

Vacuum Components

Vacuum Generators, Switches & Suction Cups



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 customer's application requirements.



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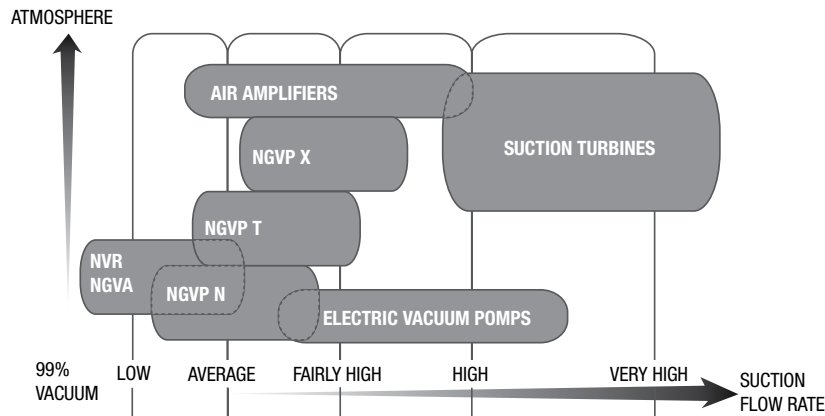
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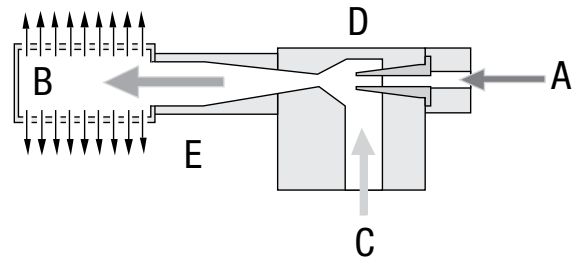
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What is a Vacuum?



Operating Principle of a Venturi

The Numatics vacuum generator works on the venturi principle. The air which is compressed at A, filtered and non-lubricated, is blown through nozzle D and its speed is increased. It then passes through the mixer E before escaping into the silencer B. The vacuum is the result of negative pressure contained in the chamber surrounding the nozzle D. The air drawn in via C follows the same route and passes into the silencer B.



Conversion of Pressure Units

	Bar 10 N/cm ² 100 kPa	Atm kp/cm ²	Torr mm of Hg	PSI
Bar = 10 N/cm ² = 100 kPa	1	0.986923	750.0617	14.50377
Atm = kp/cm ²	1.01325	1	760	14.69595
Torr = mm of Hg	0.0013332	0.001316	1	0.1933677
PSI	0.06894757	0.06804596	51.71493	

Conversion According to % Vacuum

	Bar 10 N/cm ² 100 kPa	Atm kp/cm ²	mm (water column)
10%	-0.101	-0.103	1000
20%	-0.203	-0.207	2000
30%	-0.304	-0.310	3000
40%	-0.405	-0.413	4000
50%	-0.507	-0.517	5000
60%	-0.608	-0.620	6000
70%	-0.709	-0.723	7000
80%	-0.811	-0.827	8000
90%	-0.912	-0.930	9000

Selecting a Venturi

The function of a venturi is to generate a relative vacuum in a capacity.

For vacuum operated handling, this capacity normally consists of:

- the internal volume of the suction cups in which the vacuum is to be created,
- the volume of the system (tubing).



Handling of non-porous materials:

Only the capacity needs be taken into account. The venturi will be chosen according to the time required to generate the vacuum for the relevant function.

As the maximum level of vacuum can be reached, it is useful to select versions providing a 90% vacuum: version N.

Handling of porous materials:

In this case, the capacity cannot be evacuated. Therefore, the leak rate of the suction cup system must be taken into account.

The venturi suitable for this type of handling operation is a venturi with an evacuation rate that is considerably greater than the leak rate in order to create a great enough negative pressure in the suction cups.

Versions with a high evacuation rate should be taken in preference to versions with a high level of vacuum: version T or version X for very porous materials such as cardboard or foam.

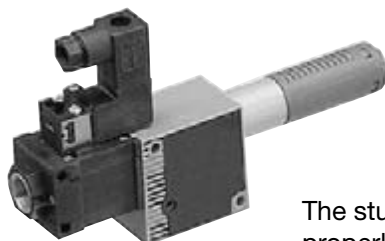
Determining the leak rate:

Apply a suction cup with a diameter compatible with the part to be handled.

Fit a venturi (with known characteristics) with a pressure gauge and a vacuum gauge.

Supply the venturi with the optimum pressure, 58-72.5 PSIG (4-5 bars).

Apply the suction cup to the surface to be tested.



The following three cases may arise:

- The vacuum gauge indicates the maximum vacuum for its characteristics; this means the part is sealed.
- The vacuum gauge does not measure any vacuum: select a more efficient venturi, as the leak rate is greater than the maximum flow rate of the venturi.
- The vacuum gauge indicates a vacuum value: e.g. -300 mb (30% vacuum). See the venturi curve.

Read off the flow rate corresponding to -300 mb (e.g. 75 NI/min).

The leak rate is 75 NI/min for the suction cup area used, at -300 mb. The forces required to handle the part should be determined on this basis.

At -300 mb, the theoretical force of the suction cup is:
 $S = \text{area of the suction cup in cm}^2$
 $F(\text{daN}) = S(\text{cm}^2 \times 0.3)$

The different characteristics of the various venturis must be made use of in order to grip the part in complete safety (factor of 2 for horizontal gripping and 4 for vertical gripping).

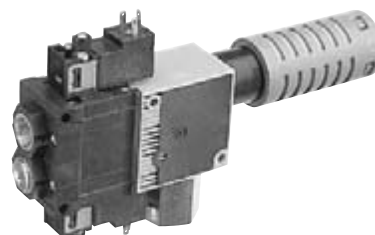
Recommendations:

An installation requires adequate ambient air. The operating speed of a machine includes:

- the gripping time
- the transfer time
- the release time

The study of optimal vacuum-operated handling must properly cover the phenomenon of releasing the part when releasing it, which is often the hardest problem to solve.

- Vacuum generator as near as possible to the suction cups.
- Suction cups with the smallest possible internal volume.
- Correctly dimensioned tubing to limit pressure drops.



Comparison of venturis and air amplifiers:

Air amplifiers:

Optimal operating area: 0 to 12% vacuum

Maximum operating range: 0 to 15% vacuum

Fields of application: TRANSPORT - DRYING - DEGASSING

Gripping of extremely porous and light weight products: carpet, textiles, foam, etc.

Transport of small parts: granules, coffee beans, rice, paper clips, etc.

Suction of smoke, degassing.

Venturi type ejectors:

Version X, 50% vacuum:

Optimal operating area: 13 to 40% vacuum

Maximum operating range: 0 to 50% vacuum

Using ejectors with 50% vacuum requires a high flow rate compared with the negative pressure.

Versions T, 75% vacuum, and N, 90% vacuum:

Optimum operating area: 41 to 90% vacuum

Maximum operating range: 0 to 90% vacuum

The advantage of the ejector with 90% vacuum is the capability of generating a high level of vacuum and, thus, a high force / area ratio.

Fields of application: HANDLING - SUCTION - EMPTYING - METERING

Gripping of porous, semi-porous and sealed products.

High-speed gripping.

Metering of air and/or liquid.

With version N, 90% vacuum:

Generating a local vacuum. Rationalizing the vacuum in the functions of your machine by using suction cups.

With version T, 75% vacuum:

Generating a general vacuum in negative pressure tables and tanks.

The ejector is often integrated in automatic handling controllers.

Remarks:

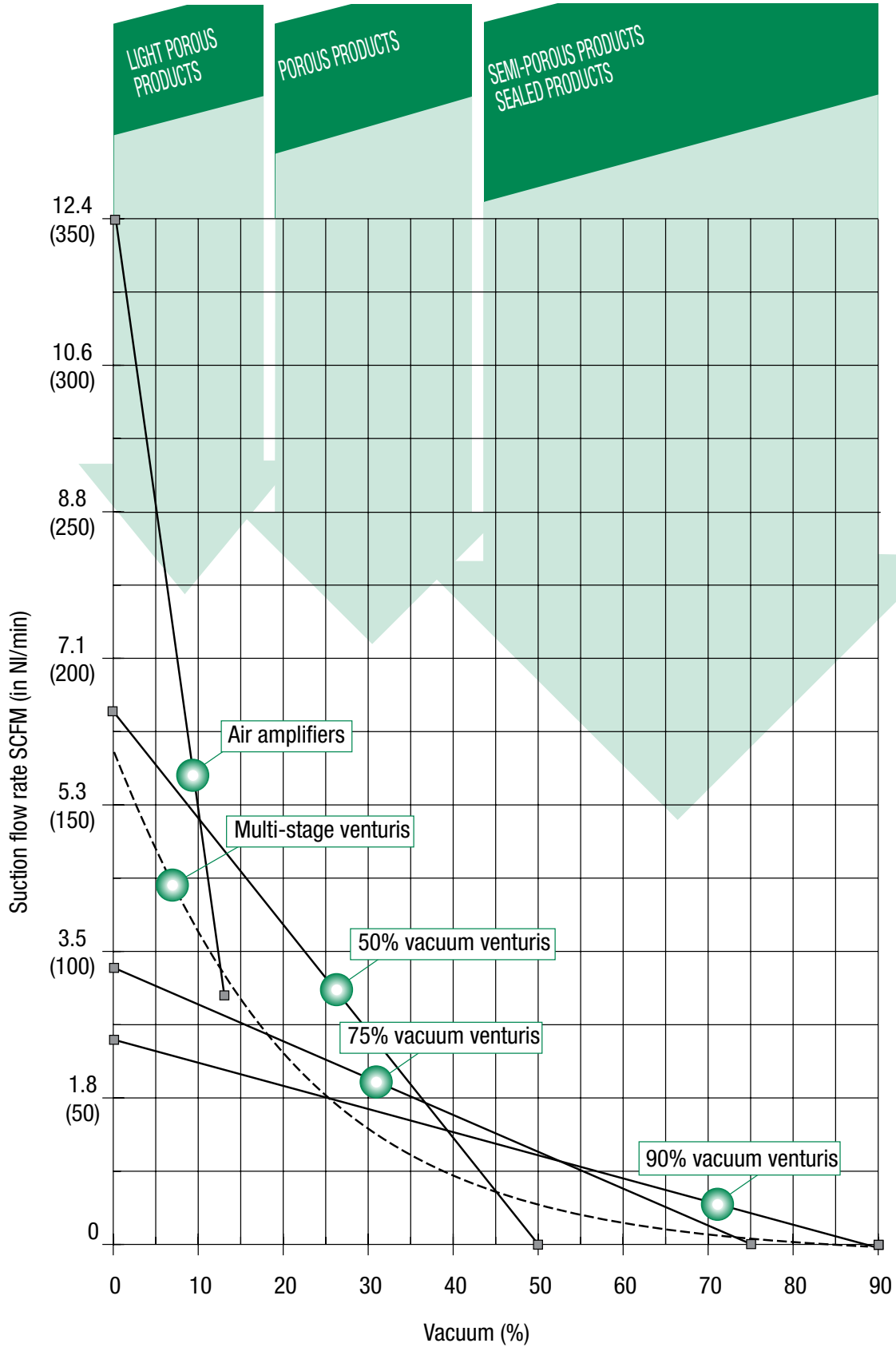
The optimum operating areas recommended above are the most suitable for the various technologies; but, they are in no way restrictive or limiting.

The notes are applicable to both branches of Numatics products, i.e. air amplifiers and ejectors; they are also applicable to all products using the same technology.

The following curves were drawn up using Numatics equipment:

Air amplifier NM 10 C, venturis NGVP 15 XK, NGVP 15 NS and NGVP 15 TS.

The values specified are values with identical compressed air consumption and represent the optimal characteristics for each vacuum generating process.



Vacuum Systems General Information

Evacuation Times in Seconds: seconds / gallon or (seconds / liter)

% VACUUM	10%	20%	30%	40%	50%	60%	70%	80%	85%
NVR 05	0.92 (0.243)	1.96 (0.518)	3.18 (0.840)	4.63 (1.223)	6.38 (1.685)	8.79 (2.322)	12.17 (3.215)	18.96 (5.009)	27.39 (7.236)
NGVA 07	0.54 (0.143)	1.15 (0.304)	1.88 (0.497)	2.76 (0.729)	3.86 (1.020)	5.44 (1.437)	7.87 (2.079)	15.40 (4.068)	24.29 (6.417)
NVR 07	0.46 (0.122)	0.98 (0.259)	1.58 (0.417)	2.28 (0.602)	3.13 (0.827)	4.27 (1.128)	5.80 (1.532)	8.55 (2.259)	11.01 (2.909)
NGVA 09	0.36 (0.095)	0.77 (0.203)	1.25 (0.330)	1.84 (0.486)	2.57 (0.679)	3.62 (0.956)	5.24 (1.384)	10.27 (2.713)	16.19 (4.277)
NVR 09	0.31 (0.082)	0.65 (0.172)	1.05 (0.277)	1.52 (0.402)	2.09 (0.552)	2.85 (0.753)	3.87 (1.022)	5.70 (1.506)	7.34 (1.939)
NGV 10 N	0.24 (0.063)	0.51 (0.135)	0.82 (0.217)	1.18 (0.312)	1.62 (0.428)	2.21 (0.584)	3.01 (0.795)	4.43 (1.170)	5.71 (1.508)
NGVP 12 N	0.14 (0.037)	0.30 (0.079)	0.49 (0.129)	0.71 (0.188)	0.97 (0.256)	1.33 (0.351)	1.81 (0.478)	2.66 (0.703)	3.42 (0.903)
NGV 15 N	0.10 (0.026)	0.22 (0.026)	0.35 (0.092)	0.51 (0.135)	0.70 (0.185)	0.95 (0.251)	1.29 (0.341)	1.90 (0.502)	2.45 (0.647)
NGVP 15 N	0.09 (0.024)	0.20 (0.053)	0.32 (0.085)	0.46 (0.122)	0.63 (0.166)	0.85 (0.225)	1.16 (0.306)	1.71 (0.452)	2.20 (0.581)
NGVP 20 N	0.06 (0.016)	0.12 (0.032)	0.19 (0.050)	0.28 (0.074)	0.38 (0.100)	0.52 (0.137)	0.71 (0.188)	1.04 (0.275)	2.13 (0.563)
NGVP 25 N	0.03 (0.008)	0.07 (0.018)	0.11 (0.029)	0.16 (0.042)	0.22 (0.058)	0.30 (0.079)	0.41 (0.108)	0.60 (0.159)	0.77 (0.203)
NGVP 30 N	0.02 (0.005)	0.05 (0.013)	0.08 (0.021)	0.12 (0.032)	0.17 (0.045)	0.23 (0.061)	0.31 (0.082)	0.45 (0.119)	0.58 (0.153)
% VACUUM	10%	20%	30%	40%	50%	60%	70%	80%	85%
NGVP 12 T	0.10 (0.026)	0.22 (0.058)	0.37 (0.098)	0.55 (0.145)	0.78 (0.206)	1.16 (0.306)	1.92 (0.507)		
NGVP 15 T	0.07(0.018)	0.15 (0.040)	0.24 (0.063)	0.36 (0.095)	0.52 (0.137)	0.77 (0.203)	1.27 (0.335)		
NGVP 20 T	0.04 (0.011)	0.09 (0.024)	0.14 (0.037)	0.22 (0.058)	0.31 (0.082)	0.46 (0.122)	0.76 (0.201)		
NGCP 25 T	0.03 (0.008)	0.06 (0.016)	0.10 (0.026)	0.14 (0.037)	0.21 (0.055)	0.30 (0.079)	0.50 (0.132)		
NGVP 30 T	0.02 (0.005)	0.04 (0.011)	0.07 (0.018)	0.10 (0.026)	0.15 (0.040)	0.22 (0.058)	0.37 (0.098)		
% VACUUM	10%	20%	30%	35%	40%	45%			
NGV 10 X	0.19 (0.050)	0.42 (0.111)	0.72 (0.190)	0.92 (0.243)	1.18 (0.312)	1.53 (0.404)			
NGVP 12 X	0.05 (0.013)	0.11 (0.029)	0.22 (0.058)	0.33 (0.087)	0.62 (0.164)	0.62 (0.164)			
NGV 15 X	0.07 (0.018)	0.16 (0.042)	0.27 (0.071)	0.35 (0.092)	0.45 (0.119)	0.58 (0.153)			
NGVP 15 X	0.04 (1.057)	0.09 (0.024)	0.15 (0.040)	0.20 (0.053)	0.27 (0.071)	0.39 (0.103)			
NGVP 20 X	0.03 (0.008)	0.06 (0.016)	0.11 (0.029)	0.15 (0.040)	0.19 (0.050)	0.28 (0.074)			
NGVP 25 X	0.02 (0.005)	0.04 (0.011)	0.08 (0.021)	0.10 (0.026)	0.14 (0.037)	0.19 (0.050)			
NGVP 30 X	0.01 (0.003)	0.03 (0.008)	0.06 (0.016)	0.08 (0.021)	0.11 (0.029)	0.15 (0.040)			

Weight of venturis in oz (grams)

Model	Nozzle size				
	1.0 mm	1.5 mm	2.0 mm	2.5 mm	3.0 mm
NGVP	3.5 (100)	3.9 (110)	5.6 (160)	6.3 (180)	9.3 (265)
NGVPS	6.3 (180)	6.7 (190)	8.5 (240)	9.2 (260)	12.2 (345)
NGVPD	9.5 (270)	9.9 (280)	11.6 (330)	12.0 (340)	15 (425)
NGVC	6.0 (170)	6.3 (180)			
NGVCS	8.8 (250)	9.2 (260)			
NGVS	16.4 (465)	16.8 (475)	18.5 (525)	19.2 (545)	22.2 (630)

