-F	30	90	12	42
NSECX400XXXXXXX	84	75	52	G3/8-F	M4-F	35	95	14	72

Compact Ejectors – NSCPI Series

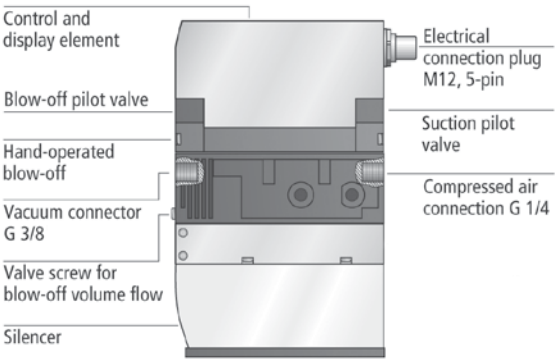
Suction rate from 2.6 SCFM to 6.8 SCFM

Handling of suction tight and porous work-pieces; Preparation and monitoring of vacuum in automated systems; Sheet metal processing and robotic applications to minimize cycle times.

Design Features

Suction capacity up to 6.8 SCFM; Nozzle diameter: 1.5 to 2.5mm; Maximum vacuum 85%. High strength plastic body; Integrated vacuum system monitoring function; I/O Link; Air-saving regulation and blow off for highly dynamic, efficient processes.

Centralized vacuum generation by means of compact ejectors NSCPi



Design

- User display with seven segments, operating keyboard and luminous display that indicates system status
- Electrical connection via standard M12 plug, optional with potential separation of sensor and actor power supply
- Integrated pneumatic valves for NO, NC or pulse switch functions
- Adjusting screw to adjust the blow-off capacity
- Pneumatic connections (G3/8" and G1/4") with protective filters

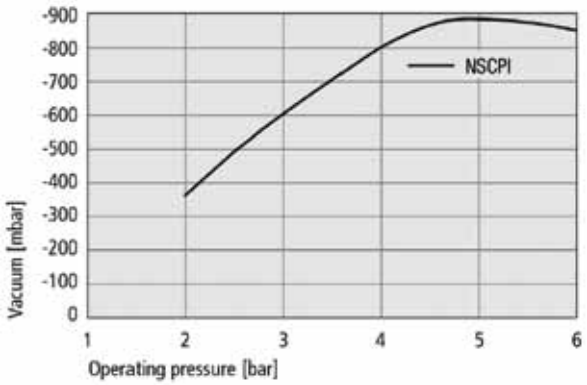
Technical Data Compact Ejectors NSCP*I*

Type	Nozzle-Ø (mm)	Degree of evacuation (%)	Max. suction rate (l/min)	Max. suction rate (m^3/h)	Air consumpt. during evac. (l/min)*	Air consumpt. during evac. (m^3/h)*	Max. air consumption blow off (l/min)
NSCPI 15	1.5	85	75	4.5	115	7.2	200
NSCPI 20	2.0	85	140	8.4	180	11.7	200
NSCPI 25	2.5	85	195	11.7	290	17.4	200

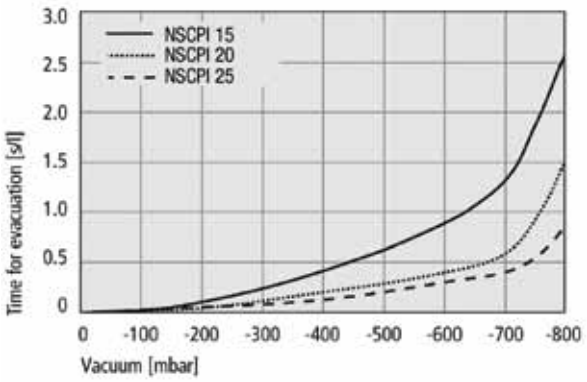
Type	Noise level free (dB)	Noise level workp. gripped (dB)	Operating pressure (bar)	Recomm. int. hose diameter compr. air (mm)**	Recomm. int. hose diameter vacuum (mm)**	Weight (kg)	Operating temperature (°C)
NSCPI 15	75	70	4 - 7	6	6	0.56	0 - 50
NSCPI 20	75	65	4 - 7	6	8	0.56	0 - 50
NSCPI 25	78	75	4 - 7	8	9	0.56	0 - 50

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

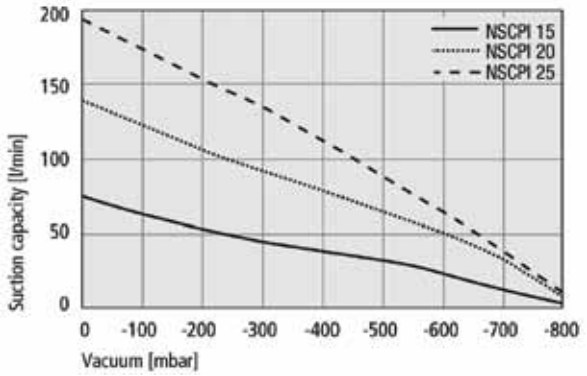
Performance Data Basic Ejectors NSCPI Series



Achievable vacuum at various operating pressures



Evacuation times for various vacuum ranges (averaged for NSDA)



Suction capacity at various degrees of evacuation

Suction Capacity in l/min at Various Degrees of Evacuation

Type	Degree of evacuation in mbar									
	0	-50	-100	-200	-300	-400	-500	-600	-700	-800
NSCP*I* 15	75.0	70.3	65.4	55.2	46.3	38.3	31.2	23.9	13.5	3.4
NSCP*I* 20	139.0	131.3	123.1	106.8	92.5	79.3	65.2	51.9	32.1	8.5
NSCP*I* 25	195.0	188.2	176.8	153.6	133.6	11.0	89.3	67.4	39.7	11.7

Evacuation Time in s/l for Various Vacuum Ranges

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

How to Order

NSCPI Series

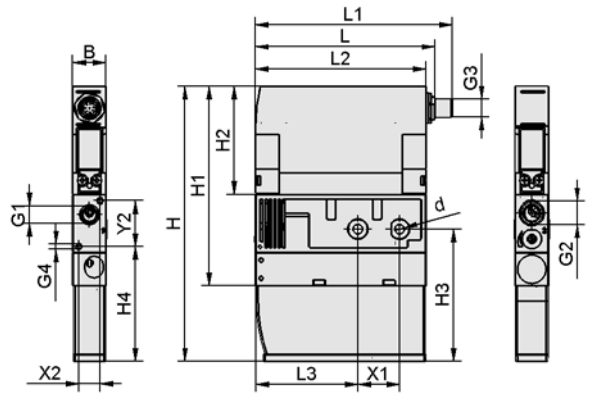
Product Family Name	Part number	Nozzle Size (mm)	Thread Type / Port Size		Description - Features	Digital Switch/ Integrated Air Savings Function
			Pressure	Vacuum		
Compact intelligent single-stage ejectors	NSCPI015ANOVDM1	1.5	G1/4 - F	G3/8 - F	Digital vacuum switch; suction valve normally open; blow-off valve; M12 - 5 Pin Connector	
	NSCPI015ANCVDM1	1.5	G1/4 - F	G3/8 - F	Digital vacuum switch; suction valve normally closed; blow-off valve; M12 - 5 Pin Connector	
	NSCPI015ANORDM1	1.5	G1/4 - F	G3/8 - F	Digital vacuum switch with integrated air saving function; suction valve normally open; blow-off valve; M12 - 5 Pin Connector	✔
	NSCPI015ANCRDM1	1.5	G1/4 - F	G3/8 - F	Digital vacuum switch with integrated air saving function; suction valve normally closed; blow-off valve; M12 - 5 Pin Connector	✔
	NSCPI020ANOVDM1	2.0	G1/4 - F	G3/8 - F	Digital vacuum switch; suction valve normally open; blow-off valve; M12 - 5 Pin Connector	
	NSCPI020ANCVDM1	2.0	G1/4 - F	G3/8 - F	Digital vacuum switch ; suction valve normally closed; blow-off valve; M12 - 5 Pin Connector	
	NSCPI020ANORDM1	2.0	G1/4 - F	G3/8 - F	Digital vacuum switch with integrated air saving function; suction valve normally open; blow-off valve; M12 - 5 Pin Connector	✔
	NSCPI020ANCRDM1	2.0	G1/4 - F	G3/8 - F	Digital vacuum switch with integrated air saving function; suction valve normally closed; blow-off valve; M12 - 5 Pin Connector	✔
	NSCPI025ANOVDM1	2.5	G1/4 - F	G3/8 - F	Digital vacuum switch; suction valve normally open; blow-off valve; M12 - 5 Pin Connector	
	NSCPI025ANCVDM1	2.5	G1/4 - F	G3/8 - F	Digital vacuum switch ; suction valve normally closed; blow-off valve; M12 - 5 Pin Connector	
	NSCPI025ANORDM1	2.5	G1/4 - F	G3/8 - F	Digital vacuum switch with integrated air saving function; suction valve normally open; blow-off valve; M12 - 5 Pin Connector	✔
	NSCPI025ANCRDM1	2.5	G1/4 - F	G3/8 - F	Digital vacuum switch with integrated air saving function; suction valve normally closed; blow-off valve; M12 - 5 Pin Connector	✔

NSCPI Compact Ejectors are delivered ready to connect (without connection cables).

Product Family Name	Part Number	Description
Accessories	NASKBM1250PURGE	Cable Connnector - M12 5-Pole
	NWARSETSCPISMPI	Maintenance Kit - NSCPI

Dimensions: mm

NSCPI Series



Type	B	d	G1	G2	G3	G4	H	H1	H2	H3	H4	L	L1	L2	L3	X1	X2	Y2
NSCPI015ANOVDM1	22	6.6	G1/4-F	G3/8-F	M12x1-M	M4-F	181.5	131.5	71.5	87.5	76	118.5	129.7	112.5	67.5	27.5	14	30
NSCPI015ANCVDM1	22	6.6	G1/4-F	G3/8-F	M12x1-M	M4-F	181.5	131.5	71.5	87.5	76	118.5	129.7	112.5	67.5	27.5	14	30
NSCPI015ANORDM1	22	6.6	G1/4-F	G3/8-F	M12x1-M	M4-F	181.5	131.5	71.5	87.5	76	118.5	129.7	112.5	67.5	27.5	14	30
NSCPI015ANCRDM1	22	6.6	G1/4-F	G3/8-F	M12x1-M	M4-F	181.5	131.5	71.5	87.5	76	118.5	129.7	112.5	67.5	27.5	14	30
NSCPI020ANOVDM1	22	6.6	G1/4-F	G3/8-F	M12x1-M	M4-F	181.5	131.5	71.5	87.5	76	118.5	129.7	112.5	67.5	27.5	14	30
NSCPI020ANCVDM1	22	6.6	G1/4-F	G3/8-F	M12x1-M	M4-F	181.5	131.5	71.5	87.5	76	118.5	129.7	112.5	67.5	27.5	14	30
NSCPI020ANORDM1	22	6.6	G1/4-F	G3/8-F	M12x1-M	M4-F	181.5	131.5	71.5	87.5	76	118.5	129.7	112.5	67.5	27.5	14	30
NSCPI020ANCRDM1	22	6.6	G1/4-F	G3/8-F	M12x1-M	M4-F	181.5	131.5	71.5	87.5	76	118.5	129.7	112.5	67.5	27.5	14	30
NSCPI025ANOVDM1	22	6.6	G1/4-F	G3/8-F	M12x1-M	M4-F	181.5	131.5	71.5	87.5	76	118.5	129.7	112.5	67.5	27.5	14	30
NSCPI025ANCVDM1	22	6.6	G1/4-F	G3/8-F	M12x1-M	M4-F	181.5	131.5	71.5	87.5	76	118.5	129.7	112.5	67.5	27.5	14	30
NSCPI025ANORDM1	22	6.6	G1/4-F	G3/8-F	M12x1-M	M4-F	181.5	131.5	71.5	87.5	76	118.5	129.7	112.5	67.5	27.5	14	30
NSCPI025ANCRDM1	22	6.6	G1/4-F	G3/8-F	M12x1-M	M4-F	181.5	131.5	71.5	87.5	76	118.5	129.7	112.5	67.5	27.5	14	30

Compact Ejectors – NSCPM Series

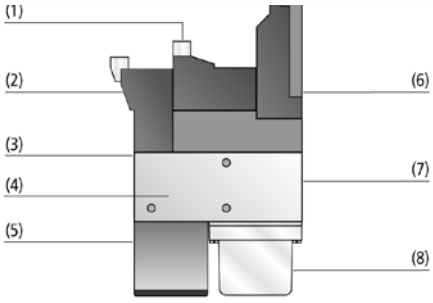
Suction rate from 0.2 SCFM to 0.8 SCFM

The NSCPM series ejector is optimally designed for use on industrial robots, linear axes and pick-and-place systems. The compact overall design makes this ejector a perfect for mounting in tight work spaces.

Design Features

Suction capacity up to 0.8 SCFM; Nozzle diameter: 0.5 to 1mm; Maximum vacuum 85%; Anodized aluminum body; Integrated valves (Normally closed blow-off valve and either a normally closed or normally open suction valve), filter, silencer and vacuum monitoring. This series of ejectors can be mounted to a connecting plate for block mounting.

Central vacuum generation by compact ejectors NSCPM



Design

- Blow-off valve (1) in idle position, normally closed (NC)
- Suction valve (2) in idle position, can be normally open (NO) or closed (NC)
- Compressed air connection (3)
- Basic body (4) made from anodized aluminum
- Integrated silencer (5) and filter (8)
- Vacuum connection (7)
- Can be connected to a collective connection plate (battery mounting)
- Optionally with integrated vacuum switch (6)

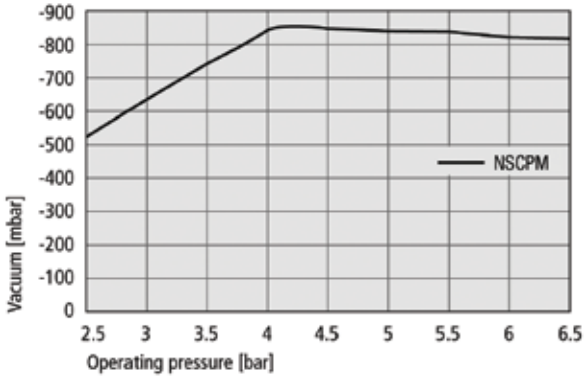
Technical Data Compact Ejectors NSCPM

Type	Nozzle-Ø (mm)	Degree of evacuation (%)	Max. suction rate (l/min)	Max. suction rate (m^3/h)	Air consumpt. during evac. (l/min)*	Air consumpt. during evac. (m^3/h)*	Max. air consumption blow off (l/min)
NSCPM 05	0.5	85	6	0.4	13	0.8	26
NSCPM 07	0.7	85	12	0.7	21	1.3	26
NSCPM 10	1.0	85	23	1.4	46	2.8	26

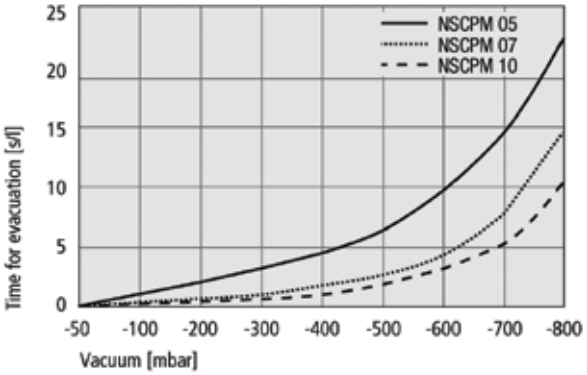
Type	Noise level gripped (dB)	Noise level free (dB)	Operating pressure (bar)	Recomm. int. hose diameter compr. air (mm)**	Recomm. int. hose diameter vacuum (mm)**	Weight (kg)	Operating temperature (°C)
NSCPM 05	62	62	4.5	2	2	.08	0 - 45
NSCPM 07	67	70	4.5	2	2	.08	0 - 45
NSCPM 10	73	76	4.5	2	4	.08	0 - 45

!The supply voltage for vacuum switches and solenoid valves is 24V DC *At optimal operating pressure **For max. length 2 m

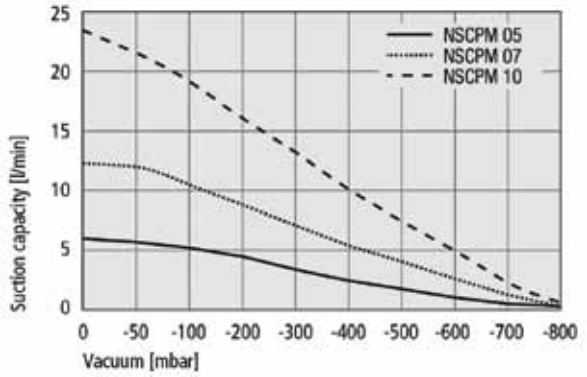
Performance Data Basic Ejectors NSCPM Series



Achievable vacuum at various operating pressures



Evacuation times for various vacuum ranges



Suction capacity at various degrees of evacuation

Suction Capacity in l/min at Various Degrees of Evacuation

Type	Degree of evacuation in mbar									
	0	-50	-100	-200	-300	-400	-500	-600	-700	-800
NSCPM 05	6.0	5.9	5.1	4.3	3.4	2.6	1.9	1.4	0.5	0.2
NSCPM 07	12.0	11.7	10.3	8.6	6.8	5.3	3.9	2.8	1.1	0.4
NSCPM 10	23.0	22.2	19.6	16.4	13.0	10.0	7.4	5.4	2.0	0.8

Evacuation Time in s/l for Various Vacuum Ranges

Type	Degree of evacuation in mbar								
	-50	-100	-200	-300	-400	-500	-600	-700	-800
NSCPM 05	0.34	0.76	1.80	3.02	4.55	6.57	9.58	14.80	22.40
NSCPM 07	0.17	0.36	0.85	1.45	2.18	3.25	4.67	7.34	14.60
NSCPM 10	0.11	0.24	0.56	0.96	1.49	2.38	3.38	5.32	11.54

How to Order

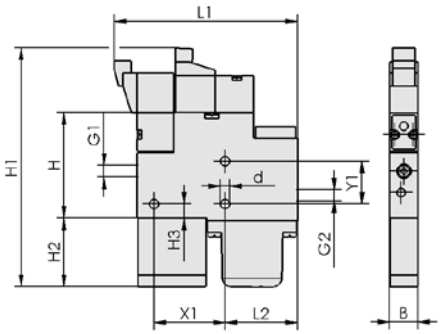
NSCPM Series

Product Family Name	Part number	Nozzle Size (mm)	Thread Type / Port Size		Description - Features
			Pressure	Vacuum	
Compact single-stage ejectors	NSCPM005ANOXXXX	0.5	M5 - F	M5 - F	Blow-off valve; suction valve normally open
	NSCPM005ANCXXXX	0.5	M5 - F	M5 - F	Blow-off valve; suction valve normally closed
	NSCPM005ANOVSXX	0.5	M5 - F	M5 - F	Blow-off valve; suction valve normally open; electronic vacuum switch
	NSCPM005ANCVSXX	0.5	M5 - F	M5 - F	Blow-off valve; suction valve normally closed; electronic vacuum switch
	NSCPM007ANOXXXX	0.7	M5 - F	M5 - F	Blow-off valve; suction valve normally open
	NSCPM007ANCXXXX	0.7	M5 - F	M5 - F	Blow-off valve; suction valve normally closed
	NSCPM007ANOVSXX	0.7	M5 - F	M5 - F	Blow-off valve; suction valve normally open; electronic vacuum switch
	NSCPM007ANCVSXX	0.7	M5 - F	M5 - F	Blow-off valve; suction valve normally closed; electronic vacuum switch
	NSCPM010ANOXXXX	1.0	M5 - F	M5 - F	Blow-off valve; suction valve normally open
	NSCPM010ANCXXXX	1.0	M5 - F	M5 - F	Blow-off valve; suction valve normally closed
	NSCPM010ANOVSXX	1.0	M5 - F	M5 - F	Blow-off valve; suction valve normally open; electronic vacuum switch
	NSCPM010ANCVSXX	1.0	M5 - F	M5 - F	Blow-off valve; suction valve normally closed; electronic vacuum switch

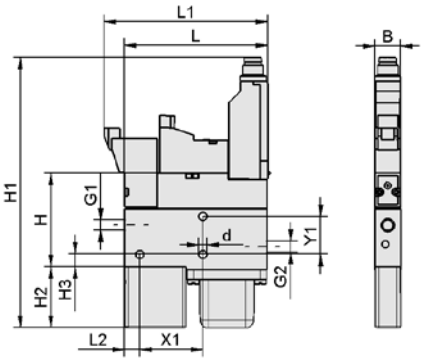
Product Family Name	Part Number	Description
Accessories	NSD249720SCPMXX	NSCPM Repl Silencer 05-07-10
	NFILT217145161X	NSCPM Filter Element 05-07-10
	NASKMIC1030PUGE	Sol Conn StraFht-3M PUR GE
	NASKBM8450PURGE	Cable M8 4 5M PUR GE Straight Connection
	NASKBM8450PURWX	Cable M8 4 5M PUR W Right-angle Connection

Dimensions: mm

NSCPM 05 to 10 NC/NO A



NSCPM...VS



Type	B	d	G1	G2	H	H1	H2	H3	L	L1	L2	X1	Y1
NSCPM005ANOXXXX	10.2	3.2	M5-F	M5-F	37.5	84	24	5	-	64.5	25.5	25	15
NSCPM005ANCXXXX	10.2	3.2	M5-F	M5-F	37.5	84	24	5	-	64.5	25.5	25	15
NSCPM007ANOXXXX	10.2	3.2	M5-F	M5-F	37.5	84	24	5	-	64.5	25.5	25	15
NSCPM007ANCXXXX	10.2	3.2	M5-F	M5-F	37.5	84	24	5	-	64.5	25.5	25	15
NSCPM010ANOXXXX	10.2	3.2	M5-F	M5-F	37.5	84	24	5	-	64.5	25.5	25	15
NSCPM010ANCXXXX	10.2	3.2	M5-F	M5-F	37.5	84	24	5	-	64.5	25.5	25	15
NSCPM005ANOVSXX	10.2	3.2	M5-F	M5-F	37.2	106.8	24	5	56.5	64.5	6	25	15
NSCPM005ANCVSXX	10.2	3.2	M5-F	M5-F	37.2	106.8	24	5	56.5	64.5	6	25	15
NSCPM007ANOVSXX	10.2	3.2	M5-F	M5-F	37.2	106.8	24	5	56.5	64.5	6	25	15
NSCPM007ANCVSXX	10.2	3.2	M5-F	M5-F	37.2	106.8	24	5	56.5	64.5	6	25	15
NSCPM010ANOVSXX	10.2	3.2	M5-F	M5-F	37.2	106.8	24	5	56.5	64.5	6	25	15
NSCPM010ANCVSXX	10.2	3.2	M5-F	M5-F	37.2	106.8	24	5	56.5	64.5	6	25	15

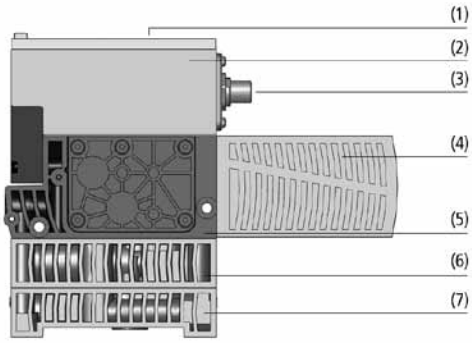
Compact Ejectors – NSXMP Series

Suction rate from 7.7 SCFM

The NSXMP series ejector is a high performance and robust vacuum generator that is design to handle suction tight work-pieces applications under extreme conditions. Example includes vacuum systems in press lines handling metal sheets. These units also work extremely well in pick-and-place applications requiring short cycle times and requirements for precise monitoring of the vacuum system.

Design Features

Suction capacity up to 7.7 SCFM; Nozzle diameter: 3.0 mm; Standard features include large visual display, condition monitoring, robust plastic body, integrated air saving function and blow off module for faster cycle times. It also includes a removable silencer that is standard.



Design

- User display (1) with large-scale operating and display elements
- Control electronics (2) with diverse monitoring functions
- Electrical connection (3) via M12 plug
- Removable silencer (4)
- Basic body (5) made of extremely robust plastic
- Compact ejector NSXMP is additionally equipped with the power blow off module (6)
- Horizontal or vertical connection plate with vacuum and compressed air connection (7); optional with quick-change adapter
- Optional integrated pressure sensor

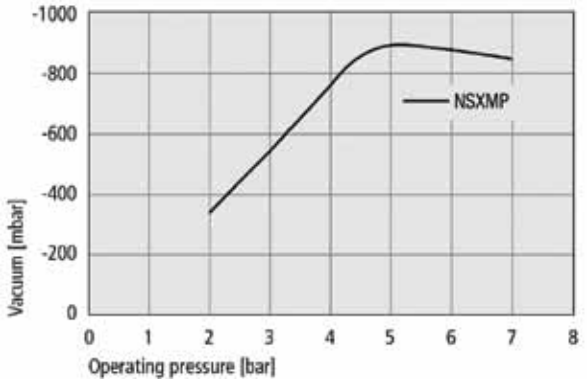
Technical Data Compact Ejectors NSXMP

Type	Nozzle-Ø (mm)	Degree of evacuation (%)	Max. suction rate (l/min)	Max. suction rate (m^3/h)	Air consumpt. during evac. (l/min)*	Air consumpt. during evac. (m^3/h)*	Max. air consumption blow off (l/min)
NSXMP 030	3.0	85	220	13.2	380	22.8	320

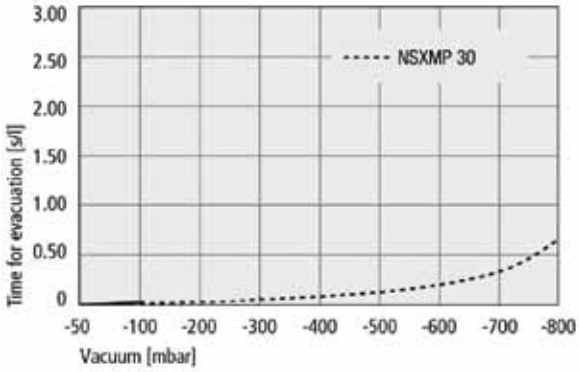
Type	Noise level free (dB)	Operating pressure (bar)	Recomm. int. hose diameter compr. air (mm)**	Recomm. int. hose diameter vacuum (mm)**	Weight (kg)	Operating temperature (°C)
NSXMP 030	72	3 - 6	8	9	0.91	0 - 50

!The supply voltage for vacuum switches and solenoid valves is 24V DC *At optimal operating pressure **For max. length 2 m

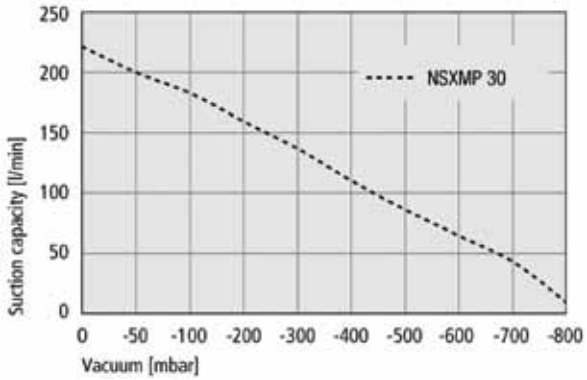
Performance Data Basic Ejectors NSXMP Series



Achievable vacuum at various operating pressures



Evacuation times for various vacuum ranges



Suction capacity at various degrees of evacuation

Suction Capacity in l/min at Various Degrees of Evacuation

Type	Degree of evacuation in mbar									
	0	-50	-100	-200	-300	-400	-500	-600	-700	-800
NSXMP 030	220	199	184	160	138	115	91	63	39	15

Evacuation Time in s/l for Various Vacuum Ranges

Type	Degree of evacuation in mbar								
	-50	-100	-200	-300	-400	-500	-600	-700	-800
NSXMP 030	0.01	0.02	0.05	0.08	0.11	0.15	0.22	0.37	0.69

How to Order

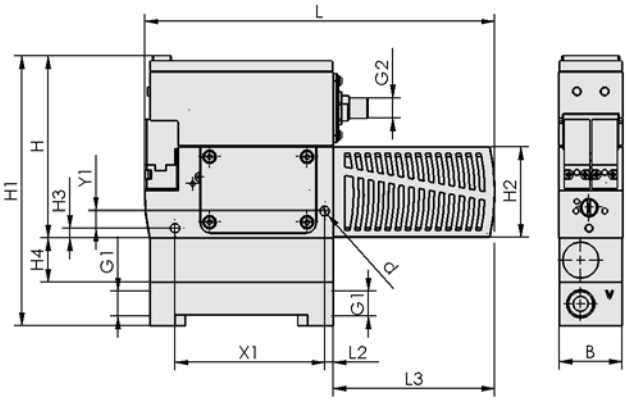
NSXMP Series

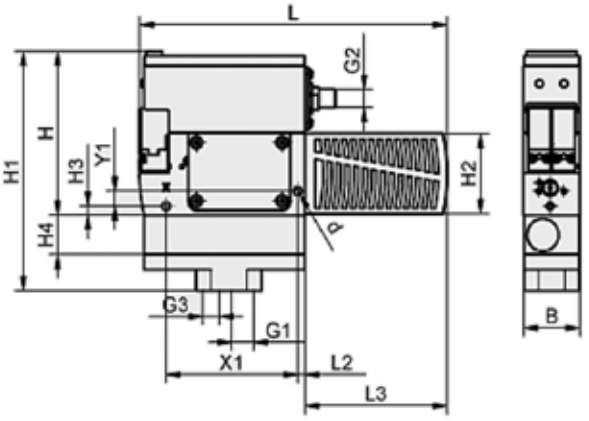
Product Family Name	Part number	Nozzle Size (mm)	Thread Type / Port Size		Description - Features
			Pressure	Vacuum	
Compact single-stage ejectors	NSXMP030IMPHM12	3	G3/8-F	G3/8-F	Suction valve - Bistable switched with pulse; Horizontal port configuration.
	NSXMP030IMPQM12	3	G3/8-F	G3/8-F	Suction valve - Bistable switched with pulse; Quick connect version - must be ordered with single or double base plate.
	NSXMP030IMPVM12	3	G3/8-F	G3/8-F	Suction valve - Bistable switched with pulse; vertical port configuration.
	NSXMP030NC0HM12	3	G3/8-F	G3/8-F	Suction valve - NC; Horizontal port configuration.
	NSXMP030NC0QM12	3	G3/8-F	G3/8-F	Suction valve - NC; Quick connect version - must be ordered with single or double base plate.
	NSXMP030NC0VM12	3	G3/8-F	G3/8-F	Suction valve - NC; vertical port configuration.

Product Family Name	Part number	Numatics Description
Accessories	NASKBM1285000XX	Cable M12 8 Pole 5M
	NGPQ1122461STNB	NSXMP Ind plate with quick change
	NGPQ2122872STNB	NSXMP Dbl plate with quick change

Dimensions: mm

NSXMP Series





Type	B	D	G1	G2	H	H1	H2	H3	H4	L	L2	L3	X1	Y1
NSXMP030NC0HM12	38	5.5	G3/8-F	M12-M	108	160	54	6	26	209	5	97	89	10
NSXMP030NC0VM12	38	5.5	G3/8-F	M12-M	108	158	54	6	26	209	5	97	89	10
NSXMP030NC0QM12	38	5.5	-	M12-M	108	146	54	6	26	209	5	97	89	10
NSXMP030IMPHM12	38	5.5	G3/8-F	M12-M	108	160	54	6	26	209	5	97	89	10
NSXMP030IMPVM12	38	5.5	G3/8-F	M12-M	108	158	54	6	26	209	5	97	89	10
NSXMP030IMPQM12	38	5.5	-	M12-M	108	146	54	6	26	209	5	97	89	10

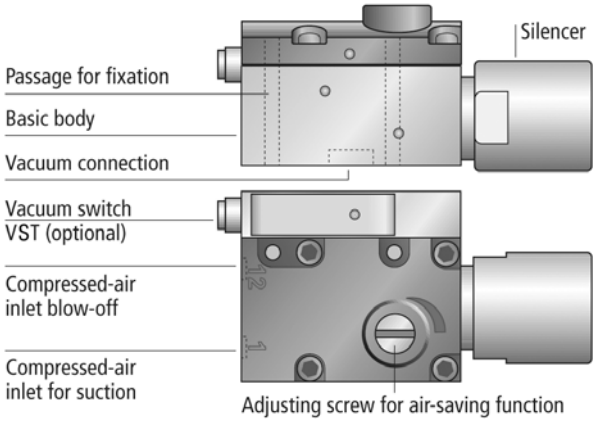
Ejectors with Blow-Off System - NSEAC-RP Series

Suction rate 1.26 SCFM

The NSEAC RP series is designed to handle applications that require short cycle times; examples include tooling systems, sheet metal fabrication, automotive, packaging machines and applications on robots.