Options

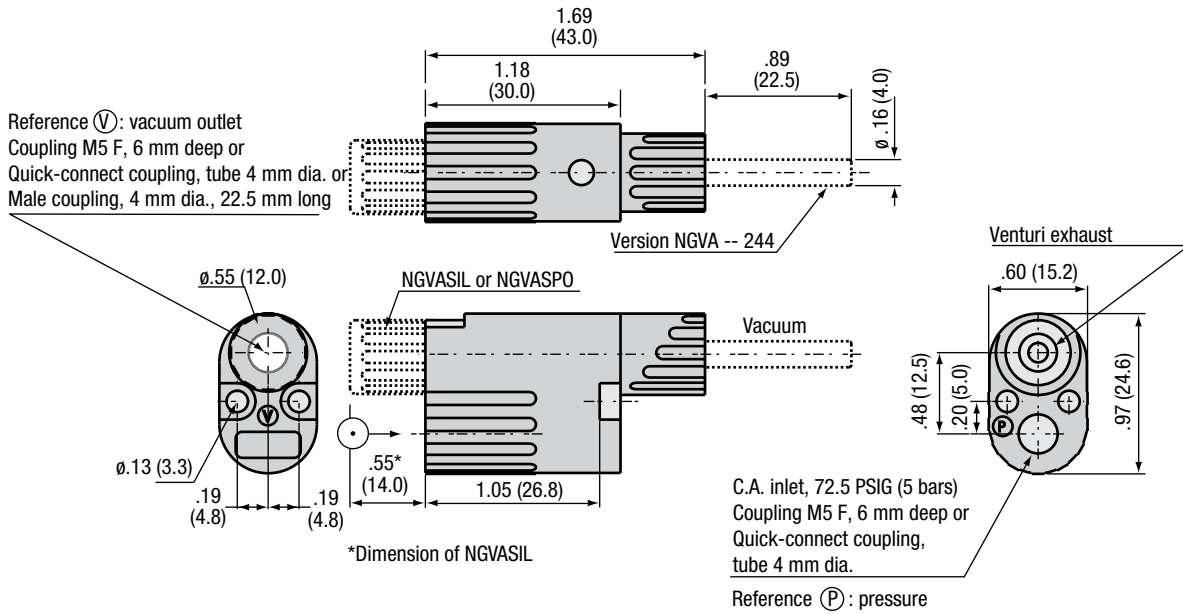
NGVO PSE 100 E	Electrical output vacuum switch.....	5.29oz / 150g
NGVO PSE 100 EC	Electrical output vacuum switch with connector.....	1.59oz / 45 g
NGVO PSE 100 P NO or NC	Pneumatic signal vacuum switch	1.27oz / 36 g
NGVO PSE 100 PK NO or NF	Pneumatic signal vacuum switch	1.23oz / 35 g
NGVO PSX 100 LC8	Electronic vacuum switch.....	1.27oz / 36 g
NGVO PSA 100 C	Display type electronic vacuum switch	1.20oz / 34 g
NGVO VAF11140	Vacuum gauge VAF11140	3.53oz / 100 g

Controllers

Pneumatic controller	0.28oz / 8 g
Electric controller.....	1.41oz / 40 g

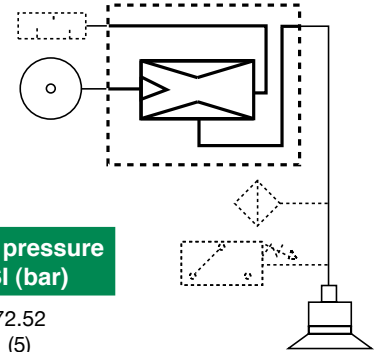


Micro-Venturis, Series NGVA



General Specifications:

- Compressed Air: Filtered, non-lubricated, pressure 30 to 87 PSIG (2 to 6 bars)
- Temperature: 14° to 176° F (-10° to 80° C)
- Material: Polyacetal (POM), blue for NGVA 07 or grey for NGVA 09
- Weight: 15g / 0.53oz
- Insert M5: Brass - On option: stainless steel



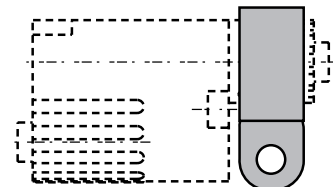
Models	Nozzle Ø In (mm)	Air Consumption SCFM (NI/min)	Maximum Vacuum %	Drawn-in air SCFM (NI/min)	At air pressure PSI (bar)
NGVA 07 (blue)	0.027 (0.7)	.74 (21)	82	.42 (12)	72.52 (5)
NGVA 09 (grey)	0.035 (0.9)	1.06 (36)	82	.64 (18)	72.52 (5)

Fitting of Optional Equipment:

- Fitting of silencer NGVASIL or NGVASPO
- Connection for exhaust collection NGVAC
- Vacuum data connector NGVAV
- Manifold installation NGVAG
- Vacuum filter NGVA F18

Attachment of Venturi:

- Clamp, ref. NGAV.F
- Supplied in sets of 5.



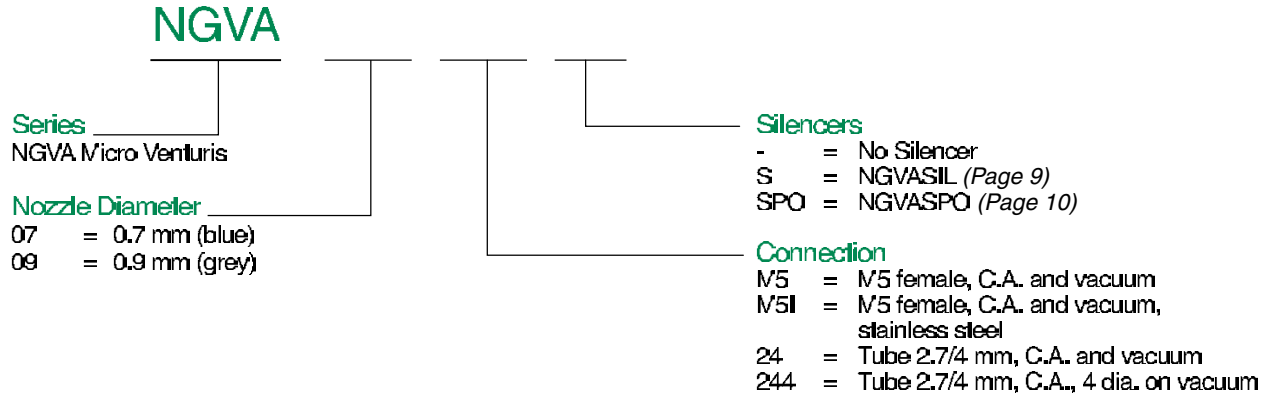
Applications:

The mini-venturis in series NGVA are especially suitable for robotic use due to their light weight and rapid response time. Their design, based on thermoplastic material, preserves their excellent mechanical characteristics while providing economic, vacuum-operated handling solutions.



Miniature Vacuum Generators

How To Order

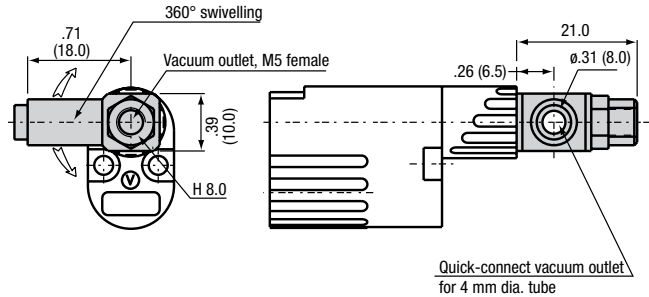




Options for Micro-Venturis, Series NGVA, S, B, D

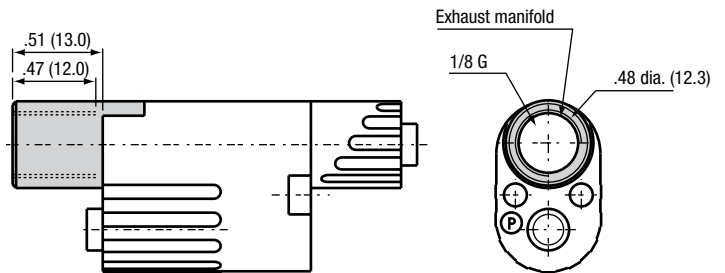
Option NGVA V:

(Option applicable for NGVA, S, B and D, vacuum outlet M5). This option allows a vacuum connector to be fitted on the suction cup system for connection to a monitoring vacuum switch (such as NPSE 100). This provides data on the vacuum level. Connection for 4 mm dia. tube.



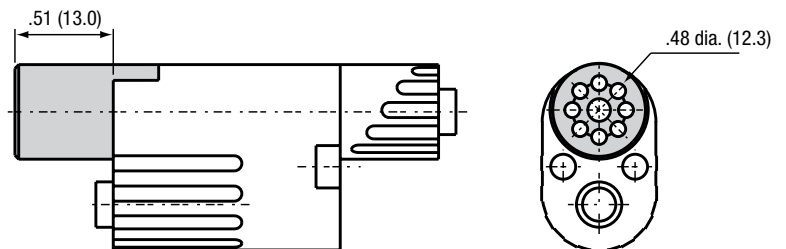
Option NGVA C:

(Factory installed)
Female connection 1/8 G (gas type) for consolidation of venturi exhaust.
If a number of venturis are used, it is recommended to use a manifold, option NGVAG2.



Option NGVASIL:

Female connector 1/8 G.
Silencer for NGVA.
10 dBA noise level reduction.



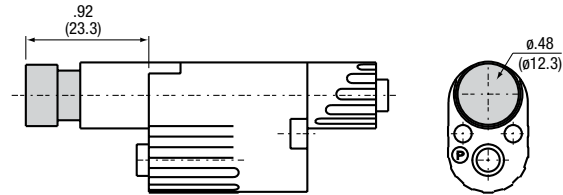


Miniature Vacuum Generators

Options for Micro-Venturis, Series NGVA, S, B, D

Option NGVASPO:

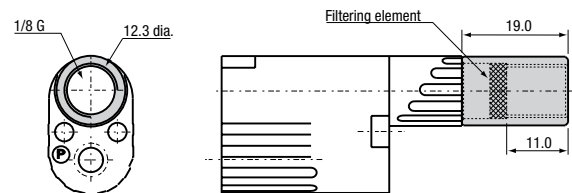
This silencer achieves a 20 dBA noise reduction level. It replaces the standard insert on the NGVA07 and NGVA09. Simply remove the standard by turning counter clockwise for removal and install the NGVASPO.



Option Vacuum Filter NGVA F18:

(Fitting on NGVA, S, B, D, vacuum outlet M5) 450-micron filtration to avoid blocking of the venturi by airborne contamination.

Note: This option is compatible with option NGVAV. In this case, option NGVAV must be installed between NGVA and option NGVAF.



Accessory NGVAG2 (3/4/6) Manifold:

Compatible with NGVA and NGVAS (M5 or 24) 4 manifold models for 2, 3, 4 or 6 venturis simultaneously, exhaust manifold and a single compressed air supply. Material: anodized aluminium.

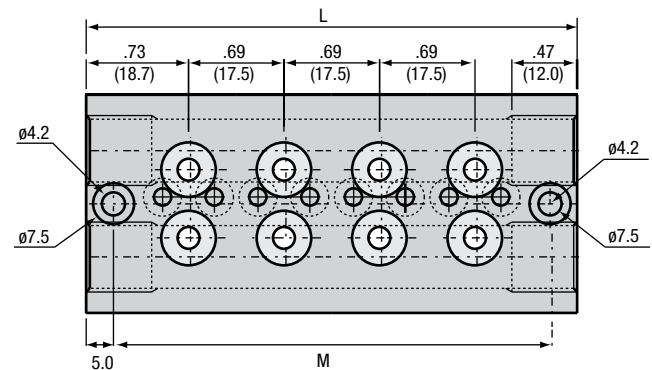
Models	NGVA G2	NGVA G3	NGVA G4	NGVA G6
L inch (mm)	2.2 (55)	2.9 (72.5)	3.5 (90)	4.9 (125)
M inch (mm)	1.8 (45)	2.5 (62.5)	3.1 (80)	4.5 (115)

Option NGVAP, Manifold:

Plug plate for unused ports.

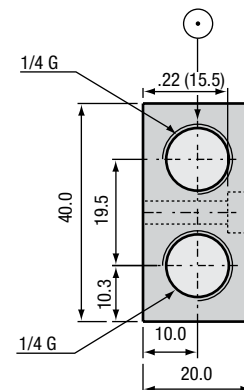
Option NGVAGB Manifold:

1/4 G plug for supply or exhaust ports.



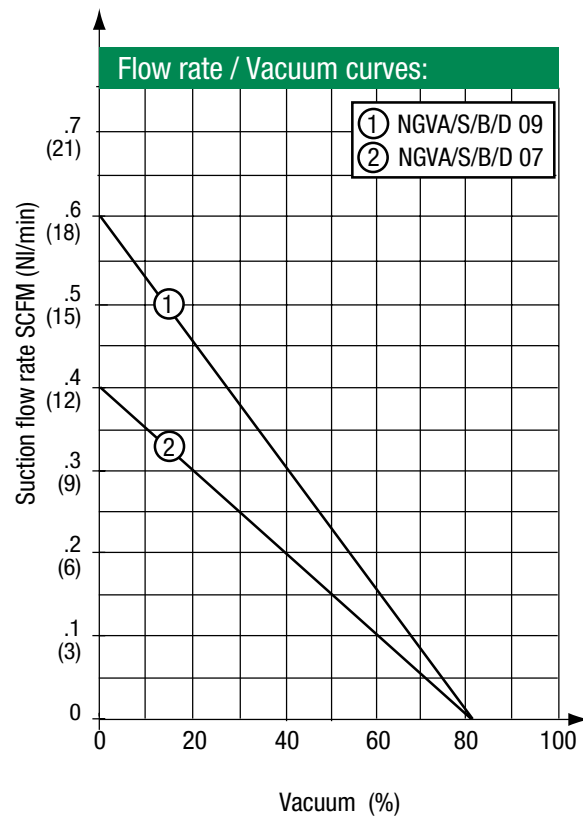
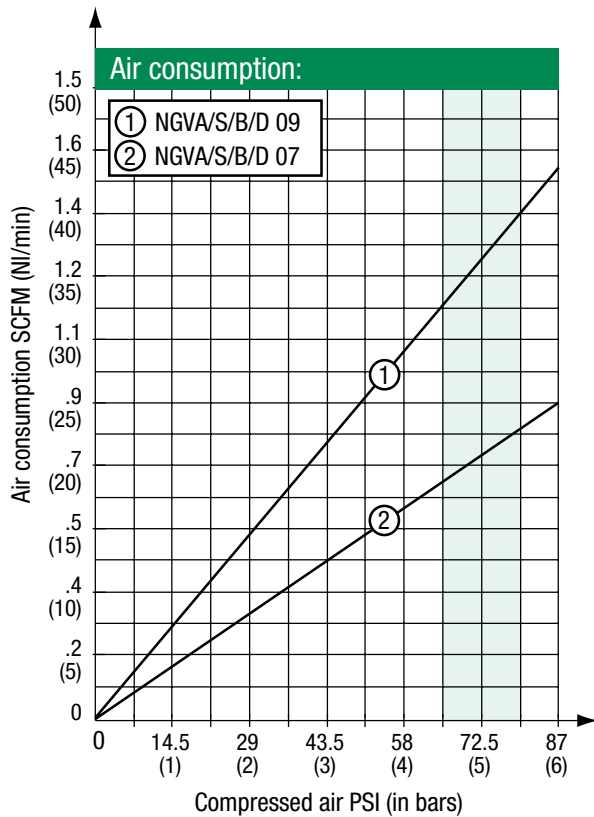
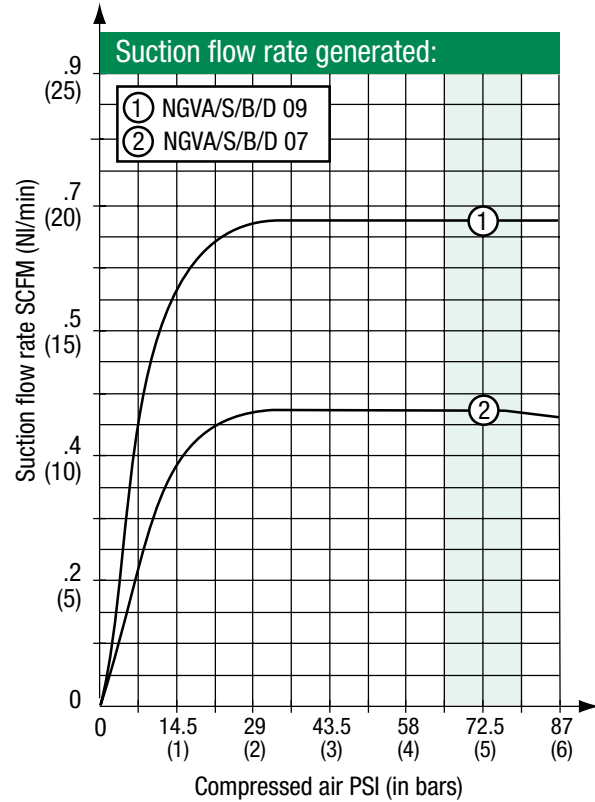
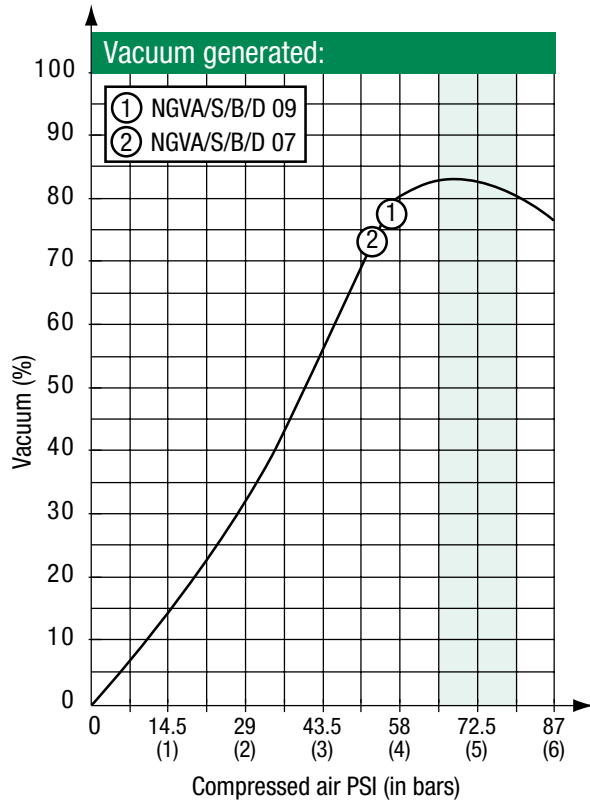
Fitting of silencer on exhaust:

Model NSILGV15
Both "exhaust" outlets must be open for NGVA G4 and NGVA G6. Each is equipped with a silencer.





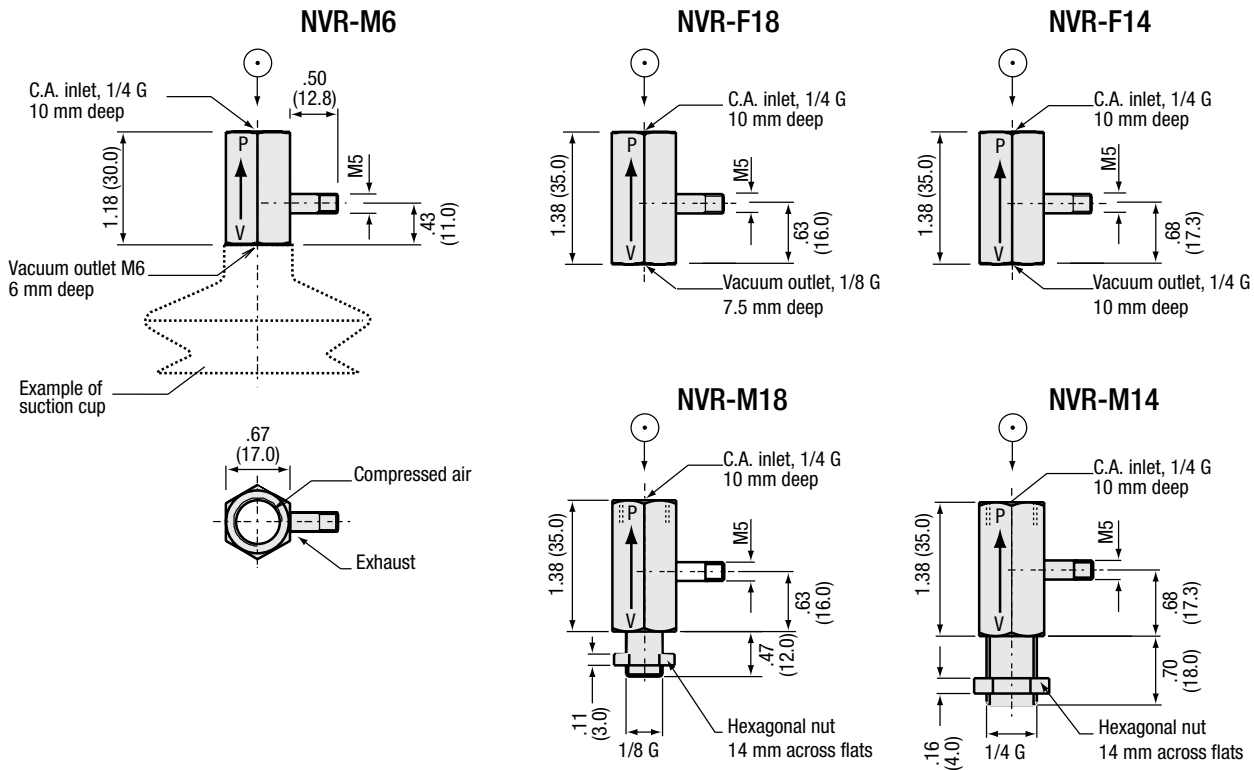
Curves for Micro-Venturis, Series NGVA, S, B, D



The curves shown above indicate the mean values of the capacities of our products.



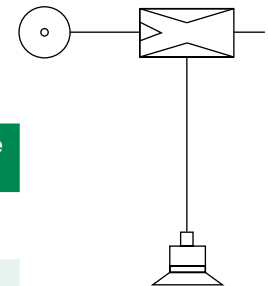
Coupling Venturis, Series NVR



General Specifications

- Compressed Air: Filtered, non-lubricated, pressure 30 to 87 PSIG (2 to 6 bars)
- Temperature: 14° to 176° F (-10° to 80° C)
- Material: Anodized aluminum body, brass nozzle
- Weight: .53 oz (15g)

Models	Nozzle Ø In (mm)	Air Consumption SCFM (NI/min)	Maximum Vacuum %	Drawn-in air SCFM (NI/min)	At air pressure PSI (bar)
NVR 05	.020 (0.5)	.42 (12)	87	.25 (7)	72.52 (5)
NVR 07	.027 (0.7)	.74 (21)	90	.49 (14)	72.52 (5)
NVR 09	.035 (0.9)	1.27 (36)	90	.74 (21)	72.52 (5)



Fitting on Spring System:

- Spring system, series NTS3, available strokes: .39, 1.2, 2.0, 2.8 in (10, 30, 50, 70 mm) page 90.
- Anti-rotation spring system, series NTSO, page 102.
- Ball joint systems, series NIMU, page 104.

Special Designs:

Possibility of special materials such as stainless steel and plastic, as per work specifications, and special characteristics such as suction flow rate or vacuum level.

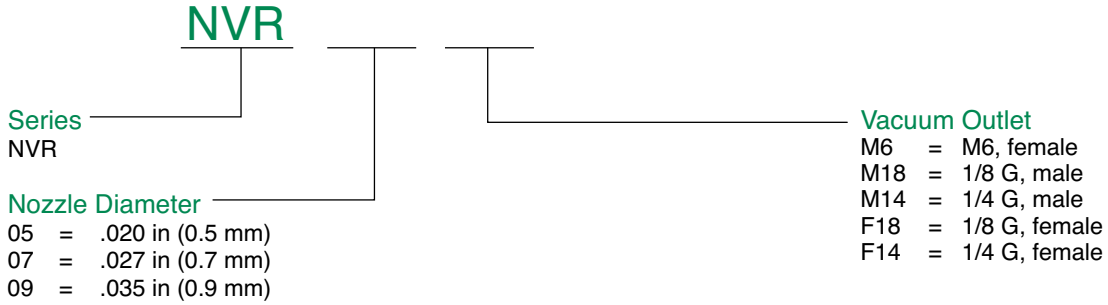
On request for model F18, provision of an auxiliary vacuum coupling M5 for connection of a vacuum switch.

Applications:

The main advantage of the Coupling Venturi, series NVR, is its direct mounting on the suction cup which allows simpler connection. By integrating the NVR type venturi in the suction cup, we obtain a localized vacuum and the possibility of obtaining multiple independent gripping, even when there are no materials detected. It is also possible to supply vacuum to two or more suction cups using a 1/8 G or 1/4 G tee fitting.

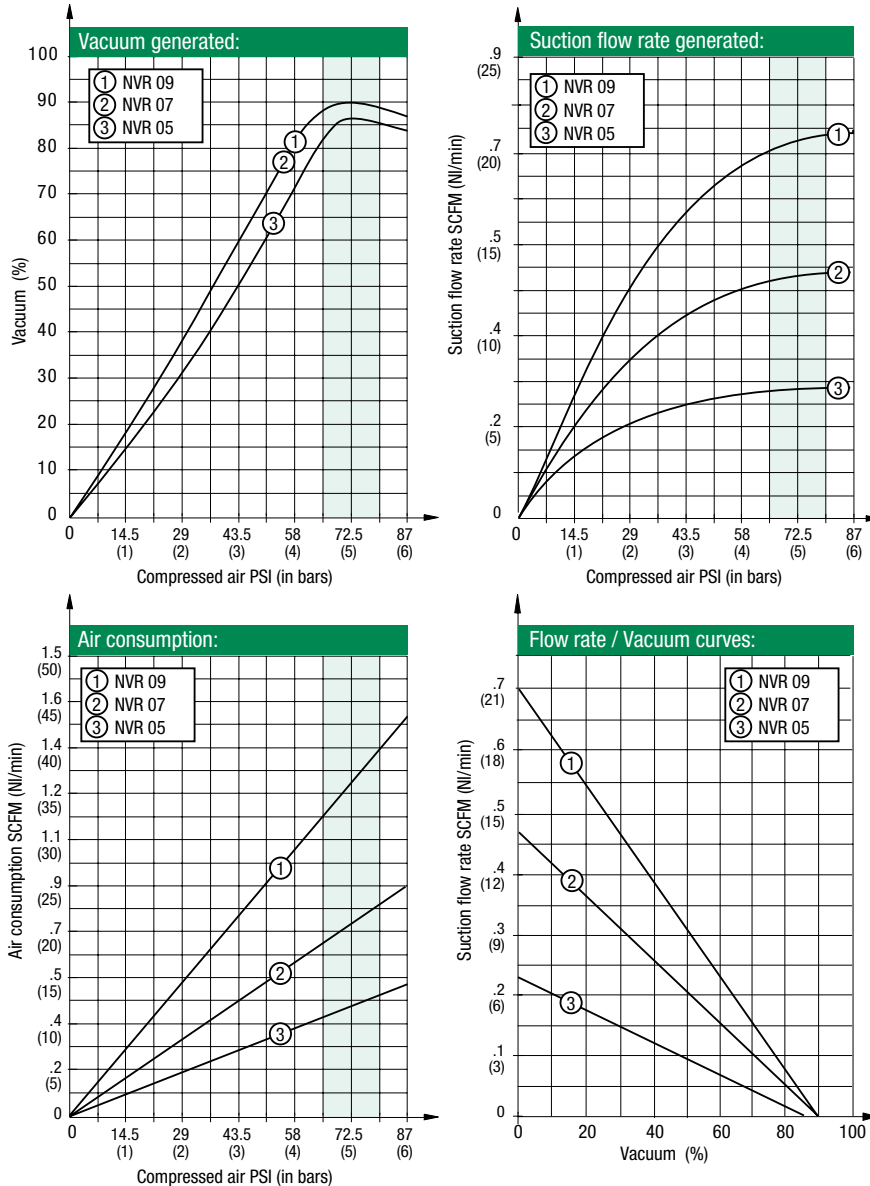


How To Order



Note: Silencer Option Part # SILGVIDM5F (Page 50)

Curves for Coupling Venturis, Series NVR

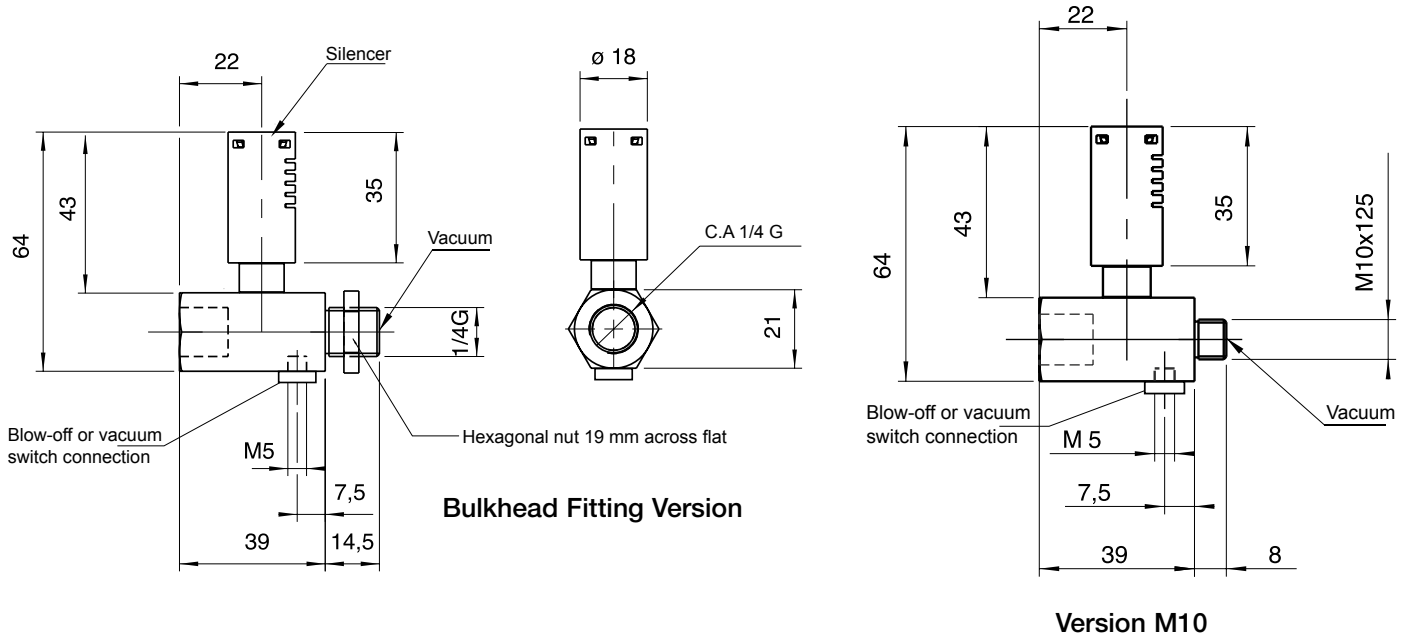


The curves shown above indicate the mean values of the capacities of our products.



Miniature Vacuum Generators

Coupling Ejectors, Series NVR 10, 12, 14



General Specifications

- Compressed Air: Filtered, non-lubricated, pressure 30 to 87 PSIG (2 to 6 bars)
- Temperature: 14° to 176° F (-10° to 80° C)
- Material: Anodized aluminum body, brass nozzle
- Weight: 1.76oz (50g)



Models	Nozzle Ø In (mm)	Air Consumption SCFM (NI/min)	Maximum Vacuum %	Drawn-in air SCFM (NI/min)	At air pressure PSI (bar)
NVR 10	0.039 (1)	1.55 (44)	90	6.07 (27)	72.50 (5)
NVR 12	0.047 (1.2)	2.37 (67)	90	10.12 (45)	72.50 (5)
NVR 14	0.055 (1.4)	3.81 (108)	90	14.39 (64)	72.50 (5)

Standard Model:

- Functions: vacuum switch or blow-off connection with or without silencer (NSILGV 10).

Special Designs:

On a specific project Numatics can modify this product and offer recommendations according to the application.

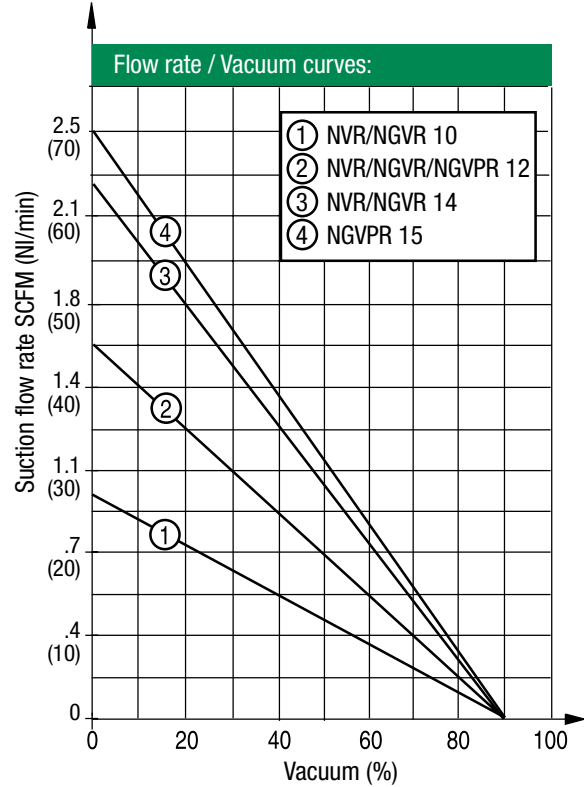
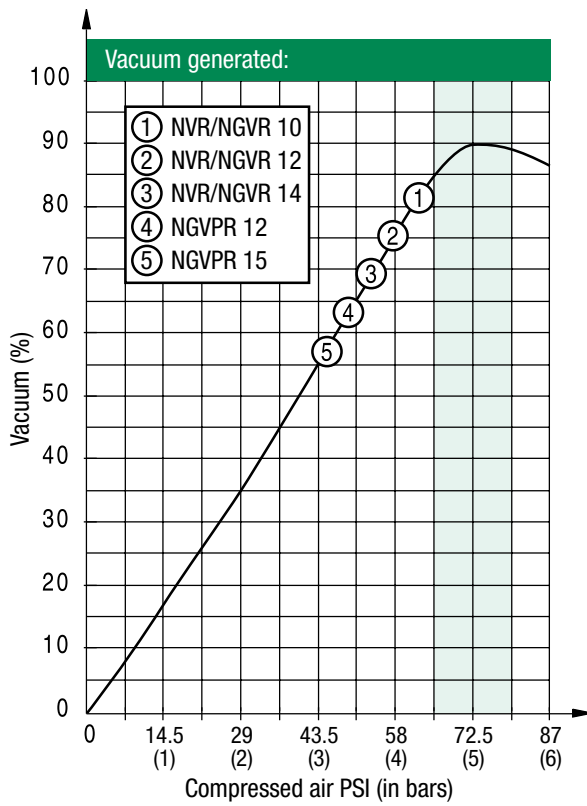
Applications:

On the same principle as NVR 05, 07, 09, the main advantage of the coupling ejector series NVR 10, 12, 14 is the direct mount onto much larger suction cups. Its aluminium construction is ideal for applications where weight is a consideration.

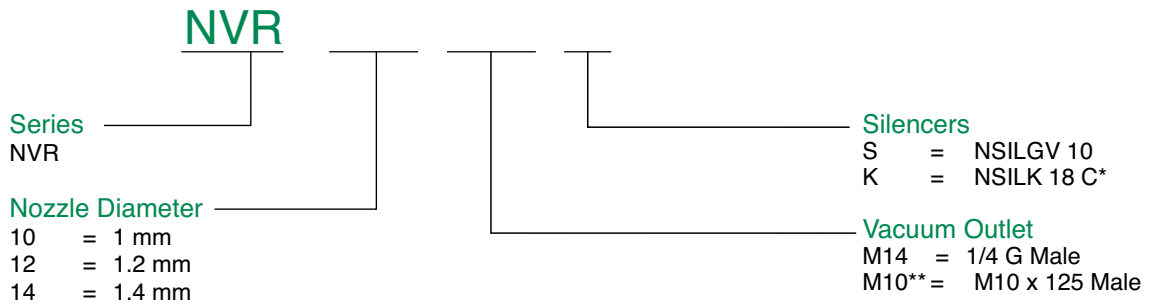


Miniature Vacuum Generators

Coupling Ejectors, Series NVR 10, 12, 14



How to Order

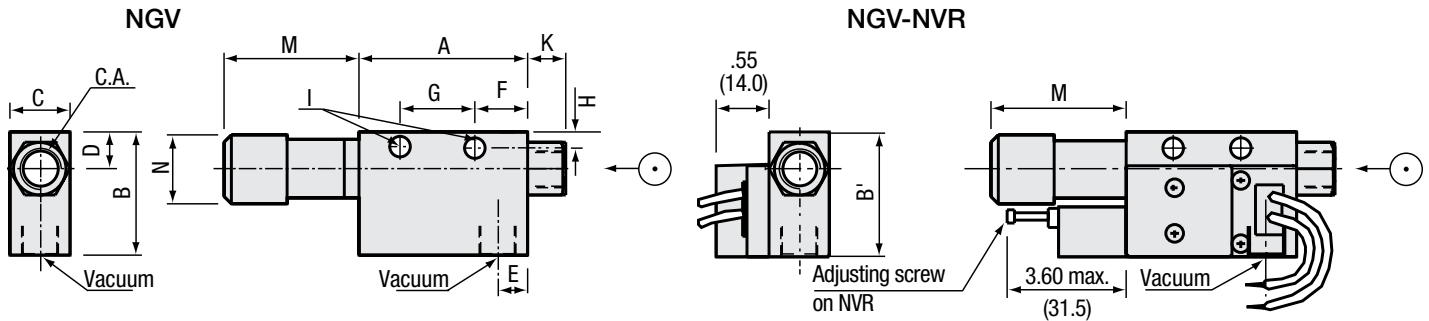


* Dimensions of through type silencers NSILK 18 C

**Special suction cups NVPG 60, 80, 95



Mini-Venturis, Series NGV



Models	A	B	B*	C	D	E	F	G	H	I	Vacuum	K	C.A.	M		N
														S	K	
NGV 10	1.77 (45)	1.3 (33)	1.3 (33)	0.63 (16)	0.39 (10)	0.31 (8)	0.55 (14)	0.79 (20)	0.18 (4.5)	0.07-0.16 (2-4.2)	1/8 G	0.39 (10)	G 1/8	1.42 (36)	-	0.73 (18.5)
NGV 15	2.48 (63)	1.38 (35)	1.38 (35)	0.79 (20)	0.43 (11)	0.39 (10)	0.79 (20)	0.98 (25)	0.2 (5)	0.07-0.18 (2-4.5)	1/4 G	0.59 (15)	G 1/4	1.79 (45.5)	1.99 (50.5)	0.79 (20)

General Specifications

- Compressed Air: Filtered, non-lubricated, pressure 30 to 87 PSIG (2 to 6 bars)
- Temperature: 14° to 176° F (-10° to 80° C)
- Material: Anodized aluminum body
- Hysteresis (version NVR): 40 to 140 mbars
- Weight: NGV 10 and NGV 15
- NGV/NGV...NV/NGV...NVR: 80/100/120 and 140/160/190

Models	Nozzle Ø In (mm)	Air Consumption SCFM (NI/min)	Maximum Vacuum %		Drawn-in air SCFM (NI/min)		At air pressure PSI (bar)
			X	N	X	N	
NGV 10	0.04 (1)	1.55 (44)	56	90	1.27 (36)	.95 (27)	72.52 (5)
NGV 15	0.06 (1.5)	3.53 (100)	56	90	3.35 (95)	2.22 (63)	72.52 (5)

Accessories:

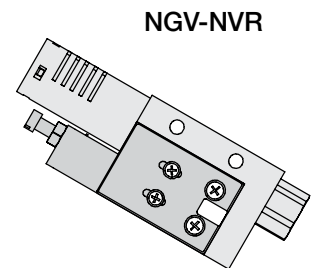
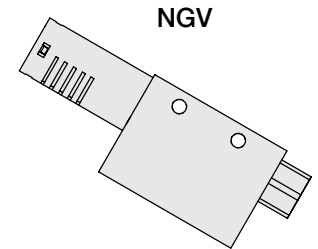
- Compressed air control valve, Numatics reference:

On Request:

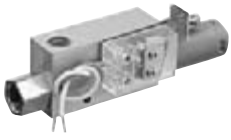
- Installation of an electronic vacuum switch on models NGV 15.
- Installation of a vacuum switch, factory pre-adjusted to approx. -350 mbars, model V.
- Installation of a non-clogging through silencer, issue K instead of S, for models 15.
- Installation of a compressed air control solenoid valve.