Design Features

Suction rates up to 1.26 SCFM; Nozzle diameter 1mm; Anodized aluminum body; Integrated blow-off function; integrated air savings function with adjusting screw; silencer.



Decentralized vacuum generation by means of ejector NSEAC-RP with blow off system right on suction cup

Design

- Body made of anodized aluminium
- Integrated blow off function
- Optional vacuum switch NVSV00AHTPNPSXX with adjustable switching point (connection cable not included in delivery)
- Two mounting screws included in delivery

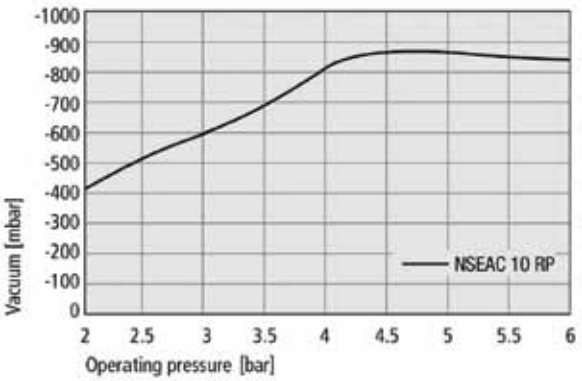
Note:
When ordering the vacuum switch option, a connector cable is required:
NASKBM8450PURGE - Cable/Straight Connection
NASKBM8450PURWX - Cable/Right-angle Connection

Technical Data Compact Ejectors NSEAC-RP

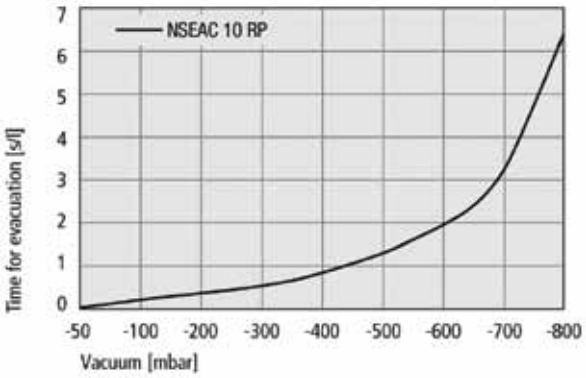
Type	Nozzle-Ø (mm)	Degree of evacuation (%)	Max. suction rate (l/min)	Max. suction rate (m^3/h)	Air consumpt. during evac. (l/min)*	Air consumpt. during evac. (m3/h)*	Max. air consumption blow off (l/min)	Operating pressure (bar)	Weight (kg)
NSEAC-RP	1.0	85	36	2.1	65	3.9	92	4 - 6	0.18

*At optimal operating pressure

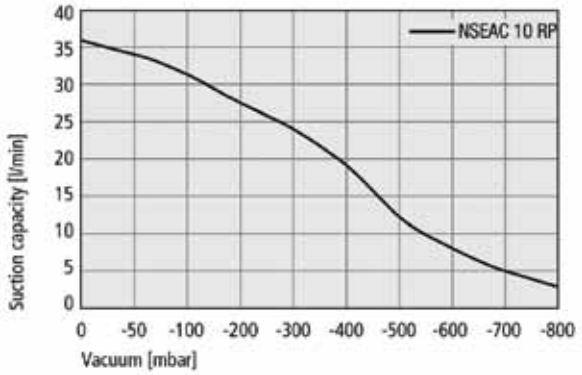
Performance Data Basic Ejectors NSEAC-RP Series



Achievable vacuum at various operating pressures



Evacuation times for various vacuum ranges



Suction capacity at various degrees of evacuation

Suction Capacity in l/min at Various Degrees of Evacuation

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

Evacuation Time in s/l for Various Vacuum Ranges

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

How to Order

NSEAC-RP Series

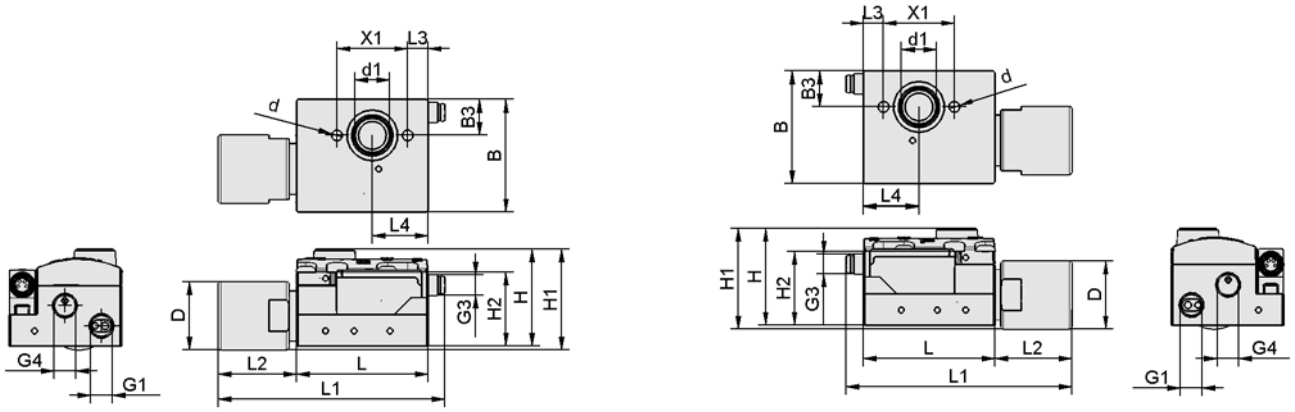
Product Family Name	Part number	Nozzle Size (mm)	Thread Type / Port Size		Description - Features
			Pressure	Vacuum	
Ejector with blow off system - NSEAC-RP Series	NSEAC10RPLXXXXX	1 mm	G1/8 - F	G1/8 - F	Integrated blow off system; left mounting orientation; integrated air savings function
	NSEAC10RPLVSTXX	1 mm	G1/8 - F	G1/8 - F	Integrated blow off system; vacuum switch; left mounting orientation; integrated air savings function
	NSEAC10RPRXXXXX	1 mm	G1/8 - F	G1/8 - F	Integrated blow off system; right mounting orientation; integrated air savings function
	NSEAC10RPRVSTXX	1 mm	G1/8 - F	G1/8 - F	Integrated blow off system; vacuum switch; right mounting orientation; integrated air savings function

Product Family Name	Part number	Numatics Description
Accessories	NADPEJ4552144SL *	Holder SEAC/RP/ECO Top Auto
	NADPEJ4552144SS *	Holder SEAC/RP/ECO Side Auto
	NHTSA2EG18G5XXX *	Holder Pads/SPRGPLGR Axial Auto
	NHTSA3EG18G5XXX *	Holder Pads/SPRGPLGR Ball Auto
	NASKBM8450PURGE	Cable M8 4 5M PUR GE Straight Connection
	NASKBM8450PURWX	Cable M8 4 5M PUR W Right-angle Connection

* Note: For the NSEAC series ejector, a holder and holder/pad is required.

Dimensions: mm

NSEAC-RP Series



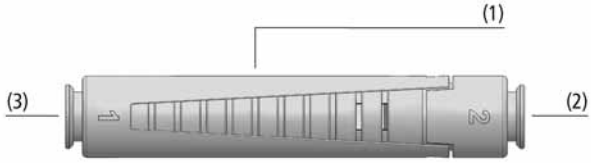
Type	B	B3	d	d1	D	G1	G3	G4	H	H1	H2	L	L1	L2	L3	L4	X1
NSEAC10RPRXXXXX	44.5	14.2	4.3	13.8	27	G1/8-F	-	G1/8"-F	38.3	39.8	29.3	52	-	29.5	8	22	28
NSEAC10RPRVSTXX	44.5	14.2	4.3	13.8	27	G1/8-F	M8-M	G1/8"-F	38.3	39.8	29.3	52	88.1	29.5	8	22	28
NSEAC10RPLXXXXX	44.5	14.2	4.3	13.8	27	G1/8-F	-	G1/8"-F	38.3	39.8	29.3	52	-	29.5	8	22	28
NSEAC10RPLVSTXX	44.5	14.2	4.3	13.8	27	G1/8-F	M8-M	G1/8"-F	38.3	39.8	29.3	52	88.1	29.5	8	22	28

In-Line Ejectors - NSLPX Series

Suction Rate from 0.28 to 0.56 SCFM

The Numatics NSLPX series of in-line ejectors is designed for easy installation directly in the vacuum hose by means of push-in fittings. This product works extremely well in applications where the space is restricted. Applications include separation systems for plastic and sheet metal machining.

Decentralized vacuum generation by means of inline ejectors NtSLP for handling plastic injection molded parts



Design

- Two-piece housing made of light, impact-resistant plastic (1)
- Axial connection of compressed air (3) and vacuum (2) with quick-action push-in couplings for hose diameter 4 mm
- Vacuum generator with single nozzle in two power ratings, 0.5 and 0.7 mm diameter
- Air outlet with good flow characteristics
- Compact low profile design; only 10 mm thick

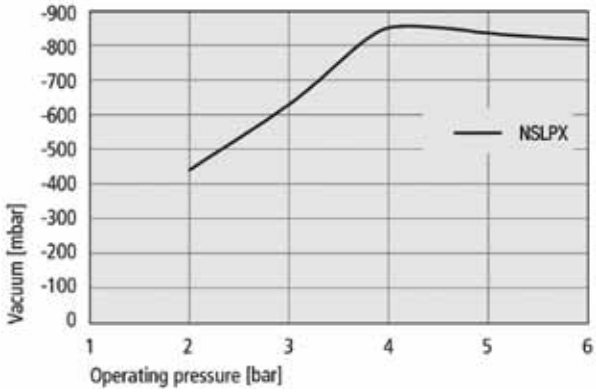
Technical Data NSLPX Series

Type	Nozzle-Ø (mm)	Degree of evacuation (%)	Max. suction rate (l/min)	Max. suction rate (m^3/h)	Air consumpt. during evac. (l/min)*	Air consumpt. during evac. (m3/h)*
NSLPX 05	0.5	85	8	0.5	13	0.8
NSLPX 07	0.7	85	16	1.0	25	1.5

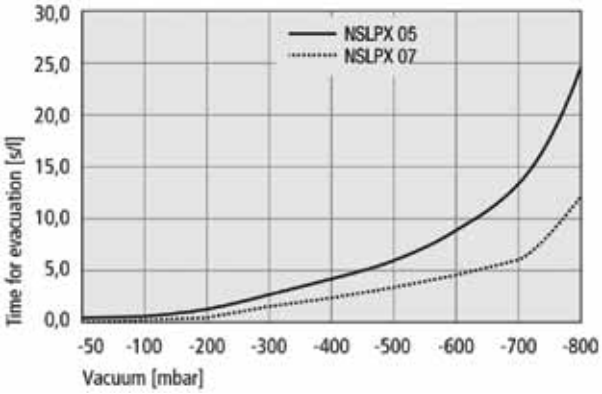
Type	Noise level workp. gripped (dB)	Noise level free (dB)	Operating pressure (bar)	Recomm. int. hose diameter compr. air/ vacuum (mm)**	Weight (g)	Operating temperature (ºC)
NSLPX 05	52	60	4.5	2	5	0...60
NSLPX 07	63	63	4.5	2	5	0...60

*At optimal operating pressure
**Up to a length of 2 m

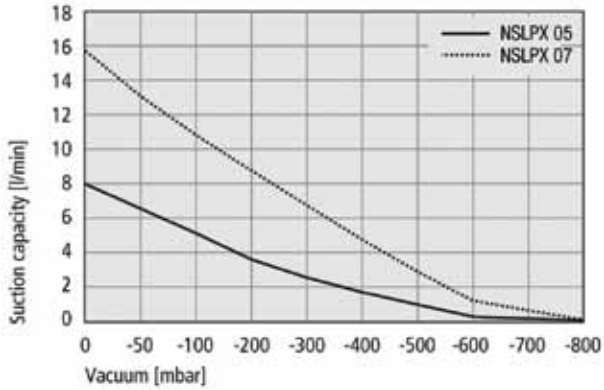
Performance Data Basic Ejectors NSLPX Series



Achievable vacuum at various operating pressures



Evacuation times for various vacuum ranges



Suction capacity at various degrees of evacuation

Suction Capacity in l/min at Various Degrees of Evacuation

Type	Degree of evacuation in mbar									
	0	-50	-100	-200	-300	-400	-500	-600	-700	-800
NSLPX005XXXXXS1	8.00	6.42	4.97	3.76	2.65	1.79	1.06	0.32	0.10	0.05
NSLPX007XXXXXS1	15.90	13.30	10.89	8.70	6.67	4.65	2.88	1.29	0.55	0.06

Evacuation Time in s/l for Various Vacuum Ranges

Type	Degree of evacuation in mbar								
	-50	-100	-200	-300	-400	-500	-600	-700	-800
NSLPX005XXXXXS1	0.4	0.7	1.6	2.7	4.0	5.8	8.5	13.1	24.5
NSLPX007XXXXXS1	0.2	0.4	0.8	1.4	2.2	3.2	4.6	6.7	12.7

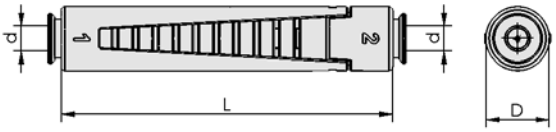
How to Order

NSLPX Series

Product Family Name	Part Number	Nozzle Size (mm)	Thread Type / Port Size		Description - Features
			Pressure	Vacuum	
NSLPX	NSLPX005XXXXXS1	0.5	Quick Connect	Quick Connect	Quick Connect Coupling fits 4mm OD Tube
	NSLPX007XXXXXS1	0.7	Quick Connect	Quick Connect	Quick Connect Coupling fits 4mm OD Tube

Dimensions: mm

NSLPX Series



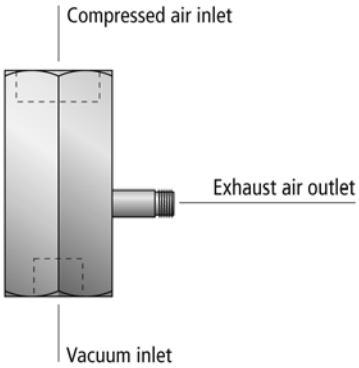
Type	d	D	L
NSLPX005XXXXXS1	4	10	57
NSLPX007XXXXXS1	4	10	57

In-Line Ejectors - NVRXX Series

Suction Rate from 0.28 to 0.56 SCFM

No costly hose installation necessary; vacuum is generated directly at the point of use

Decentralized vacuum generation by means of inline ejector NVRXX for handling plastic parts



Design

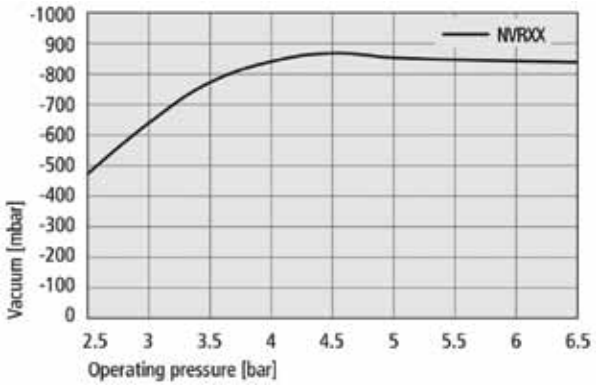
- Body made of anodized aluminum
- Nozzle system made of brass
- Vacuum generator with single nozzle

Technical Data NSLPX Series

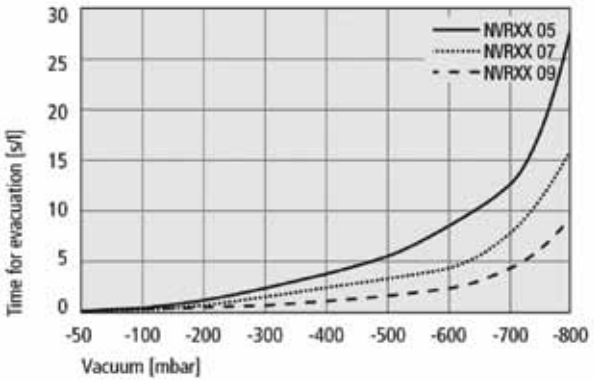
Type	Nozzle-Ø (mm)	Degree of evacuation (%)	Max. suction rate (l/min)	Max. suction rate (m^3/h)	Air consumpt. during evac. (l/min)*	Air consumpt. during evac. (m3/h)*	Operating pressure (bar)	Weight (g)	Operating temperature (°C)
NVR 05	0.5	87	7	0.4	12	0.7	5	15	0...60
NVR 07	0.7	90	14	0.8	21	1.3	5	15	0...60
NVR 09	0.9	89	21	1.3	36	2.2	5	15	0...60

*At optimal operating pressure

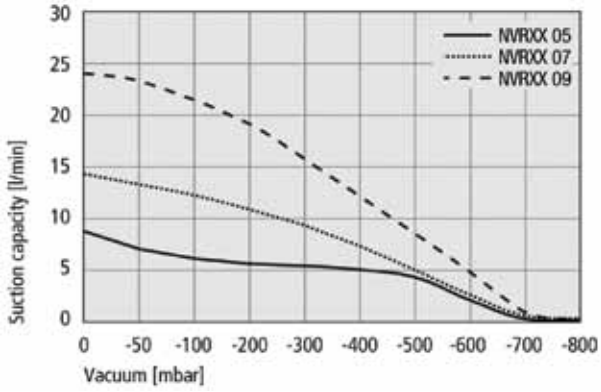
Performance Data Basic Ejectors NVRXX Series



Achievable vacuum at various operating pressures



Evacuation times for various vacuum ranges



Suction capacity at various degrees of evacuation

Suction Capacity in l/min at Various Degrees of Evacuation

Type	Degree of evacuation in mbar									
	0	-50	-100	-200	-300	-400	-500	-600	-700	-800
NVR 05	8.00	7.00	6.50	6.00	5.70	5.00	4.00	2.00	0.30	0.10
NVR 07	14.00	13.00	12.50	11.00	9.50	7.40	5.00	3.00	0.45	0.20
NVR 09	24.00	23.00	21.00	19.00	16.00	12.00	8.00	5.00	1.10	0.24

Evacuation Time in s/l for Various Vacuum Ranges

Type	Degree of evacuation in mbar								
	-50	-100	-200	-300	-400	-500	-600	-700	-800
NVR 05	0.37	0.73	1.53	2.55	3.83	5.55	7.84	12.61	27.25
NVR 07	0.21	0.41	0.84	1.41	2.17	3.17	4.77	7.79	15.65
NVR 09	0.10	0.22	0.49	0.81	1.25	1.83	2.75	4.45	8.62

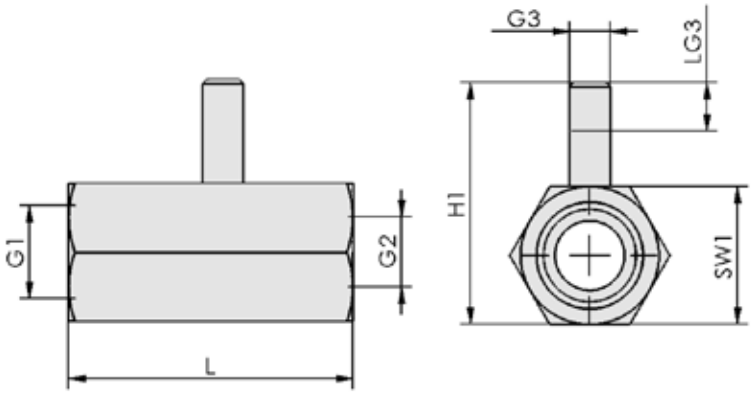
How to Order

NVRXX Series

Product Family Name	Part Number	Nozzle Size (mm)	Thread Type / Port Size		Description - Features
			Pressure	Vacuum	
NVRXX	NVRXX005XXXXXXX	0.5	G1/4-F	G1/8-F	Aluminum (Brass Nozzle)
	NVRXX007XXXXXXX	0.7	G1/4-F	G1/8-F	Aluminum (Brass Nozzle)
	NVRXX009XXXXXXX	0.9	G1/4-F	G1/8-F	Aluminum (Brass Nozzle)

Dimensions: mm

NVRXX Series



Type	G1 (P)	G2 (V)	G3 (R)	H1	L	LG3	SW1
NVRXX005XXXXXXX	G1/4"-F	G1/8"-F	M5-M	29.8	35	5	17
NVRXX007XXXXXXX	G1/4"-F	G1/8"-F	M5-M	29.8	35	5	17
NVRXX009XXXXXXX	G1/4"-F	G1/8"-F	M5-M	29.8	35	5	17

Electric Vacuum Pumps – NEVE-TR Series

Suction rate from 11 SCFM to 28 SCFM

The NEVE-TR series vacuum pumps can be used for a wide range of applications for manual or automated handling of work-pieces. Examples of applications include the handling of airtight work-pieces and applications that require rapid evacuation of the vacuum system.

NOTE: The NEVE-TR series vacuum pumps are delivered as a ready-to-connect product.

Design

- Dry-running pump with filter included
- Available in three-phase AC
- Pump available as a multi-cell compressor with very little vibration and constant output or as a compact diaphragm pump
- Compact design with integrated cooling fan and permanently lubricated bearings
- Mounting holes with integrated damping elements
- Should preferably be mounted with the motor shaft horizontal

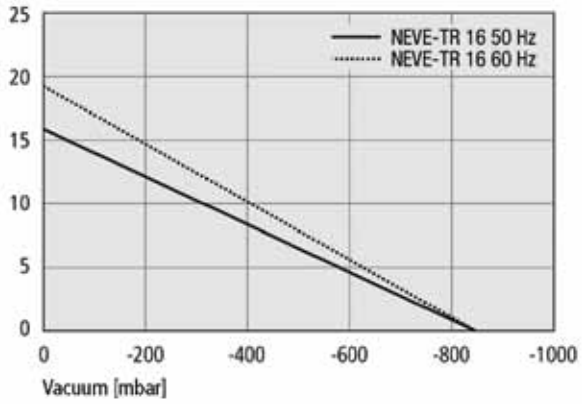
Technical Data Electric Vacuum Pumps NEVE-TR Series

Type	Max. vacuum (mbar)	Suction rate at 60Hz (SCFM)	Voltage (50 Hz)	Voltage (60 Hz)
NEVE-TR 16	-850	11	175-260V or 300-450V	200-300V or 350-520V
NEVE-TR 25	-850	17.5	190-255V/330-440V AC3	190-290V/330-500V AC3
NEVE-TR 40	-850	28	190-255V or 330-440V	190-290V or 330-500V

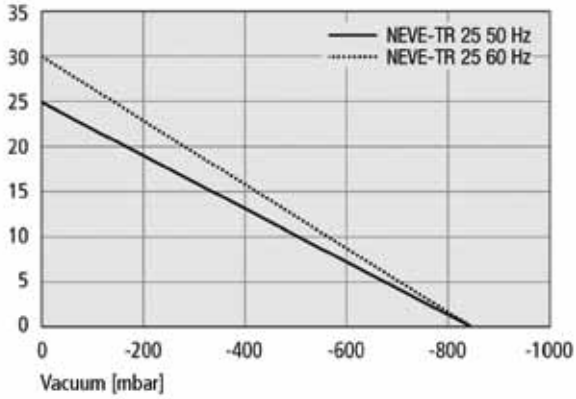
Type	Current range (50 Hz)*	Current range (60 Hz)*	Rated power (kW) at 60 Hz	Protection IP	Weight (kg)	Noise level at 50 Hz (dB)
NEVE-TR 16	3.8A or 2.2A	3.9A or 2.25A	0.70	IP 54	22.4	61
NEVE-TR 25	3.5-4.2A / 2.0-2.4A	4.0-3.6A / 2.3-2.1A	0.90	IP 55	26.0	62
NEVE-TR 40	6.9A or 4.0A	6.9A or 4.0A	1.50	IP 55	38.5	67

*Specifications for 230 V / 230 V or 400 V

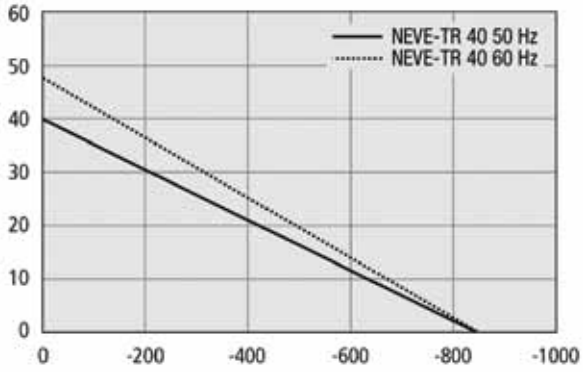
Performance Data Basic Ejectors NEVE-TR Series



Suction capacity at various degrees of evacuation



Suction capacity at various degrees of evacuation



Suction capacity at various degrees of evacuation

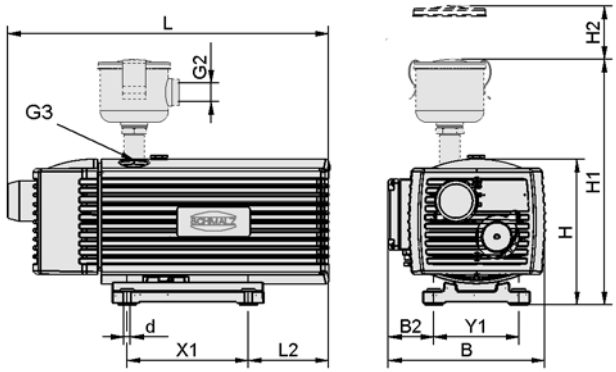
How to Order

NEVE-TR Series

Product Family Name	Part number	Suction Capacity (SCFM)	Vacuum Port
Electric vacuum pumps	NEVETR16AC3FXXX	11	G3/4 - F
	NEVETR25AC3FXXX	17.5	G3/4 - F
	NEVETR40AC3FXXX	28	G11/4 - F

Dimensions: mm

NEVE-TR Series



Type	B	B1	B2	d	G2	G3	G5	H	H1	H2	L	L1	L2	X1	Y1	Y2
NEVETR16AC3FXXX	231	-	66	7	G3/4-F	G1/2-F	-	214	345	70	452	-	73	202	125	-
NEVETR25AC3FXXX	260	-	40	7	G3/4"-F	G3/4"-F	-	293	380	70	505	-	96	220	208	-
NEVETR40AC3FXXX	280	-	51	7	G1-1/4"-F	G3/4"F	-	293	425	70	572	-	131	220	208	-

Table of Contents

Vacuum Suction Cups

Flat Round Suction Cups – NPFYN Series

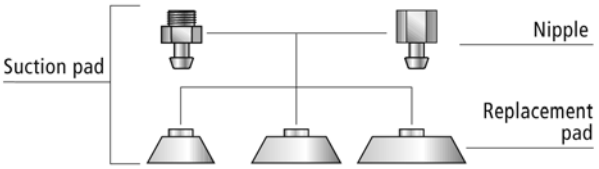
Suction area (Ø) from 3.5 mm to 95 mm

The NPFYN series suction cup is designed to handle work-piece surfaces that are smooth and even. Our standard cup materials are Nitrile and Silicone rubber, but others are available upon request for special applications.

Design Features

Diameter: 3.5 to 95 mm; Material: Nitrile, Silicone; Optimized suction cup shape that provides a high suction force, with small dimensions; Low internal volume that provides for very short cycle times.

Flat suction cups NPFYN being used for handling plastic boards



Design

- Robust, wear-resistant suction cup NPFYN with single sealing lip, consisting of suction cup NPFG and connection fitting
- Fitting plugged in on cups up to 50 mm in diameter
- Fitting screwed into a metal inlay (vulcanized to the cup) on cups with a diameter of 60 mm or more

Technical Data Flat Round Suction Cups – NPFYN Series

Type	Suction Force (N)*	Volume (cm^3)	Min. curve radius (mm) (convex)	Recom. internal hose diameter d (mm)**
NPFYN 3.5	0.42	0.002	8	2
NPFYN 5	0.75	0.005	8	2
NPFYN 6	1.20	0.008	8	2
NPFYN 8	2.30	0.030	10	2
NPFYN 10	4.00	0.070	13	2
NPFYN 15	9.00	0.400	13	4
NPFYN 20	15.50	0.800	20	4
NPFYN 25	26.50	1.300	25	4
NPFYN 30	34.00	1.300	40	4
NPFYN 35	44.00	2.700	50	4
NPFYN 40	57.70	3.800	50	4
NPFYN 50	91.00	7.000	75	4
NPFYN 60	125.00	10.000	100	6
NPFYN 80	260.00	25.000	150	6
NPFYN 95	350.00	35.000	200	6

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

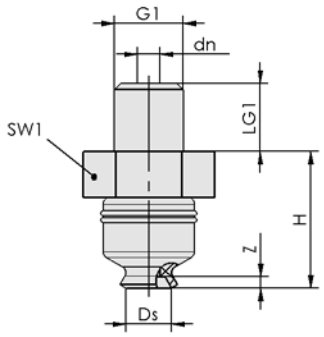
How to Order

NPFYN Series and NPFGX Replacement Cups - Flat Round Suction Cups

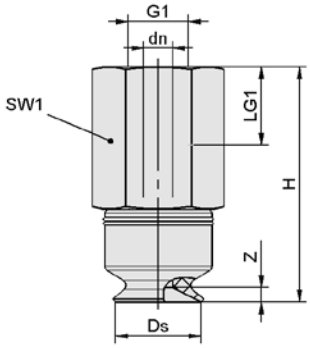
Suction Cup Assembly				Replacement Cups	
Series / Cup Diameter (mm)	Thread Type / Port Size	Material Type		Material Type	
		Nitrile (55 Hardness)	Silicone (55 Hardness)	Nitrile (55 Hardness)	Silicone (55 Hardness)
NPFYN 3.5	M3-M	NPFYN003XXB5AMM	NPFYN003XXS5AMM	NPFGX003XXB5XXX	NPFGX003XXS5XXX
NPFYN 5	M5-M	NPFYN005XXB5BMM	NPFYN005XXS5BMM	NPFGX005XXB5XXX	NPFGX005XXS5XXX
NPFYN 8	M5-M	NPFYN008XXB5BMM	NPFYN008XXS5BMM	NPFGX008XXB5XXX	NPFGX008XXS5XXX
NPFYN 10	G1/8-F	NPFYN010XXB51FG	NPFYN010XXS51FG	NPFGX010XXB5XXX	NPFGX010XXS5XXX
	G1/8-M	NPFYN010XXB51MG	NPFYN010XXS51MG		
	M5-M	NPFYN010XXB5BMM	NPFYN010XXS5BMM		
NPFYN 15	G1/8-F	NPFYN015XXB51FG	NPFYN015XXS51FG	NPFGX015XXB5XXX	NPFGX015XXS5XXX
	G1/8-M	NPFYN015XXB51MG	NPFYN015XXS51MG		
NPFYN 20	G1/8-F	NPFYN020XXB51FG	NPFYN020XXS51FG	NPFGX020XXB5XXX	NPFGX020XXS5XXX
	G1/8-M	NPFYN020XXB51MG	NPFYN020XXS51MG		
NPFYN 25	G1/8-F	NPFYN025XXB51FG	NPFYN025XXS51FG	NPFGX025XXB5XXX	NPFGX025XXS5XXX
	G1/8-M	NPFYN025XXB51MG	NPFYN025XXS51MG		
	NPT1/8-M	NPFYN025XXB51MN	NPFYN025XXS51MN		
NPFYN 30	G1/8-F	NPFYN030XXB51FG	NPFYN030XXS51FG	NPFGX030XXB5XXX	NPFGX030XXS5XXX
	G1/8-M	NPFYN030XXB51MG	NPFYN030XXS51MG		
	NPT1/8-M	NPFYN030XXB51MN	NPFYN030XXS51MN		
NPFYN 35	G1/8-F	NPFYN035XXB51FG	NPFYN035XXS51FG	NPFGX035XXB5XXX	NPFGX035XXS5XXX
	G1/8-M	NPFYN035XXB51MG	NPFYN035XXS51MG		
	NPT1/8-M	NPFYN035XXB51MN	NPFYN035XXS51MN		
NPFYN 40	G1/8-F	NPFYN040XXB51FG	NPFYN040XXS51FG	NPFGX040XXB5XXX	NPFGX040XXS5XXX
	G1/8-M	NPFYN040XXB51MG	NPFYN040XXS51MG		
	NPT1/8-M	NPFYN040XXB51MN	NPFYN040XXS51MN		
NPFYN 50	G1/8-F	NPFYN050XXB51FG	NPFYN050XXS51FG	NPFGX050XXB5XXX	NPFGX050XXS5XXX
	G1/8-M	NPFYN050XXB51MG	NPFYN050XXS51MG		
NPFYN 60	G1/4-F	NPFYN060XXB52FG	NPFYN060XXS52FG	NPFGX060XXB5XXX	NPFGX060XXS5XXX
	G1/4-M	NPFYN060XXB52MG	NPFYN060XXS52MG		
NPFYN 80	G1/4-F	NPFYN080XXB52FG	NPFYN080XXS52FG	NPFGX080XXB5XXX	NPFGX080XXS5XXX
	G1/4-M	NPFYN080XXB52MG	NPFYN080XXS52MG		
NPFYN 95	G1/4-F	NPFYN095XXB52FG	NPFYN095XXS52FG	NPFGX095XXB5XXX	NPFGX095XXS5XXX
	G1/4-M	NPFYN095XXB52MG	NPFYN095XXS52MG		