Applications:

The mini-venturis in series NGV are a light-weight and compact design. This twofold advantage allows their integration in robotic systems. Version NGV ...NVR is equipped with an electromagnetic vacuum switch so the user can control the vacuum level in the suction cup system at all times.

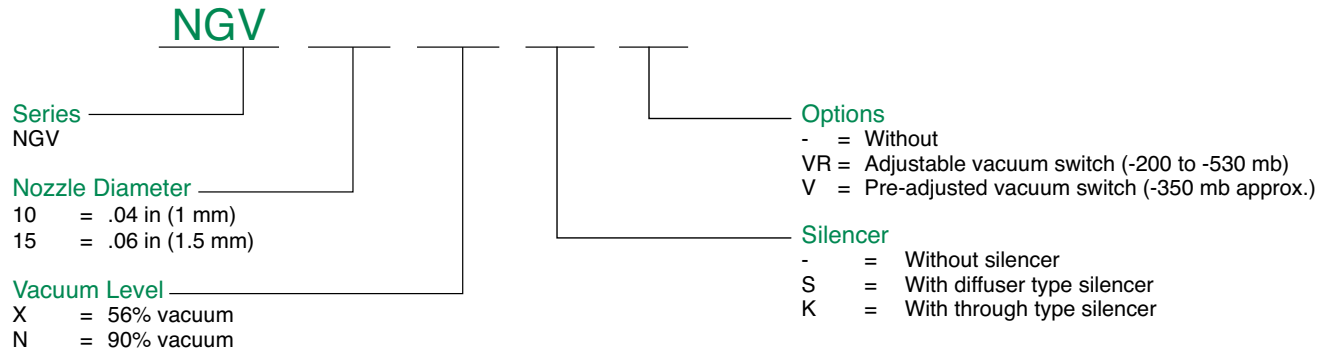


Max. output capacity:
125V, 50Hz, 5A
250V, 50Hz, 3A



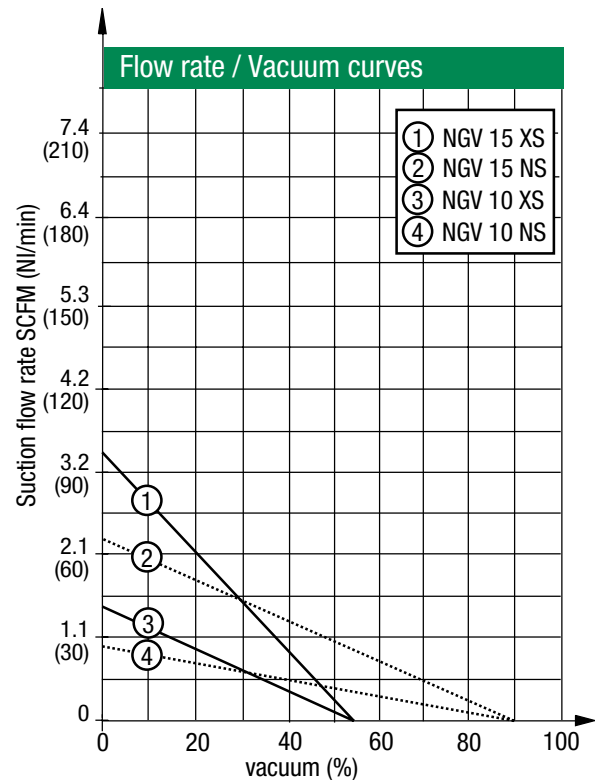
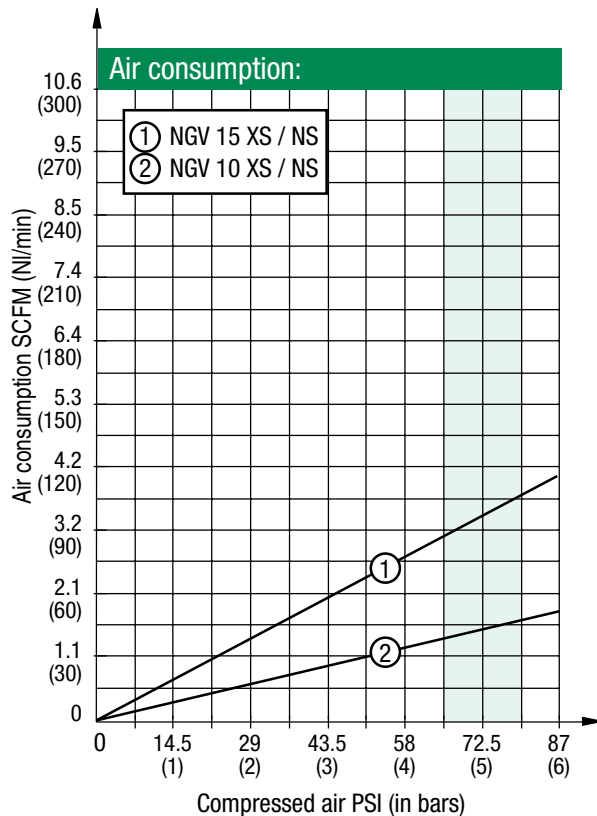
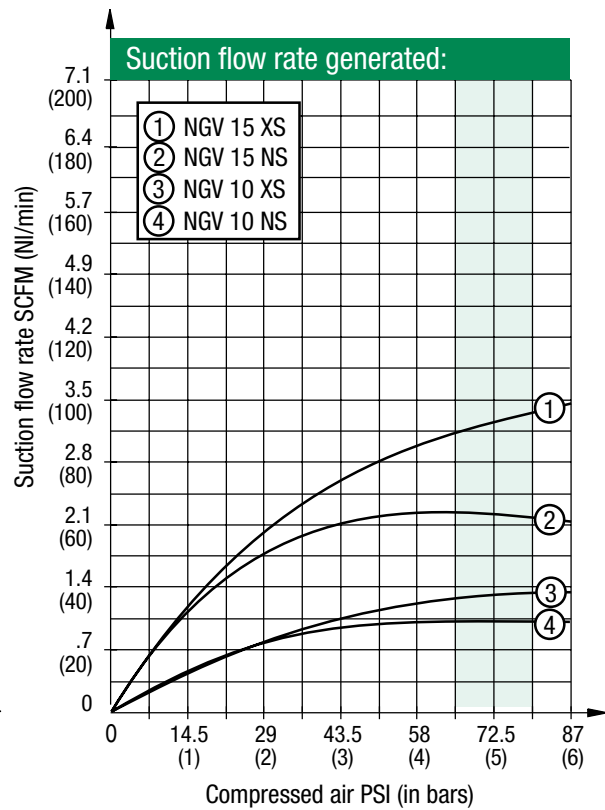
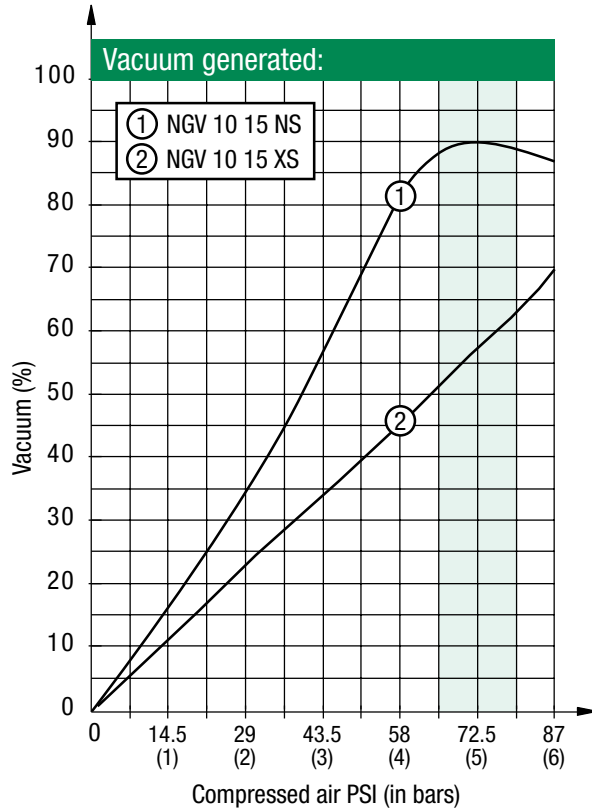
Miniature Vacuum Generators

How To Order





Curves for Mini-Venturis, Series NGV



The curves shown above indicate the mean values of the capacities of our products.



Modular Vacuum Generators

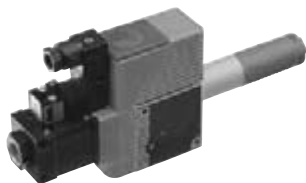
Specifications



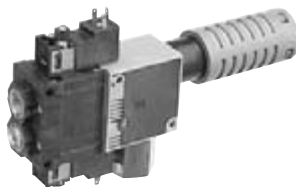
NGVP



NGVC



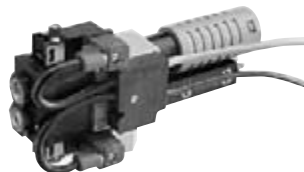
NGVCS



NGVPD



NGVE P1 or E1



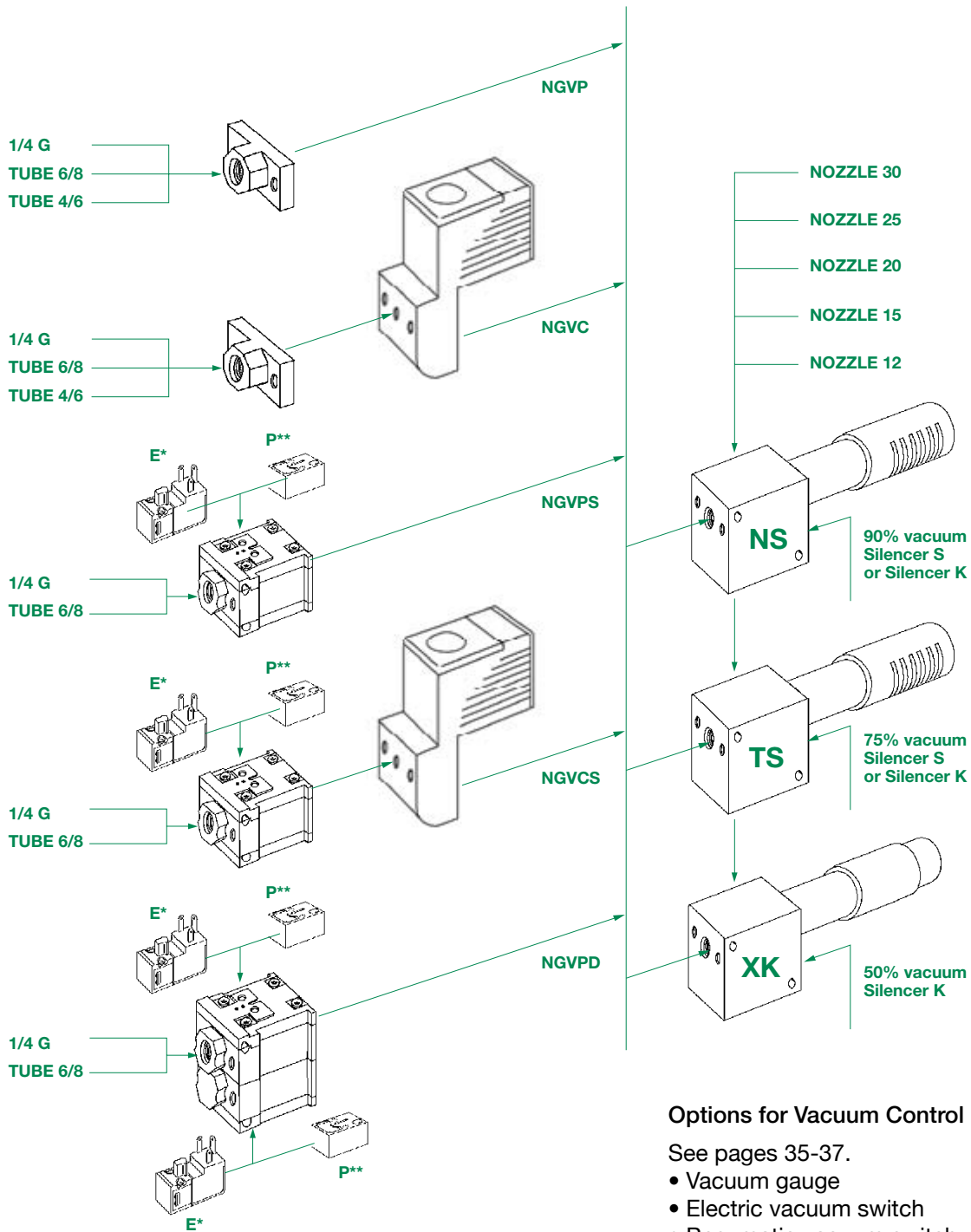
NGVMAX E1 or P1

Models	Standard Venturis					Special Venturis	
	NGVP	NGVC	NGVP	NGVCS	NGVPD	NGVE(*)	NGVMAX
C.A.* 1/4G - 4x6 - 6x8	•	•					
C.A.* 1/4G - 6x8			•	•	•	•	•
Vacuum outlet 1/2G Opt 1/4G - 3/8G	•	•	•	•	•	•	•
C.A. control*			•	•	•	•	•
Blow-off control					•		•
Capacity blow off		•		•			
Electric vacuum switch	+	+	+	+	+		
Pneumatic vacuum switch	+	+	+	+	+	•	•
Electronic vacuum switch	+	+	+	+	+		
Display type electronic vacuum switch	+	+	+	+	+	•	•
Vacuum gauge	+	+	+	+	+		
Vacuum check valve	+		+		+	•	•
Electric or Pneumatic control			+	+	+	+	+
Air economy with release							•
Air economy without release						•	

• : Standard or integrated + : Option *C.A.: Compressed Air



Modular Venturis



E* : Electric
P** : Pneumatic

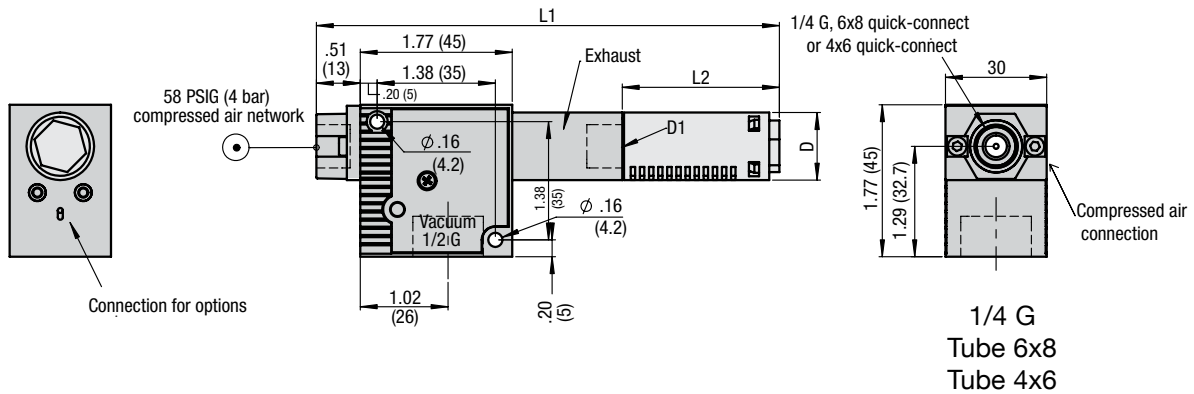
Options for Vacuum Control

See pages 35-37.

- Vacuum gauge
- Electric vacuum switch
- Pneumatic vacuum switch
- Electronic vacuum switch
- Display type electronic vacuum switch



Simple Venturis, Series NGVP



General Specifications

- Compressed Air: Filtered, non-lubricated, 30 to 58 PSIG (2 to 4 bars)
- Temperature: 14° to 176° F (-10° to 80° C)
- Optimal Pressure: 58 PSIG (4 bars)
- Body Material: DELRIN

Models	Nozzle Ø in (mm)	Air Consumption (NI/min)	Maximum Vacuum %			Drawn-in air (NI/min)			D in (mm)		D1 G		L1* in (mm)		L2 in (mm)		
			X	T	N	X	T	N	X	N/T	X	N/T	X	N/T	S	K(N/T)	K(X)
NGVP 12	.05 (1.2)	2.37 (67)	40	75	90	5.30 (150)	2.22 (63)	1.59 (45)	1.18 (30)	0.78 (20)	1/2	1/4	6.3 (160)	5 (127)	1.77 (45)	2.68 (68)	4.76 (121)
NGVP 15	.06 (1.5)	3.53 (100)	50	75	90	6.36 (180)	3.35 (95)	2.47 (70)	1.18 (30)	0.78 (20)	1/2	1/4	6.3 (160)	5.39 (137)	1.77 (45)	2.68 (68)	4.76 (121)
NGVP 20	.08 (2)	6.36 (180)	50	75	90	8.83 (250)	5.65 (160)	4.41 (125)	1.18 (30)	1.18 (30)	1/2	1/2	7.79 (198)	5.39 (137)	2.36 (60)	4.76 (121)	4.76 (121)
NGVP 25	.10 (2.5)	(9.53) 270	50	75	90	12.71 (360)	8.47 (240)	7.06 (200)	1.18 (30)	1.18 (30)	1/2	1/2	7.79 (198)	5.39 (137)	2.36 (60)	4.76 (121)	4.76 (121)
NGVP 30	.12 (3)	14.12 (400)	50	75	90	15.89 (450)	11.65 (330)	9.36 (265)	1.18 (30)	1.18 (30)	1/2	1/2	10.62 (270)	10.63 (270)	-	4.76 (121)	4.76 (121)

On standard basis, versions N and T are supplied with silencer S and version X is supplied with silencer K, except for model NGVP 30 which is always equipped with silencer K.

(*) L1 equipped with standard silencer

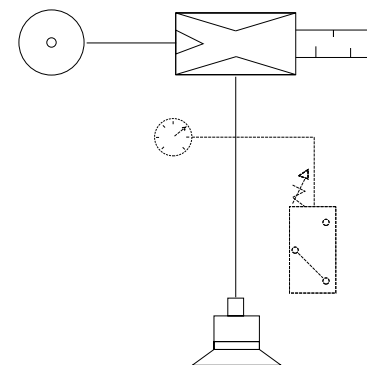
Options:

- See pages 34 to 37.

Applications:

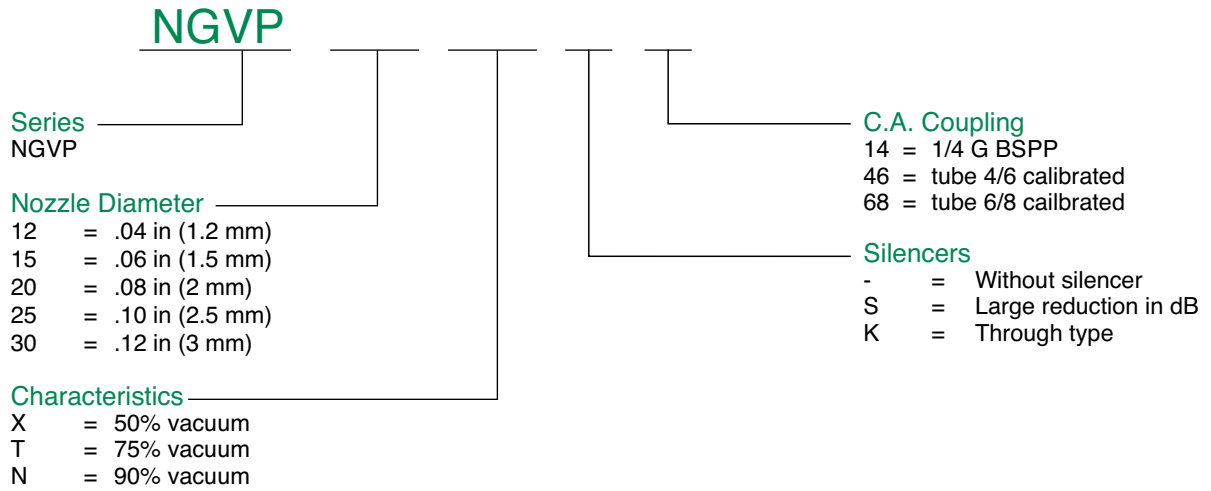
Vacuum generators in series NGVP are the basic venturis in the modular range. They are available at 5 different power levels (evacuation time) and 3 different vacuum levels: version X with 50% vacuum for very porous products, version T with 75% for porous products and version N with 90% vacuum for sealed products. The suction flow rate increases as the maximum vacuum level decreases, with the same nozzle diameter.

As well as being used with suction cups, they can be used for the purposes of liquid metering, spraying and tank depressurization, etc.





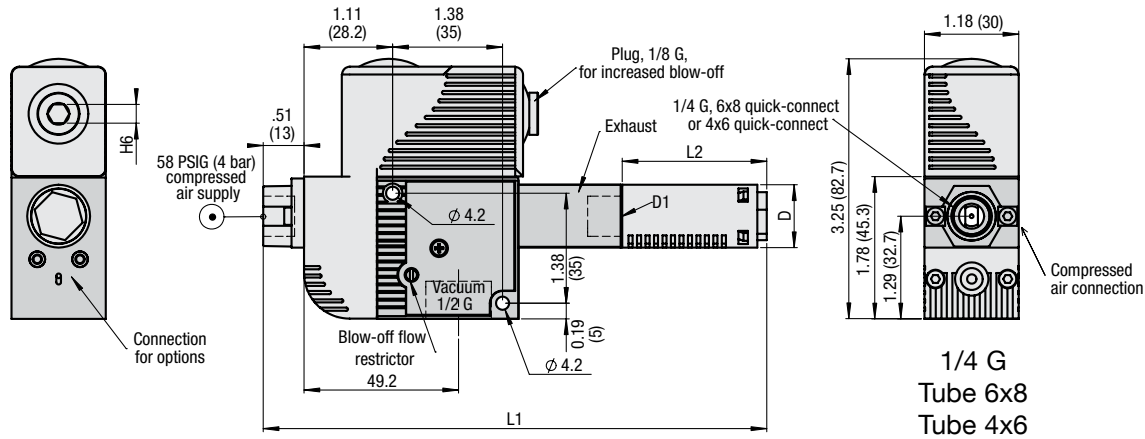
How To Order





Modular Vacuum Generators

Venturis with Automatic Blow-Off, Series NGVC



General Specifications

- Compressed Air: Filtered, non-lubricated, 30 to 58 PSIG (2 to 4 bars)
- Temperature: 32° to 140° F (0° to 60° C)
- Unit Material: DELRIN 500, grey and blue
- Optimal Pressure: 58 PSIG (4 bars)
- Blow-off Flow Rate: Adjustable by flow restrictor
- Body Material: DELRIN
- Operating Frequency: 2 Hz

Models	Nozzle Ø in (mm)	Air Consumption SCFM (NI/min)	Max. Vacuum %		Drawn-in-air SCFM (NI/min)		D in (mm) N/T	D1 Gas N/T	L1*		L2	
			T	N	T	N			N/T	S	K	
NGVC 12	.05 (1.2)	2.37 (67)	75	90	2.22 (63)	1.59 (45)	0.79 (20)	1/4	5.91 (150.2)	1.77 (45)	2.67 (68)	
NGVC 15	.06 (1.5)	3.53 (100)	75	90	3.35 (95)	2.47 (70)	0.79 (20)	1/4	6.3 (160.2)	1.77 (45)	2.67 (68)	

On standard basis, supplied with silencer S.

(*) L1 equipped with standard silencer

Options:

- See pages 34 to 37.
- Blowing adjustment on bottom for manifold installation.
- Provision of a 1/8 G type port on front for connection of a vacuum gauge.

Specific Features (on request):

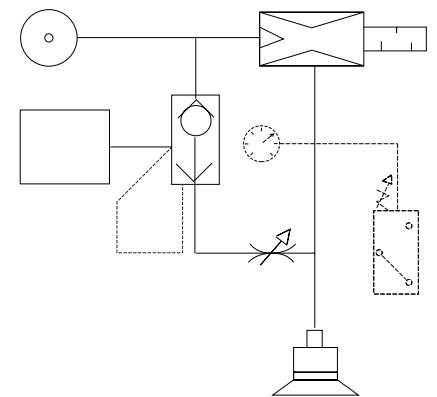
- The auto blow-off function is also available with more powerful vacuum generators (2 and 2.5 mm nozzles).

Applications:

Vacuum generators in series NGVC are venturis with automatic blow-off. This special feature allows the part gripped to be released automatically, increasing the cycle rate.

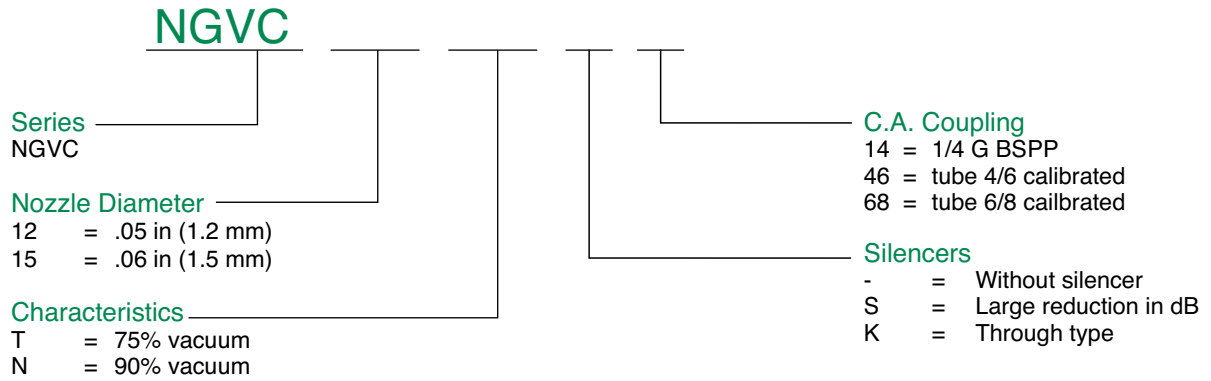
For control of vacuum generation, see the NGVCS range.

The addition of a 1/8 G type male connection on the unit provides a connection for a supplementary compressed air tank to increase the blow off capacity, e.g. for large-diameter suction cups.



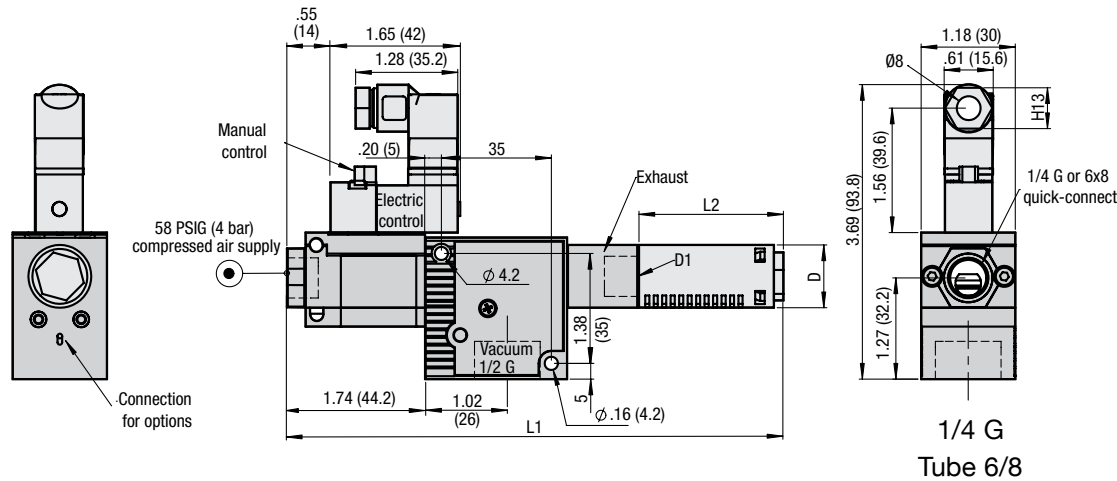


How To Order





Controlled Venturis, Series NGVPS



General Specifications

- Compressed Air: Filtered, non-lubricated, 30 to 87 PSIG (2 to 6 bars)
- Temperature: 32° to 140° F (0° to 60° C)
- Optimum Pressure: 58 PSIG (4 bars)
- Max. valve flow rate: 26.48 SCFM at 58 PSIG (750 NI/min at 4 bar)
- Valve Cycles: Approximately 15 million
- Operating frequency: 2 Hz maximum
- Function: N.C.
- Function: N.O. at 24 V DC on request
- Valve/Body material: DELRIN 100

Models	Nozzle ϕ in (mm)	Air Consumption SCFM (NI/min)	Maximum Vacuum %			Drawn-in air SCFM (NI/min)			D in (mm)		D1 G		L1* in (mm)		L2 in (mm)		
			X	T	N	X	T	N	X	N/T	X	N/T	X	N/T	S	K(N/T)	K(X)
NGVPS 12	.05 (1.2)	2.37 (67)	40	75	90	5.30 (150)	2.22 (63)	1.59 (45)	1.18 (30)	0.78 (20)	1/2	1/4	7.53 (160)	6.23 (127)	1.77 (45)	2.68 (68)	4.76 (121)
NGVPS 15	.06 (1.5)	3.53 (100)	50	75	90	6.36 (180)	3.35 (95)	2.47 (70)	1.18 (30)	0.78 (20)	1/2	1/4	7.53 (160)	6.62 (137)	1.77 (45)	2.68 (68)	4.76 (121)
NGVPS 20	.08 (2)	6.36 (180)	50	75	90	8.83 (250)	5.65 (160)	4.41 (125)	1.18 (30)	1.18 (30)	1/2	1/2	9.02 (198)	6.62 (137)	2.36 (60)	4.76 (121)	4.76 (121)
NGVPS 25	.10 (2.5)	9.53 (270)	50	75	90	12.71 (360)	8.47 (240)	7.06 (200)	1.18 (30)	1.18 (30)	1/2	1/2	9.02 (198)	6.62 (137)	2.36 (60)	4.76 (121)	4.76 (121)
NGVPS 30	.12 (3)	14.12 (400)	50	75	90	15.89 (450)	11.65 (330)	9.36 (265)	1.18 (30)	1.18 (30)	1/2	1/2	11.86 (270)	11.86 (270)	-	4.76 (121)	4.76 (121)

On standard basis, versions N and T are supplied with silencer S and version X is supplied with silencer K, except for model NGVPS 30 which is always equipped with silencer K.
 (*) L1 equipped with standard silencer

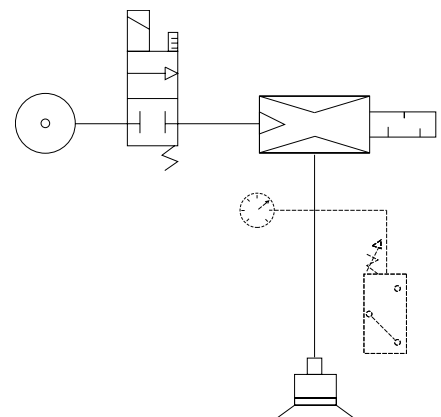
Options:

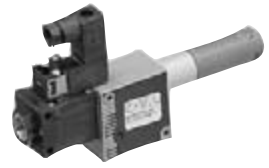
- See pages 34 to 37.

Applications:

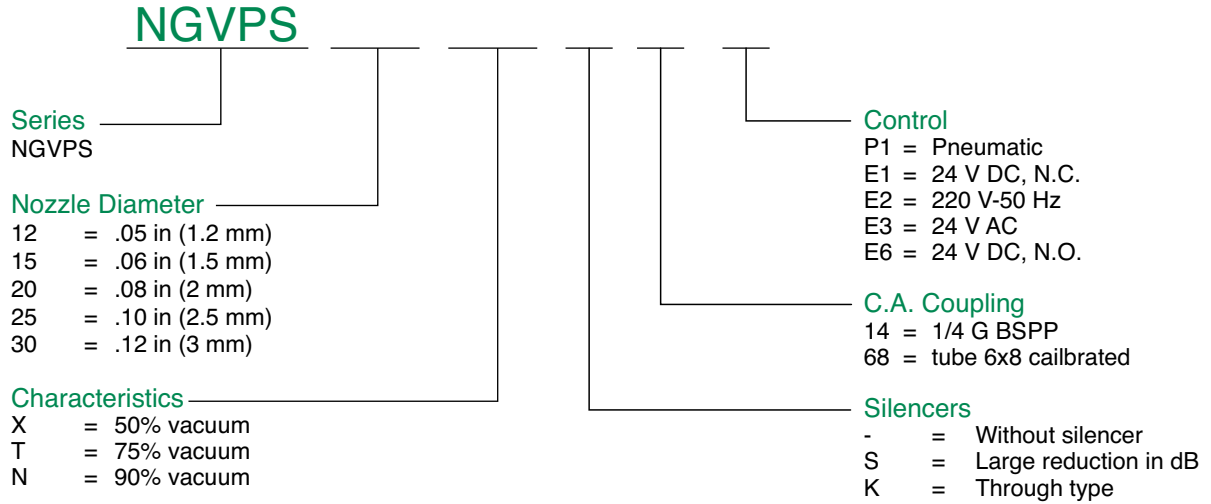
Vacuum generators in series NGVPS control vacuum generation by means of an integrated valve. This installation simplifies wiring and reduces venturi response times.

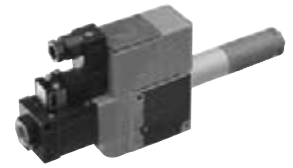
The valve can be controlled electrically (all voltages) or pneumatically (control by pneumatic logic and for explosion-proof conditions).



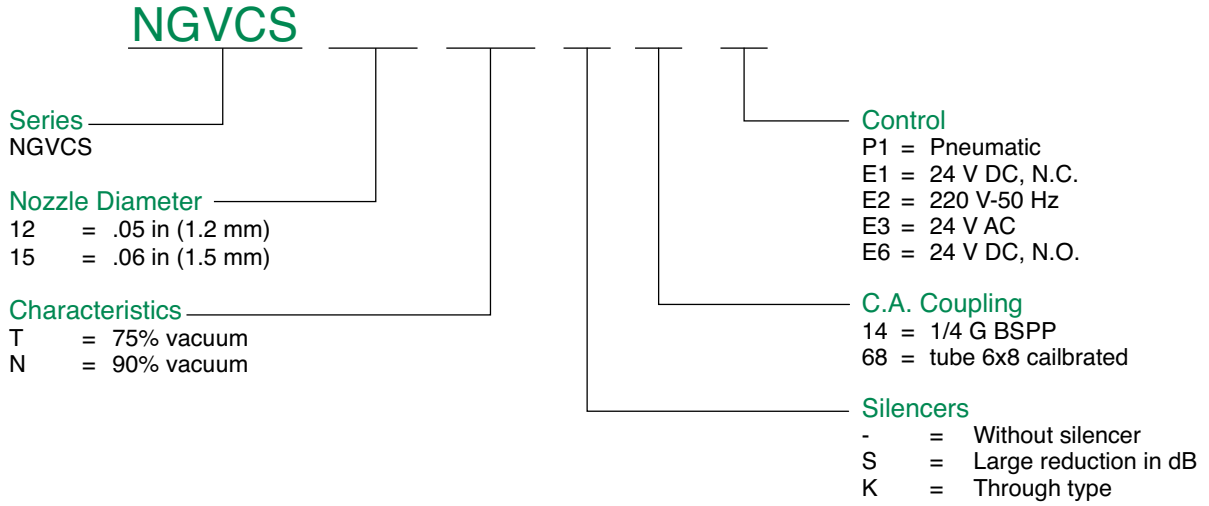


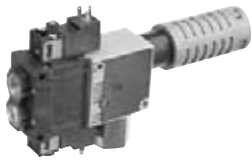
How To Order



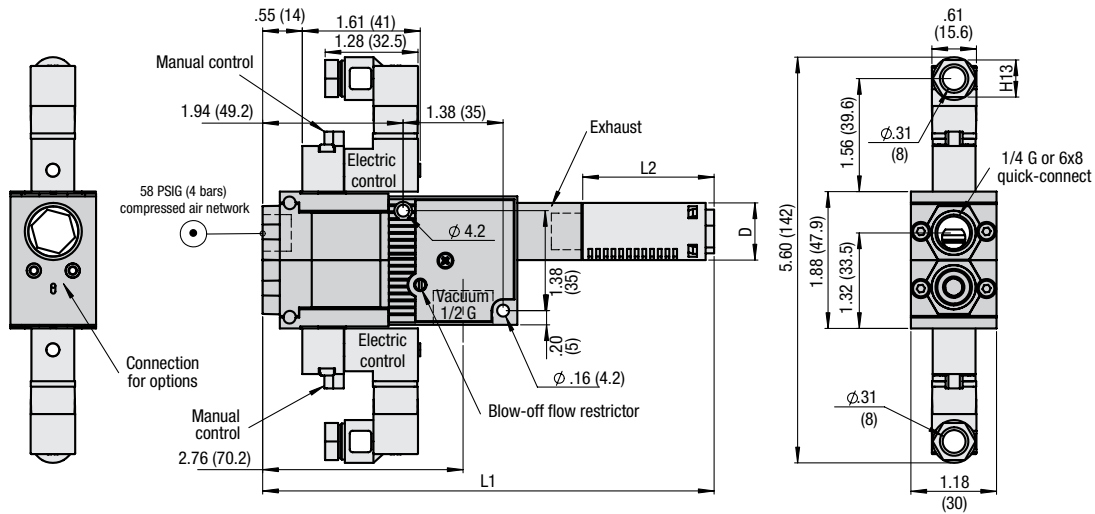


How to Order





Venturis with Gripping and Blow-Off Control, Series NGVPD



1/4 G
Tube 6x8

General Specifications

- Compressed Air: Filtered, non-lubricated, 30 to 58 PSIG (2 to 4 bars)
- Valve Cycles: Approximately 15 million
- Operating frequency: 2 Hz maximum
- Valve Function: N.C.
- Valve Function: N.O. at 24 V DC on request
- Valve/body material: DELRIN 100
- Optimal Pressure: 58 PSIG (4 bars)
- Blow-off Flow Rate: 30 NI/min closed, 260 NI/min open