Dimensions: mm

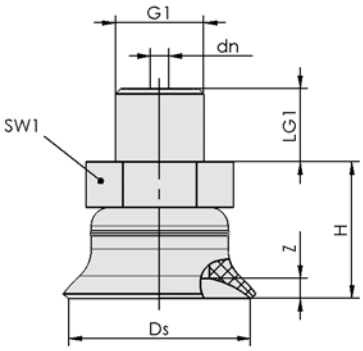
NPFYN 3.5 to 10 Male



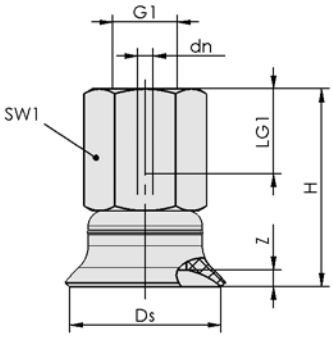
NPFYN 5 to 10 Female



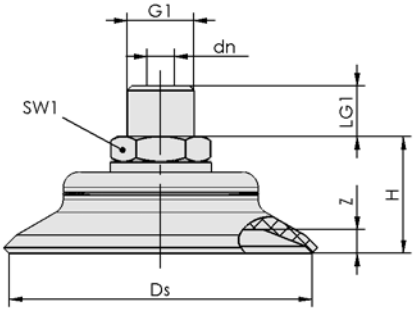
NPFYN 15 to 50 Male



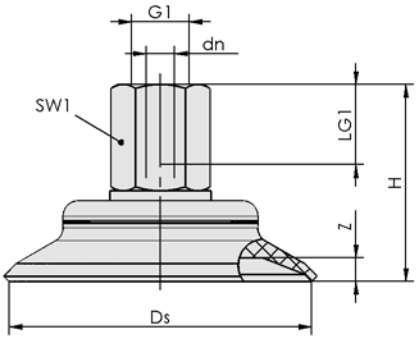
NPFYN 15 to 50 Female



NPFYN 60 to 95 Male



NPFYN 60 to 95 Female



Dimensions: mm

Type	dn	Ds	G1	H	LG1	SW1	Z (stroke)
NPFYN003XXB5AMM	1	3.5	M3-M	6	3	5	0.5
NPFYN003XXS5AMM	1	3.5	M3-M	6	3	5	0.5
NPFYN005XXB5BMM	2	5	M5-M	11.5	4.5	8	0.9
NPFYN005XXS5BMM	2	5	M5-M	11.5	4.5	8	0.9
NPFYN008XXB5BMM	2	8	M5-M	12	4.5	8	1.4
NPFYN008XXS5BMM	2	8	M5-M	12	4.5	8	1.4
NPFYN010XXB51MG	2	10	M5-M	12.5	4.5	8	1.3
NPFYN010XXB51FG	2	10	G1/8-M	12.5	8	14	1.3
NPFYN010XXB5BMM	2	10	G1/8-F	23.5	9	14	1.3
NPFYN010XXS51MG	2	10	M5-M	12.5	4.5	8	1.3
NPFYN010XXS51FG	2	10	G1/8-M	12.5	8	14	1.3
NPFYN010XXS5BMM	2	10	G1/8-F	23.5	9	14	1.3
NPFYN015XXB51MG	2	15	G1/8-M	13	8	14	1.9
NPFYN015XXB51FG	2	15	G1/8-F	24	9	14	1.9
NPFYN015XXS51MG	2	15	G1/8-M	13	8	14	1.9
NPFYN015XXS51FG	2	15	G1/8-F	24	9	14	1.9
NPFYN020XXB51MG	2	20	G1/8-M	15	8	14	2.3
NPFYN020XXB51FG	2	20	G1/8-F	26	9	14	2.3
NPFYN020XXS51MG	2	20	G1/8-M	15	8	14	2.3
NPFYN020XXS51FG	2	20	G1/8-F	26	9	14	2.3
NPFYN025XXB51MG	2.4	25	G1/8-M	19	8	14	3
NPFYN025XXB51FG	2.4	25	G1/8-F	30	9	14	3
NPFYN025XXB51MN	2.4	25	NPTG1/8-F	30	9	14	3
NPFYN025XXS51MG	2.4	25	G1/8-M	19	8	14	3
NPFYN025XXS51FG	2.4	25	G1/8-F	30	9	14	3
NPFYN025XXS51MN	2.4	25	NPTG1/8-F	30	9	14	3
NPFYN030XXB51MG	2.4	30	G1/8-M	17	8	14	2
NPFYN030XXB51FG	2.4	30	G1/8-F	28	9	14	2
NPFYN030XXB51MN	2.4	30	NPTG1/8-F	28	9	14	2
NPFYN030XXS51MG	2.4	30	G1/8-M	17	8	14	2
NPFYN030XXS51FG	2.4	30	G1/8-F	28	9	14	2
NPFYN030XXS51MN	2.4	30	NPTG1/8-F	28	9	14	2
NPFYN035XXB51MG	2.4	35	G1/8-M	19	8	14	3
NPFYN035XXB51FG	2.4	35	G1/8-F	30	9	14	3
NPFYN035XXB51MN	2.4	35	NPTG1/8-F	30	9	14	3
NPFYN035XXS51MG	2.4	35	G1/8-M	19	8	14	3
NPFYN035XXS51FG	2.4	35	G1/8-F	30	9	14	3
NPFYN035XXS51MN	2.4	35	NPTG1/8-F	30	9	14	3
NPFYN040XXB51MG	2.4	40	G1/8-M	19	8	14	3.5
NPFYN040XXB51FG	2.4	40	G1/8-F	30	9	14	3.5
NPFYN040XXB51MN	2.4	40	NPTG1/8-F	30	9	14	3.5
NPFYN040XXS51MG	2.4	40	G1/8-M	19	8	14	3.5

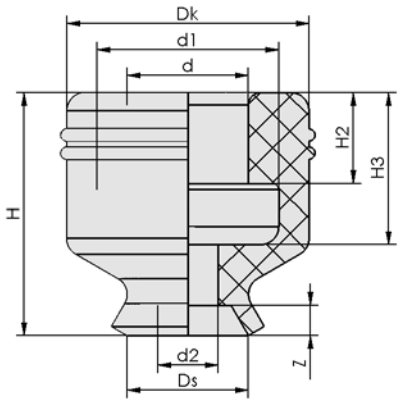
Dimensions: mm

Type	dn	Ds	G1	H	LG1	SW1	Z (stroke)
NPFYN040XXS51FG	2.4	40	G1/8-F	30	9	14	3.5
NPFYN040XXS51MN	2.4	40	NPT1/8-F	30	9	14	3.5
NPFYN050XXB51MG	2.4	50	G1/8-M	20	8	14	4
NPFYN050XXB51FG	2.4	50	G1/8-F	31	9	14	4
NPFYN050XXS51MG	2.4	50	G1/8-M	20	8	14	4
NPFYN050XXS51FG	2.4	50	G1/8-F	31	9	14	4
NPFYN060XXB52MG	5.5	60	G1/4-M	23	10	17	5
NPFYN060XXB52FG	5.5	60	G1/4-F	39	11	17	5
NPFYN060XXS52MG	5.5	60	G1/4-M	23	10	17	5
NPFYN060XXS52FG	5.5	60	G1/4-F	39	11	17	5
NPFYN080XXB52MG	5.5	80	G1/4-M	25	10	17	6
NPFYN080XXB52FG	5.5	80	G1/4-F	41	11	17	6
NPFYN080XXS52MG	5.5	80	G1/4-M	25	10	17	6
NPFYN080XXS52FG	5.5	80	G1/4-F	41	11	17	6
NPFYN095XXB52MG	5.5	95	G1/4-M	25.5	10	17	6
NPFYN095XXB52FG	5.5	95	G1/4-F	41.5	11	17	6
NPFYN095XXS52MG	5.5	95	G1/4-M	25.5	10	17	6
NPFYN095XXS52FG	5.5	95	G1/4-F	41.5	11	17	6

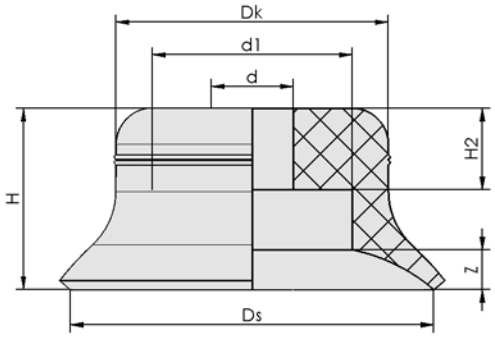
Dimensions: mm

Replacement Cups for the NPFYN Series

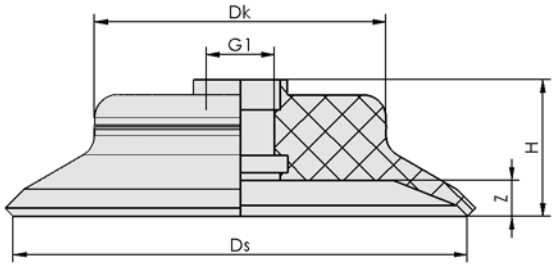
NPFGX 3 to 10



NPFGX 15 to 50



NPFGX 60 to 95



Type	Ds	G1	H	Z (stroke)	d1	d	Dk	H2	H3	d2
NPFYN 3.5	3.5	-	4	0.5	3	2	4	1.5	2.5	1
NPFYN 5	5	-	6.5	0.9	6	4	7.5	2	4	1.5
NPFYN 8	8	-	7	1.4	6	4	8	2	4	2
NPFYN 10	10	-	7.5	1.3	6	4	8.5	2	4	2
NPFYN 15	15	-	8	1.9	7.8	4.5	12	2.6	-	-
NPFYN 20	20	-	10	2.3	11	4.5	15	4.5	-	-
NPFYN 25	25	-	14	3	11	6	16	7	-	-
NPFYN 30	30	-	12	2	11	6	14.5	7	-	-
NPFYN 35	35	-	14	3	11	6	20.5	7	-	-
NPFYN 40	40	-	14	3.5	11	6	24	7	-	-
NPFYN 50	50		15	4	20	8	28.5	7.2	-	-
NPFYN 60	60	M10x1.25-F	18	5	-	-	38.5	-	-	-
NPFYN 80	80	M10x1.25-F	18	6	-	-	52	-	-	-
NPFYN 95	95	M10x1.25-F	19	6	-	-	68	-	-	-

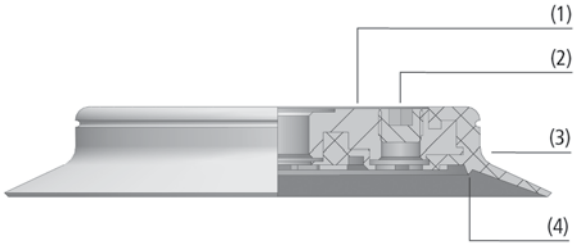
Flat Round Suction Plates – NSPUX Series

Suction area (Ø) from 125 mm to 250 mm

Flat round suction cup for handling smooth flat work-pieces such as sheets of glass and plastic. In addition, this family of cups will also handle work-pieces that are scaly or rough, such as wood or metal.

Design Features

Diameter: Flat cup 125 to 250mm; Material: Nitrile, Silicone; Universal sealing lip and additional sealing edge, for sealing on smooth or slightly rough surfaces; low internal volume for high cycle rates; Small dimensions, but optimized shape for high suction force; Robust cup with aluminum supporting plate.



Suction plates. NSPUX being used for handling coated chipboards

Design

- Suction cup NSPUX consisting of sealing ring (3) and aluminum support plate (1)
- Sealing ring clipped securely onto support plate with positive locking
- Internal sealing edge (4) for better sealing on slightly rough surfaces
- Side vacuum connector (2) normally sealed with a plug (glued into position for extra safety)

Technical Data Flat Round Suction Plates – NSPUX Series

Type	Suction Force Ds (N)*	Suction Force d2 (N)**	Volume (cm^3)	Min. curve radius (mm) (convex)	Recom. internal hose diameter d (mm)***
NSPUX125XXB52FG	660	365	70	220	9
NSPUX125XXS52FG	660	365	70	220	9
NSPUX160XXB54FG	1090	600	123	350	9
NSPUX160XXS54FG	1090	600	123	350	9
NSPUX210XXB54FG	1870	1250	226	750	12
NSPUX210XXS54FG	1870	1250	226	750	12
NSPUX250XXB54FG	2650	1940	332	2200	12
NSPUX250XXS54FG	2650	1940	332	2200	12

How to Order Continued

NSPUX Series - Flat Round Suction Plates

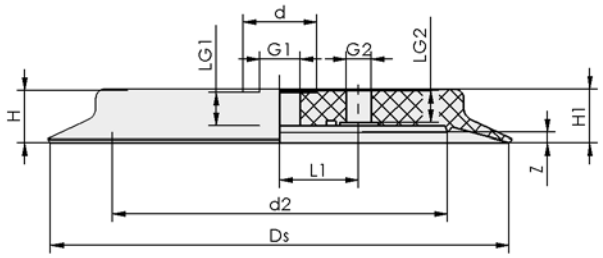
Suction Cup Assembly			
Series / Cup Diameter (mm)	Thread Type / Port Size	Material Type	
		Nitrile (55 Hardness)	Silicone (55 Hardness)
NSPUX 125	G1/4-F	NSPUX125XXB52FG	NSPUX125XXS52FG
NSPUX 160	G1/2-F	NSPUX160XXB54FG	NSPUX160XXS54FG
NSPUX 210	G1/2-F	NSPUX210XXB54FG	NSPUX210XXS54FG
NSPUX 250	G1/2-F	NSPUX250XXB54FG	NSPUX250XXS54FG

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

- Sealing ring – elastomer part, available in various diameters
- Aluminium support plate, available with various threads

Dimensions: mm

NSPUX 125 to 250



Type	Ds	G1	H	LG1	Z (stroke)	d	d2	H1	L1	G2	LG2
NSPUX 125	125	G1/4-F	25	13	7	22	83	26	22	G1/4-F	14
NSPUX 16	160	G1/2-F	25	13.5	7	34	113	26.5	36.5	G1/4-F	15
NSPUX 210	210	G1/2-F	25	13.5	5	34	163	26.5	36.5	G1/4-F	15
NSPUX 250	250	G1/2-F	25	13.5	7	34	203	26.5	76	G1/2-F	15

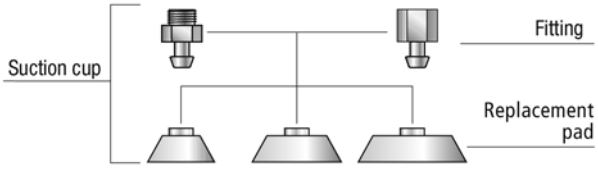
Flat Oval Suction Cups – NSGON Series

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

Flat oval suction cup with maximum suction force particularly on narrow, elongated work-pieces, such as sections and pipes; Handling of objects with frame type elements, such as windows and doors.

Design Features

Dimensions: Oval Cup 4 x 2 to 90 x 30 mm; Material: Nitrile, Silicone; High suction forces with reduced space requirement; Works better than round cups when handling narrow work-pieces where flat surface areas are too small for a round cup. Suction cups of size 24 x 8 and larger are additionally secured with a two-ear clamp to prevent rotation.



Flat suction cups NSGON being used for handling blister packaging

Design

- Robust, wear-resistant suction cup NSGON with single sealing lip, consisting of suction cup NSGO and connection fitting
- Fitting plugged into cup

Technical Data Flat Oval Suction Cups – NSGON Series

Type	Suction Force (N)*	Volume (cm^3)	Min. curve radius (mm) (convex)	Recom. internal hose diameter d (mm)**
NSGON 4x2	0.42	0.004	1	2
NSGON 7x3.5	1.00	0.019	3	2
NSGON 12x4	1.80	0.048	3	2
NSGON 15x5	3.10	0.036	4	2
NSGON 18x6	4.50	0.058	4	2
NSGON 24x8	8.00	0.138	8	4
NSGON 30x10	12.20	0.280	8	4
NSGON 45x15	28.20	0.980	10	6
NSGON 60x20	50.10	2.300	20	6
NSGON 75x25	78.30	4.700	30	6
NSGON 90x30	112.60	8.500	35	6

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

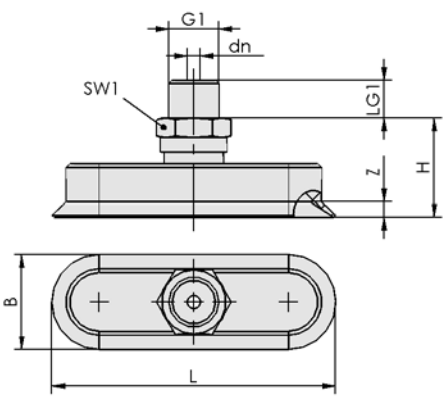
How to Order

NSGON Series and NSGOX Replacement Cups (Flat Oval Cups)

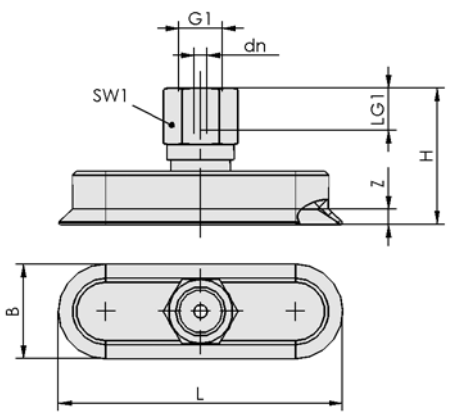
Suction Cup Assembly					Replacement Cups		
Series / Cup Diameter (mm)	Thread Type / Port Size	Material Type			Material Type		
		Nitrile (60 Hardness)	Silicone (60 Hardness)	Silicone (70 Hardness)	Nitrile (60 Hardness)	Silicone (60 Hardness)	Silicone (70 Hardness)
NSGON 4x2	M3-M	NSGON00402B6AMM	NSGON00402S6AMM		NSGOX00402B6XXX	NSGOX00402S6XXX	
NSGON 7x3.5	M3-M	NSGON00703B6AMM	NSGON00703S6AMM		NSGOX00703B6XXX	NSGOX00703S6XXX	
NSGON 12x4	M5-M	NSGON01204B6BMM		NSGON01204S8BMM	NSGOX01204B6XXX		NSGOX01204S8XXX
NSGON 15x5	M5-F	NSGON01505B6BFM	NSGON01505S6BFM		NSGOX01505B6XXX	NSGOX01505S6XXX	
	M5-M	NSGON01505B6BMM	NSGON01505S6BMM				
NSGON 18x6	M5-F	NSGON01806B6BFM	NSGON01806S6BFM		NSGOX01806B6XXX	NSGOX01806S6XXX	
	M5-M	NSGON01806B6BMM	NSGON01806S6BMM				
NSGON 24x8	G1/8-F	NSGON02408B61FG	NSGON02408S61FG		NSGOX02408B6XXX	NSGOX02408S6XXX	
	G1/8-M	NSGON02408B61MG	NSGON02408S61MG				
NSGON 30x10	G1/8-F	NSGON03010B61FG	NSGON03010S61FG		NSGOX03010B6XXX	NSGOX03010S6XXX	
	G1/8-M	NSGON03010B61MG	NSGON03010S61MG				
NSGON 45x15	G1/4-F	NSGON04515B62FG	NSGON04515S62FG		NSGOX04515B6XXX	NSGOX04515S6XXX	
	G1/4-M	NSGON04515B62MG	NSGON04515S62MG				
NSGON 60x20	G1/4-F	NSGON06020B62FG	NSGON06020S62FG		NSGOX06020B6XXX	NSGOX06020S6XXX	
	G1/4-M	NSGON06020B62MG	NSGON06020S62MG				
NSGON 75x25	G1/4-F	NSGON07525B62FG	NSGON07525S62FG		NSGOX07525B6XXX	NSGOX07525S6XXX	
	G1/4-M	NSGON07525B62MG	NSGON07525S62MG				
NSGON 90x30	G1/4-F	NSGON09030B62FG		NSGON09030S82FG	NSGOX09030B6XXX		NSGOX09030S8XXX
	G1/4-M	NSGON09030B62MG		NSGON09030S82MG			

Dimensions: mm

NSGON 4x2 to 90x30 - Female



NSGON 15x5 to 90x30 - Male

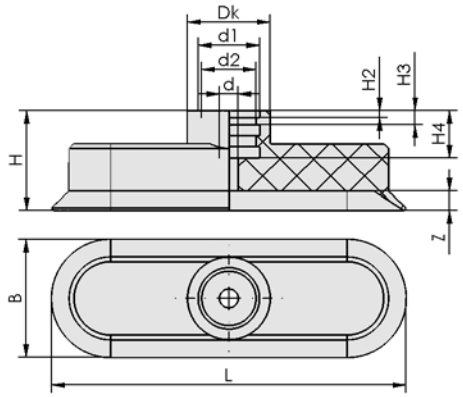


Dimensions: mm

Type	B	dn	G1	H	L	LG1	SW1	Z (stroke)
NSGON00402B6AMM	2	1	M3-M	8	4	3	5	0.5
NSGON00402S6AMM	2	1	M3-M	8	4	3	5	0.5
NSGON00703B6AMM	3.5	1	M3-M	8	7	3	5	0.8
NSGON00703S6AMM	3.5	1	M3-M	8	7	3	5	0.8
NSGON01204B6BMM	4	1.8	M5-M	18	12	4.5	8	0.5
NSGON01204S8BMM	4	1.8	M5-M	18	12	4.5	8	0.5
NSGON01505B6BMM	5	2	M5-M	17	15	5	8	0.7
NSGON01505B6BFM	5	2	M5-F	22	15	5.5	8	0.7
NSGON01505S6BMM	5	2	M5-M	17	15	5	8	0.7
NSGON01505S6BFM	5	2	M5-F	22	15	5.5	8	0.7
NSGON01806B6BMM	6	2	M5-M	17	18	5	8	0.8
NSGON01806B6BFM	6	2	M5-F	22	18	5.5	8	0.8
NSGON01806S6BMM	6	2	M5-M	17	18	5	8	0.8
NSGON01806S6BFM	6	2	M5-F	22	18	5.5	8	0.8
NSGON02408B61MG	8	3.5	G1/8"-M	17	24	8	14	1
NSGON02408B61FG	8	3.5	G1/8"-F	25	24	9	14	1
NSGON02408S61MG	8	3.5	G1/8"-M	17	24	8	14	1
NSGON02408S61FG	8	3.5	G1/8"-F	25	24	9	14	1
NSGON03010B61MG	10	3.5	G1/8"-M	17	30	8	14	1.5
NSGON03010B61FG	10	3.5	G1/8"-F	25	30	9	14	1.5
NSGON03010S61MG	10	3.5	G1/8"-M	17	30	8	14	1.5
NSGON03010S61FG	10	3.5	G1/8"-F	25	30	9	14	1.5
NSGON04515B62MG	15	3.5	G1/4"-M	26	45	10	17	2
NSGON04515B62FG	15	3.5	G1/4"-F	36	45	12	17	2
NSGON04515S62MG	15	3.5	G1/4"-M	26	45	10	17	2
NSGON04515S62FG	15	3.5	G1/4"-F	36	45	12	17	2
NSGON06020B62MG	20	3.5	G1/4"-M	26	60	10	17	2.5
NSGON06020B62FG	20	3.5	G1/4"-F	36	60	12	17	2.5
NSGON06020S62MG	20	3.5	G1/4"-M	26	60	10	17	2.5
NSGON06020S62FG	20	3.5	G1/4"-F	36	60	12	17	2.5
NSGON07525B62MG	25	3.5	G1/4"-M	26	75	10	17	2.8
NSGON07525B62FG	25	3.5	G1/4"-F	36	75	12	17	2.8
NSGON07525S62MG	25	3.5	G1/4"-M	26	75	10	17	2.8
NSGON07525S62FG	25	3.5	G1/4"-F	36	75	12	17	2.8
NSGON09030B62MG	30	3.5	G1/4"-M	26	90	10	17	3.5
NSGON09030B62FG	30	3.5	G1/4"-F	36	90	12	17	3.5
NSGON09030S82MG	30	3.5	G1/4"-M	26	90	10	17	3.5
NSGON09030S82FG	30	3.5	G1/4"-F	36	90	12	17	3.5

Dimensions: mm

NSGOX 4x2 to 90x30



Type	B	d	d1	d2	Dk	H	H2	H3	H4	L	Z (stroke)
NSGOX 4x2	2	1.2	3	2.4	6	6	2.4	3.4	-	4	0.5
NSGOX 7x3.5	3.5	1.5	3	2.4	6	6	2.4	3.4	-	7	0.8
NSGOX 12x4	4	3.5	4	-	8	15	9.5	-	-	12	0.5
NSGOX 15x5	5	2.8	6	4.5	8.5	12	1	3	5.5	15	0.7
NSGOX 18x6	6	3.2	6	4.5	8.5	12	1	3	5.5	18	0.8
NSGOX 24x8	8	1.5	7	5.5	11.5	12	1	3	5.5	24	1
NSGOX 30x10	10	2.5	7	5.5	11.5	12	1	3	5.5	30	1.5
NSGOX 45x15	15	3	13	11.5	15.5	21	1.5	3	10	45	2
NSGOX 60x20	20	4	13	11.5	15.5	21	1.5	3	10	60	2.5
NSGOX 75x25	25	4	13	11.5	17.5	21	1.5	3	10	75	2.8
NSGOX 90x30	30	4	13	11.5	17.5	21	1.5	3	10	90	3.5

Round 1.5 Bellows Suction Cups – NFSGA Series

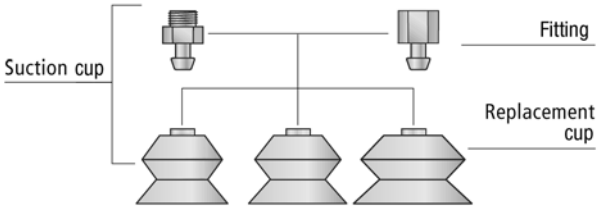
Suction area (Ø) from 11 mm to 150 mm

Round 1.5 bellows suction cup that is designed to handle sensitive and/or uneven work-pieces; Examples include work-pieces such as pipes where the surface is curved. The bellows type cup helps to provide a reliable seal. Special design of the suction cup bellows allows for use in systems with quick cycle times.

Design Features

Diameter: 11 to 150 mm; Round 1.5 bellows cup; Material: Nitrile, Silicone, Vulkollan; Robust and hard wearing suction cups with soft tapered sealing lip; High suction force with optimum dampening effect during placement of suction cup on work-piece; Very stiff top fold, providing good resistance to horizontal forces during high acceleration applications.

Bellows suction cups NFSGA VU1 being used for handling cardboard boxes



Design

- Suction cup connected positively to fitting; no turning even when handling heavy loads
- Suction cup with supports on the bottom
- All fittings plugged in
- Suction cup with a diameter of 25 mm or more with supports on the bottom

Technical Data Round 1.5 Bellows Suction Cups – NFSGA Series

Type	Suction Force (N)*	Pull-off force (N)	Volume (cm^3)	Min. curve radius (mm) (convex)	Recom. internal hose diameter d (mm)**
NFSGA 11	0.95	3.8	0.225	10	4
NFSGA 14	1.20	5.0	0.420	13	4
NFSGA 16	2.30	6.7	0.750	20	4
NFSGA 20	4.70	10.7	1.150	30	4
NFSGA 22	5.70	15.2	1.400	25	4
NFSGA 25	5.30	17.3	3.150	20	4
NFSGA 33	13.60	39.6	4.750	40	6
NFSGA 43	22.80	64.5	9.250	60	6
NFSGA 50	52.0	88	22.6	40	6
NFSGA 53	51.30	95.0	26.250	75	6
NFSGA 60	75.0	120	31.0	50	6
NFSGA 63	85.00	135.0	39.000	75	6
NFSGA 78	137.40	218.0	76.000	70	6
NFSGA 85	140.0	250	78.0	80	6
NFSGA 110	280	570	330	85	12
NFSGA 150	570	1000	800	250	12

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

How to Order

NFSGA Series - Round 1.5 Bellows Suction Cups

Suction Cup Assembly					
Series / Cup Diameter (mm)	Thread Type / Port Size	Material Type			
		Nitrile (55 Hardness)	Nitrile (70 Hardness)	Silicone (55 Hardness)	Vulkollan (72 Hardness)
NFSGA 11	G1/8-F	NFSGA011XXB51FG		NFSGA011XXS51FG	
	G1/8-M	NFSGA011XXB51MG		NFSGA011XXS51MG	
	NPT1/8-M	NFSGA011XXB51MN		NFSGA011XXS51MN	
	M5-M	NFSGA011XXB5BMM		NFSGA011XXS5BMM	
NFSGA 14	G1/8-F	NFSGA014XXB51FG		NFSGA014XXS51FG	
	G1/8-M	NFSGA014XXB51MG		NFSGA014XXS51MG	
	NPT1/8-M	NFSGA014XXB51MN		NFSGA014XXS51MN	
	M5-M	NFSGA014XXB5BMM		NFSGA014XXS5BMM	
NFSGA 16	G1/8-F	NFSGA016XXB51FG		NFSGA016XXS51FG	
	G1/8-M	NFSGA016XXB51MG		NFSGA016XXS51MG	
	NPT1/8-M	NFSGA016XXB51MN		NFSGA016XXS51MN	
	M5-M	NFSGA016XXB5BMM		NFSGA016XXS5BMM	
NFSGA 20	G1/8-F	NFSGA020XXB51FG		NFSGA020XXS51FG	
	G1/8-M	NFSGA020XXB51MG		NFSGA020XXS51MG	
	NPT1/8-M	NFSGA020XXB51MN		NFSGA020XXS51MN	
	M5-M	NFSGA020XXB5BMM		NFSGA020XXS5BMM	
NFSGA 22	G1/8-F	NFSGA022XXB51FG		NFSGA022XXS51FG	
	G1/8-M	NFSGA022XXB51MG		NFSGA022XXS51MG	
	NPT1/8-M	NFSGA022XXB51MN		NFSGA022XXS51MN	
	M5-M	NFSGA022XXB5BMM		NFSGA022XXS5BMM	
NFSGA 25	G1/8-F	NFSGA025XXB51FG		NFSGA025XXS51FG	
	G1/8-M	NFSGA025XXB51MG		NFSGA025XXS51MG	
	NPT1/8-M	NFSGA025XXB51MN		NFSGA025XXS51MN	
NFSGA 33	NPT1/8-M	NFSGA033XXB51MN		NFSGA033XXS51MN	
	G1/4-F	NFSGA033XXB52FG		NFSGA033XXS52FG	
	G1/4-M	NFSGA033XXB52MG		NFSGA033XXS52MG	
NFSGA 43	NPT1/8-M	NFSGA043XXB51MN		NFSGA043XXS51MN	
	G1/4-F	NFSGA043XXB52FG		NFSGA043XXS52FG	
	G1/4-M	NFSGA043XXB52MG		NFSGA043XXS52MG	
NFSGA 50	G1/4-F				NFSGA050XXV92FG
	G1/4-M				NFSGA050XXV92MG
NFSGA 53	NPT1/8-M	NFSGA053XXB51MN		NFSGA053XXS51MN	
	G1/4-F	NFSGA053XXB52FG		NFSGA053XXS52FG	
	G1/4-M	NFSGA053XXB52MG		NFSGA053XXS52MG	
NFSGA 60	G1/4-F				NFSGA060XXV92FG
	G1/4-M				NFSGA060XXV92MG
NFSGA 63	NPT1/8-M	NFSGA063XXB51MN		NFSGA063XXS51MN	
	G1/4-F	NFSGA063XXB52FG		NFSGA063XXS52FG	
	G1/4-M	NFSGA063XXB52MG		NFSGA063XXS52MG	
NFSGA 78	G1/4-F	NFSGA078XXB52FG		NFSGA078XXS52FG	
	G1/4-M	NFSGA078XXB52MG		NFSGA078XXS52MG	
	NPT3/8-M	NFSGA078XXB53MN		NFSGA078XXS53MN	
NFSGA 85	G1/4-F				NFSGA085XXV92FG
	G1/4-M				NFSGA085XXV92MG
NFSGA 110	G1/2-F		NFSGA110XXB84FG	NFSGA110XXS54FG	
NFSGA 150	G1/2-F		NFSGA150XXB84FG	NFSGA150XXS54FG	

How to Order

NFGAX Series (Replacement Cups for NFSGA Series)