Models	Nozzle Ø In (mm)	Air Consumption SCFM (NI/min)	Maximum Vacuum %			Drawn-in air SCFM (NI/min)			D in (mm)		D1 G		L1* in (mm)		L2 in (mm)		
			X	T	N	X	T	N	X	N/T	X	N/T	X	N/T	S	K(N/T)	K(X)
NGVPD 12	.05 (1.2)	2.37 (67)	40	75	90	5.30 (150)	2.22 (63)	1.59 (45)	1.18 (30)	0.79 (20)	1/2	1/4	7.53 (191.2)	6.23 (158.2)	1.77 (45)	2.68 (68)	4.76 (121)
NGVPD 15	.06 (1.5)	3.53 (100)	50	75	90	6.36 (180)	3.35 (95)	2.47 (70)	1.18 (30)	0.79 (20)	1/2	1/4	7.53 (191.2)	6.62 (168.2)	1.77 (45)	2.68 (68)	4.76 (121)
NGVPD 20	.08 (2)	6.36 (180)	50	75	90	8.83 (250)	5.65 (160)	4.41 (125)	1.18 (30)	1.18 (30)	1/2	1/2	9.02 (229.2)	6.62 (168.2)	2.36 (60)	4.76 (121)	4.76 (121)
NGVPD 25	.10 (2.5)	9.53 (270)	50	75	90	12.71 (360)	8.47 (240)	7.06 (200)	1.18 (30)	1.18 (30)	1/2	1/2	9.02 (229.2)	6.62 (168.2)	2.36 (60)	4.76 (121)	4.76 (121)
NGVPD 30	.12 (3)	14.12 (400)	50	75	90	15.89 (450)	11.65 (330)	9.36 (265)	1.18 (30)	1.18 (30)	1/2	1/2	11.86 (301.2)	11.86 (301.2)	-	4.76 (121)	4.76 (121)

On standard basis, versions N and T are supplied with silencer S and version X is supplied with silencer K, except for model NGVP 30 which is always equipped with silencer K.

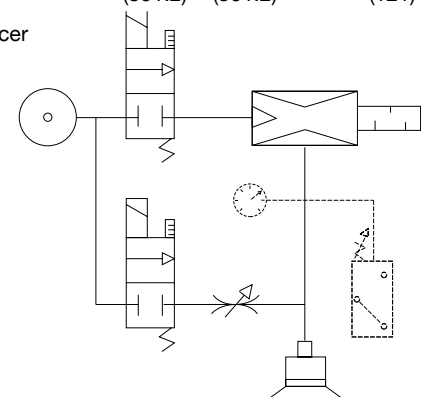
(*) L1 equipped with standard silencer

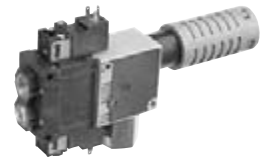
Options:

- See pages 34 to 37.

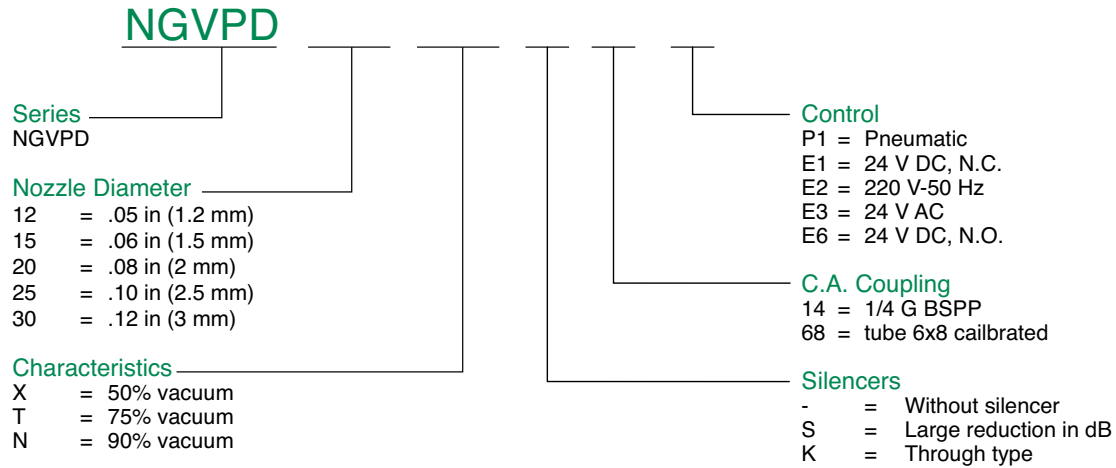
Applications:

The NGVPD Series provide vacuum on/off and an adjustable blow-off. This improves the gripping and release rate due to the ability to clean the surface prior to contact and a blow-off for faster part release.



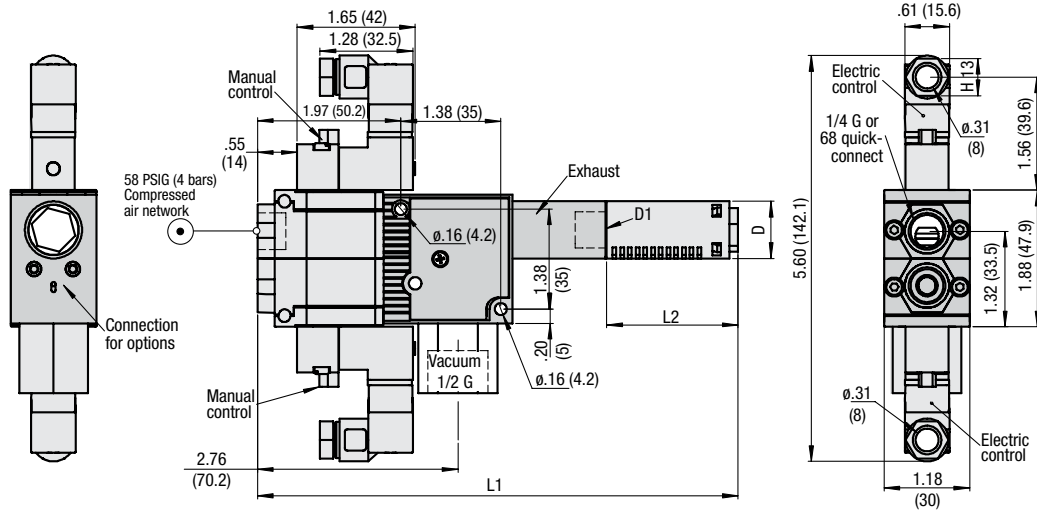


How To Order





Safety Venturis with Blow-Off, Series NGVS



1/4 G
Tube 6x8

General Specifications

- Compressed Air: Filtered, non-lubricated, 30 to 58 PSIG (2 to 4 bars)
- Valve Cycles: Approximately 15 million
- Operating frequency: 2 Hz maximum
- Valve Function: N.C.
- Valve Function: N.O. at 24 V DC on request
- Valve/body material: Aluminum
- Optimal Pressure: 58 PSIG (4 bars)
- Cycle Rate: Less than 20 cycles per minute

Models	Nozzle Ø In (mm)	Air Consumption SCFM (NI/min)	Max. Vacuum %	Drawn-in-air SCFM (NI/min)	D in (mm)	D1 G	L1* in (mm)	L2 in (mm) S K
NGVS 12	.05 (1.2)	2.37 (67)	90	1.59 (45)	0.79 (20)	1/4	6.19 (157.2)	1.77 (45) 2.68 (68)
NGVS 15	.06 (1.5)	3.53 (100)	90	2.47 (70)	0.79 (20)	1/4	6.58 (167.2)	1.77 (45) 2.68 (68)
NGVS 20	.08 (2)	6.36 (180)	90	4.41 (125)	1.18 (30)	1/2	6.58 (167.2)	2.36 (60) 4.76 (121)
NGVS 25	.10 (2.5)	9.53 (270)	90	7.06 (200)	1.18 (30)	1/2	6.58 (167.2)	2.36 (60) 4.76 (121)
NGVS 30	.12 (3)	14.12 (400)	90	9.36 (265)	1.18 (30)	1/2	11.82 (300.2)	- 4.76 (121)

(*) L1 equipped with standard silencer

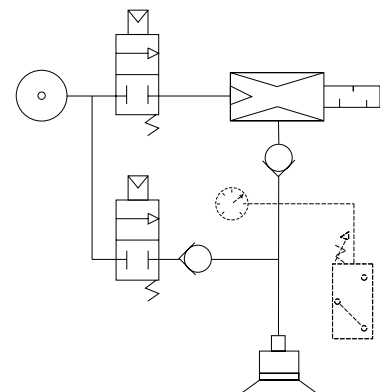
Options:

- See pages 34 to 37.

Applications:

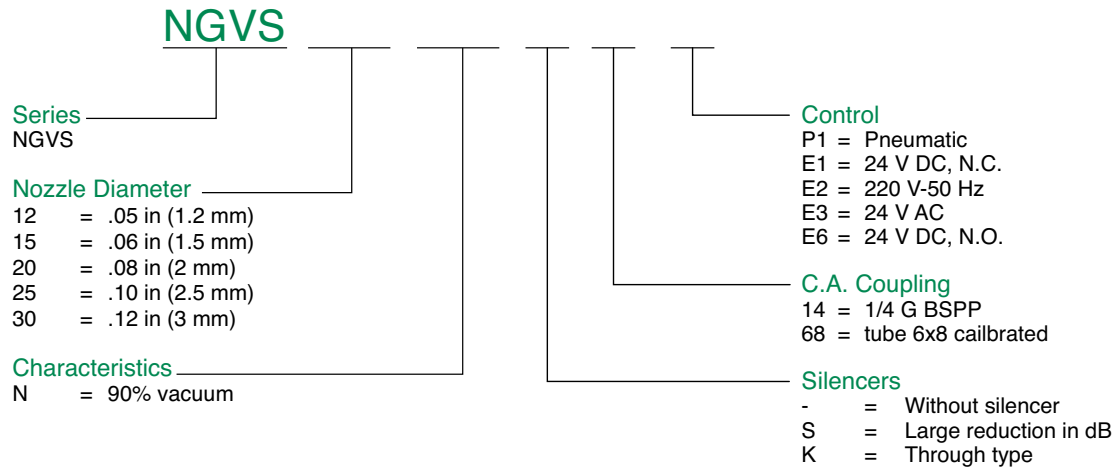
The Series NGVS has integrated vacuum generation and blow-off (with adjustable flow rate). In addition, two non-return valves hermetically seal off the vacuum circuit in the event of failure of either of the two power sources (electric and/or pneumatic). It therefore ensures that parts remain gripped.

Caution: Parts to be handled must be non-porous.





How To Order



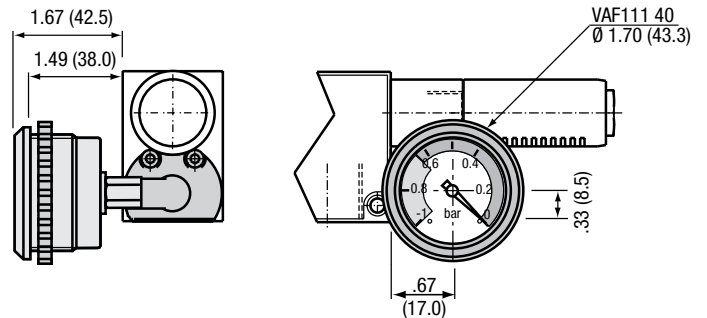


Options for Modular Venturis

Option NGVO VAF 111 40, vacuum gauge:

See characteristics on page 115.

The vacuum gauge allows visual verification of the vacuum level in the suction cup system. This option makes it easy to have continuous confirmation on the state of the vacuum system.



Option NGVO PSE 100 E or EC, vacuum switch with electric signal:

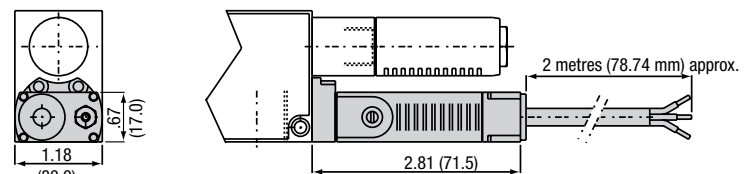
See characteristics on page 65.

The NPSE 100 E or NEC vacuum switch indicates the vacuum level in the suction cup system. When a small number of suction cups are used (5 to 10 maximum), this indication is enough to confirm that the gripped part is in the place. Hysteresis must also be taken into account (125 mbars) according to the application of the vacuum switch data.

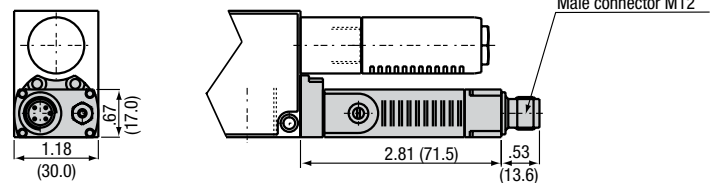
The venturi supply pressure can be checked to generate a vacuum level equal to the selected threshold.

For connector cable: see page 38.
(Connector with LED possible for display of the vacuum switch status).

NGVO PSE 100 E with cable (2 metres)



NGVO PSE 100 EC with connector M12 (supplied without connector cable)



The NGVO options are supplied separately and can be installed by the user.



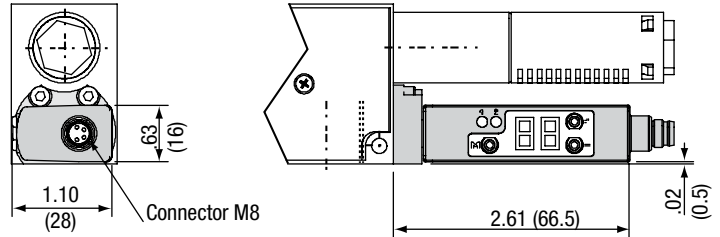
Options for Modular Venturis

Option NGVO PSA 100 C, electronic display-type vacuum switch:

See precise characteristics on page 67.

At the top of the range of electronic vacuum switches, the NPSA 100 C provides LED display of the vacuum level. It is also equipped with two on/off outputs (N.O or N.C.) with independently adjustable hysteresis.

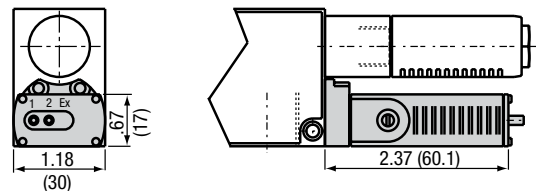
PNP on standard basis
Connector M8



Option NGVO PSE 100 P N.O. or N.C.

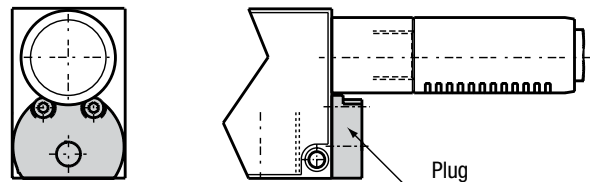
Pneumatic signal vacuum switch
(See characteristics on page 66).

This vacuum switch is fully pneumatic and is ideal for application in hazardous environments.



Option NGVOB, (plug for vacuum data port)

This optional plug should be used if the NGVO vacuum switch is removed from venturi body.



The NGVO options are supplied separately and can be installed by the user.

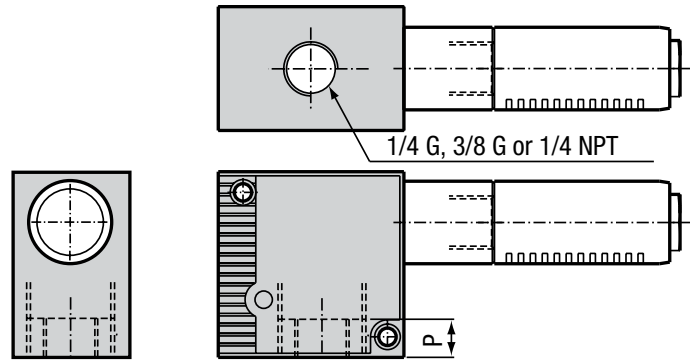


Options for Modular Venturis: Factory Installed

Vacuum outlet reducer options:

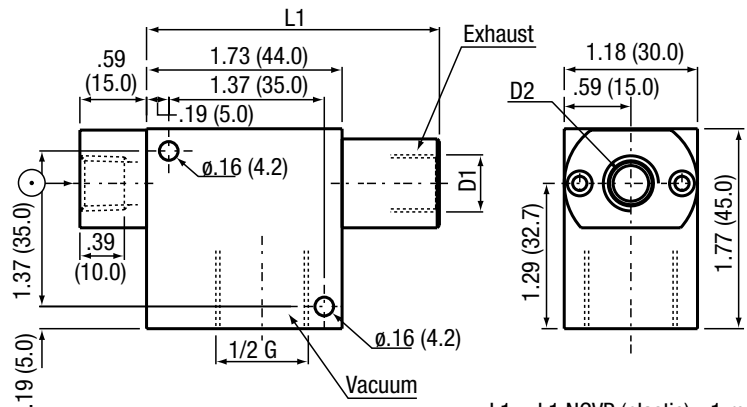
- NGVO R 14: Female 1/4 G type, 9 mm deep.
- NGVO R 14 NPT: Female 1/4 NPT, 11 mm deep.
- NGVO R 38: Female 3/8 G type, 11 mm deep.

These options provide the user with connections other than the standard 1/2 G type on the vacuum outlet, i.e. female 1/4 G type, 1/4 NPT or female 3/8 G type.