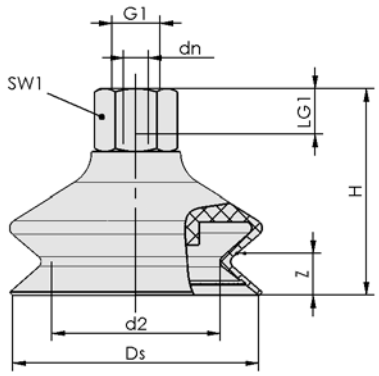
Replacement Cups				
Series / Cup Diameter (mm)	Material Type			
	Nitrile (55 Hardness)	Nitrile (70 Hardness)	Silicone (55 Hardness)	Vulkollan (72 Hardness)
NFSGA 11	NFGAX011XXB5XXX		NFGAX011XXS5XXX	
NFSGA 14	NFGAX014XXB5XXX		NFGAX014XXS5XXX	
NFSGA 16	NFGAX016XXB5XXX		NFGAX016XXS5XXX	
NFSGA 20	NFGAX020XXB5XXX		NFGAX020XXS5XXX	
NFSGA 22	NFGAX022XXB5XXX		NFGAX022XXS5XXX	
NFSGA 25	NFGAX025XXB5XXX		NFGAX025XXS5XXX	
NFSGA 33	NFGAX033XXB5XXX		NFGAX033XXS5XXX	
NFSGA 43	NFGAX043XXB5XXX		NFGAX043XXS5XXX	
NFSGA 50				NFGAX050XXV9XXX
NFSGA 53	NFGAX053XXB5XXX		NFGAX053XXS5XXX	
NFSGA 60				NFGAX060XXV9XXX
NFSGA 63	NFGAX063XXB5XXX		NFGAX063XXS5XXX	
NFSGA 78	NFGAX078XXB5XXX		NFGAX078XXS5XXX	
NFSGA 85				NFGAX085XXV9XXX
NFSGA 110		NFGAX110XXB8XXX	NFGAX110XXS5XXX	
NFSGA 150		NFGAX150XXB8XXX	NFGAX150XXS5XXX	

Suction pad NFSGA (elastomer part + connection fitting) is delivered unassembled (diameters of 33 mm and more are assembled).
The delivery consists of:

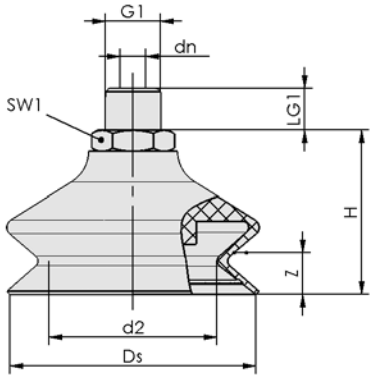
- Suction cup of type NFGA – elastomer part, available in various diameters and materials
- Connection fitting – available with various threads container

Dimensions: mm

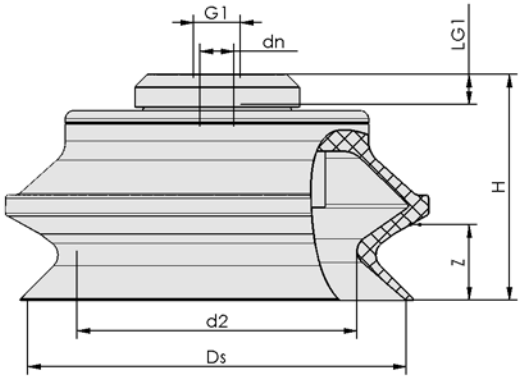
NFSGA 11 to 85 Female



NFSGA 11 to 85 Male



NFSGA 110 to 150 Female



Type	dn	Ds	G1	H	LG1	SW1	Z (stroke)	d2
NFSGA011XXB51MG	3.5	11	G1/8-M	22	7.5	14	4	5.2
NFSGA011XXB5BMM	2.5	11	M5-M	21	5	7	4	5.1
NFSGA011XXB51FG	3.5	11	G1/8-F	28	8	14	4	5.1
NFSGA011XXB51MN	3.5	11	NPT1/8-M	22	7.5	14	4	5.2
NFSGA011XXS51MG	3.5	11	G1/8-M	22	7.5	14	4	5.2
NFSGA011XXS5BMM	2.5	11	M5-M	21	5	7	4	5.1
NFSGA011XXS51FG	3.5	11	G1/8-F	28	8	14	4	5.1
NFSGA011XXS51MN	3.5	11	NPT1/8-M	22	7.5	14	4	5.2
NFSGA014XXB51MG	3.5	14	G1/8-M	21.5	7.5	14	5	5
NFSGA014XXB5BMM	2.5	14	M5-M	20.5	5	7	5	5
NFSGA014XXS51FG	3.5	14	G1/8-F	27.5	8	14	5	5
NFSGA014XXB51MN	3.5	14	NPT1/8-M	21.5	7.5	14	5	5
NFSGA014XXS51MG	3.5	14	G1/8-M	21.5	7.5	14	5	5
NFSGA014XXS5BMM	2.5	14	M5-M	20.5	5	7	5	5
NFSGA014XXS51FG	3.5	14	G1/8-F	27.5	8	14	5	5
NFSGA014XXS51MN	3.5	14	NPT1/8-M	21.5	7.5	14	5	5

Dimensions: mm

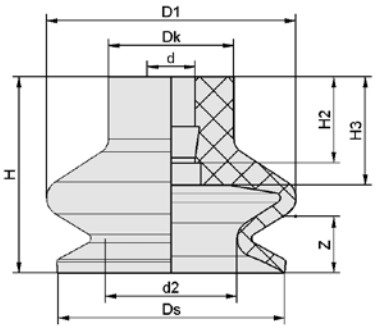
Type	dn	Ds	G1	H	LG1	SW1	Z (stroke)	d2
NFSGA016XXB51MG	3.5	16	G1/8-M	25.2	7.5	14	7	8.4
NFSGA016XXB5BMM	2.5	16	M5-M	24.2	5	7	7	8.4
NFSGA016XXB51FG	3.5	16	G1/8-F	31.2	8	14	7	8.4
NFSGA016XXB51MN	3.5	16	NPT1/8-M	25.2	7.5	14	7	8.4
NFSGA016XXS51MG	3.5	16	G1/8-M	25.2	7.5	14	7	8.4
NFSGA016XXS5BMM	2.5	16	M5-M	24.2	5	7	7	8.4
NFSGA016XXS51FG	3.5	16	G1/8-F	31.2	8	14	7	8.4
NFSGA016XXS51MN	3.5	16	NPT1/8-M	25.2	7.5	14	7	8.4
NFSGA020XXB51MG	3.5	20	G1/8-M	21.2	7.5	14	5	11
NFSGA020XXB51FG	3.5	20	G1/8-F	27.2	8	14	5	11
NFSGA020XXB5BMM	2.5	20	M5-M	20.2	5	7	5	11
NFSGA020XXB51MN	3.5	20	NPT1/8-M	21.2	7.5	14	5	11
NFSGA020XXS51MG	3.5	20	G1/8-M	21.2	7.5	14	5	11
NFSGA020XXS51FG	3.5	20	G1/8-F	27.2	8	14	5	11
NFSGA020XXS5BMM	2.5	20	M5-M	20.2	5	7	5	11
NFSGA020XXS51MN	3.5	20	NPT1/8-M	21.2	7.5	14	5	11
NFSGA022XXB51MG	3.5	22	G1/8-M	25	7.5	14	6	11.7
NFSGA022XXB51FG	3.5	22	G1/8-F	31	8	14	6	11.7
NFSGA022XXB5BMM	2.5	22	M5-M	31	5	7	6	11.7
NFSGA022XXB51MN	3.5	22	NPT1/8-M	25	7.5	14	6	11.7
NFSGA022XXS51MG	3.5	22	G1/8-M	25	7.5	14	6	11.7
NFSGA022XXS51FG	3.5	22	G1/8-F	31	8	14	6	11.7
NFSGA022XXS5BMM	2.5	22	M5-M	31	5	7	6	11.7
NFSGA022XXS51MN	3.5	22	NPT1/8-M	25	7.5	14	6	11.7
NFSGA025XXB51MG	3.5	25	G1/8-M	29	7.5	14	9	9.9
NFSGA025XXB51FG	3.5	25	G1/8-F	35	8	14	9	9.9
NFSGA025XXB51MN	3.5	25	NPT1/8-M	29	7.5	14	9	9.9
NFSGA025XXS51MG	3.5	25	G1/8-M	29.5	7.5	14	9	9.9
NFSGA025XXS51FG	3.5	25	G1/8-F	35	8	14	9	9.9
NFSGA025XXS51MN	3.5	25	NPT1/8-M	29.5	7.5	14	9	9.9
NFSGA033XXB52MG	4.4	33	G1/4-M	31	11	17	9	17
NFSGA033XXB52FG	4.4	33	G1/4-F	42	12	17	9	17
NFSGA033XXB51MN	4.4	33	NPT1/4-M	31	11	17	9	17
NFSGA033XXS52MG	4.4	33	G1/4-M	31	11	17	9	17
NFSGA033XXS52FG	4.4	33	G1/4-F	42	12	17	9	17
NFSGA033XXS51MN	4.4	33	NPT1/4-M	31	11	17	9	17
NFSGA043XXB52FG	4.4	43	G1/4-F	42.6	12	17	10	21.9
NFSGA043XXB52MG	4.4	43	G1/4-M	31.6	11	17	10	21.9
NFSGA043XXB51MN	4.4	43	NPT1/4-M	31.6	11	17	10	21.9
NFSGA043XXS52FG	4.4	43	G1/4-F	42.6	12	17	10	21.9
NFSGA043XXS52MG	4.4	43	G1/4-M	31.6	11	17	10	21.9
NFSGA043XXS51MN	4.4	43	NPT1/4-M	31.6	11	17	10	21.9
NFSGA050XXV92MG	3.5	50	G1/4-M	37.5	10	17	14.5	33.5

Dimensions: mm

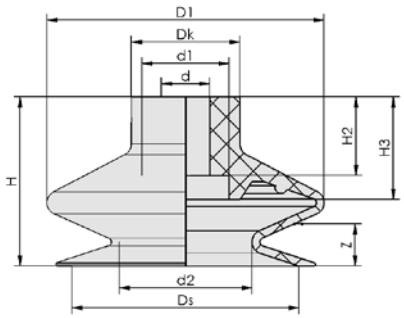
Type	dn	Ds	G1	H	LG1	SW1	Z (stroke)	d2
NFSGA050XXV92FG	3.5	50	G1/4-F	47.5	12	17	14.5	33.5
NFSGA053XXB52FG	4.4	53	G1/4-F	49	12	17	12	33
NFSGA053XXB52MG	4.4	53	G1/4-M	38	11	17	12	33
NFSGA053XXB51MN	4.4	53	NPT1/4-M	38	11	17	12	33
NFSGA053XXS52FG	4.4	53	G1/4-F	49	12	17	12	33
NFSGA053XXS52MG	4.4	53	G1/4-M	38	11	17	12	33
NFSGA053XXS51MN	4.4	53	NPT1/4-M	38	11	17	12	33
NFSGA060XXV92MG	6	60	G1/4-M	39	10	17	12.5	41
NFSGA060XXV92FG	6	60	G1/4-F	49	12	17	12.5	41
NFSGA063XXB52FG	4.4	63	G1/4-F	49	12	17	14	44.5
NFSGA063XXB52MG	4.4	63	G1/4-M	38	11	17	14	44.5
NFSGA063XXB51MN	4.4	63	NPT1/4-M	38	11	17	14	44.5
NFSGA063XXS52FG	4.4	63	G1/4-F	49	12	17	14	44.5
NFSGA063XXS52MG	4.4	63	G1/4-M	38	11	17	14	44.5
NFSGA063XXS51MN	4.4	63	NPT1/4-M	38	11	17	14	44.5
NFSGA078XXB52FG	8.2	78	G1/4-F	62	12	21	14	54
NFSGA078XXB52MG	8.2	78	G1/4-M	53	11	21	14	54
NFSGA078XXB53MN	8.2	78	NPT1/4-M	53	11	21	14	54
NFSGA078XXS52FG	8.2	78	G1/4-F	62	12	21	14	54
NFSGA078XXS52MG	8.2	78	G1/4-M	53	11	21	14	54
NFSGA078XXS53MN	8.2	78	NPT1/4-M	53	11	21	14	54
NFSGA085XXV92MG	6	85	G1/4-M	52	10	22	15	55
NFSGA085XXV92FG	6	85	G1/4-F	62	12	22	15	55
NFSGA110XXB84FG	13.5	110	G1/2-F	69.5	13	-	29	80
NFSGA110XXS54FG	13.5	110	G1/2-F	69.5	13	-	29	80
NFSGA150XXB84FG	13.5	150	G1/2-F	89.5	13	-	37.5	111
NFSGA150XXS54FG	13.5	150	G1/2-F	89.5	13	-	37.5	111

Dimensions: mm

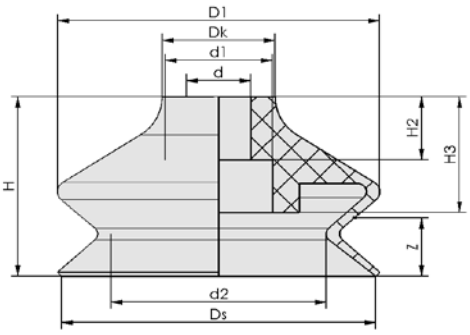
NFGAX 11 to 25



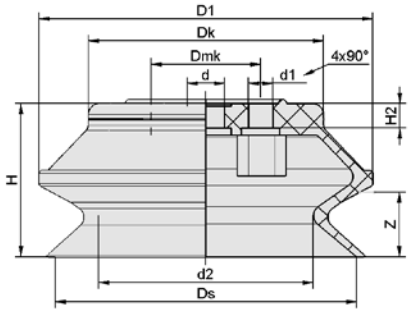
NFGAX 33 to 78



NFGAX 50 to 85 (VUL)



NFGAX 110 to 150 Female



Type	Ds	H	Z (stroke)	d1	d	Dk	H2	H3	d2	D1
NFGAX 11	11	16	4	-	4.5	10	6.9	9.3	5.1	12
NFGAX 14	14	15.5	5	-	4.5	10	6.9	8.5	5	13.7
NFGAX 16	16	19.2	7	-	4.5	10	6.9	9.3	8.4	17
NFGAX 20	20	15.2	5	-	4.5	10	6.9	8.7	11	19.9
NFGAX 22	22	19	6		4.5	10	6.9	9.1	11.7	24.2
NFGAX 25	25	23	9		4.5	10	6.9	8.9	9.9	25
NFGAX 33	33	27	9	16	8	18	13	14	17	36
NFGAX 43	43	27.6	10	14.5	8	18	13	17.1	21.9	45.9
NFGAX 50	8	13.6	33.5	50	17.5	47	32.5	8	18	14.5
NFGAX 53	53	34	12	14.5	8	18	13	19	33	58.6
NFGAX 60	12	20	41	60	21	59	34	12	22	12.5
NFGAX 63	63	34	14	14.5	8	18	13	18.8	44.5	67
NFGAX 78	78	47	14	21.8	11.8	24.7	19.7	31.4	54	83
NFGAX 85	12	25	55	85	25	84	47	20	32	15
NFGAX 110	110	55	29	7	13.5	86	8	10	80	123
NFGAX 150	150	74	37.5	7	13.5	120	6	-	111	168

Round 2.5 Bellows Suction Cups – NFSGX Series

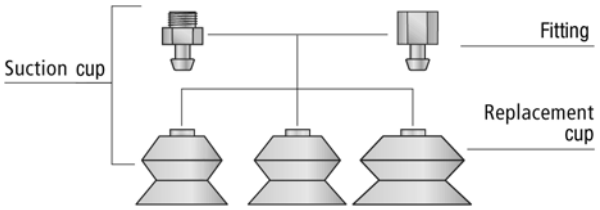
Suction area (Ø) from 5 mm to 88 mm

Round 2.5 bellows suction cup that is designed to handle extremely sensitive and/or uneven work-pieces; Examples include work-pieces such as pipes where the surface is curved. The bellows type cup helps to provide a reliable seal.

Design Features

Diameter: 5 to 88 mm; Round 2.5 bellows; Material: Nitrile, Silicone, Vulkollan; Robust and hard wearing suction cups with soft tapered sealing lip; High suction force with optimum dampening effect during placement of suction cup on work-piece.

Bellows suction cups NFSG being used for handling hot plastic parts



Design

Robust, wear-resistant suction cup NFSG with single sealing lip, consisting of suction cup NFGX with 2.5 bellows and connection fitting

- All fittings plugged in
- Suction cups with a diameter of 52 mm or more with supports on the bottom

Design (VUL)

- Handling of workpieces with very abrasive surfaces
- Suction cup positively connected to fitting to prevent turning, even when lifting heavy loads

Technical Data 2.5 Bellows Suction Cups – NFSGX Series

Type	Suction Force (N)*	Pull-off force (N)	Volume (cm^3)	Min. curve radius (mm) (convex)***	Recom. internal hose diameter d (mm)**
NFSGX 5	0.1	0.8	0.033	8	2
NFSGX 7	0.1	0.9	0.043	8	4
NFSGX 9	0.7	2.3	0.150	10	4
NFSGX 12	0.9	3.5	0.600	13	4
NFSGX 14	1.2	5.7	0.975	15	4
NFSGX 18	2.3	8.5	1.350	20	4
NFSGX 20	3.8	12.1	2.000	30	4
NFSGX 25	4.5	19.0	5.400	30	4
NFSGX 32	12.0	36.9	10.000	35	6
NFSGX 42	13.6	44.0	19.500	75	6
NFSGX 52	27.0	96.0	62.000	75	6
NFSGX 60 VU1-72	61.0	100	61	50	6
NFSGX 62	39.6	137.0	72.500	75	6
NFSGX 85 VU1-72	120.0	250	195	60	6
NFSGX 88	45.2	286.0	165.000	100	9

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

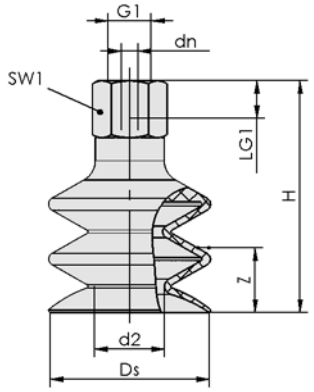
How to Order

NFSGX Series and NFGXX Replacment Cups (Round 2.5 Bellows)

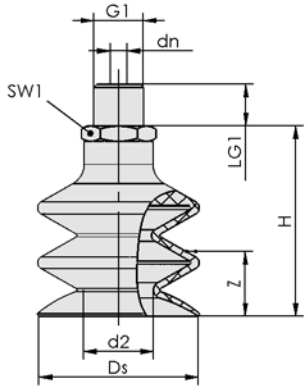
Suction Cup Assembly					Replacement Cups		
Series / Cup Diameter (mm)	Thread Type / Port Size	Material Type			Material Type		
		Nitrile (55 Hardness)	Silicone (55 Hardness)	Vulkollan (72 Hardness)	Nitrile (55 Hardness)	Silicone (55 Hardness)	Vulkollan (72 Hardness)
NFSGX 5	M5-F	NFSGX005XXB5BFM	NFSGX005XXS5BFM		NFGXX005XXB5XXX	NFGXX005XXS5XXX	
	M5-M	NFSGX005XXB5BMM	NFSGX005XXS5BMM				
NFSGX 9	G1/8-F	NFSGX009XXB51FG	NFSGX009XXS51FG		NFGXX009XXB5XXX	NFGXX009XXS5XXX	
	G1/8-M	NFSGX009XXB51MG	NFSGX009XXS51MG				
	NPT1/8-M	NFSGX009XXB51MN	NFSGX009XXS51MN				
	M5-M	NFSGX009XXB5BMM	NFSGX009XXS5BMM				
NFSGX 12	G1/8-F	NFSGX012XXB51FG	NFSGX012XXS51FG		NFGXX012XXB5XXX	NFGXX012XXS5XXX	
	G1/8-M	NFSGX012XXB51MG	NFSGX012XXS51MG				
	NPT1/8-M	NFSGX012XXB51MN	NFSGX012XXS51MN				
	M5-M	NFSGX012XXB5BMM	NFSGX012XXS5BMM				
NFSGX 14	G1/8-F	NFSGX014XXB51FG	NFSGX014XXS51FG		NFGXX014XXB5XXX	NFGXX014XXS5XXX	
	G1/8-M	NFSGX014XXB51MG	NFSGX014XXS51MG				
	NPT1/8-M	NFSGX014XXB51MN	NFSGX014XXS51MN				
	M5-M	NFSGX014XXB5BMM	NFSGX014XXS5BMM				
NFSGX 18	G1/8-F	NFSGX018XXB51FG	NFSGX018XXS51FG		NFGXX018XXB5XXX	NFGXX018XXS5XXX	
	G1/8-M	NFSGX018XXB51MG	NFSGX018XXS51MG				
	NPT1/8-M	NFSGX018XXB51MN	NFSGX018XXS51MN				
	M5-M	NFSGX018XXB5BMM	NFSGX018XXS5BMM				
NFSGX 20	G1/8-F	NFSGX020XXB51FG	NFSGX020XXS51FG		NFGXX020XXB5XXX	NFGXX020XXS5XXX	
	G1/8-M	NFSGX020XXB51MG	NFSGX020XXS51MG				
	NPT1/8-M	NFSGX020XXB51MN	NFSGX020XXS51MN				
	M5-M	NFSGX020XXB5BMM	NFSGX020XXS5BMM				
NFSGX 25	G1/8-F	NFSGX025XXB51FG	NFSGX025XXS51FG		NFGXX025XXB5XXX	NFGXX025XXS5XXX	
	G1/8-M	NFSGX025XXB51MG	NFSGX025XXS51MG				
	NPT1/8-M	NFSGX025XXB51MN	NFSGX025XXS51MN				
NFSGX 32	NPT1/8-M	NFSGX032XXB51MN	NFSGX032XXS51MN		NFGXX032XXB5XXX	NFGXX032XXS5XXX	
	G1/4-F	NFSGX032XXB52FG	NFSGX032XXS52FG				
	G1/4-M	NFSGX032XXB52MG	NFSGX032XXS52MG				
NFSGX 42	NPT1/8-M	NFSGX042XXB51MN	NFSGX042XXS51MN		NFGXX042XXB5XXX	NFGXX042XXS5XXX	
	G1/4-F	NFSGX042XXB52FG	NFSGX042XXS52FG				
	G1/4-M	NFSGX042XXB52MG	NFSGX042XXS52MG				
NFSGX 52	NPT1/8-M	NFSGX052XXB51MN	NFSGX052XXS51MN		NFGXX052XXB5XXX	NFGXX052XXS5XXX	
	G1/4-F	NFSGX052XXB52FG	NFSGX052XXS52FG				
	G1/4-M	NFSGX052XXB52MG	NFSGX052XXS52MG				
NFSGX 60	G1/4-F			NFSGX060XXV92FG			NFGXX060XXV9XXX
	G1/4-M			NFSGX060XXV92MG			
NFSGX 62	NPT1/8-M	NFSGX062XXB51MN	NFSGX062XXS51MN		NFGXX062XXB5XXX	NFGXX062XXS5XXX	
	G1/4-F	NFSGX062XXB52FG	NFSGX062XXS52FG				
	G1/4-M	NFSGX062XXB52MG	NFSGX062XXS52MG				
NFSGX 85	G1/4-F			NFSGX085XXV92FG			NFGXX085XXV9XXX
	G1/4-M			NFSGX085XXV92MG			
NFSGX 88	G1/4-F	NFSGX088XXB52FG	NFSGX088XXS52FG		NFGXX088XXB5XXX	NFGXX088XXS5XXX	
	G1/4-M	NFSGX088XXB52MG	NFSGX088XXS52MG				
	NPT3/8-M	NFSGX088XXB53MN	NFSGX088XXS53MN				

Dimensions: mm

NFSGX 5 to 88 Female



NFSGX 5 to 88 Male



Type	d2	dn	Ds	G1	H	LG1	SW1	Z (stroke)
NFSGX005XXB5BMM	2.6	2	5	M5-M	19	5	8	3
NFSGX005XXB5BFM	2.6	2	5	M5-F	24	5.5	8	3
NFSGX005XXS5BMM	2.6	2	5	M5-M	19	5	8	3
NFSGX005XXS5BFM	2.6	2	5	M5-F	24	5.5	8	3
NFSGX009XXB5BMM	4.1	2.5	9	M5-M	20	5	7	3
NFSGX009XXB51MG	4.1	3.5	9	G1/8-M	21	7.5	14	3
NFSGX009XXB51FG	4.1	3.5	9	G1/8-F	27	8.5	14	3
NFSGX009XXB51MN	4.1	2.5	9	NPT1/8-M	21	7.5	14	3
NFSGX009XXS5BMM	4.1	3.5	9	M5-M	20	5	7	3
NFSGX009XXS51MG	4.1	3.5	9	G1/8-M	21	7.5	14	3
NFSGX009XXS51FG	4.1	3.5	9	G1/8-F	27	8.5	14	3
NFSGX009XXS51MN	4.1	3.5	9	NPT1/8-M	21	7.5	14	3
NFSGX014XXB51MG	5.4	3.5	14.5	G1/8-M	28	7.5	14	9
NFSGX014XXB5BMM	5	2.5	12	M5-M	26	5	7	7
NFSGX014XXB51FG	5.4	3.5	14.5	G1/8-F	34	8.5	14	9
NFSGX014XXB51MN	5.4	3.5	14.5	NPT1/8-M	28	7.5	14	9
NFSGX014XXS51MG	5.4	3.5	14.5	G1/8-M	28	7.5	14	9
NFSGX014XXS5BMM	5	2.5	12	M5-M	26	5	7	7
NFSGX014XXS51FG	5.4	3.5	14.5	G1/8-F	34	8.5	14	9
NFSGX014XXS51MN	5.4	3.5	14.5	NPT1/8-M	28	7.5	14	9
NFSGX018XXB51MG	8	3.5	17.2	G1/8-M	28	7.5	14	9
NFSGX018XXB5BMM	8	2.5	17.2	M5-M	27	5	7	9
NFSGX018XXB51FG	8	3.5	17.2	G1/8-F	34	8.5	14	9
NFSGX018XXB51MN	8	3.5	17.2	NPT1/8-M	28	7.5	14	9
NFSGX018XXS51MG	8	3.5	17.2	G1/8-M	28	7.5	14	9
NFSGX018XXS5BMM	8	2.5	17.2	M5-M	27	5	7	9
NFSGX018XXS51FG	8	3.5	17.2	G1/8-F	34	8.5	14	9
NFSGX018XXS51MN	8	3.5	17.2	NPT1/8-M	28	7.5	14	9
NFSGX020XXB51MG	10.5	3.5	20	G1/8-M	28	7.5	14	9
NFSGX020XXB5BMM	10.5	2.5	20	M5-M	27	5	7	9
NFSGX020XXB51FG	10.5	3.5	20	G1/8-F	34	8.5	14	9
NFSGX020XXB51MN	10.5	3.5	20	NPT1/8-M	28	7.5	14	9
NFSGX020XXS51MG	10.5	3.5	20	G1/8-M	28	7.5	14	9

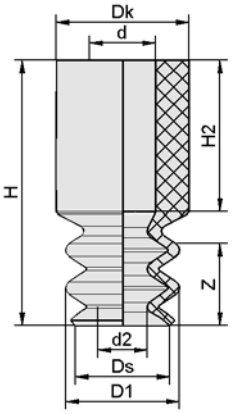
Dimensions: mm

Type	d2	dn	Ds	G1	H	LG1	SW1	Z (stroke)
NFSGX020XXS5BMM	10.5	2.5	20	M5-M	27	5	7	9
NFSGX020XXS51FG	10.5	3.5	20	G1/8-F	34	8.5	14	9
NFSGX020XXS51MN	10.5	3.5	20	NPT1/8-M	28	7.5	14	9
NFSGX025XXB51MG	10	3.5	23	G1/8-M	40	7.5	14	18
NFSGX025XXB51FG	10	3.5	23	G1/8-F	46	8.5	14	18
NFSGX025XXB51MN	10	3.5	23	NPT1/8-M	40	7.5	14	18
NFSGX025XXS51MG	10	3.5	23	G1/8-M	40	7.5	14	18
NFSGX025XXS51FG	10	3.5	23	G1/8-F	46	8.5	14	18
NFSGX032XXB52MG	16	4.4	32	G1/4-M	41.5	11	17	15
NFSGX032XXB52FG	16	4.4	32	G1/4-F	52.5	12	17	15
NFSGX032XXB51MN	16	4.4	32	NPT1/4-M	41.5	11	17	15
NFSGX032XXS52MG	16	4.4	32	G1/4-M	41.5	11	17	15
NFSGX032XXS52FG	16	4.4	32	G1/4-F	52.5	12	17	15
NFSGX032XXS51MN	16	4.4	32	NPT1/4-M	41.5	11	17	15
NFSGX042XXB52FG	17.8	4.4	42.6	G1/4-F	61	12	17	20
NFSGX042XXB52MG	17.8	4.4	42.6	G1/4-M	50	11	17	20
NFSGX042XXB51MN	17.8	4.4	42.6	NPT1/4-M	50	11	17	20
NFSGX042XXS52FG	17.8	4.4	42.6	G1/4-F	61	12	17	20
NFSGX042XXS52MG	17.8	4.4	42.6	G1/4-M	50	11	17	20
NFSGX042XXS51MN	17.8	4.4	42.6	NPT1/4-M	50	11	17	20
NFSGX052XXB52FG	24.6	4.4	52.5	G1/4-F	64	12	17	25
NFSGX052XXB52MG	24.6	4.4	52.5	G1/4-M	53	11	17	25
NFSGX052XXB51MN	24.6	4.4	52.5	NPT1/4-M	53	11	17	25
NFSGX052XXS52FG	24.6	4.4	52.5	G1/4-F	64	12	17	25
NFSGX052XXS52MG	24.6	4.4	52.5	G1/4-M	53	11	17	25
NFSGX052XXS51MN	24.6	4.4	52.5	NPT1/4-M	53	11	17	25
NFSGX060XXV92MG	36	6	59	G1/4-M	60	10	17	30
NFSGX060XXV92FG	36	6	59	G1/4-F	70	12	17	30
NFSGX062XXB52FG	29.5	4.4	62.2	G1/4-F	70	12	17	29
NFSGX062XXB52MG	29.5	4.4	62.2	G1/4-M	59	11	17	29
NFSGX062XXB51MN	29.5	4.4	62.2	NPT1/4-M	59	11	17	29
NFSGX062XXS52FG	29.5	4.4	62.2	G1/4-F	70	12	17	29
NFSGX062XXS52MG	29.5	4.4	62.2	G1/4-M	59	11	17	29
NFSGX062XXS51MN	29.5	4.4	62.2	NPT 1/4-M	59	11	17	29
NFSGX085XXV92MG	51	6	80.2	G1/4-M	90	10	22	38
NFSGX085XXV92FG	51	6	80.2	G1/4-F	100	12	22	38
NFSGX088XXB52MG	33	8	89	G1/4-M	92	11	21	34
NFSGX088XXB52FG	33	8	89	G1/4-F	103	12	21	34
NFSGX088XXB53MN	33	8	89	NPT1/4-M	92	11	21	34
NFSGX088XXS52MG	33	8	89	G1/4-M	92	11	21	34
NFSGX088XXS52FG	33	8	89	G1/4-F	103	12	21	34
NFSGX088XXS53MN	33	8	89	NPT1/4-M	92	11	21	34

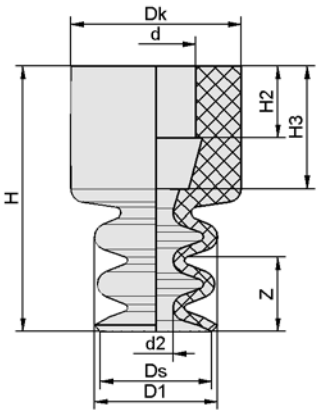
Dimensions: mm

Replacement cups for NFSGX Series

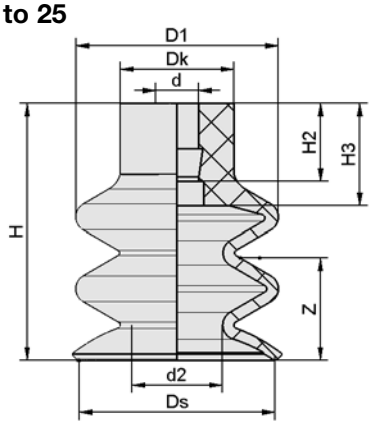
NFGXX 5



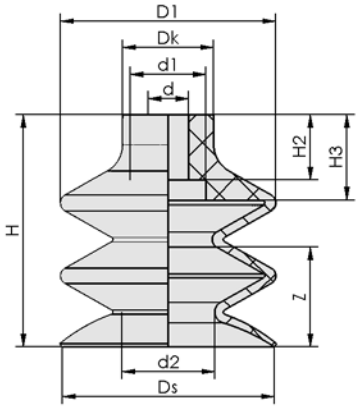
NFGXX 7 to 9



NFGXX 12 to 25



NFGXX 32 to 88



Type	d	d1	d2	D1	Dk	Ds	H	H2	H3	Z (stroke)
NFGXX 5	3.5	-	2.6	6	7	5	14	8	-	2
NFGXX 9	4.5	-	4.1	8.9	9	9	15	8.2	-	3
NFGXX 12	4.5	-	5	12	10	12	21	6.9	9	6
NFGXX 14	4.5	-	5.4	13.9	10	14.5	22.8	6.9	9	9
NFGXX 18	4.5	-	8	17.8	10	17.2	22.6	6.9	9	9
NFGXX 20	4.5	-	10.5	20	10	20	22.1	6.9	9	9
NFGXX 25	4.5	-	10	25	10	23	34	6.9	9	18
NFGXX 32	8	15	16	32.6	18	32	37.5	13	17	15
NFGXX 42	8	15	17.8	43.5	18	42.6	46	13	17	20
NFGXX 52	8	-	24.6	52	18	52.5	48.7	13	-	25
NFGXX 60	12	20	36	60	21	59	55	12	18	30
NFGXX 62	8	-	29.5	62	18	62.2	54	13	-	29
NFGXX 85	12	25	51	85	25	80.2	85	20	27	38
NFGXX 88	11.7	25	33	88.2	25	89	86.5	19.7	26	34

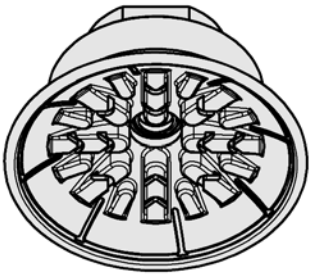
Flat Round Suction Cups (Automotive) – NSAFX Series

Suction area (Ø) from 50 mm to 125 mm

This flat round cup is designed to handle a wide range of sheet metal applications, especially thin walled sheets of metal and other sensitive work-pieces; Examples include the handling of thin metal body sheets used in the automotive industry, such as feeder systems for press room lines.