Option NGVO AL and NGVO AL NPT: (For venturi NGVP)

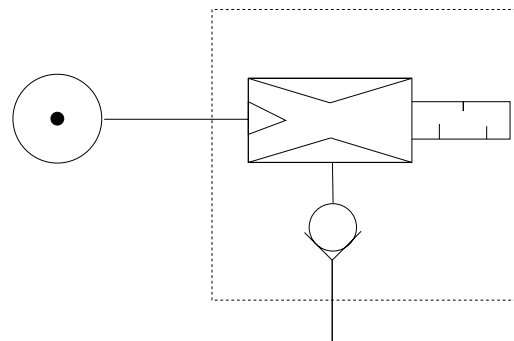
Aluminum body and flange, 1/4 G type
Important note: Vacuum switch options cannot be installed.



L1 = L1 NGVP (plastic) - 1 mm
D1 = D1 (NGVP N, T and X)
D2 = 1/4 G type for NGVO AL
1/4 NPT for NGVO AL-NPT

Option NGVO CAV.D: (For venturi NGVPD)

Non-return valve option
Blow-off function required downstream of valve.

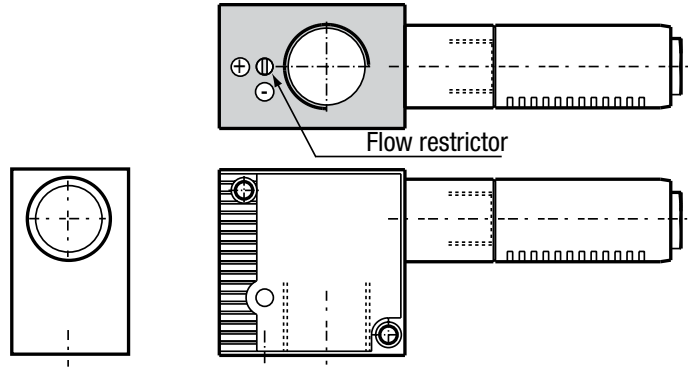




Options for Modular Venturis: Factory Installed

Option NGVO RD, bottom position:

For manifold mounting or installations where the side of the venturi is not accessible an option is offered that relocates the blow-off adjustment to the bottom of the unit. This is applicable for series NGVCS, NGVC and NGVPD.

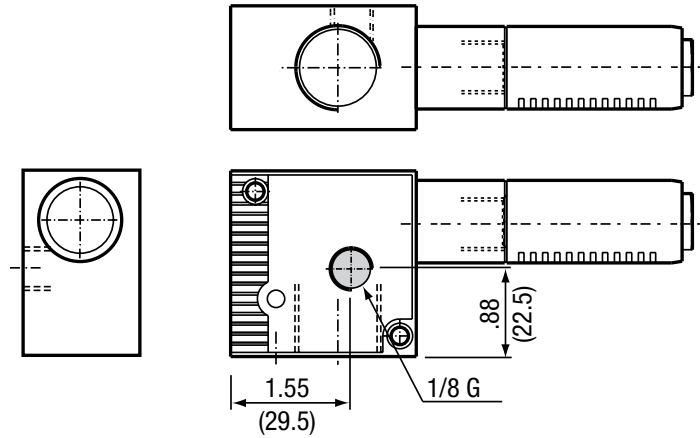


Option NGVO T 18:

Female connector of 1/8 G type on front panel for fitting of a vacuum gauge NVAF 111-40.

This option is not compatible with the non-return valve option NGVO CAV D.

Factory installed.



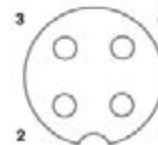


Vacuum Product Cables

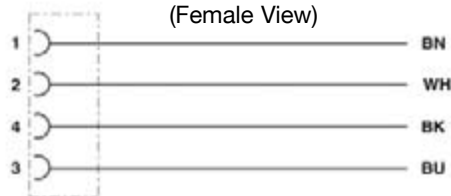


M12 Female 4 pole Straight Single Ended Cable

- TC0402MIE0000000 - 2 meter
- TC0405MIE0000000 - 5 meter
- TC0410MIE0000000 - 10 meter



M12 Pin Out/Color Code
(Female View)



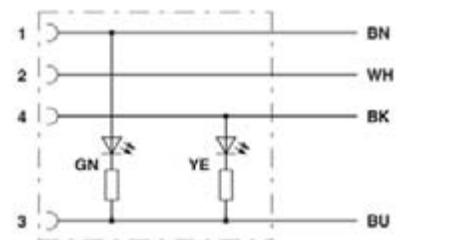
M12 Female 4 pole 90° Single Ended Cable

- TD0402MIE0000000 - 2 meter
- TD0405MIE0000000 - 5 meter
- TD0410MIE0000000 - 10 meter



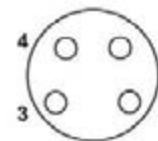
M12 Female 4 pole 90° Single Ended Cable - Lighted

- TD0402MIE000066H - 2 meter
- TD0405MIE000066H - 5 meter
- TD0410MIE000066H - 10 meter

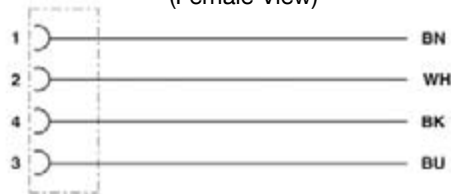


M8 Female 4 pole Straight Single Ended Cable

- PC0402MIE0000000 - 2 meter
- PC0405MIE0000000 - 5 meter
- PC0410MIE0000000 - 10 meter



M8 Pin Out/Color Code
(Female View)



M8 Female 4 pole 90° Single Ended Cable

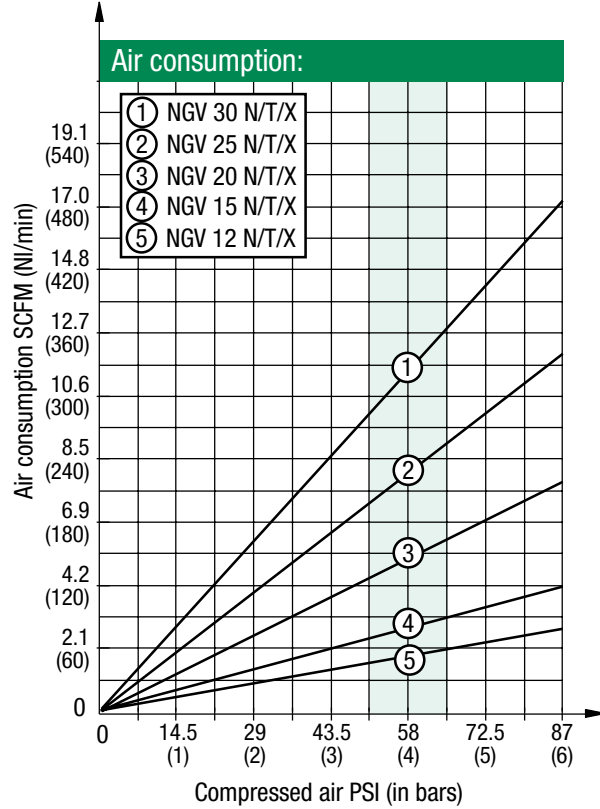
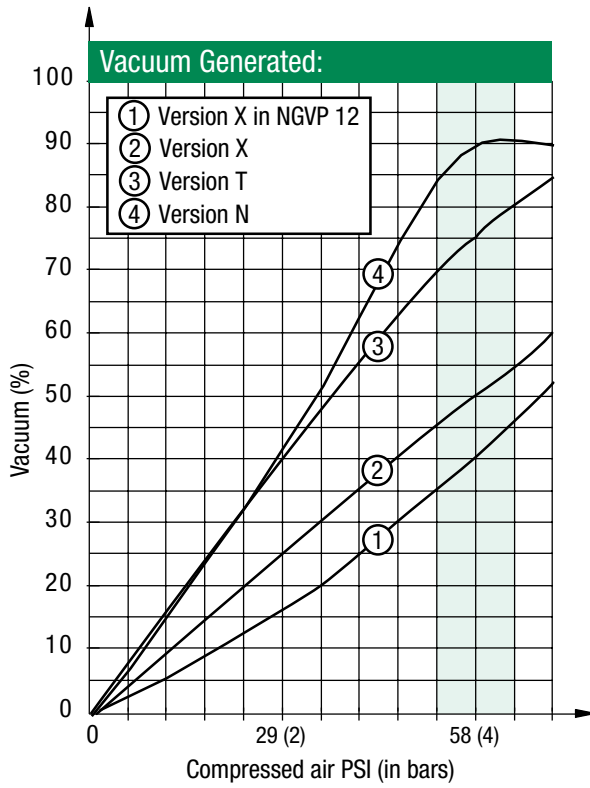
- PD0402MIE0000000 - 2 meter
- PD0405MIE0000000 - 5 meter
- PD0410MIE0000000 - 10 meter

Technical Data

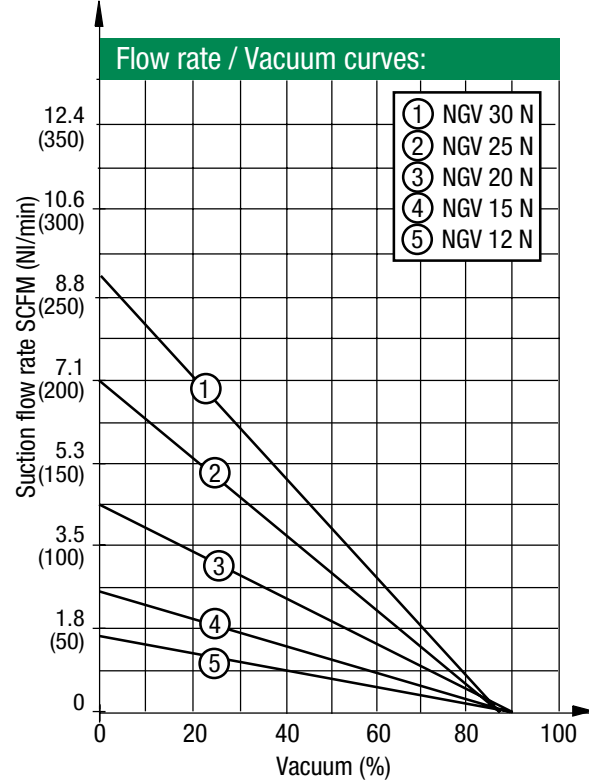
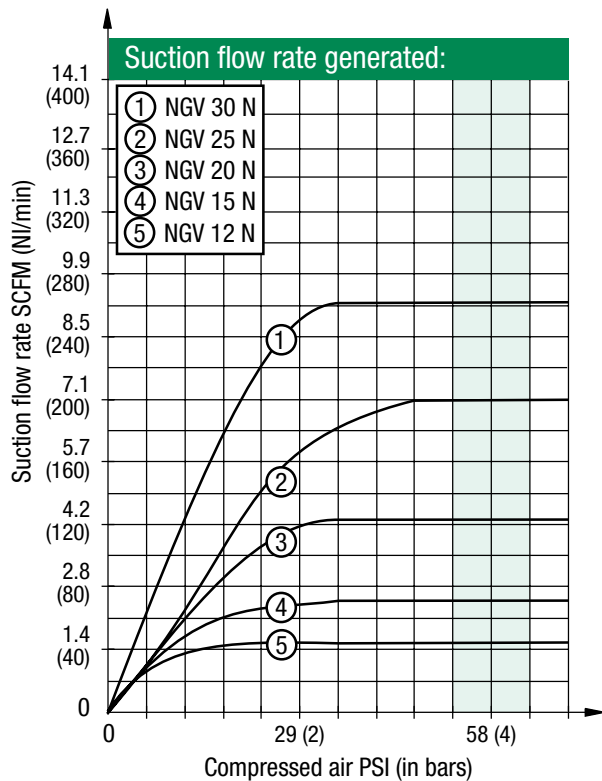
Molded Body / Insert	TPU
Couling Nut	Zinc, Ni Plated
Cable Jacket Material	PUR
Cable O.D.....	4.4 to 4.7 mm
Voltage Rating (conductor).....	250V (M12) 24V (M12LED) 12V (M8)
Current Rating	4.0 Amps (M12) 3.0 Amps (M8)
Degree of Protection	IP65/IP68/IP69K (mated)
Operating Temperature	-25° C - 80°C
Conductor Gauge.....	22 AWG (M12) 24 AWG (M8)
Bend Radius.....	47mm (M12) 44mm (M8)



Curves for Modular Venturis, Series NGVP and NGVC



Version N, 90% vacuum. Supply pressure of 58 PSIG (4 bars).



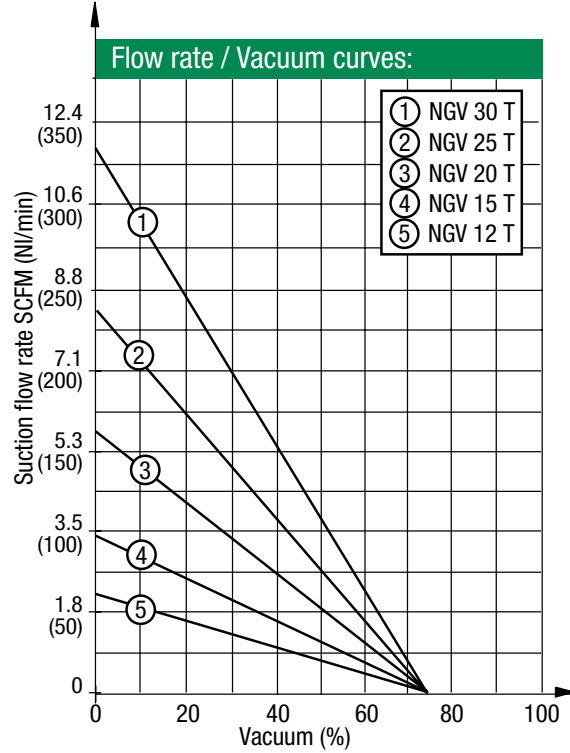
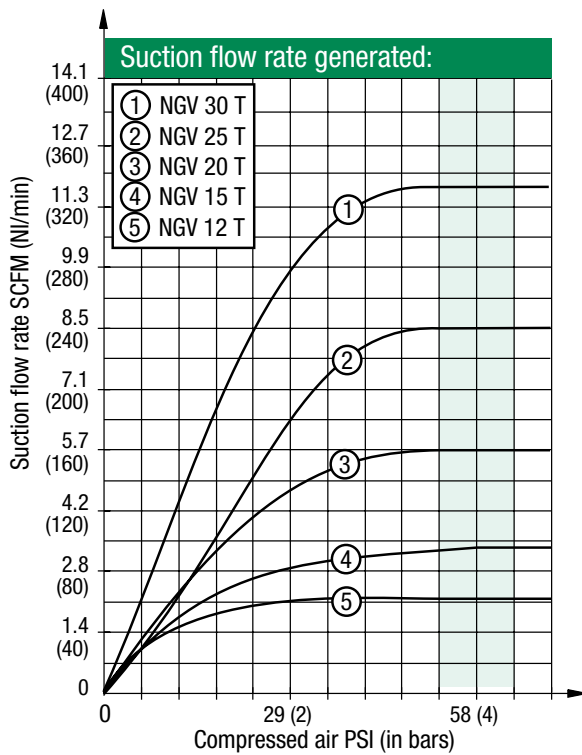
The curves shown above indicate the mean values of the capacities of our products.



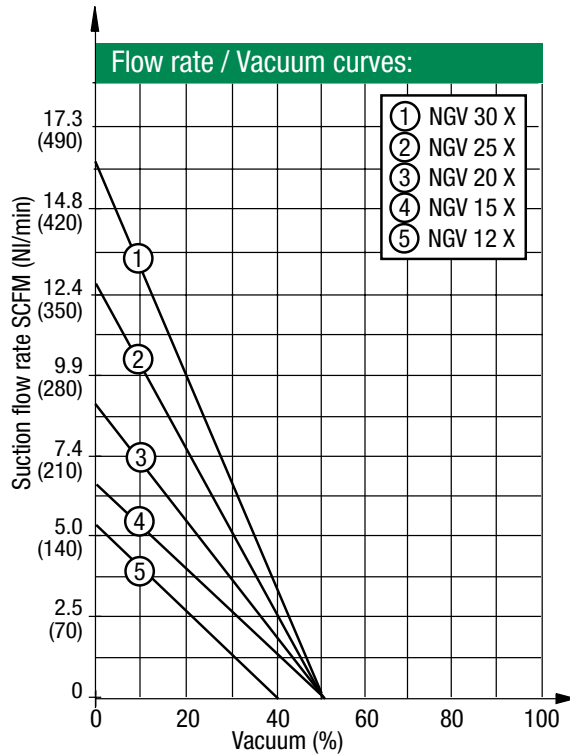
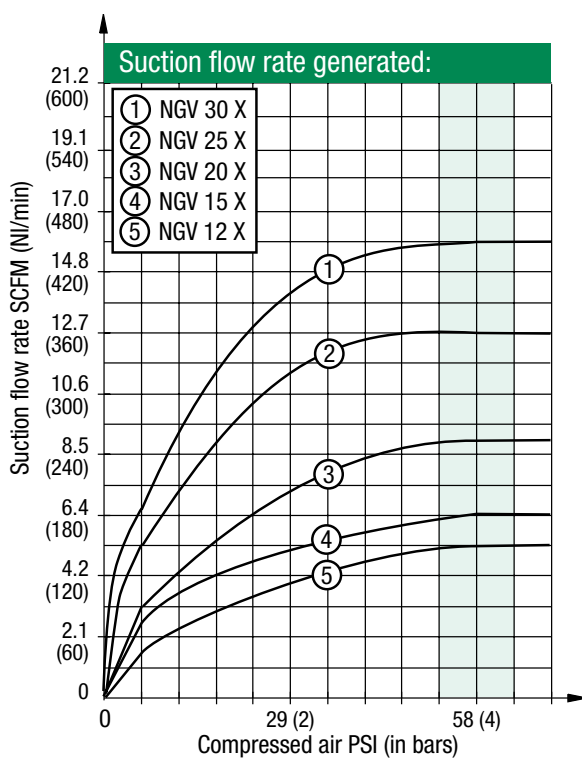
Modular Vacuum Generators

Curves for Modular Venturis, Series NGVP and NGVC

Version T, 75% vacuum. Supply pressure of 58 PSIG (4 bars).



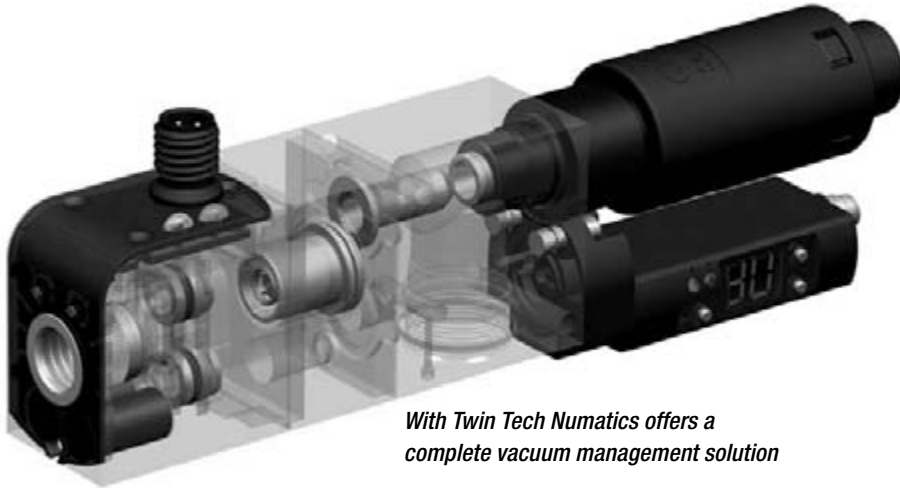
Version X, 50% vacuum. Supply pressure of 58 PSIG (4 bars).