Design Features

Diameter: 50 to 125 mm; Flat round cup; Material: Nitrile; Connection fitting vulcanized to suction cup; Designed to handle high vertical or horizontal holding forces; large area internal structured support; Soft and flexible sealing lip that provides reliable sealing on flat or slightly curved surfaces.



Flat suction cups NSAFX being used for handling sheet metal parts

Design

- Large structured inner support
- Robust and wear resistant, with single sealing lip and special slot
- Nitrile - 45 shore hardness
- Slots in bottom of cup prevents oily metal sheets from slipping

Technical Data – NSAFX Series

Type	Suction Force (N)*	Lateral force (N)**	Lateral force oily surface (N)**	Volume (cm^3)	Min. curve radius (mm) (convex)***	Recom. internal hose diameter d (mm)***
NSAFX 50	100	80	76	7.0	65	4
NSAFX 60	150	105	85	13.0	75	6
NSAFX 80	272	205	180	36.0	100	6
NSAFX 100	430	310	300	58.0	135	6
NSAFX 125	660	475	400	115.0	165	9

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

How to Order

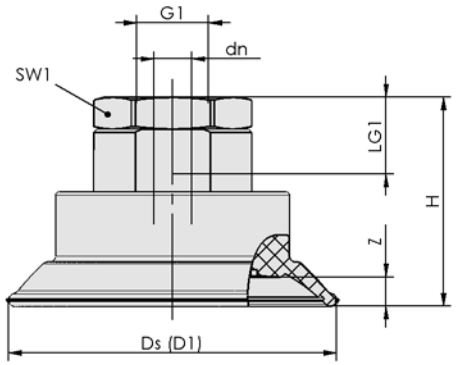
NSAFX Series (Flat Round Cups - Automotive Style)

Suction Cup Assembly		
Series / Cup Diameter (mm)	Thread Type / Port Size	Material Type
		Nitrile (45 Hardness)
NSAFX 50	G3/8-F	NSAFX050XXB33FG
NSAFX 50	NPT3/8-F	NSAFX050XXB33FN
NSAFX 60	G3/8-F	NSAFX060XXB33FG
NSAFX 60	NPT3/8-F	NSAFX060XXB33FN
NSAFX 80	G3/8-F	NSAFX080XXB33FG
NSAFX 80	NPT3/8-F	NSAFX080XXB33FN
NSAFX 100	G3/8-F	NSAFX100XXB33FG
NSAFX 100	NPT3/8-F	NSAFX100XXB33FN
NSAFX 125	G3/8-F	NSAFX125XXB33FG
NSAFX 125	NPT3/8-F	NSAFX125XXB33FN

The connection fitting is vulcanized to the suction cup

Dimensions: mm

NSAFX 50 to 125 Female



Type	D1*	dn	Ds	G1	H	LG1	SW1	Z (stroke)
NSAFX050XXB33FG	56	6	52	G3/8-F	28	15	22	5.0
NSAFX050XXB33FN	56	6	52	NPT3/8-F	28	15	22	5.0
NSAFX060XXB33FG	67	6	63	G3/8-F	31	15	22	6.0
NSAFX060XXB33FN	67	6	63	NPT3/8-F	31	15	22	6.0
NSAFX080XXB33FG	89	6	83	G3/8-F	35	15	22	7.6
NSAFX080XXB33FN	89	6	83	NPT3/8-F	35	15	22	7.6
NSAFX100XXB33FG	110	6	103	G3/8-F	36	15	22	9.5
NSAFX100XXB33FN	110	6	103	NPT3/8-F	36	15	22	9.5
NSAFX125XXB33FG	135	9	128	G3/8-F	43	15	22	12.5
NSAFX125XXB33FN	135	9	128	NPT3/8-F	43	15	22	12.5

* D1 is the external dimension of the suction cup when it is pressed against the workpiece by the vacuum

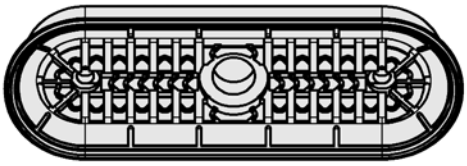
Flat Oval Suction Cup (Automotive) – NSAOF Series

Suction area (LxW) from 80 x 40 mm to 120 x 60 mm

The oval suction cup design has a low inner volume for elongated sheet metal such as sections, pipes or ribbing; Very effective for the handling of thin sheets of steel or aluminum without deformation of work-piece. Examples include the handling of thin metal body sheets used in the automotive industry, such as feeder systems for press room lines.

Design Features

Dimensions: 80 x 40 to 120 x 60 mm; Flat oval cup; Material: Nitrile; Connection fitting vulcanized to suction cup; Designed to handle high vertical or horizontal holding forces; large area internal structured support.



Flat suction cups NSAOF being used for handling pressed sheet-metal parts

Design

- Robust, wear-resistant oval suction cup with single sealing lip, special slot and inner support
- Connection nipple glued to the suction cup with a reinforcing element (very high strength)
- Suction pad available with various connection types
- Nitrile - Shore Hardness 45
- Slots in bottom of cup prevents oily metal from slipping

Technical Data – NSAOF Series

Type	Suction Force (N)*	Lateral force (N)**	Lateral force oily surface (N)**	Volume (cm^3)	Min. curve radius (mm) (convex)***	Recom. internal hose diameter d (mm)***
NSAOF 80x40	140	110	100	10.7	50	4
NSAOF 100x50	217	181	121	20.0	75	6
NSAOF 120x60	312	254	170	35.0	75	6

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

How to Order

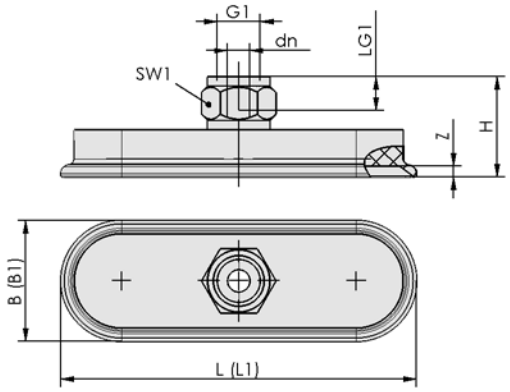
NSAOF Series (Flat Oval Cups - Automotive Style)

Suction Cup Assembly		
Series / Cup Diameter (mm)	Thread Type / Port Size	Material Type
		Nitrile (45 Hardness)
NSAOF 80x40	G3/8-F	NSAOF08040B33FG
NSAOF 80x40	NPT3/8-F	NSAOF08040B33FN
NSAOF 100x50	G3/8-F	NSAOF10050B33FG
NSAOF 100x50	NPT3/8-F	NSAOF10050B33FN
NSAOF 120x60	G3/8-F	NSAOF12060B33FG
NSAOF 120x60	NPT3/8-F	NSAOF12060B33FN

The connection fitting is vulcanized to the suction cup

Dimensions: mm

NSAOF 80x40 to 120x60 Female



Type	B	B1**	dn	G1	H	L	L1**	LG1	SW1	Z (stroke)
NSAOF08040B33FG	40	43	6	G3/8-F	28	82	85	9	22	4
NSAOF08040B33FN	40	43	6	NPT3/8-F	28	82	85	9	22	4
NSAOF10050B33FG	50	54	8	G3/8-F	31	102	106	9	22	5
NSAOF10050B33FN	50	54	8	NPT3/8-F	31	102	106	9	22	5
NSAOF12060B33FG	60	65	8	G3/8-F	33	123	128	9	22	6
NSAOF12060B33FN	60	65	8	NPT3/8-F	33	123	128	9	22	6

** The B1 and L1 are the external dimensions of the suction cup when it is pressed against the work piece by the vacuum.

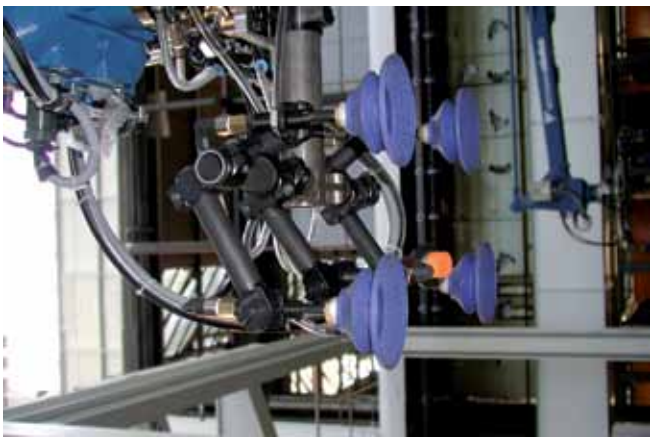
Round 1.5 Bellows Suction Cup (Automotive) – NSABX Series

Suction area (Ø) from 40 mm to 125 mm

This round 1.5 bellows cup is designed to handle thin walled curved sheet metal surfaces, such as pre-shaped parts. Examples include the handling of thin metal body sheets used in the automotive industry, such as feeder systems for press room lines.

Design Features

Diameter: 40 to 125 mm; Round 1.5 bellows cup; Material: Nitrile; Connection fitting vulcanized to suction cup; Designed to handle high vertical or horizontal holding forces; large area internal structured support.



Design

- Robust, wear-resistant 1.5 bellows suction cup with single sealing lip, special slot and inner support
- Connection fitting vulcanized to the suction cup with a reinforcing element (very high strength)
- Nitrile - Shore Hardness 60
- Slots in bottom of cup prevents oily metal from slipping

Technical Data – NSABX Series

Type	Suction Force (N)*	Pull-off force (N)	Lateral force (N)**	Lateral force oily surface (N)**	Volume (cm^3)	Min. curve radius (mm) (convex)***	Recom. internal hose diameter d (mm)***
NSABX 40	38	59	36	33	7.0	40	4
NSABX 50	53	87	55	52	11.5	50	4
NSABX 60	82	130	82	77	24.0	65	6
NSABX 80	135	221	145	140	56.5	75	6
NSABX 100	190	357	220	214	92.5	90	6
NSABX 125	250	558	352	335	191.0	140	9

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

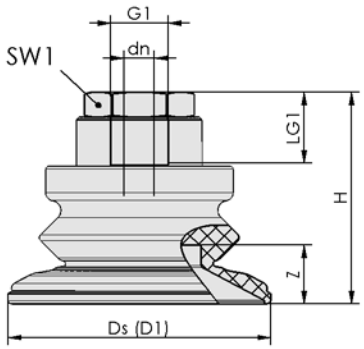
How to Order

NSABX Series (Round 1.5 Bellows Cups - Automotive Style)

Suction Cup Assembly		
Series / Cup Diameter (mm)	Thread Type / Port Size	Material Type
		Nitrile (60 Hardness)
NSABX 40	G3/8-F	NSABX040XXB63FG
NSABX 40	NPT3/8-F	NSABX040XXB63FN
NSABX 50	G3/8-F	NSABX050XXB63FG
NSABX 50	NPT3/8-F	NSABX050XXB63FN
NSABX 60	G3/8-F	NSABX060XXB63FG
NSABX 60	NPT3/8-F	NSABX060XXB63FN
NSABX 80	G3/8-F	NSABX080XXB63FG
NSABX 80	NPT3/8-F	NSABX080XXB63FN
NSABX 100	G3/8-F	NSABX100XXB63FG
NSABX 100	NPT3/8-F	NSABX100XXB63FN
NSABX 125	G3/8-F	NSABX125XXB63FG
NSABX 125	NPT3/8-F	NSABX125XXB63FN

Dimensions: mm

NSABX 40 to 125 Female



Type	D1*	dn	Ds	G1	H	LG1	SW1	Z (stroke)
NSABX040XXB63FG	45	4	42	G3/8-F	44	9.5	22	10
NSABX040XXB63FN	45	4	42	NPT3/8-F	44	9.5	22	10
NSABX050XXB63FG	56	6	52	G3/8-F	37	15	22	11.5
NSABX050XXB63FN	56	6	52	NPT3/8-F	37	15	22	11.5
NSABX060XXB63FG	67	6	63	G3/8-F	41.5	15	22	14.5
NSABX060XXB63FN	67	6	63	NPT3/8-F	41.5	15	22	14.5
NSABX080XXB63FG	89	6	83	G3/8-F	50	15	22	22
NSABX080XXB63FN	89	6	83	NPT3/8-F	50	15	22	22
NSABX100XXB63FG	110	6	103	G3/8-F	57	15	22	26
NSABX100XXB63FN	110	6	103	NPT3/8-F	57	15	22	26
NSABX125XXB63FG	135	9	128	G3/8-F	68	15	22	32
NSABX125XXB63FN	135	9	128	NPT3/8-F	68	15	22	32

* D1 is the external dimension of the suction cup when it is pressed against the workpiece by the vacuum

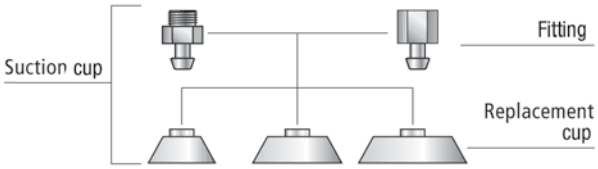
Flat Round Suction Cups (Plastic Film & Paper) - NSGPN Series

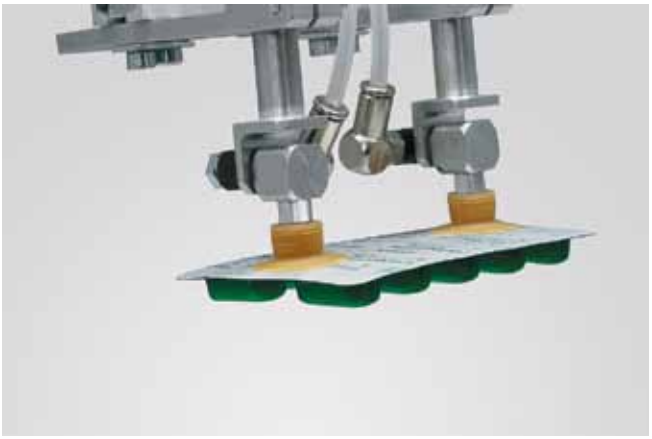
Suction area (Ø) from 15 mm to 40 mm

Special flat round suction cups for handling paper, wood veneers, wafers, blister packs, and films; this series of cups are standard with an elongated sealing lip and inner support for handling of sensitive work-pieces.

Design Features

Diameter: 15 to 40 mm; Round flat cup; Material: Natural Rubber and Silicone; Connection fitting plugged into suction cup; Special flat long tapered sealing lip and inner support.





Flat suction cups NSGPN being used for handling blister packagings

Design

- Robust and wear-resistant with single sealing lip
- Fitting plugged into cup
- Natural Rubber - Shore Hardness 40 A
- Silicone - Shore Hardness 50 A

Technical Data – NSGPN Series

Type	Suction Force (N)*	Volume (cm^3)	Recom. internal hose diameter d (mm)**
NSGPN 15	5.5	0.12	2
NSGPN 20	8.5	0.31	2
NSGPN 24	11.0	0.70	4
NSGPN 30	19.0	1.50	4
NSGPN 34	25.0	2.10	4
NSGPN 40	33.0	2.90	4

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

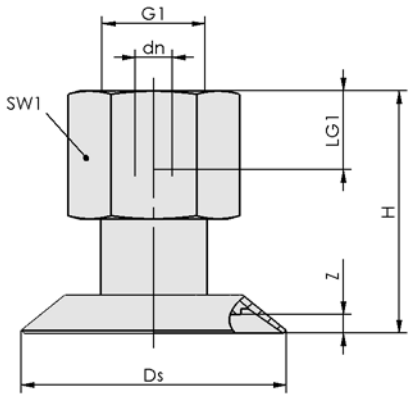
How to Order

NSGPN Series (Flat Round Cups - for Plastic Film and Paper)

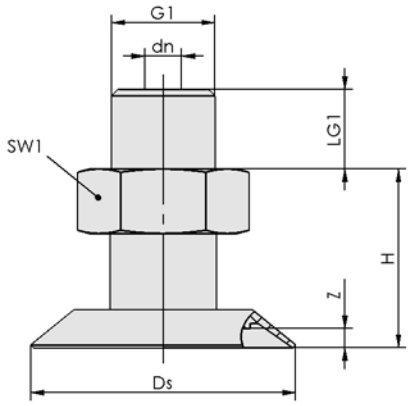
Suction Cup Assembly				Replacement Cups	
Series / Cup Diameter (mm)	Thread Type / Port Size	Material Type		Material Type	
		Natural Rubber (40 Hardness)	Silicone (50 Hardness)	Natural Rubber (40 Hardness)	Silicone (50 Hardness)
NSGPN 15	G1/8-F	NSGPN015XXN21FG	NSGPN015XXS41FG	NSGPX015XXN2XXX	NSGPX015XXS4XXX
	G1/8-M	NSGPN015XXN21MG	NSGPN015XXS41MG		
	M5-M	NSGPN015XXN2BMM	NSGPN015XXS4BMM		
NSGPN 20	G1/8-F	NSGPN020XXN21FG	NSGPN020XXS41FG	NSGPX020XXN2XXX	NSGPX020XXS4XXX
	G1/8-M	NSGPN020XXN21MG	NSGPN020XXS41MG		
	M5-M	NSGPN020XXN2BMM	NSGPN020XXS4BMM		
NSGPN 24	G1/8-F	NSGPN024XXN21FG	NSGPN024XXS41FG	NSGPX024XXN2XXX	NSGPX024XXS4XXX
	G1/8-M	NSGPN024XXN21MG	NSGPN024XXS41MG		
	M5-M	NSGPN024XXN2BMM	NSGPN024XXS4BMM		
NSGPN 30	G1/4-F	NSGPN030XXN22FG	NSGPN030XXS42FG	NSGPX030XXN2XXX	NSGPX030XXS4XXX
	G1/4-M	NSGPN030XXN22MG	NSGPN030XXS42MG		
NSGPN 34	G1/4-F	NSGPN034XXN22FG		NSGPX034XXN2XXX	
	G1/4-M	NSGPN034XXN22MG			
NSGPN 40	G1/4-F	NSGPN040XXN22FG		NSGPX040XXN2XXX	
	G1/4-M	NSGPN040XXN22MG			

Dimensions: mm

NSGPN 15 to 40 Female



NSGPN 15 to 40 Male

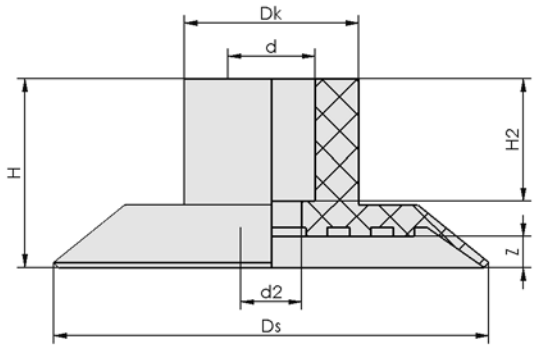


Type	dn	Ds	G1	H	LG1	SW1	Z (stroke)
NSGPN015XXN2BMM	2.5	14.5	M5-M	15	5	7	0.9
NSGPN015XXN21MG	3.5	14.5	G1/8-M	16	7.5	14	0.9
NSGPN015XXN21FG	3.5	14.5	G1/8-F	22	8	14	0.9
NSGPN015XXS4BMM	2.5	14.5	M5-M	15	5	7	0.9
NSGPN015XXS41MG	3.5	14.5	G1/8-M	16	7.5	14	0.9
NSGPN015XXS41FG	3.5	14.5	G1/8-F	22	8	14	0.9
NSGPN020XXN2BMM	2.5	20.9	M5-M	15.4	5	7	1.5
NSGPN020XXN21MG	3.5	20.9	G1/8-M	16.4	7.5	14	1.5
NSGPN020XXN21FG	3.5	20.9	G1/8-F	22.4	8	14	1.5
NSGPN020XXS4BMM	2.5	20.9	M5-M	15.4	5	7	1.5
NSGPN020XXS41MG	3.5	20.9	G1/8-M	16.4	7.5	14	1.5
NSGPN020XXS41FG	3.5	20.9	G1/8-F	22.4	8	14	1.5
NSGPN024XXN2BMG	2.5	24.4	M5-M	15.8	5	7	1.7
NSGPN024XXN21MG	3.5	24.4	G1/8-M	16.8	7.5	14	1.7
NSGPN024XXN21FG	3.5	24.4	G1/8-F	22.8	8	14	1.7
NSGPN024XXS4BMM	2.5	24.4	M5-M	15.8	5	7	1.7
NSGPN024XXS41MG	3.5	24.4	G1/8-M	16.8	7.5	14	1.7
NSGPN024XXS41FG	3.5	24.4	G1/8-F	22.8	8	14	1.7
NSGPN030XXN22MG	5.5	30.6	G1/4-M	27.2	10	17	2
NSGPN030XXN22FG	5.5	30.6	G1/4-F	37.2	12	17	2
NSGPN030XXS42FG	5.5	30.6	G1/4-F	37.2	12	17	2
NSGPN030XXS42MG	5.5	30.6	G1/4-M	27.2	10	17	2
NSGPN034XXN22MG	5.5	34.5	G1/4-M	28	10	17	1.4
NSGPN034XXN22FG	5.5	34.5	G1/4-F	38	12	17	1.4
NSGPN040XXN22MG	5.5	40.5	G1/4-M	25.6	10	17	2.3
NSGPN040XXN22FG	5.5	40.5	G1/4-F	35.6	12	17	2.3

Dimensions: mm

Replacement cups for NSGPN Series

NSGPX 15 to 40

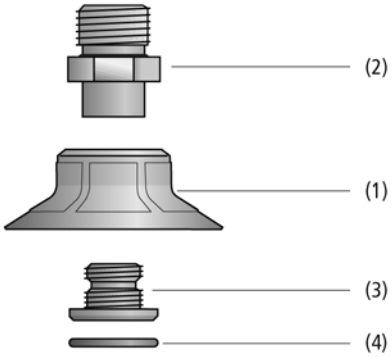


Type	d	d2	Dk	Ds	H	H2	Z (stroke)
NSGPX 15	4.5	3.5	9.0	14.5	10.0	7.2	0.9
NSGPX 20	4.5	3.5	10.5	20.9	10.4	7.1	1.5
NSGPX 24	4.5	3.5	10.0	24.4	10.8	7.3	1.7
NSGPX 30	11.2	6.6	15.6	30.6	22.2	15.7	2.0
NSGPX 34	11.2	5.8	14.8	34.5	23.0	16.8	1.4
NSGPX 40	8.0	5.0	16.0	40.5	20.6	14.5	2.3

NSPFX Series (Flat Round Suction Cups)

Suction area (Ø) from 20 mm to 50 mm

Flat round suction cups specially designed for the packaging industry. This particular cup is typically used for heavy duty packaging applications that require extended life with a reliable seal. Examples of applications include high speed palletizing, de-palletizing processes, cardboard box/tray effectors, and rigid packaging in top/side loading machines.



Design Features

Diameter: 20 to 50mm; Flat round suction cup; Material: Elastodur; flexible, adaptable sealing lip; robust, reinforced main body

Flat suction cups NSPFX being used in packaging machines

Design

- Round flat suction cup NSPF (1) with soft, flexible sealing lip and supporting ribs 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 fitting: consisting of machine-side fitting (2) and suction-side fitting (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
- Elastodur - Shore hardness 65 (wear proof - extended life)

Technical Data – NSPFX Series

Type	Suction Force (N)*	Pull-off force (N)	Lateral force (N)	Volume (cm^3)	Min. curve radius [mm] (convex)	Recom. internal hose diameter d (mm)**	Type Connection element SC...
NSPF-20 ED-65	16.0	19.2	10.5	1.0	25	4	040
NSPF-25 ED-65	22.7	27.1	17.0	1.5	40	4	040
NSPF-30 ED-65	29.5	35.3	22.5	2.3	45	6	040
NSPF-40 ED-65	49.5	62.5	25.0	5.1	75	6	050
NSPF-50 ED-65	74.2	87.4	44.0	7.9	100	6	060

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

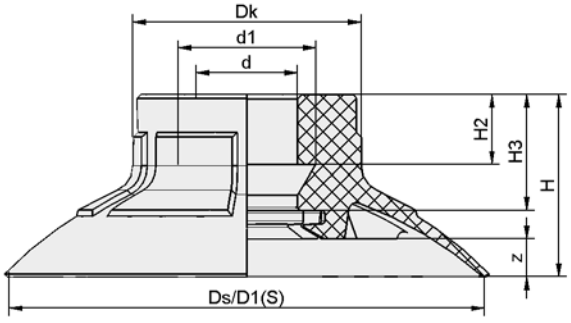
How to Order

NSPFX Series (Flat round cups - Packaging style)

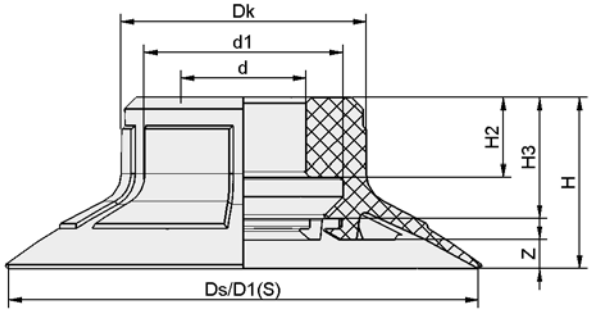
Packaging Cup / Fitting / Screen				
Cup Only		Fitting		Filter Screen
Series / Cup Diameter (mm)	Elastodur (65 Hardness)	Thread Type / Port Size	Fitting	
NSPFX - 20	NSPFX020XXE7XXX	G1/8-M	NSCXX040XXXX1MG	NSIE11010XXXFLR
		G1/8-F	NSCXX040XXXX1FG	
		NPT1/8-M	NSCXX040XXXX1MN	
		NPT1/8-F	NSCXX040XXXX1FN	
NSPFX - 25	NSPFX025XXE7XXX	G1/8-M	NSCXX040XXXX1MG	NSIE11010XXXFLR
		G1/8-F	NSCXX040XXXX1FG	
		NPT1/8-M	NSCXX040XXXX1MN	
		NPT1/8-F	NSCXX040XXXX1FN	
NSPFX - 30	NSPFX030XXE7XXX	G1/8-M	NSCXX040XXXX1MG	NSIE11010XXXFLR
		G1/8-F	NSCXX040XXXX1FG	
		NPT1/8-M	NSCXX040XXXX1MN	
		NPT1/8-F	NSCXX040XXXX1FN	
NSPFX - 40	NSPFX040XXE7XXX	G1/4-M	NSCXX050XXXX2MG	NSIE17508020FLR
		G1/4-F	NSCXX050XXXX2FG	
		NPT1/4-M	NSCXX050XXXX2MN	
		NPT1/4-F	NSCXX050XXXX2FN	
NSPFX - 50	NSPFX050XXE7XXX	G1/4-M	NSCXX050XXXX2MG	NSIE17508020FLR
		G1/4-F	NSCXX050XXXX2FG	
		NPT1/4-M	NSCXX050XXXX2MN	
		NPT1/4-F	NSCXX050XXXX2FN	

Dimensions: mm

NSPFX 20 to 30

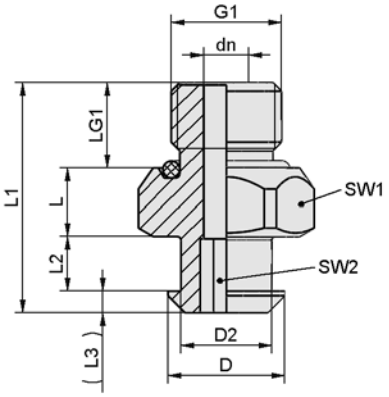


NSPFX 40 to 50

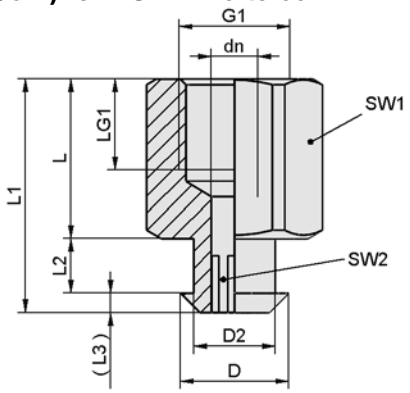


Dimensions: mm

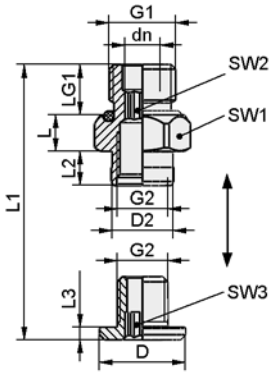
NSCXX 40 - Connection Fitting G1/8-M (NPT1/8-M) for NSPFX 20 to 30



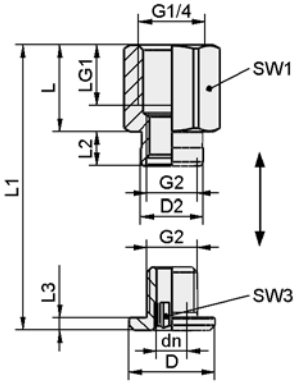
NSCXX 40 - Connection Fitting G1/8-F (NPT1/8-F) for NSPFX 20 to 30



NSCXX 50 - Connection Fitting G1/4-M (NPT1/4-M) for NSPFX 40 to 50



NSCXX 50 - Connection Fitting G1/8-F (NPT1/8-F) for NSPFX 40 to 50



Type	d	d1	Dk	Ds	D1 (S)	H	H2	H3	Z (stroke)
NSPFX 20	7.5	10.5	15.1	21.4	23.3	11	4.6	7.1	2
NSPFX 25	7.5	10.5	15.1	26.4	28	11	4.6	7.1	2
NSPFX 30	7.5	10.5	15.1	31.4	33.6	12	4.6	7.6	2.5
NSPFX 40	11	17.5	21.6	41.4	43.7	15	7	10.6	2.5
NSPFX 50	11	17.5	21.6	51.4	53.9	16	7	10.6	3.5

Type	D	D2	dn	G1	L	L1	L2	L3	LG1	SW1	SW2
NSCXX040XXXX1MG	10.3	8	4	G1/8-M	6	25.2	4.8	1.9	7.5	14	4
NSCXX040XXXX1FG	10.3	8	4	G1/8-F	14	20.7	4.8	1.9	8	14	4
NSCXX040XXXX1MN	10.3	8	4	NPT1/8-M	6	25.2	4.8	1.9	7.5	14	4
NSCXX040XXXX1FN	10.3	8	4	NPT1/8-F	14	20.7	4.8	1.9	8	14	4
NSCXX050XXXX2MG	17	12	6	G1/4-M	7.2	26.5	6.8	2.5	10	17	6
NSCXX050XXXX2FG	17	12	6	G1/4-F	17.2	26.5	6.8	2.5	12	17	6
NSCXX050XXXX2MN	17	12	6	NPT1/4-M	7.2	26.5	6.8	2.5	10	17	6
NSCXX050XXXX2FN	17	12	6	NPT1/4-F	17.2	26.5	6.8	2.5	12	17	6

NSPB4 Series (Round 4.5 Bellows Suction Cups)

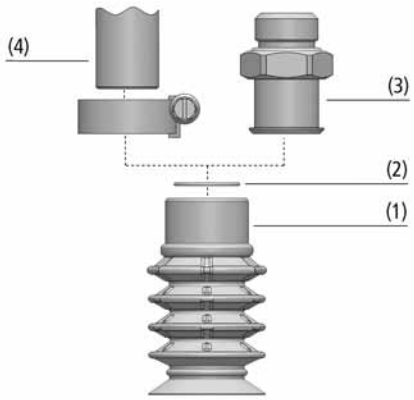
Suction area (Ø) from 20 mm to 40 mm

Round 4.5 bellows suction cups specially designed for the packaging industry. This particular cup is typically used for handling flexible products, such as pouches and various types of plastic film packaged products. This type of cup provides a reliable means of gripping and handling of solid, powder and liquid filled pouches, and can be used in high speed applications in conjunction with robots.

NSPB4-195

Design Features

Diameter: 20 to 40mm; Round 4.5 bellows cup; Material: Silicone (food grade); thin steep sealing lip with low fins.



Design

- Bellows suction cup NSPB4 (1) with 4.5 bellows and soft, flexible sealing lip
- Special reinforced bellows for additional stability
- Mounting via Connector SC (3). Alternatively direct attachment on 3/8"- or 1/2"-pipe via hose clamp (4)
- Clip-in filter screen (4) as pre-filter (filter pore size 250 µm)
- Mounting elements with male thread include integrated sealing ring
- Silicone - Shore hardness 55 (food grade)

Technical Data – NSPB4 Series

Type	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 (cm^3)	Type Connection element SC...
NSPB4 20	2.6	5.3	8	4.9	7	7.9	080
NSPB4 30	5.3	10.6	16	9.9	13	15.6	080
NSPB4 40	8.3	16.6	25	14.1	23	35.7	090

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

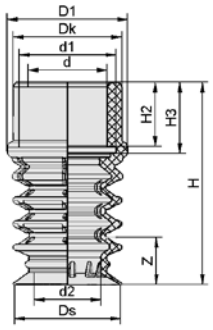
How to Order

NSPB4 Series (Round 4.5 bellows cups - Packaging style)

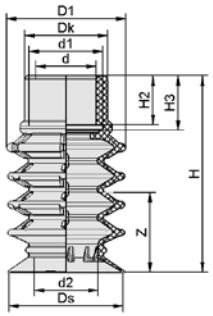
Packaging Cup / Fitting / Screen / Clamp					
Cup Only		Fitting		Filter Screen	Hose Clamp
Series / Cup Diameter (mm)	Silicone (50 Hardness)	Thread Type / Port Size	Fitting		
NSPB4 - 20	NSPB4020XXS5XXX	G3/8-M	NSCXX080XXXX3MG	NSIE17008103FLR	NSSBX01627XXXXX
		G3/8-F	NSCXX080XXXX3FG		
NSPB4 - 30	NSPB4030XXS5XXX	G3/8-M	NSCXX080XXXX3MG	NSIE17008103FLR	NSSBX01627XXXXX
		G3/8-F	NSCXX080XXXX3FG		
NSPB4 - 40	NSPB4040XXS5XXX	G1/2-M	NSCXX090XXXX4MG	NSIE19510XXXFLR	NSSBX02032XXXXX
		G1/2-F	NSCXX090XXXX4FG		

Dimensions: mm

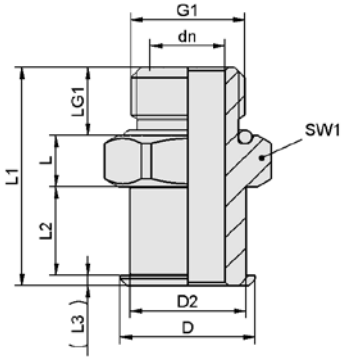
NSPB4 20



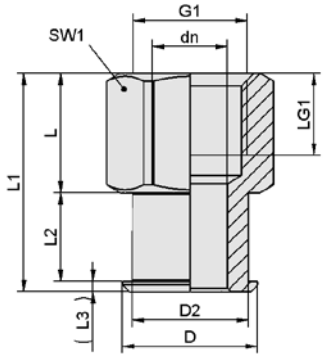
NSPB4 30 to 40



NSCXX 80 & 90 Connection Fitting - Male



NSCXX 80 & 90 Connection Fitting - Female



Type	d	d1	D1	Dk	Ds	H	H2	H3	Z (stroke)
NSPB4 20	16	19.6	24.4	22	21.4	41	13	14.4	10
NSPB4 30	16	19.6	31	22	30.2	52	13	14.4	20
NSPB4 40	20	24.8	41	28	40.5	66	14	16	27

Connection Fitting	D	D2	dn	G1	L	L1	L2	L3	LG1	SW1
NSCXX080XXXX3MG	19.8	17	11	G3/8-M	7.5	32	13	1.5	10	22
NSCXX080XXXX3FG	19.8	17	11	G3/8-F	17.5	32	13	1.5	12	22
NSCXX090XXXX4MG	25	21	15	G1/2-M	7.8	38	14	2	14	27
NSCXX090XXXX4FG	25	21	15	G1/2-F	21.6	38	14	2	16	27

NSPB1 Series (Round 1.5 Bellows Suction Cups)

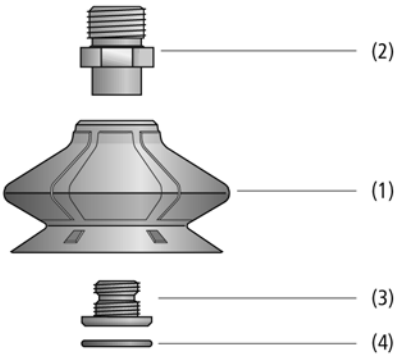
Suction area (Ø) from 20 mm to 60 mm

Round 1.5 bellows suction cups specially designed for the packaging industry. This particular cup is typically used for similar applications as the round flat packaging cups (NSPFX), but 1.5 bellows allows for the handling of work pieces that require more flexibility. Examples of applications include high speed palletizing, de-palletizing processes, cardboard box/tray effectors, and rigid packaging in top/side loading machines.

NSPB1

Design Features

Diameter: 20 to 60mm; Round 1.5 bellows suction cup; Material: Elastodur; flexible, adaptable sealing lip; robust, reinforced main body.



Bellows suction cups NSPB1 being used in top-loading machines

Design

- Round, 1.5 bellows suction cup (1) with soft, flexible sealing lip
- Made of wear-proof material Elastodur ED-65
- Models with diameter up to 30 mm feature plug-in fitting
- Starting at 40 mm diameter with a 2-piece fitting; consisting of machine-side fitting(2) and suction-side fitting (3)
- Clip-in filter screen (4) as pre-filter
- All connection fittings with male thread are equipped with integrated sealing

Technical Data – NSPB1 Series

Type	Suction Force (N)*	Pull-off force (N)	Lateral force (N)	Volume (cm^3)	Min. curve radius [mm] (convex)	Recom. internal hose diameter d (mm)**	Type Connection element SC...
NSPB1 20	9.9	16.2	9.8	2.9	20	4	040
NSPB1 25	14.9	23.4	13.0	5.1	20	4	040
NSPB1 30	20.7	30.6	15.5	7.8	35	6	040
NSPB1 40	35.9	46.8	24.8	18.4	70	6	050
NSPB1 50	54.7	72.7	31.2	30.3	100	6	050
NSPB1 60	78.0	100.9	49.4	49.5	200	6	050

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

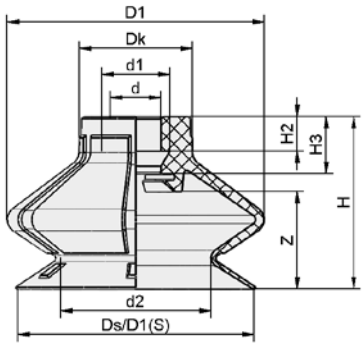
How to Order

NSPB1 Series (Round 1.5 bellows cups - Packaging style)

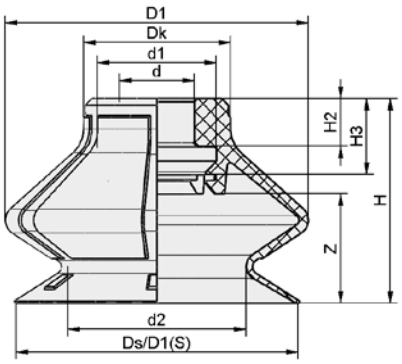
Packaging Cup / Fitting / Screen				
Cup Only		Fitting		Filter Screen
Series / Cup Diameter (mm)	Elastodur (65 Hardness)	Thread Type / Port Size	Fitting	
NSPB1 - 20	NSPB1020XXE7XXX	G1/8-M	NSCXX040XXXX1MG	NSIE11010XXXFLR
		G1/8-F	NSCXX040XXXX1FG	
		NPT1/8-M	NSCXX040XXXX1MN	
		NPT1/8-F	NSCXX040XXXX1FN	
NSPB1 - 25	NSPB1025XXE7XXX	G1/8-M	NSCXX040XXXX1MG	NSIE11010XXXFLR
		G1/8-F	NSCXX040XXXX1FG	
		NPT1/8-M	NSCXX040XXXX1MN	
		NPT1/8-F	NSCXX040XXXX1FN	
NSPB1 - 30	NSPB1030XXE7XXX	G1/8-M	NSCXX040XXXX1MG	NSIE11010XXXFLR
		G1/8-F	NSCXX040XXXX1FG	
		NPT1/8-M	NSCXX040XXXX1MN	
		NPT1/8-F	NSCXX040XXXX1FN	
NSPB1 - 40	NSPB1040XXE7XXX	G1/4-M	NSCXX050XXXX2MG	NSIE17508020FLR
		G1/4-F	NSCXX050XXXX2FG	
		NPT1/4-M	NSCXX050XXXX2MN	
		NPT1/4-F	NSCXX050XXXX2FN	
NSPB1 - 50	NSPB1050XXE7XXX	G1/4-M	NSCXX050XXXX2MG	NSIE17508020FLR
		G1/4-F	NSCXX050XXXX2FG	
		NPT1/4-M	NSCXX050XXXX2MN	
		NPT1/4-F	NSCXX050XXXX2FN	
NSPB1 - 60	NSPB1060XXE7XXX	G1/4-M	NSCXX050XXXX2MG	NSIE17508020FLR
		G1/4-F	NSCXX050XXXX2FG	
		NPT1/4-M	NSCXX050XXXX2MN	
		NPT1/4-F	NSCXX050XXXX2FN	

Dimensions: mm

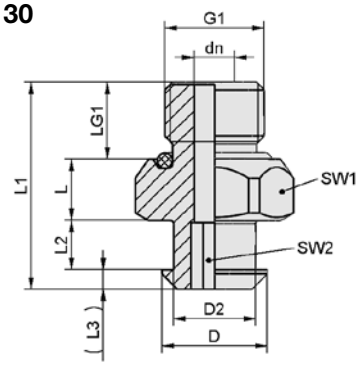
NSPB1 20 to 30



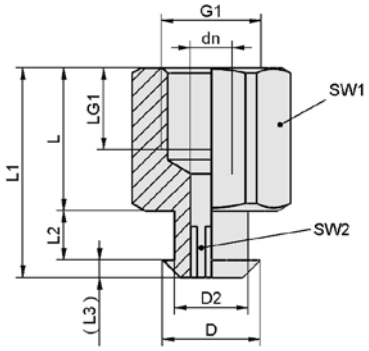
NSPB1 40 to 60



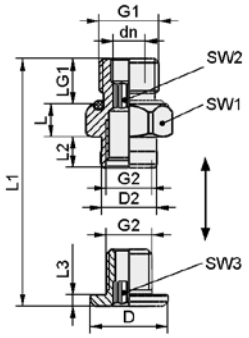
NSCXX 40 - Connection Fitting G1/8-M (NPT1/8-M) for NSPB1 20 to 30



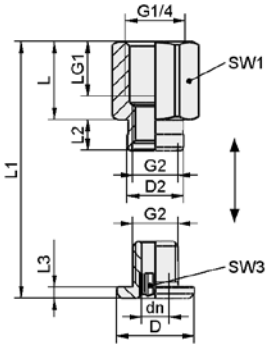
NSCXX 40 - Connection Fitting G1/8-F (NPT1/8-F) for NSPB1 20 to 30



NSCXX 50 - Connection Fitting G1/8-M (NPT1/8-M) for NSPB1 40 to 60



NSCXX 50 - Connection Fitting G1/8-F (NPT1/8-F) for NSPB1 40 to 60



Type	d	d1	D1	Dk	d2	Ds	D1 (S)	H	H2	H3	Z
NSPB1 20	7.5	10.5	24.6	15.1	13.8	21.4	26.3	18	4.6	7.6	8
NSPB1 25	7.5	10.5	29	15.1	16.9	26.4	31.3	21	4.6	7.6	11
NSPB1 30	7.5	10.5	34.2	15.1	20	31.4	36.7	23	4.6	7.6	13
NSPB1 40	11	17.5	44.6	21.6	26.1	41.4	48	30	7	11.1	16
NSPB1 50	11	17.5	55.2	21.6	32.3	51.4	58.4	32	7	11.1	18
NSPB1 60	11	17.5	65.7	21.6	38.6	61.4	69.6	36	7	11.1	22

Type	D	D2	dn	G1	L	L1	L2	L3	LG1	SW1	SW2
NSCXX040XXXX1MG	10.3	8	4	G1/8-M	6	25.2	4.8	1.9	7.5	14	4
NSCXX040XXXX1FG	10.3	8	4	G1/8-F	14	20.7	4.8	1.9	8	14	4
NSCXX040XXXX1MN	10.3	8	4	NPT1/8-M	6	25.2	4.8	1.9	7.5	14	4
NSCXX040XXXX1FN	10.3	8	4	NPT1/8-F	14	20.7	4.8	1.9	8	14	4
NSCXX050XXXX2MG	17	12	6	G1/4-M	7.2	26.5	6.8	2.5	10	17	6
NSCXX050XXXX2FG	17	12	6	G1/4-F	17.2	26.5	6.8	2.5	12	17	6
NSCXX050XXXX2MN	17	12	6	NPT1/4-M	7.2	26.5	6.8	2.5	10	17	6
NSCXX050XXXX2FN	17	12	6	NPT1/4-F	17.2	26.5	6.8	2.5	12	17	6

NSPOB Series (Oval 1.5 Bellows Suction Cups)

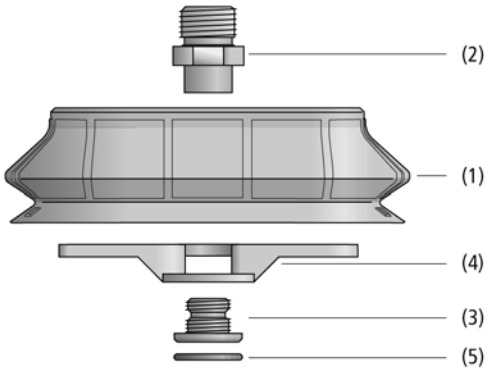
Suction area (Ø) from 60 x 20 mm to 100 x 40 mm

Oval 1.5 bellows suction cups specially designed for the packaging industry. This particular cup is typically used for similar applications as the round 1.5 bellows, but the oval shape allows for the handling of work pieces that do not have enough surface area on the work piece to fit a round cup. This suction cup can be used in most of the other packaging type applications, but allows the cups to be placed closer than the round cups and provide a better fit for narrow work pieces.

NSPOB

Design Features

Diameter: 60 x 20 to 100 x 40mm; Oval 1.5 bellows suction cup; Material: Elastodur; flexible, adaptable sealing lip; robust, reinforced main body.



Bellows suction cups NSPOB1 being used for handling of cardboard

Design

- Oval 1.5 bellows suction cup NSPOB with soft flexible sealing lip
- Made of wear-proof material Elastodur - Shore hardness 65
- All sizes come with a 2-piece fitting: consisting of machine-side fitting(2) and suction-side fitting (3)
- Size 100 mm x 40 mm with additional suction cup insert (4); included in delivery of connection fittings; reusable
- Clip-in filter screen (5) as pre-filter (filter pore size 250 µm)

Technical Data – NSPOB Series

Type	Suction Force (N)*	Pull-off force (N)	Lateral force (N)	Volume (cm^3)	Min. curve radius [mm] (convex)	Recom. internal hose diameter d (mm)**	Type Connection element SC...
NSPOB 60 x 20	32.5	39.8	32.2	11.0	25	6	040
NSPOB 100 x 40	111.2	131.4	76.9	60.1	50	6	050

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

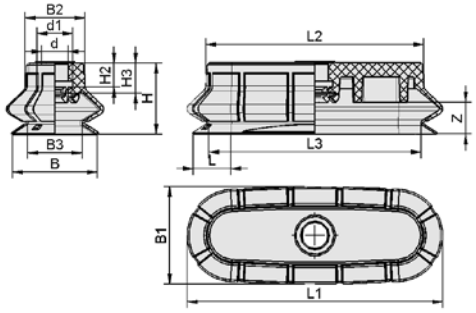
How to Order

NSPOB Series (Oval 1.5 bellows cups - Packaging style)

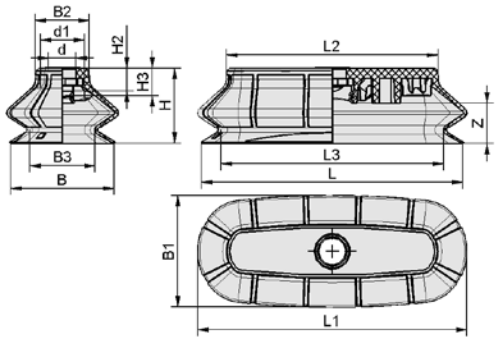
Packaging Cup / Fitting / Screen				
Cup Only		Fitting		Filter Screen
Series / Cup Diameter (mm)	Elastodur (65 Hardness)	Thread Type / Port Size	Fitting	
NSPOB - 60x20	NSPOB06020E7XXX	G1/8-M	NSCXX04001XX1MG	NSIE11010XXXFLR
		G1/8-F	NSCXX04001XX1FG	
		NPT1/8-M	NSCXX04001XX1MN	
NSPOB - 100x40	NSPOB10040E7XXX	G1/4-M	NSCXX05010XX2MG	NSIE17508020FLR
		G1/4-F	NSCXX05010XX2FG	
		NPT1/4-M	NSCXX05010XX2MN	

Dimensions: mm

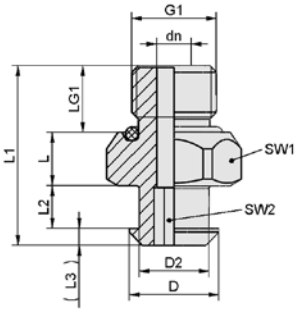
NSPOB 60 x 20



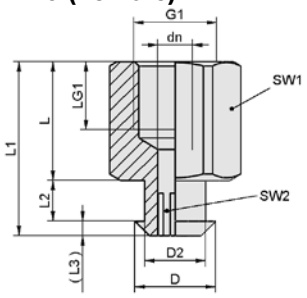
NSPOB 100 x 40



NSCXX 40 & 50 for NSPOB1 60 x 20 (Male)



NSCXX 40 & 50 for NSPOB1 60 x 20 and 100 x 40 (Female)



Type	B	B1	B2	B3	d	d1	H	H2	H3	L	L1	L2	L3	Z (stroke)
NSPOB 60 x 20	21.4	24.6	16.8	12.8	7.3	10.5	18	4.8	7.6	61.4	64.6	55.1	53.4	8
NSPOB 100 x 40	41.4	44.6	21.6	25.9	11	17.5	30	9.2	11.1	104.4	107.6	84.6	88.9	16

Type	D	D2	dn	G1	L	L1	L2	L3	LG1	SW1	SW2
NSCXX04001XX1MG	10.3	8	4	G1/8-M	6	20.3	4.8	2	7.5	14	4
NSCXX04001XX1FG	10.3	8	4	G1/8-F	14	20.8	4.8	2	8	14	4
NSCXX04001XX1MN	10.3	8	4	NPT1/8-M	6	20.3	4.8	2	7.5	14	4
NSCXX05010XX2MG	17	12	6	G1/4-M	7.2	26.5	6.8	2.5	10	17	6
NSCXX05010XX2FG	17	12	6	G1/4-F	17.2	26.5	6.8	2.5	12	17	6
NSCXX05010XX3MN	17	12	6	NPT1/4-M	7.2	26.5	6.8	2.5	10	17	6

Round 1.5, 2.5 and 3.5 Bellows Suction Cups for Eggs - NEFGX Series

Egg Suction Cups - Suction area (Ø) from 30 to 35 mm

Round 2.5 bellows suction cups specially designed for the handling of eggs. It is designed to carefully handle the eggs in a dynamic process while also providing a reliable seal.

Round Bell Shaped Suction Cup for Candy - NSPGX Series

Candy Suction Cups - Suction area (Ø) from 33 mm

Round bell shaped suction cup specially designed for handling round or oval chocolates and other candy products. It is capable of handling round chocolates with a maximum diameter of 35mm or oval chocolates with a maximum diameter of 30mm.

Design Features

Diameter/Egg Cup: 30 to 35mm; Material: Silicone (food grade) or Natural Rubber;

Diameter/Candy Cup: 32.3mm; Material: Silicone (Food Grade)

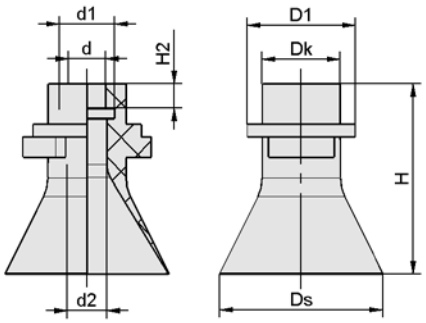
How to Order

Egg Cup				
Series / Cup Diameter (mm)	Cup Only			Bellows
	Silicone (35 Hardness)	Silicone (50 Hardness)	Natural Rubber (50 Hardness)	
NEFGX - 30	NEFGX030XXS1XXX			2.5
NEFGB - 33		NEFGB033XXS4XXX		3.5
NEFGA - 35			NEFGA035XXN4XXX	1.5

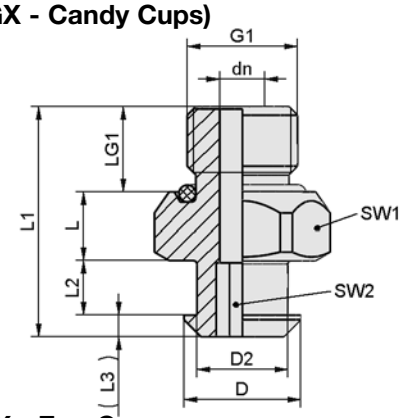
Candy Cup / Fitting				
Cup Only		Fitting		Description
Series / Cup Diameter (mm)	Silicone (food grade)	Thread Type / Port Size	Fitting	
NSPG 33	NSPGX033XXS3XXX	G1/8-M	NSCXX040XXXX1MG	Bell Shape
		G1/8-F	NSCXX040XXXX1FG	Bell Shape
		NPT1/8-M	NSCXX040XXXX1MN	Bell Shape
		NPT1/8-F	NSCXX040XXXX1FN	Bell Shape

Dimensions: mm

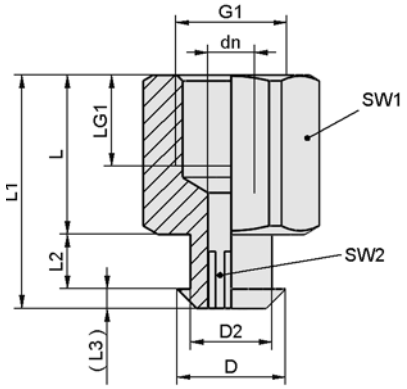
NSPGX 33 Candy Cup



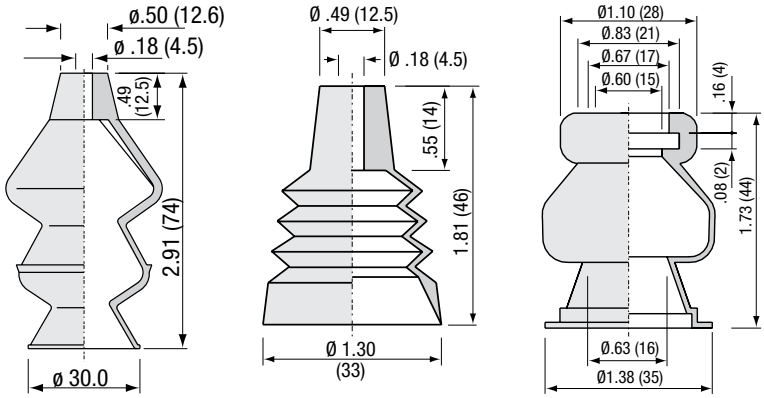
NSCXX 40 Connector Fitting - Male (NSPGX - Candy Cups)



NSCXX 40 Connector Fitting - Female (NSPGX - Candy Cups)



NEFGX - Egg Cups



Dimensions: mm

Type	Ds	H	d	d2
NEFGX030XXS1XXX	30	74	4.03	12.6
NEFGB033XXS4XXX	33	46	4.5	12.5
NEFGA035XXN4XXX	35	44	15	28

Type	d	d1	d2	Dk	Ds	D1	H	H2
NSPGX033XXS3XXX	7.3	11	7.8	15.5	32.3	21.5	38	4.8

Type	dn	D	D2	G1	L	L1	L2	L3	LG1	SW1	SW2
NSCXX040XXXX1MG	4	10.3	8	G1/8"-M	6	25.2	4.8	1.9	7.5	14	4
NSCXX040XXXX1FG	4	10.3	8	G1/8"-F	14	20.7	4.8	1.9	8	14	4
NSCXX040XXXX1MN	4	10.3	8	NPT-M	6	25.2	4.8	1.9	7.5	14	4
NSCXX040XXXX1FN	4	10.3	8	NPT-F	14	20.7	4.8	1.9	8	14	4

Spring Plungers – NFSTE Series

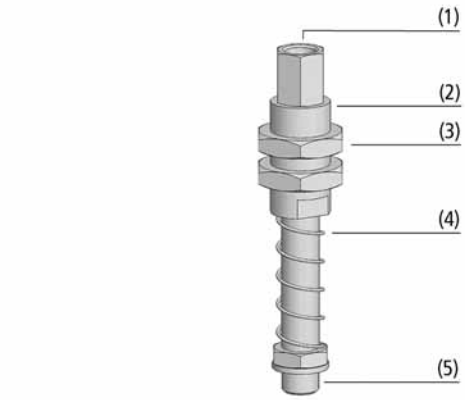
Stroke from 5 mm to 75 mm

Spring plungers are typically used as a means of compensating for applications that involve work-pieces of differing heights and also applications that involve easily damaged items such as sheets of glass. The spring plunger provides for a soft placement of the suction cup on the work-piece.

Design Features

Suction Cup Connection: M3, M5, G1/8 to G1/2; Plunger Stroke: 5 to 75 mm; Plunger rod with integrated vacuum feed; lower dampening spring; wide selection of connection threads and stroke lengths.

Mounting example spring plungers NFSTE



Design

- Spring plunger consisting of a high-strength rod made of galvanized steel, guide sleeve (2) and lower damping spring (4)
- Plunger rod with integrated vacuum feed, always female connection thread (1)
- Always female connection thread for suction cups (5) up to size M5, otherwise male thread
- Two lock nuts (3) for attachment

Mounting example spring plungers NFSTE

Technical Data – NFSTE Series

Type	Spring rate (N/mm)	Spring pretension (N)	Spring force (N)*	Vertical load (N)**	Horizontal load (N)***	Weight (g)	Operating temperature (ºC)
NFSTE005XXXXAFM	0.596	1.49	2.98	550	47	9	0-80
NFSTE005XXVGAFM	0.596	1.49	2.98	550	47	9	0-80
NFSTE005XXXXBFM	0.508	3.30	4.57	1500	132	16	0-80
NFSTE005XXVGBFM	0.508	3.30	4.57	1500	132	16	0-80
NFSTE010XXXXBFM	0.323	2.75	4.36	1500	97	19	0-80
NFSTE010XXVGBFM	0.323	2.75	4.36	1500	97	19	0-80
NFSTE020XXXXBFM	0.209	1.78	3.87	1500	63	25	0-80
NFSTE020XXVGBFM	0.209	1.78	3.87	1500	63	25	0-80
NFSTE015XXXX1MG	0.221	3.53	5.19	3700	385	80	0-80
NFSTE015XXVG1MG	0.221	3.53	5.19	3700	385	80	0-80
NFSTE025XXXX1MG	0.143	3.57	5.36	3700	283	90	0-80
NFSTE050XXXX1MG	0.097	2.92	5.34	3700	173	110	0-80
NFSTE050XXVG1MG	0.097	2.92	5.34	3700	173	110	0-80
NFSTE025XXXX2MG	0.711	6.47	15.36	2400	747	145	0-80
NFSTE025XXVG2MG	0.711	6.47	15.36	2400	747	144	0-80
NFSTE050XXXX2MG	0.452	1.40	12.70	2400	466	175	0-80
NFSTE075XXXX2MG	0.262	5.38	15.20	2400	340	190	0-80
NFSTE075XXVG2MG	0.262	5.38	15.20	2400	340	202	0-80
NFSTE025XXXX4MG	3.829	25.64	73.50	4900	1870	400	0-80
NFSTE075XXXX4MG	1.072	37.20	77.40	4900	800	530	0-80

*Referred to 50% of operating stroke
**Maximum static loading
***The specification of the horizontal stress refers to the lower edge of the plunger with extended spring. It is a maximum static stress and it impairs the spring compression and extension in horizontal position.

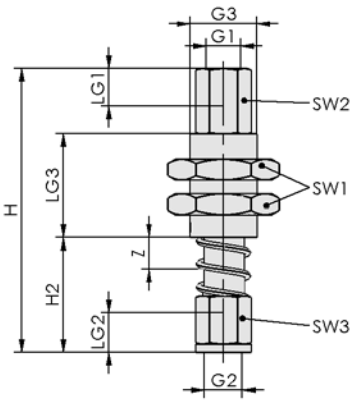
How to Order

NFSTE Series - Spring Plungers

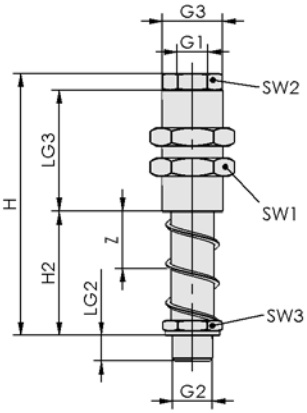
Series / Plunger Stroke (mm)	Spring Plunger Part Number	Thread Type / Port Size	Additional Features
NFSTE 5	NFSTE005XXVGAFM	M3-F	Anti-Rotation Guard
	NFSTE005XXVGBFM	M5-F	Anti-Rotation Guard
	NFSTE005XXXXAFM	M3-F	
	NFSTE005XXXXBFM	M5-F	
NFSTE 10	NFSTE010XXVGBFM	M5-F	Anti-Rotation Guard
	NFSTE010XXXXBFM	M5-F	
NFSTE 15	NFSTE015XXVG1MG	G1/8-M	Anti-Rotation Guard
	NFSTE015XXXX1MG	G1/8-M	
NFSTE 20	NFSTE020XXVGBFM	M5-F	Anti-Rotation Guard
	NFSTE020XXXXBFM	M5-F	
NFSTE 25	NFSTE025XXVG2MG	G1/4-M	Anti-Rotation Guard
	NFSTE025XXXX1MG	G1/8-M	
	NFSTE025XXXX2MG	G1/4-M	
	NFSTE025XXXX4MG	G1/2 -M	
NFSTE 50	NFSTE050XXVG1MG	G1/8-M	Anti-Rotation Guard
	NFSTE050XXXX1MG	G1/8-M	
	NFSTE050XXXX2MG	G1/4-M	
NFSTE 75	NFSTE075XXVG2MG	G1/4-M	Anti-Rotation Guard
	NFSTE075XXXX2MG	G1/4-M	
	NFSTE075XXXX4MG	G1/2 -M	

Dimensions: mm

NFSTE M3 to M5 (VG)



NFSTE G1/8 to G1/2 (VG)



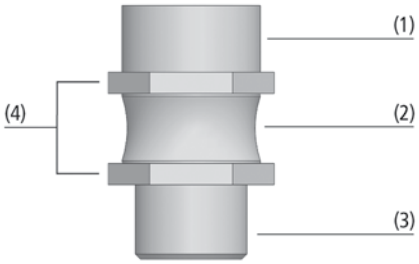
Type	G1	G2	G3	H	H2	LG1	LG2	LG3	SW1	SW2	SW3	Z (stroke)
NFSTE005XXXXAFM	M3-F	M3-F	M6x0.75-M	33.5	15	3.8	6	10	10	5	7	5
NFSTE005XXVGAFM	M3-F	M3-F	M6x0.75-M	33.5	15	3.8	6	10	10	5	7	5
NFSTE005XXXXBFM	M5-F	M5-F	G1/8-M	41.2	17	5.5	6.2	15	14	7	7	5
NFSTE005XXVGBFM	M5-F	M5-F	G1/8-M	41.2	17	5.5	6.2	15	14	7	7	5
NFSTE010XXXXBFM	M5-F	M5-F	G1/8-M	47.2	23	5.5	6.2	15	14	7	7	10
NFSTE010XXVGBFM	M5-F	M5-F	G1/8-M	47.2	23	5.5	6.2	15	14	7	7	10
NFSTE020XXXXBFM	M5-F	M5-F	G1/8-M	59.2	35	5.5	6.2	15	14	7	7	20
NFSTE020XXVGBFM	M5-F	M5-F	G1/8-M	59.2	35	5.5	6.2	15	14	7	7	20
NFSTE015XXXX1MG	G1/8"-F	G1/8"-M	M16x1-M	73.5	29.5	8	6.5	30	22	12	14	15
NFSTE015XXVG1MG	G1/8"-F	G1/8"-M	M16x1-M	73.5	28.5	8	6.5	30	22	12	14	15
NFSTE025XXXX1MG	G1/8"-F	G1/8"-M	M16x1-M	86.5	42.5	8	6.5	30	22	12	14	25
NFSTE050XXXX1MG	G1/8"-F	G1/8"-M	M16x1-M	117.5	73.5	8	6.5	30	22	12	14	50
NFSTE050XXVG1MG	G1/8"-F	G1/8"-M	M16x1-M	117.5	72.5	8	6.5	30	22	12	14	50
NFSTE025XXXX2MG	G1/8"-F	G1/4"-M	M20x1.5-M	86	40.5	13	8.5	40	24	17	17	25
NFSTE025XXVG2MG	G1/8"-F	G1/4"-M	M20x1.5-M	86	40.5	13	8.5	40	24	17	17	25
NFSTE050XXXX2MG	G1/8"-F	G1/4"-M	M20x1.5-M	115.5	70	13	8.5	40	24	17	17	50
NFSTE075XXXX2MG	G1/8"-F	G1/4"-M	M20x1.5-M	145	99.5	13	8.5	40	24	17	17	75
NFSTE075XXVG2MG	G1/8"-F	G1/4"-M	M20x1.5-M	145	99.5	13	8.5	40	24	17	17	75
NFSTE025XXXX4MG	G3/8"-F	G1/2"-M	M30x1.5-M	105.5	42.5	13	10.5	55	36	24	24	25
NFSTE075XXXX4MG	G3/8"-F	G1/2"-M	M30x1.5-M	176.5	113.5	13	10.5	55	36	24	24	75

Flexolink - NFLK Series

Connection Threads from G1/8 to G1/2

The Numatics NFLK Series is used for handling work pieces with sloping surfaces and differing heights (used in conjunction with suction cups or plates). It also helps to compensate when large work pieces sag after being engaged and lifted.

Flexolink NFLK for adaptation to sloping metal sheets



Design

- Flexible mounting made of high-quality steel with a rubber buffer (vulcanized into position) as a joint (2)
- Maximum deflection angle limited by a screw-in stop
- Force is transferred via a shaped metal connection within the joint
- Flats on upper and lower halves for damage-free installation (4)
- Connection thread for top connection (1) and (3) in various sizes
- Deflection (max.) 12°

Technical Data

NFLK

Type	Vertical Load (N)	Bending Moment (Nm)	Weight (g)
NFLK G1/4-F G1/4-M	750	10	30
NFLK G1/4-M G1/4-M	750	10	30
NFLK G1/2-F G1/2-M	3000	50	100
NFLK G1/2-M G1/2-M	3000	65	100

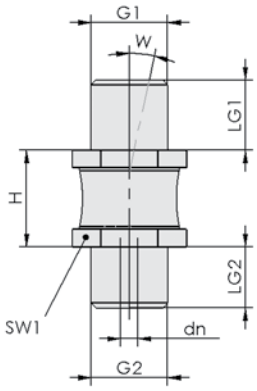
How to Order

NFLK

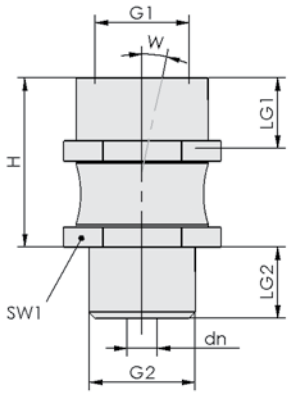
Flexolink Series	Part number	Thread Type / Port Size (1)	Thread Type / Port Size (2)
NFLK	NFLK1FG1MGXXXXX	G1/4-F	G1/4-M
	NFLK1MG1MGXXXXX	G1/4-M	G1/4-M
	NFLK4FG4MGXXXXX	G1/2-F	G1/2-M
	NFLK4MG4MGXXXXX	G1/2-M	G1/2-M

Dimensions: mm

NFLK M-M



NFLK F-M



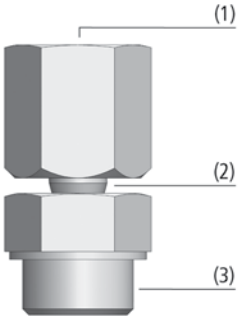
Type	dn	G1	G2	H	LG1	LG2	SW1	W [°]
NFLK1FG1MGXXXXX	3	G1/4"-F	G1/4"-M	27	12	12	17	12
NFLK1MG1MGXXXXX	3	G1/4"-M	G1/4"-M	16.5	10.5	12	17	12
NFLK4FG4MGXXXXX	6	G1/2"-F	G1/2"-M	33.5	14	14	27	12
NFLK4MG4MGXXXXX	5.5	G1/2"-M	G1/2"-M	21	14	14	27	12

Ball Joints - NKGL Series

Connection Threads from G1/8 to G1/2

The Numatics NKGL Series is used for handling work pieces with sloping surfaces (used in conjunction with suction cups or plates). It also helps to compensate when large work pieces sag after being engaged and lifted.

Mounting example ball joints NKGL



Design

- Ball and socket made of galvanized steel or stainless steel
- Ball and socket (2) with O-ring seal to prevent vacuum leaks
- Connection thread above (1) and below (3) in various sizes
- Deflection (max.) 15°

Technical Data

NKGL

Type	Vertical Load (N)	Weight (g)
NKGL G1/8-IG G1/8-AG A2	300	26
NKGL G1/4-IG G1/4-AG	1500	67
NKGL G1/2-IG G1/2-AG	2500	116

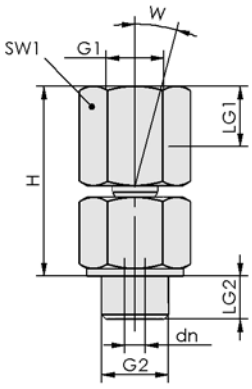
How to Order

NKGL

Ball Joint Series	Part number	Thread Type / Port Size (1)	Thread Type / Port Size (2)	Material
NKGL	NKGL1FG1MGA2XXX	G1/8-F	G1/8-M	Stainless Steel
	NKGL2FG2MGXXXXX	G1/4-F	G1/4-M	Galvanized Steel
	NKGL4FG4MGXXXXX	G1/2-F	G1/2-M	Galvanized Steel

Dimensions: mm

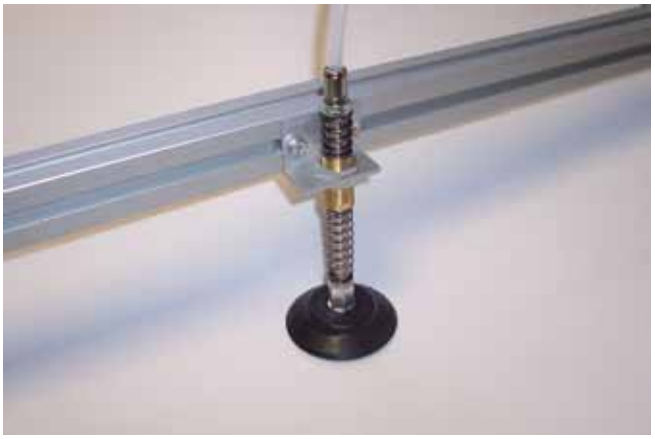
NKGL G1/8 to G1/2



Type	dn	G1	G2	H	LG1	LG2	SW1	W [°]
NKGL1FG1MGA2XXX	2.0	G1/8-F	G1/8-M	26.5	8.5	7	14	15
NKGL2FG2MGXXXXX	3.5	G1/4-F	G1/4-M	37.5	12	10	19	15
NKGL4FG4MGXXXXX	4	G1/2"-F	G1/2"-M	40	14	12	24	15

Holders for Spring Plungers /Suction Cups- NHTR Series

The Numatics NHTR Series are holders/brackets that allow for direct mountings of the spring plungers and suction cups. The holders are versatile and for quick turn around resulting is shorter set up times.



Mounting example holders NHTR

Design

- Size 47: sheet-steel holder with mounting holes
- Size 55-62: angled aluminum bracket with mounting holes
- Delivered complete with M8 mounting screw and position locking pin

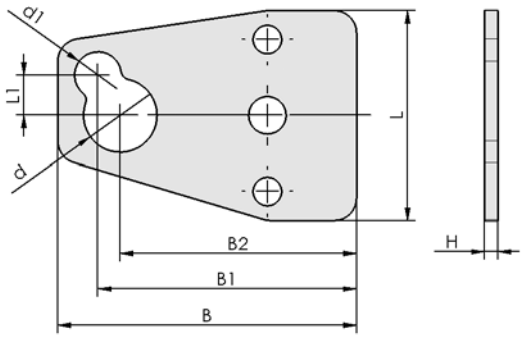
How to Order

NHTR

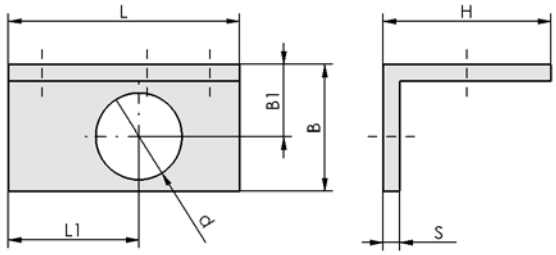
Series Holders	Part number	Dimensions (Length in mm)	Spring Plunger Connection Diameter (mm)	Shape
NHTR	NHTR471ND1016FL	47	D10/D16	Flat
	NHTR551ND200WIX	55	D20	Angle
	NHTR621ND300WIX	62	D30	Angle

Dimensions: mm

NHTR-STA FL



NHTR-STA WI



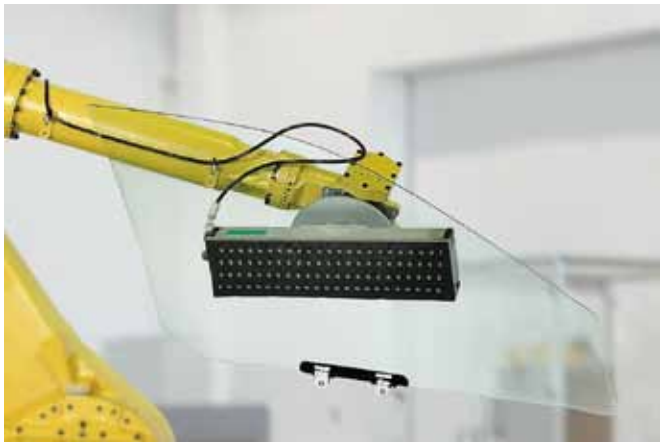
Type	B	B1	B2	d	d1	H	L	L1	s
NHTR471ND1016FL	67	58	53	17	11	3	47	9	-
NHTR551ND200WIX	30	17	-	21	-	40	55	31	4
NHTR621ND300WIX	50	27	-	31	-	40	62	40	5

Large Area Gripper – NFX Series

The NFX Series large area gripper is designed to handle a wide range of work piece dimensions and/or undefined positions. This product provides a reliable solution for handling work pieces with gaps. It works extremely well in handling cardboard, metal, wood, plastic and glass. The NFX gripper comes standard with integrated multi-stage ejectors.

Design Features

Robust aluminum structure provides strength, but also light weight allowing for fast cycle times.



Design

- Extruded aluminum frame/profile
- Integrated functions built-in to end covers
- Integrated plug-in ejector; easily replaceable
- Sealing plate
- Available with foam pad or suction cups
- Hole spacing on foam is 18 mm
- Foam height is 20 mm
- Suction cups – 1.5 Bellows – Packaging type; Elastodur material
- Available with two different valve configurations (SVK & SWX)
- Cost effective design (SWX) - Flow Resistor Technology
- Fast cycle times and rough work pieces (SVK)

Technical Data

NFX (Foam Pad and Suction Cups)

Type	Noise Level (db (A))	Max. Evacuation Level (%)
NFX	65	80

How to Order

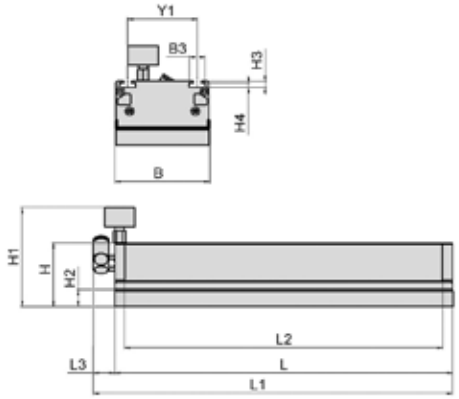
NFX Series – Large Area Gripper

Large Area Gripper Series	Part number	Sealing Plate (Foam) or Suction Cups	Feature	Numatics Description
NFX	NFXSVK43518XXXX	SEALING PLATE (FOAM)	SVK	Quick blow-off/fast cycle times for increased production speed; Good for porous or rough work pieces; high degree of air flow
	NFXSWX43518XXXX	SEALING PLATE (FOAM)	SWX	Flow screens for any installation position and high accelerations
	NFXSVK435541SP3	1.5 BELLOWS SUCTION CUPS	SVK	Quick blow-off/fast cycle times for increased production speed; Good for porous or rough work pieces; high degree of air flow
	NFXSWX435541SP3	1.5 BELLOWS SUCTION CUPS	SWX	Flow screens for any installation position and high accelerations

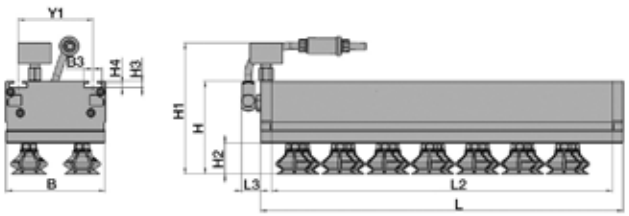
	Part number	Sealing Plate (Foam) or Suction Cups	Numatics Description
Accessories	NDIPL4351186XXX	Replacement Sealing Frame	Suitable for all NFX units
	NDIPL435181010F	Replacement Foam	Replacement Foam NFX435.5 18 O10O10 F
	NSPB1030XXE7XXX	Replacement Suction Cups	Packaging Cup-1.5 Bellows: 30mm, Diameter: 30mm, Elastodur: 65

Dimensions: mm

NFX (Foam Pads)

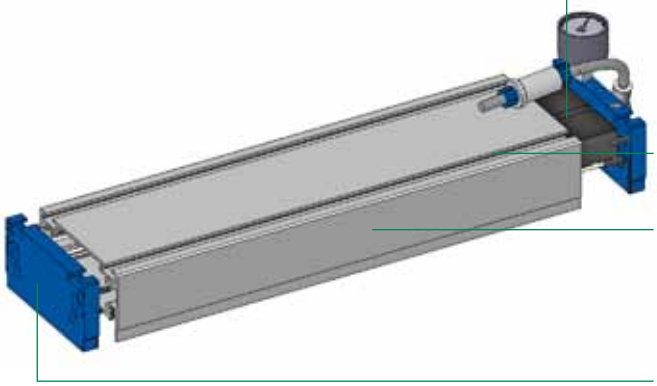


NFX (Suction Cups)



Type	B	B3	H	H1	H2	H3	H4	L	L1	L2	L3	Y1
NFXSWX43518XXXX	122	21	82	128	22	7.7	5.2	435.5	462.5	409.5	27	90
NFXSVK43518XXXX	122	21	82	128	22	7.7	5.2	435.5	462.5	409.5	27	90
NFXSWX435541SP3	120	21	112	158	37	7.7	5.2	435.5	-	409.5	23	90
NFXSVK435541SP3	120	21	112	158	37	7.7	5.2	435.5	-	409.5	23	90

NFX with Integrated Vacuum Generation



Vacuum generator
- Plug-in ejector with lightweight design
- Quickly replaceable
- Alternatively with up to 4 multi-stage ejectors for optimum performance adjustment

Vacuum display using vacuum manometer

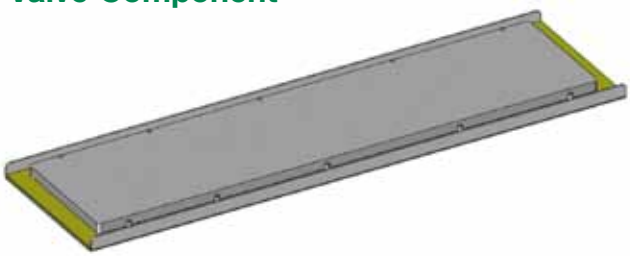
T-slot
- For flexible mechanical attachment of the gripper

Main body
- Made from extruded aluminium section
- Variable in width by combining units
- Variable in length

End cover with function modules
- For the “sensor”, “blow-off” and “separation” connections

+

Valve Component



Valve type SVK
- Quick blow-off and fast cycle times for increased production speed
- High degree of air passage for handling porous and rough workpieces

Valve type SWX
- Flow screens for any installation position and high accelerations

+

Sealing plate

Suction pads

Sealing plate (foam)
- Flexible and highly resistant
- Different grids according to the width of the work piece
- Quickly replaceable
- Optional: sealing plate with integrated filter screen to protect against contamination

Suction pads (elastomer)
- Soft, adaptable sealing lip
- Quickly replaceable

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Example:

Large-area vacuum gripping system
NFX with sealing plate

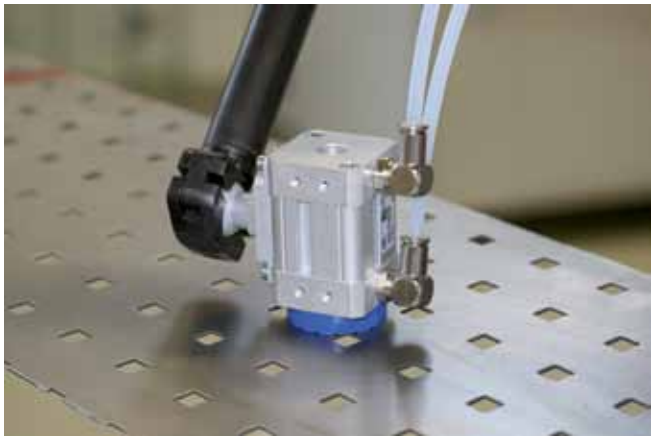
Example:

Large-area vacuum gripping system
NFX with suction pads

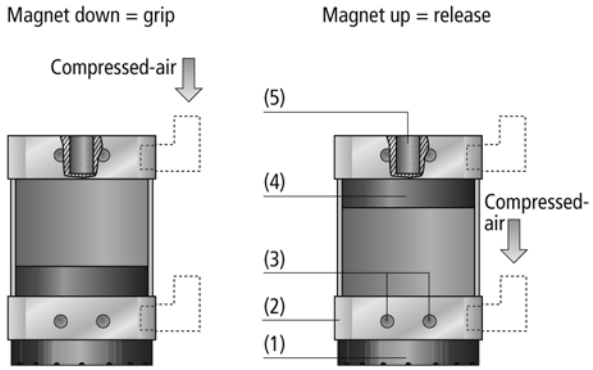
Magnetic Grippers - NSGMX Series

Suction Area from 30mm to 70mm

The NSGMX series is a magnetic gripper that is provides a great solution for applications where suction cups are not practical. This type of gripper is used for handling ferromagnetic work pieces. This gripper is lightweight and provides for safe gripping via a permanent magnet. No electric power is required. Examples of applications include perforated metal sheets, laser-cut work pieces and metal sheets with holes.



Magnetic grippers NSGM being used for handling perforated metal sheets



Design

- Robust aluminum housing (2) with permanent magnet (4)
- Clip-on, easy to replace friction ring (1)
- Bistable design: the magnet settings “grip” and “release” are maintained in event of power loss
- Standard connection threads (5) in top cover
- Mounting threads (3) for holder systems NHTS on 3 sides
- The holder system NHTS offers several options for mounting a gripper onto the gripping apparatus

Technical Data – Magnetic Grippers

Type	Holding Force (N)*	Remaining Force (N)	Operating Pressure (bar)	Control Pressure Range (bar)	Installation Position	Principle of Operation	Operating Temperature (ºC)	Weight (g)
NSGMX 30	35	0.3	3.5-6	-0.6	Any	Bistable	5-70	130
NSGMX 40	100	0.3	3.5-6	-0.6	Any	Bistable	5-70	240
NSGMX 50	180	0.3	3.5-6	-0.6	Any	Bistable	5-70	440
NSGMX 70	290	0.3	3.5-6	-0.6	Any	Bistable	5-70	715

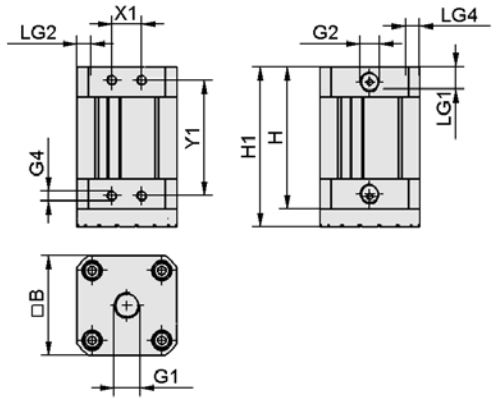
*Note: The value given is a statistical value with no safety factor; based on a plate with a thickness of 2 mm. For system configurations with magnetic grippers SGM, a safety factor of S = 3 must be applied.

How to Order

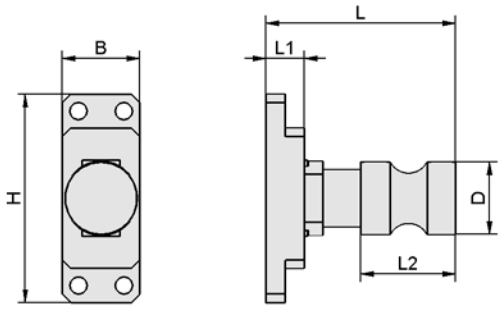
Magnetic Gripper Series	Part Number	Diameter (mm)	Connection (G1)	Connection (G2)	Replacement "Friction Ring"	Gripper - Holder System
NSGMX	NSGMXXXX30XG1FG	30	G1/8-F	G1/8-F	NREIBRINGSGM30X	NHTSA2SGM3040XX
	NSGMXXXX40XG2FG	40	G1/4-F	G1/8-F	NREIBRINGSGM40X	NHTSA2SGM3040XX
	NSGMXXXX50XG2FG	50	G1/4-F	G1/8-F	NREIBRINGSGM50X	NHTSA2SGM5070XX
	NSGMXXXX70XG2FG	70	G1/4-F	G1/8-F	NREIBRINGSGM70X	NHTSA2SGM5070XX

Dimensions: mm

NSGM 30 to 70



NHTS-A2

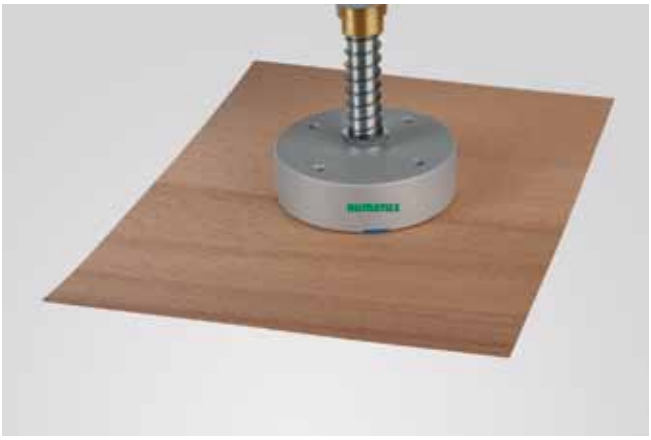


Type	B*	G1	G2	G4	H	H1	LG1	LG2	LG4	X1	Y1
NSGMXXXX30XG1FG	30	G1/8"-F	G1/8"-F	M4-F	61.4	70.2	7	6	5	12	46
NSGMXXXX40XG2FG	40.6	G1/4"-F	G1/8"-F	M4-F	61.4	70.2	11	6	7	12	46
NSGMXXXX50XG2FG	50.6	G1/4"-F	G1/8"-F	M5-F	71.4	80.2	11	6	7	15	58
NSGMXXXX70XG2FG	68.7	G1/4"-F	G1/8"-F	M5-F	71.4	80.2	11	6	8	15	58

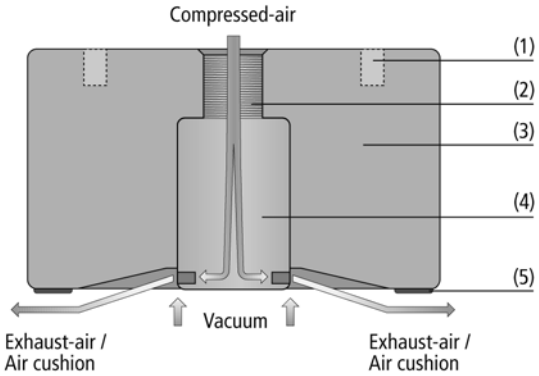
Floating Grippers - NSBSX Series

Diameter 30mm to 60mm

The Numatics NSBSX series floating gripper is designed for handling thin delicate work pieces without deforming them. It generates vacuum based on the Bernoulli principle. It has a high flow rate and low vacuum. This floating gripper is available in diameter sizes from 30mm to 60mm. Examples of applications includes the handling of very porous materials, such as circuit boards or highly sensitive work pieces like wafers or solar cells.



Floating suction cups NSBSX being used for handling thin wood veneer



Design

- Connection directly via four mounting threads on the top side (1)
- Vertical compressed-air connections (2)
- Horizontal compressed air connection (closed with a plug)
- Anodized aluminum body with integrated Bernoulli nozzle (3)
- Streaming element (4)
- Mark-free rubber buffer of special material on the bottom side of the Gripper (5)

Technical Data – Floating Grippers

Type	Holding Force (N)*	Air Consumption (l/min)*	Operating Pressure (bar)	Weight (g)
NSBSX030XSFXBFM	4.0	100	1-6	31
NSBSX040XSFG1FG	6.5	100	1-6	51
NSBSX060XSFG1FG	13.0	150	1-6	118

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

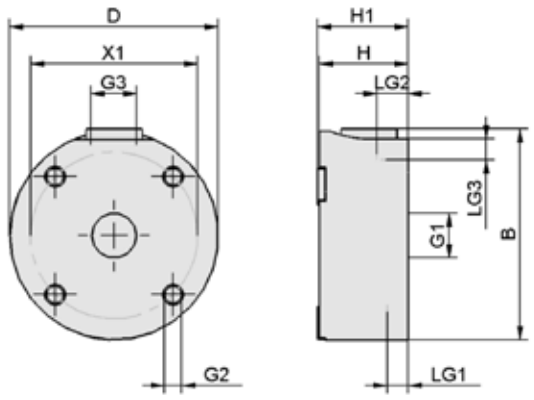
How to Order

NSBSX Series - Floating Grippers

Floating Gripper Series	Part Number	Diameter (mm)	Thread Type / Port Size	Holding Force (N)	Operating Pressure (Bar)
NSBSX	NSBSX030XSFXBFM	30	M5-F	4	1 to 6
	NSBSX040XSFG1FG	40	G1/8-F	6.5	1 to 6
	NSBSX060XSFG1FG	60	G1/8-F	13	1 to 6

Dimensions: mm

NSBSX 30 to 100



Type	B	D	G1	G2	G3	H	H1	LG1	LG2	LG3	X1
NSBSX030XSFXBFM	21.7	20	M5-F	M3-F	M5-F	17	17.4	5	6	6	15
NSBSX040XSFG1FG	40.5	40	G1/8"-F	M4-F	G1/8"-F	17	17.4	5	6	6	32
NSBSX060XSFG1FG	61.1	60	G1/8"-F	M4-F	G1/8"-F	17	17.4	5	6	6	45

Miniature Vacuum Switches/Sensors - NVS-V-SA/SD Series

The Numatics NVS-V-SA/SD series is a mini sensor with housing and connector cable. Examples of applications include the measurement of vacuum values close to the suction cup, remote evaluation of signals, in addition to being used in most other areas of automated handling.

NVSV SA / SD

Design

- Electronic vacuum switch for measurement of vacuum values close to the suction cup
- Remote evaluation of the signals
- Processing of output signals in, for example, a stored-program controller
- Ideal for outputting part-presence signals
- For use in all areas of automated handling

Technical Data

NVS-V-SA/SD

Type	NVSVSA00M5XXXXX	NVSVSA00D4XXXXX	NVSVSD60M5XXXXX	NVSVSD60D4XXXXX
Measured medium	Non-aggressive gases; dry, oil-free air	Non-aggressive gases; dry, oil-free air	Non-aggressive gases; dry, oil-free air	Non-aggressive gases; dry, oil-free air
Measuring range	-1-0 bar	-1-0 bar	-1-0 bar	-1-0 bar
Max. overpressure resistance (bar)	5	5	5	5
Repeatability	± 1% of full-scale value	± 1% of full-scale value	± 1% of full-scale value	± 1% of full-scale value
Hysteresis	-	-	Fixed: approx. 20 mbar	Fixed: approx. 20 mbar
Output signal	Analog: 1-5 V	Analog: 1-5 V	1 digital	1 digital
Switching capacity (mA)	-	-	60	60
Point attitude	-	-	- 600 mbar	- 600 mbar
Indication	-	-	LED	LED
Electrical connection	Cable	Cable	Cable	Cable
Voltage	10-24V DC	10-24V DC	10-24V DC	10-24V DC
Protection IP	IP 40	IP 40	IP 40	IP 40
Temperature influence	± 3% of full-scale value	± 3% of full-scale value	± 3% of full-scale value	± 3% of full-scale value
Operating temperature (°C)	0-50 °C	0-50 °C	0-50 °C	0-50 °C
Length of cable (m)	3	3	3	3
Weight (g)	5	5	5	5

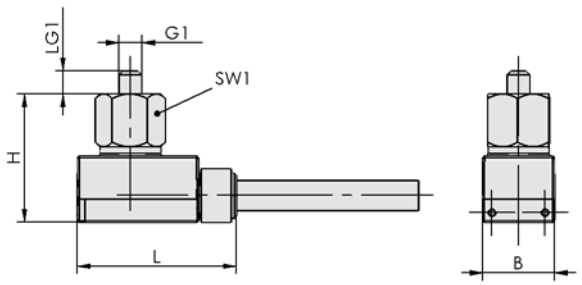
How to Order

NVS-V-SA/SD Series - Miniature Vacuum Switches/Sensors

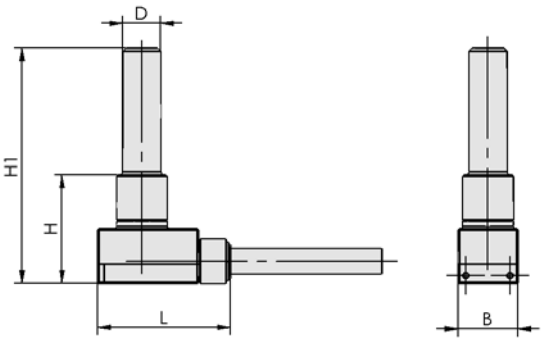
Vacuum Switches / Sensors	Part Number	Measuring Range (Bar)	Principle of Function	Switching Point (mBar)	Vacuum Connection
NVS-V-SA/SD	NVSVSA00M5XXXXX	-1 to 0	Analog		M5-M
	NVSVSA00D4XXXXX	-1 to 0	Analog		4mm Plug-in Tube
	NVSVSD60M5XXXXX	-1 to 0	Digital	-600	M5-M
	NVSVSD60D4XXXXX	-1 to 0	Digital	-600	4mm Plug-in Tube

Dimensions: mm

NVS-V-SA/SD - M5



NVS-V-SA/SD - D4



Type	B	D	G1	H	H1	L	LG1	SW1
NVSVSA00M5XXXXX	9.5	-	M5-M	16.9	-	21	5	8
NVSVSA00D4XXXXX	9.5	4	-	17.2	32.2	21	-	-
NVSVSD60M5XXXXX	9.5	-	M5-M	16.9	-	21	5	8
NVSVSD60D4XXXXX	9.5	4	-	17.2	32.2	21	-	-

Vacuum Switches - NVS-V-AH / AV-T Series

The NVS-V-AH / AV-T vacuum switch/sensor works very well in dynamic handling systems and can be used as a measuring or switching element. This product offers two digital switch outputs and a switching capacity of 200mA.

NVS-V-AH / AV-T

Technical Data

NVS-V-AH / AV-T

Type	NVSV00AHTPNPSXX	NVSV00AVTPNPSXX
Measured medium	Non-aggressive gases; dry, oil-free air	Non-aggressive gases; dry, oil-free air
Measuring range	-1-0 bar	-1-0 bar
Max. overpressure resistance (bar)	5	5
Repeatability	± 1% of full-scale value	± 1% of full-scale value
Hysteresis	Fixed: approx. 20 mbar	Fixed: approx. 20 mbar
Output signal	2 digital	2 digital
Switching capacity (mA)	200	200
Indication	LED	LED
Electrical connection	Male connect M8, 4 pole	Male connect M8, 4 pole
Voltage	10-30V DC	10-30V DC
Current consumption (mA)	20	20
Protection IP	IP 40	IP 40
Temperature influence	± 3% of full-scale value	± 3% of full-scale value
Operating temperature (ºC)	0-60 °C	0-60 °C
Weight (g)	6	6

Design

- Plastic housing in 10 mm design
- Adapter plate for quick mounting, either vertically or horizontally
- Teach button integrated into the cover
- Transparent cover over the LED indicator
- Power and control connections via 4-pin M8 connector
- Optionally available with M5 vacuum connection or 6 mm plug-in tube

How to Order

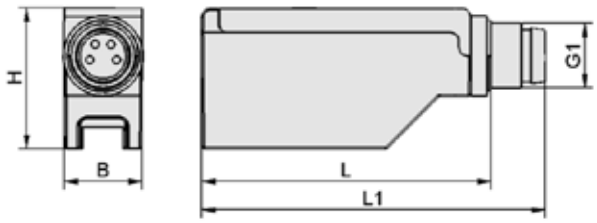
NVS-V-AH / AV-T Switches/Sensors

Vacuum Switches / Sensors	Part Number	Measuring Range (Bar)	Connection	Switching Point Adjustment	Switching Function	Standard Feature
NVS-V-AH/AV-T	NVSV00AHTPNPSXX	0 to 10	Horizontal	Teach button	PNP	Fixed hysteresis
	NVSV00AVTPNPSXX	0 to 10	Vertical	Teach button	PNP	Fixed hysteresis

Product Family Name	Part Number	Description	Comments
Accessories	NASKBM8450PURGE	Cable M8 4 5M PUR GE	Straight Connection
	NASKBM8450PURWX	Cable M8 4 5M PUR W	Right Angle Connection
	NADAPVS61316XXX	6mm Plug-in tube	Connection Adapter
	NADAPVSX1316BMM	M5-M	Connection Adapter

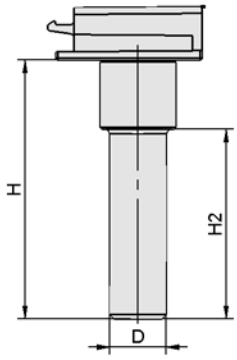
Dimensions: mm

NVS-V-AH/AV-T

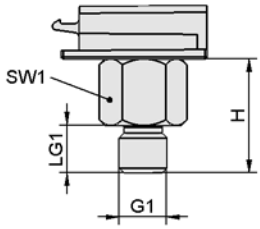


Type	B	G1	H	L	L1
NVS-V-AH-T-PNP-S	10	M8-M	17.5	36.2	43
NVS-V-AV-T-PNP-S	10	M8-M	16.4	41.2	48

NADAP-VS 6-1.3x16



NADAP-VS M5-AG-1.3x16



Type	D	G1	H	H2	LG1	SW1
NADAP-VS 6-1.3x16	6	-	27.3	20.0	-	-
NADAP-VS M5-AG-1.3x16	-	M5-M	12.0	-	5.0	8

Vacuum Switches - NVS-V Series

The NVS-V electronic vacuum switch provides precise measurement comes with analog and digital outputs. This series can easily adapt to customer applications with the adjustable hysteresis and switching points. Its small size and low weight permit use directly on the suction cup.

NVS-V

Technical Data

NVS-V

Type	NVS-V
Measured medium	Non-aggressive gases; dry, oil-free air
Measuring range	-1-0 bar
Max. overpressure resistance (bar)	5
Repeatability	± 1% of full-scale value
Hysteresis	Adjustable: 3 to 25% of set value
Output signal	1 anal./1 dig 1-5V
Switching capacity (mA)	125
On time (ms)	5
Indication	LED
Electrical connection	Male connect M8, 4 pole
Measured medium connection	G1/8" male + M5 fem.
Voltage	10.8-30V DC
Current consumption (mA)	30
Protection IP	IP 40/65 (with hose)
Temperature influence	± 3% of full-scale value
Operating temperature (°C)	0-50 °C
Weight (g)	18

Design

- Electronic vacuum switch in robust polycarbonate housing
- Vacuum connection with flange or G1/8" male thread; both versions with additional M5 female thread
- Switching point and hysteresis adjustable with screws
- Supply voltage via 4-pin M8 screw connector
- Integrated LED for indication of the switching state
- Venting plug (reference air, IP 65) for screwing into switch housing

How to Order

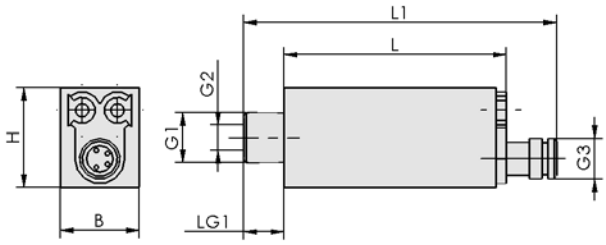
NVS-V Switches/Sensors

Vacuum Switches / Sensors	Part Number	Measuring Range (Bar)	Vacuum Connection	Switching Function
NVS-V	NVSVPNPXXXXXXXX	-1 to 0	G1/8-M	PNP

Product Family Name	Part Number	Description	Comments
Accessories	NASKBM8450PURGE	Cable M8 4 5M PUR GE	Straight Connection
	NASKBM8450PURWX	Cable M8 4 5M PUR W	Right Angle Connection

Dimensions: mm

NVS-V



Type	B	G1	G2	G3	H	L	L1	L3	LG1
NVS-V-PNP	15.7	G1/8"-M	M5-F	M8x1-M	19.7	44	62	-	8

Vacuum Switches - NVS-V-D Series

The NVS-V-D electronic vacuum switch with digital display provides precise measurement. Switching point and hysteresis is programmable with foil keypad, in addition to offering two separately programmable outputs. This series can easily adapt to customer applications with the adjustable hysteresis and switching points. Its small size and low weight permit use directly on the suction cup.

NVS-V-D

Design

- Electronic vacuum switch in a robust polycarbonate housing
- Vacuum connection with G1/8" male thread; additional M5 female thread
- 3-digit display and foil keypad on the front for adjustment of the settings
- Integrated LED for indication of the switching state
- Supply voltage via 4-pin M8 screw connector
- Compact construction and low weight

Technical Data

NVS-V-D

Type	NVSV00DPNPXXXXX
Measured medium	Non-aggressive gases; dry, oil-free air
Measuring range	-1-0 bar
Max. overpressure resistance (bar)	5
Repeatability	± 1% of full-scale value
Hysteresis	Adjustable: 0 to 100% of set value or comparator mode
Output signal	2 digital
Switching capacity (mA)	180
Indication	2xLED
Display resolution	0 bar, 5 mmHg, 0.2 inHg, 1 kPa
Display units	bar, mmHg, inHg, kPa
Measured-value display	3-digit 7-segment LED
Electrical connection	Male connect M8, 4 pole
Measured medium connection	G1/8" male + M5 fem.
Voltage	10.8-30V DC
Current consumption (mA)	30
Protection IP	IP 40/65 (with hose)
Temperature influence	± 3% of full-scale value in the range 0 to 50°C
Operating temperature (°C)	0-50 °C
Weight (g)	25

How to Order

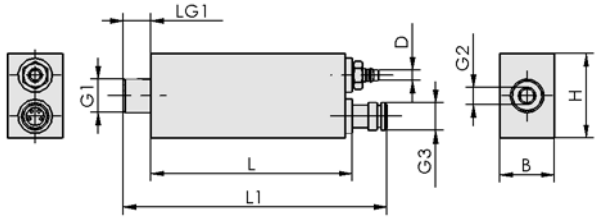
NVS-V-D Switches/Sensors

Vacuum Switches / Sensors	Part Number	Measuring Range (Bar)	Vacuum Connection	Switching Function	Standard Feature
NVS-V-D	NVSV00DPNPXXXXX	-1 to 0	G1/8-M & M5-F	PNP	Digital Display

Product Family Name	Part Number	Description	Comments
Accessories	NASKBM8450PURGE	Cable M8 4 5M PUR GE	Straight Connection
	NASKBM8450PURWX	Cable M8 4 5M PUR W	Right Angle Connection

Dimensions: mm

NVS-V-D



Type	B	D	G1	G2	G3	H	L	L1	LG1
NVS-V-D	16	3.4	G1/8"-M	M5-F	M8x1-M	24.7	58.5	75.5	8

Pressure Switches - NVS-P10-D Series

The NVS-P10-D electronic pressure switch with digital display provides precise measurement. Switching point and hysteresis is programmable with foil keypad, in addition to offering two separately programmable outputs. This series can easily adapt to customer applications with the adjustable hysteresis and switching points. Compact construction and low weight permit use directly on suction cup.

NVS-P10-D

Design

- Electronic pressure switch in robust polycarbonate housing
- Pressure connection via G1/8" male thread, additional M5 female thread
- Display with three digits and foil keypad on front for setting the values
- Integrated LED for indication of the switching state
- Electrical connections via 4-pin M8 screw connector

Technical Data

NVS-P10-D

Type	NVSP10DPNPXXXXX
Measured medium	Non-aggressive gases; dry, oil-free air
Measuring range	0-10 bar
Max. overpressure resistance (bar)	16
Repeatability	± 1% of full-scale value
Hysteresis	Adjustable: 0 to 100% of set value or comparator mode
Output signal	2 digital
Switching capacity (mA)	180
Indication	2xLED
Display resolution	0 bar, 1 psi, 0.05 kgf/cm2, 0.01 Mpa
Display units	bar, psi, kgf/cm2, Mpa
Measured-value display	3-digit 7-segment LED
Electrical connection	Male connect M8, 4 pole
Measured medium connection	G1/8" male + M5 fem.
Voltage	10.8-30V DC
Current consumption (mA)	55
Protection IP	IP 40/65 (with hose)
Temperature influence	± 3% of full-scale value in the range 0 to 50°C
Operating temperature (ºC)	0-50 °C
Weight (g)	25

How to Order

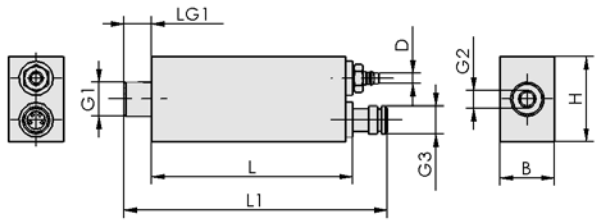
NVS-P10-D Series

Pressure Switch	Part Number	Measuring Range (Bar)	Pressure Connection	Switching Function	Standard Feature
NVS-P10-D	NVSP10DPNPXXXXX	0 to 10	G1/8-M & M5-F	PNP	Digital Display

Product Family Name	Part Number	Description	Comments
Accessories	NASKBM8450PURGE	Cable M8 4 5M PUR GE	Straight Connection
	NASKBM8450PURWX	Cable M8 4 5M PUR W	Right Angle Connection

Dimensions: mm

NVS-P10-D



Type	B	D	G1	G2	G3	H	L	L1	LG1
NVS-P10-D	16	3.4	G1/8"-M	M5-F	M8x1-M	24.7	58.5	75.5	8

Vacuum Switches - NVS-V-PM-NO / NC Series

The NVS-V-PM-NO / NC vacuum switch is a pneumatic-type version. No electric connections are required; just a purely pneumatic operation. This switch can be used as a measuring and switching element.

NVS-V-PM NO / NC

Technical Data

NVS-V-PM-NO / NC

Type	NVS-V-PM-NC	NVS-V-PM-NO
Measured medium	Non-aggressive gases; dry, oil-free air	Non-aggressive gases; dry, oil-free air
Measuring range	-1-0 bar	-1-0 bar
Max. overpressure resistance (bar)	6	6
Repeatability	± 3% of full-scale value	± 3% of full-scale value
Hysteresis	Fixed: approx. 40 mbar	Fixed: approx. 10 mbar
Switching capacity (mA)	-	-
Switching frequency (Hz)	-	-
Electrical connection	-	-
Measured medium connection	M5-F	M5-F
Control pressure range	1.5-8 bar	1.5-8 bar
Voltage	-	-
Max. flow rate (l/min)	100	100
Protection IP	-	-
Operating temperature (°C)	0-60 °C	0-60 °C
Weight (g)	33	33

Design

- Vacuum switch in pneumatic (PM) version
- NVS-V-PM with pneumatic output in NO or alternatively NC version
- Robust and hard-wearing plastic housing

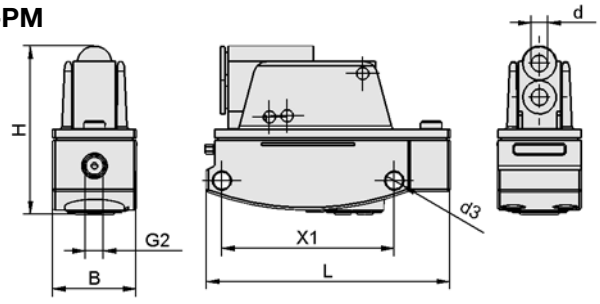
How to Order

NVS-V-PM-NO / NC Series

Pressure Switch	Part Number	Measuring Range (Bar)	Pressure Connection	Switching Function	Principle of Operation
NVS-V-PM-NC/NO	NVSVPMNCXXXXXXX	-1 to 0	M5-F	Normally Closed	Pneumatic
	NVSVPMNOXXXXXXX	-1 to 0	M5-F	Normally Open	Pneumatic

Dimensions: mm

NVS-V-PM



Type	B	d	d3	G2	H	X1	L
VS-V-PM-NC	19.8	4	4.2	M5-F	40	41	58
VS-V-PM-NO	19.8	4	4.2	M5-F	40	41	58

Vacuum/Pressure Switches - NVS-P Series

The NVS-P is an electronic vacuum and pressure switch that provides switching and precise measurements, and provides analog and digital outputs. This series is typically used for monitoring the pressure and vacuum in a system. It can be used for all types of automated handling.

NVS-P

Technical Data

NVS-P

Type	NVS-P
Measured medium	Non-aggressive gases; dry, oil-free air
Measuring range	-1-10 bar
Max. overpressure resistance (bar)	16
Repeatability	± 1% of full-scale value
Hysteresis	Adjustable: 3 to 25% of set value
Output signal	1 anal./1 dig 1-5V
Switching capacity (mA)	125
On time (ms)	5
Indication	LED
Electrical connection	Male connect M8, 4 pole
Measured medium connection	G1/8" male + M5 fem.
Voltage	10.8-30V DC
Current consumption (mA)	30
Protection IP	IP 40/65 (with hose)
Temperature influence	± 3% of full-scale value
Operating temperature (°C)	0-50 °C
Weight (g)	18

Design

- Electronic vacuum and pressure switch in a robust polycarbonate housing
- Pressure-line connection with flange or with G1/8" male thread; both versions with additional M5 female thread
- Switching point and hysteresis adjustable with screws
- Power input via 4-pin M8 screw connector
- Indication of the switching state with integrated function LED
- Venting plug (reference air, IP 65) for screwing into switch housing
- Compact construction and low weight

How to Order

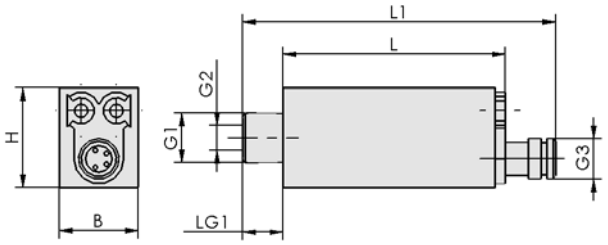
NVS-P Series

Vacuum & Pressure Switch	Part Number	Measuring Range (Bar)	Vacuum Connection	Switching Function
NVS-P	NVSPPNPXXXXXXXX	-1 to 10	G1/8-M & M5-F	PNP

Product Family Name	Part Number	Description	Comments
Accessories	NASKBM8450PURGE	Cable M8 4 5M PUR GE	Straight Connection
	NASKBM8450PURWX	Cable M8 4 5M PUR W	Right Angle Connection

Dimensions: mm

NVS-P



Type	B	G1	G2	G3	H	L	L1	LG1
NVS-P	15.7	G1/8"-M	M5-F	M8x1-M	19.7	44	62	8.0

Vacuum Switches - NVS-P10-AH / AV-T

The The NVS-P10-AH / AV-T electronic pressure switch is used for safety monitoring in pressure systems. It is suitable for both measuring and switching.

NVSP10AHTPNPSXX

NVSP10AVTPNPSXX

Design

- Plastic housing in 10 mm design
- Adapter plate for quick mounting, either vertically or horizontally
- Teach button integrated into the cover
- Transparent cover over the LED indicator
- Power and control connections via 4-pin M8 connector
- Available with 6 mm plug-in tube or M5 pneumatic connection

Technical Data

NVS-P10-AH / AV-T

Type	NVSP10AHTPNPSXX	NVSP10AVTPNPSXX
Measured medium	Non-aggressive gases; dry, oil-free air	Non-aggressive gases; dry, oil-free air
Measuring range	0...10 bar	0...10 bar
Max. overpressure resistance (bar)	15	15
Repeatability	± 1% of full-scale value	± 1% of full-scale value
Hysteresis	Fixed: 2% of full-scale value	Fixed: 2% of full-scale value
Output signal	2 digital	2 digital
Switching capacity (mA)	200	200
Indication	2xLED	2xLED
Electrical connection	Male connect M8, 4 pole	Male connect M8, 4 pole
Voltage	10-30V DC	10-30V DC
Current consumption (mA)	-	-
Protection IP	IP 40	IP 40
Temperature influence	± 3% of full-scale value	± 3% of full-scale value
Operating temperature (ºC)	0...60 °C	0...60 °C
Weight (g)	6	6

How to Order

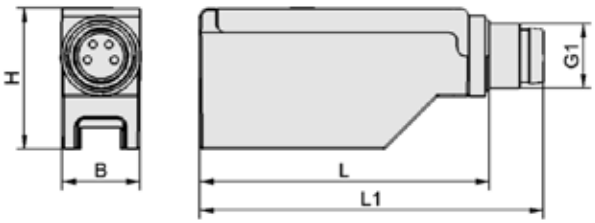
NVS-P10-AH / AV-T Series

Vacuum & Pressure Switch	Part Number	Measuring Range (Bar)	Vacuum Connection	Switching Function	Standard Feature
NVS-P10-AH / AV-T	NVSP10AHTPNPSXX	0 to 10	Horizontal	PNP	Fixed hysteresis
	NVSP10AVTPNPSXX	0 to 10	Vertical	PNP	Fixed hysteresis

Product Family Name	Part Number	Description	Comments
Accessories	NASKBM8450PURGE	Cable M8 4 5M PUR GE	Straight Connection
	NASKBM8450PURWX	Cable M8 4 5M PUR W	Right Angle Connection
	NADAPVS61316XXX	6mm Plug-in tube	Connection Adapter
	NADAPVSX1316BMM	M5-M	Connection Adapter

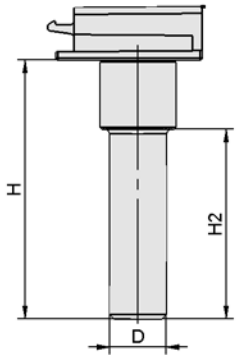
Dimensions: mm

NVS-P10-AH/AV-T

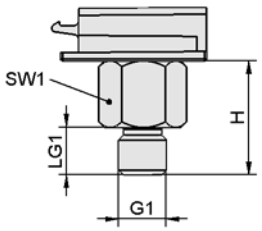


Type	B	G1	H	L	L1
NVS-P10-AH-T-PNP-S	10	M8-M	17.5	36.2	43
NVS-P10-AV-T-PNP-S	10	M8-M	16.4	41.2	48

NADAP-VS 6-1.3x16



NADAP-VS M5-AG-1.3x16



Type	D	G1	H	H2	LG1	SW1
NADAP-VS 6-1.3x16	6	-	27.3	20.0	-	-
NADAP-VS M5-AG-1.3x16	-	M5-M	12.0	-	5.0	8

Vacuum Regulators - NVRG Series

The NVRG series vacuum regulator is used to compensate for pressure variations in vacuum generators. It is a mechanically adjustable regulator that provides precise constant regulation with good repeatability.

Vacuum Regulators NVR

Design

- Vacuum regulator in a robust aluminum housing; diaphragm made of FPM
- Continuous adjustment with the aid of a spindle

Technical Data

Vacuum Regulators NVR

Type	Work area	Repeatability	Max. flow rate (l/min)	Max. flow rate (m3/h)	Operating temp.	Weight (kg)	Max. pressure (bar)
NVRGXXXXXXHW2FG	-950 – -25 mbar	± 2% of full-scale value	200	12.0	5-60 °C	0.20	5
NVRGXXXXXXHW3FG	-990 – -14 mbar	5.0 mbar	270	16.2	5-60 °C	0.65	5

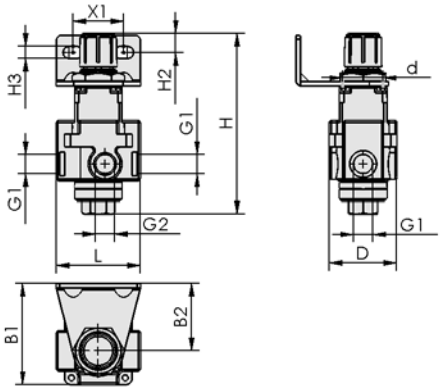
How to Order

NVRG Series

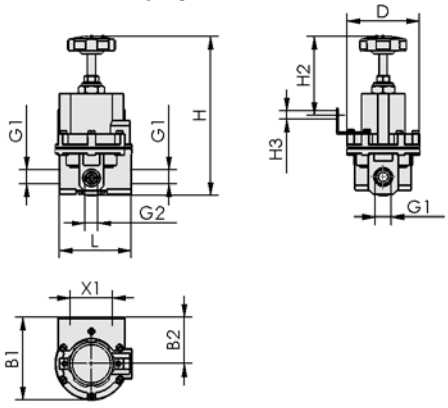
Vacuum Regulators	Part Number	Adjustable Range (mBar)	Vacuum Connection	Max Flow (l/min)	Standard Feature
NVRG	NVRGXXXXXXHW2FG	-950 to -25	G1/4-F	200	Bracket
	NVRGXXXXXXHW3FG	-990 to -14	G3/8-F	270	Bracket

Dimensions: mm

NVRGXXXXXXHW2FG



NVRGXXXXXXHW3FG



Type	B1	B2	d	D	G1	G2	H	H2	H3	L	X1
NVRGXXXXXXHW2FG	60	40	24	40	G1/4"-F	G1/4"-F	109	11.4	7	50	30
NVRGXXXXXXHW3FG	87.2	49	-	76.4	G3/8"-F	G3/8"-F	168	83.3	9	76	45

Vacuum Filters - NVFTX Series

Suction Rate from 1.6 to 21 SCFM

Vacuum filters are used to protect the vacuum generators (typically electric vacuum pumps) from foreign matter that could damage the pump. These filters with 80µ elements can be used to filter vacuum or compressed air up to 7 bar.

Design

- Vacuum filter housing & bowl - clear nylon
- Filter element material - polyethylene (80µ)

How to Order

NVFTX Series – Vacuum Filters

Filter Series	Part Number	Thread Type / Port Size	Filter Element	Replacement Filter Element	Replacement Holder (includes 2 mtg screws)
NVFTX	NVFTXXXXXX801FG	G1/8-F	80µ	NFILT802537PE12	NHTRFI2SWIV1812
	NVFTXXXXXX802FG	G1/4-F	80µ	NFILT802537PE13	NHTRFI2SWIV1813
	NVFTXXXXXX803FG	G3/8-F	80µ	NFILT802571PE34	NHTRFI2SWIV1814
	NVFTXXXXXX804FG	G1/2-F	80µ	NFILT802571PE35	NHTRFI2SWIV1815
	NVFTXXXXXX805FG	G3/4-F	80µ	NFILT803989PE5X	NHTRFI2SWIV34XX

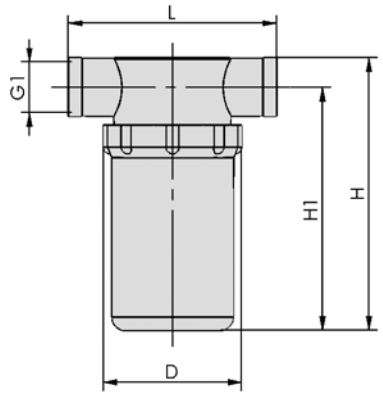
Technical Data

NVFTX Series – Vacuum Filters

Type	Filter pore size (µm)	Nominal flow rate (l/min)	Nominal flow rate [m3/h]	Max. vacuum (mbar)	Max. overpressure at 25°C (bar)	Max. overpressure at 50°C (bar)	Weight (kg)
NVFTXXXXXX801FG	80	45	2.7	-990	7	5	49
NVFTXXXXXX802FG	80	110	6.6	-990	7	5	47
NVFTXXXXXX803FG	80	245	14.7	-990	7	5	79
NVFTXXXXXX804FG	80	300	18.0	-990	7	5	76
NVFTXXXXXX805FG	80	600	36.0	-990	7	5	164

Dimensions: mm

NVFT G1/8 to G3/4

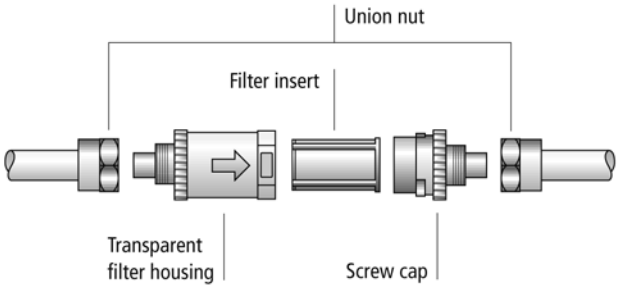


Type	D	G1	H	H1	L
NVFTXXXXXX801FG	48.0	G1/8-F	60	50	76.0
NVFTXXXXXX802FG	48.0	G1/4-F	60	50	76.0
NVFTXXXXXX803FG	48.5	G3/8-F	101	88	77.2
NVFTXXXXXX804FG	48.0	G1/2-F	101	88	77.2
NVFTXXXXXX805FG	75.0	G3/4-F	137	118	90.5

Vacuum Filters - NVFIX Series

Suction Rate from 1.1 to 2.3 SCFM

In-line vacuum filters for use in vacuum systems within lower levels of dirt. This type of filter can be easily installed via a simple hose connection. It works very well for installations on individual suction cups that are picking up dirty work pieces.



Design

- Nozzles with union nuts on both ends for connection of hoses
- Internal hose diameter of 4 & 6 mm
- Transparent filter housing with arrow for indication of the flow direction
- Filter head with knurled screw cap
- Slide-in filter element made of transparent material (visual monitoring)

How to Order

NVFIX Series – In-Line Vacuum Filters

Filter Series	Part Number	Port Size	Filter Element	Replacement Filter Element
NVFIX	NVFIX6450XXXXXX	6mm - OD / 4mm - ID	50µ	NFILT501021VFIX
	NVFIX8650XXXXXX	8mm - OD / 6mm - ID	50µ	NFILT501623VFIX

Technical Data

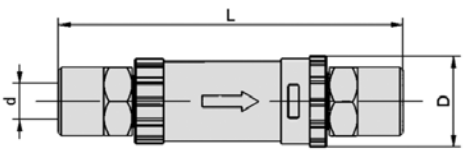
NVFIX Series – In-Line Vacuum Filters

Type	Filter pore size (µm)	Nominal flow rate (l/min)	Nominal flow rate (m3/h)*	Max. vacuum (mbar)	Max. overpressure at 25°C (bar)	Max. overpressure at 50°C (bar)	Weight (kg)
NVFIX6450XXXXXX	50	32	1.92	-990	7	5	6
NVFIX8650XXXXXX	50	66	3.96	-990	7	5	10

*In the case of a pressure drop of max. 40 mbar while gripping

Dimensions: mm

NVFI-6/4, NVFI-8/6



Type	d	D	L
NVFIX6450XXXXXX	6	16	61
NVFIX8650XXXXXX	8	23	68

Check Valves - NSVK and NSVKG Series

Connection Threads from M5 to G1/2

The Numatics vacuum check valves are typically used in applications where some of the suction cups might not be in contact with the work piece. In these cases, the check valve will react and shut off the unused suction cup.

Design

- Ball seat valve
- Ball in brass seat, installed in a space-saving manner in an aluminum body
- Suitable for installation in any orientation
- Available with male thread at top (NSVK) or bottom (NSVKG)

How to Order

NSVKG and NSVK Series – Check Valves

Check Valve Series	Part number	Thread Type / Port Size (G1)	Thread Type / Port Size (G2)
NSVKG	NSVKGXXXXXXX1MG	G1/8-M	G1/8-F
	NSVKGXXXXXXX2MG	G1/4-M	G1/4-F
	NSVKGXXXXXXX4MG	G1/2-M	G1/2-F
	NSVKGXXXXXXXBMM	M5-M	M5-F
NSVKX	NSVKXXXXXXXX1FG	G1/8-F	G1/8-M
	NSVKXXXXXXXX2FG	G1/4-F	G1/4-M
	NSVKXXXXXXXX4FG	G1/2-F	G1/2-M
	NSVKXXXXXXXXBFM	M5-F	M5-M

Accessories - How to Order

Cable Connectors

Accessories	Part Number	Description	Accessory/Series
Cable Connectors	NASKBM8450PURGE	Cable M8 4 5M PUR GE	NSBPC, NSCPM, NSEAC, Switches-Sensors - Straight Connection
	NASKBM8450PURWX	Cable M8 4 5M PUR W	NSBPC, NSCPM, NSEAC, Switches-Sensors -Right Angle Connection
	NASKMIC1030PUGE	Sol Conn StraFht-3M PUR GE	NSBPC, NSCPM - Cable for solenoid valves
	NASKBM1250PURGE	Cable Connector - M12 5-Pole	NSCPI
	NASKBM1285000XX	Cable M12 8 Pole 5M	NSXMP

Silencers

Accessories	Part Number	Description	Accessory/Series
Silencers	NSDXXXXXXX24BMM	Repl. Silencer NSBP EJT 05	NSBP, NSBPC, NSEG
	NSDXXXXXXX401MG	Repl. Silencer NSBP EJT 07/10	NSBP, NSBPC, NSEG
	NSDXXXXXXX763MG	Repl. Silencer NSBP EJT 20/25	NSBP, NSBPC,
	NSD249720SCPMXX	SCPM Repl Silencer 05-07-10	NSCPM
	NFILT217145161X	SCPM Filter Element 05-07-10	NSCPM

Holders - Mountings

Accessories	Part Number	Description	Accessory/Series
Holders - Mountings	NBEPL1111453SBP	Mtg Plate NSBP EJT	NSBP, NSBPC,
	NSETSBPX0056CFN	Mtg. Set NSBP/NSBPC M4F	NSBP, NSBPC,
	NADPEJ4552144SL	Holder SEAC/RP/ECO Top Auto	NSEAC
	NADPEJ4552144SS	Holder SEAC/RP/ECO Side Auto	NSEAC
	NHTSA2EG18G5XXX	Holder Pads/SPRGPLGR Axial Auto	NSEAC
	NHTSA3EG18G5XXX	Holder Pads/SPRGPLGR Ball Auto	NSEAC
	NHTRFI2SWIV1812	Replacements Holder for Filter	NVFT
	NHTRFI2SWIV1813	Replacements Holder for Filter	NVFT
	NHTRFI2SWIV1814	Replacements Holder for Filter	NVFT
	NHTRFI2SWIV1815	Replacements Holder for Filter	NVFT
	NHTRFI2SWIV34XX	Replacements Holder for Filter	NVFT
	NHTSA2SGM3040XX	Holder systems for NSGM Series	NSGMXXXX30XG1FG, NSGMXXXX40XG2FG
	NHTSA2SGM5070XX	Holder systems for NSGM Series	NSGMXXXX50XG2FG, NSGMXXXX70XG2FG
	NGPQ1122461STNB	Single base plate-quick change	NSXMP
	NGPQ2122872STNB	Double base plate-quick change	NSXMP

Misc. Accessories

Accessories	Part Number	Description	Accessory/Series
Misc. Ejector Accessories	NFILT217145161X	Filter Element NSCPM 05-07-10	NSCPM
	NWARSETSCPISMPI	Maintenance Kit - NSCPI	NSCPI

Accessories	Part Number	Description	Accessory/Series
Vacuum Switches-Sensors	NADAPVS61316XXX	6mm Plug-in tube	Connection Adapter
	NADAPVSX1316BMM	M5-M	Connection Adapter

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