The curves shown above indicate the mean values of the capacities of our products.



A New Perspective in Industrial Vacuum Technology



With Twin Tech Numatics offers a complete vacuum management solution

With Twin Tech™ the association of two patented technologies, the new NGEM series vacuum pump guarantees optimal performance, a significant reduction in the sound level as well as air consumption in a single compact, integrated, light weight module.

Numatics is an ISO 9001 certified company which offers innovative solutions integrating reliable and optimized components with intelligent functionalities. The focus is to provide the most personalized and economic solution to a given application while assuring a significant improvement in the productivity and the security of the vacuum users around the world.



Integrated Vacuum Control

INTEGRATED SOLENOID PILOTS

A traditional single or multi stage vacuum pump must be equipped with additional peripheral modules necessary for its functioning: solenoid-pilots, valve and electronic circuit, supply pressure regulator, vacuum switch and blow-off valve, which lead to increased dimensions, weight, complex wiring and additional cost of the overall vacuum system.

The patented ivc technology of Numatics allows the integration of all necessary functions into a single compact and light weight module. The installation is drastically simplified and does not require additional peripheral modules as it comes in a ready to use plug and play format.



Intelligent Pressure Regulation

OPTIMIZED COMPRESSED AIR CONSUMPTION

Even the multi stage models of traditional vacuum pumps are noisy and consume substantial amounts of compressed air. Numatics resolves this problem with the ipr technology.

The internal intelligence of the NGEM vacuum pumps regulates the operational pressure to a maximum of 58 PSIG regardless of a greater incoming supply pressure. The unique combination of the pressure regulator and venturi reduces both the sound level and the energy consumption significantly.



IVC Integrated Vacuum Control

Advantages:

DIRECT CONTROL, 24VDC – 0.7W

Numatics innovation, the integration of the micro solenoid pilots, the valves and the electronic control circuit makes the module independent and simplifies its implementation:

Direct connection from a programmable controller, normalized M12 connector, built-in visual LEDs and auxiliary manual controls facilitate the operation.

EXTENDED VACUUM PERFORMANCE

- maximum vacuum level: up to 90%
- flow rate: up to 13.6 SCFM (385 NI/min)

COMPACT & LIGHT WEIGHT

In contrast to the traditional and multi stage vacuum pumps, the NGEM series integrates all miniaturized peripheral devices in one compact and light weight unit.

INTEGRATED BLOW-OFF

Full pressure blow-off with adjustable flow-rate, by choice:

- controlled by 2 solenoid-pilots
- temporized by electronic control circuit (1 unique control)

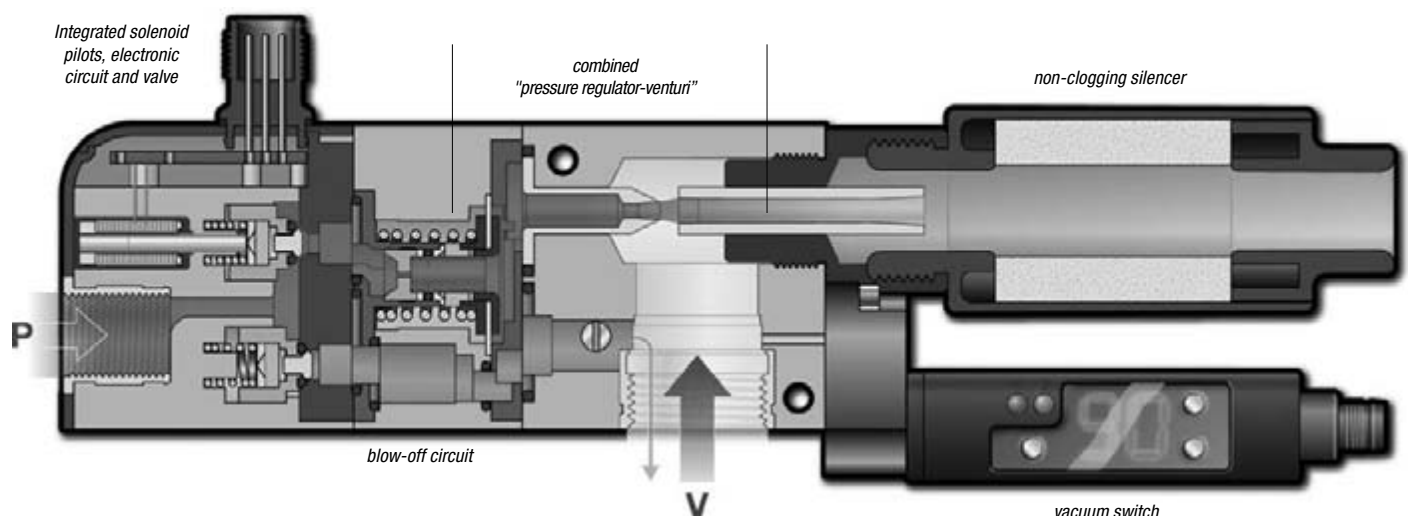
FLEXIBLE CONFIGURATIONS

The NGEM series is especially developed to facilitate the determination of specific module corresponding for your application needs:

- choice of vacuum level (90% or 60%) and different vacuum flow rates up to 13.6 SCFM (385 NI/min) according to your needs.
- thus making it possible for you to optimize the necessary functions valid for your specific application (i.e.: modules with or without blow-off).
- the proposed accessories permit you to adapt the NGEM series vacuum pump to your environment (adjustable vacuum-switch, part presence checking, non-return valve,...).

The Integrated Functions

As the industry moves towards integrated automation solutions, Numatics identifies and integrates the latest trends in automation technology into its product innovation programs through collaborations and partnerships with renowned organisations and experts in multiple domains of science and technology.





ipr Intelligent Pressure Regulation

Advantages:

ENERGY SAVINGS

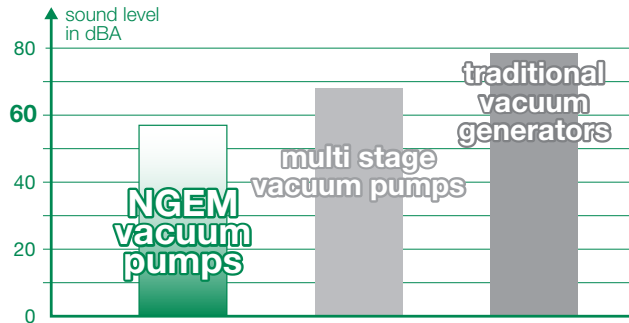
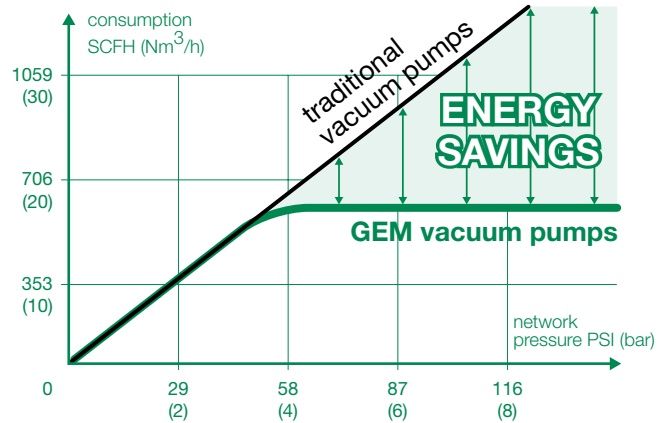
The innovative combination of “pressure regulation-venturi” ipr optimizes the functioning of the vacuum pumps whatever the supply pressure.

This results in substantial savings of compressed air consumption as is shown in the adjacent figure.

FUNCTIONING SILENCE

The NGEM Series vacuum pumps offer exceptionally silent operation and guarantee a significant reduction in sound level.

The reduction in the sound level may attain 20 dBA.



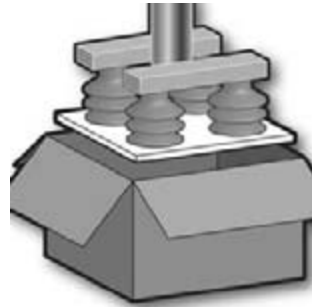


NGEM Applications

PACKAGING MACHINES

Automatic packing systems require greater speed and flexibility.

The NGEM range is perfectly adapted to meet these requirements by offering an optimum evacuation time, incorporating vacuum and blow-off functions with a large variety of vacuum switches, and all this with a reduction of noise level and air consumption.



ROBOTIC HANDLING TOOLS

The NGEM Series vacuum generators offer versatility in a compact package. They optimize the vacuum control due to a variety of options that include built in on/off control of vacuum and blow-off, automatic or timed blow-off, adjustable blow-off etc. In addition, they provide reduced sound levels, lighter weight, and smaller dimensions.



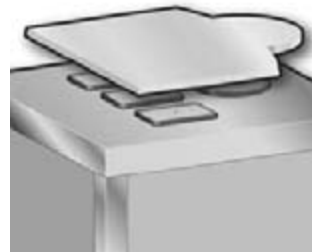
PLASTIC INDUSTRY

The NGEM range is the perfect solution to your multiple and optimized handling needs. Thanks to its wide flexibility, it is ideal for end of line part gripping by handling your product fast and secure. Its built-in controls facilitate connections, accelerate cycle rates, and can be provided with high precision vacuum switches.



CLAMPING

Due to the wide range of configurations the NGEM Series is ideal for vacuum clamping and part transfer in all types of environments. Its technology enables the NGEM to operate in all positions, conserve air consumption, and reduce sound levels.



YOU ARE UNIQUE: By request, Numatics is able to evaluate your application and provide a proposal integrating the NGEM modules specific to your needs.



Exceptional Performance

ENERGY SAVINGS

With a traditional vacuum pump, the air consumption increases with the pressure in the network.

Thanks to the integrated combination "pressure regulator-venturi", the NGEM vacuum pumps optimize the energy consumption resulting in substantial energy savings independent of the network pressure.

The energy savings may attain more than 50%.

nozzle ϕ	compressed air consumption (NI/mn)			
1.2 mm	65	108	139	
1.5 mm	97	157	203	
2 mm	179	278	357	
2.5 mm	260	404	519	
3 mm	385	614	797	
network pressure	4 to 8 bars	87 PSI (6 bars)	116 PSI (8 bars)	
	NGEM	traditional vacuum generators		

*thanks to NGEM, at 6 bars you will save up to **37%** of compressed air*

*thanks to NGEM, at 8 bars you will save up to **51%** of compressed air*

SILENT TECHNOLOGY

With a traditional vacuum pump, the sound emitted through the exhaust equipped with a silencer increases with the pressure in the network. Thanks to the integrated combination "pressure regulator-venturi" and the optimized silencer, the NGEM vacuum pumps provide an exceptionally silent functioning regardless of the pressure.

nozzle ϕ	sound level (dBA)			
1.2 mm	57	76	84	
1.5 mm	57	77	85	
2 mm	57	78	85	
2.5 mm	65	76	85	
3 mm	67	78	85	
network pressure	4 to 8 bars	87 PSI (6 bars)	116 PSI (8 bars)	
	NGEM	traditional vacuum generators		

*thanks to NGEM sound level reduction up to **20 dBA** at 6 bars*

*thanks to NGEM sound level reduction up to **30 dBA** at 8 bars*

CLOG FREE DESIGN

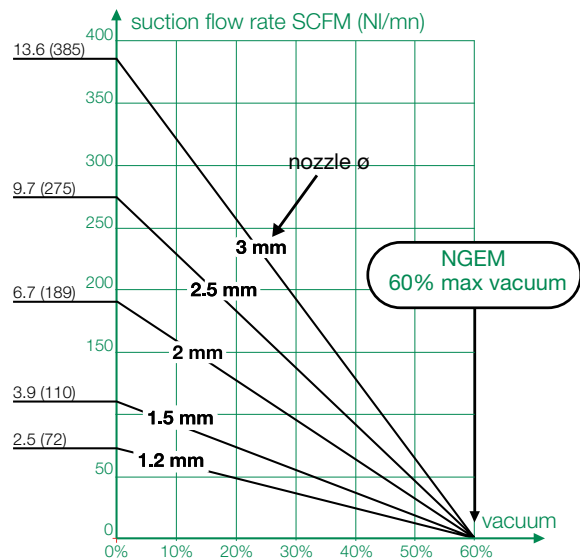
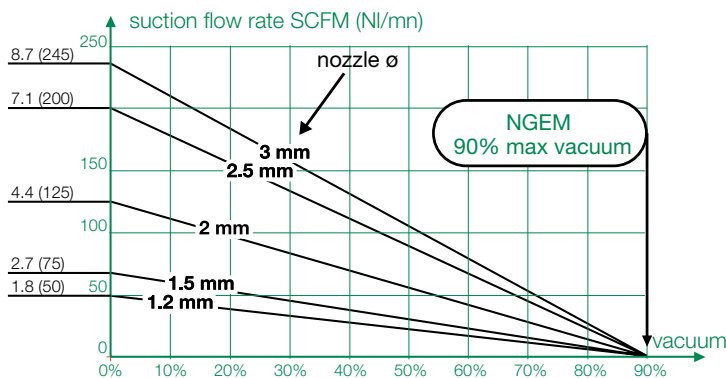
The applications equipped with multi-stage vacuum pumps in dusty industrial environments are frequently subjected to clogging problems.

The problem can be attributed to their complex internal design and also the working principle of the multi-stage vacuum pumps.

The NGEM modules offer a simple design and a non-clogging silencer which facilitate the evacuation of the absorbed particles during the suction phase.

VACUUM 60%-90%

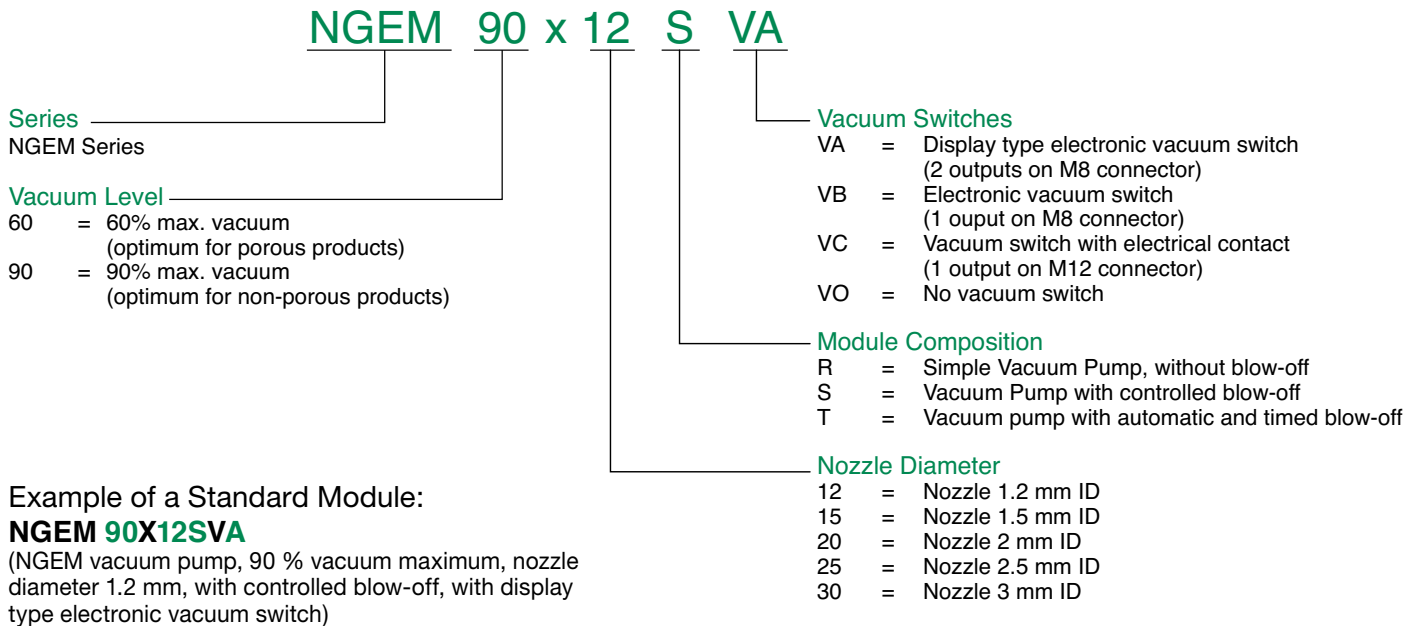
According to the application and to the parts to be handled, the NGEM vacuum pumps offer an extended vacuum range (60% or 90% vacuum).





NGEM Series

How to Order



Choice of the Vacuum Pump Characteristics

Select the required vacuum level (60 or 90%) and then the nozzle diameter necessary for the application. For a given application (gripping of porous product, non-porous product or emptying a volume) the choice will be done by following the methods described below:

POROUS PRODUCTS

For instance: cardboard, raw wood, pastries...

NGEM PUMP 60% MAX. VACUUM

For the choice of the nozzle diameter and with regard to the product porosity, (leak rate), please refer to the curve "NGEM 60 % max. vacuum" page 7.

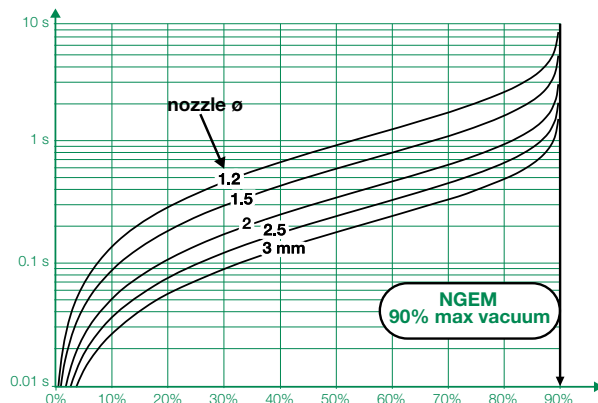
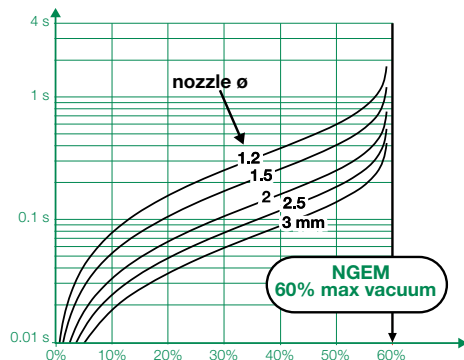
NON-POROUS PRODUCTS

For instance: glass, plastic, coated wood, metal sheet...

NGEM PUMP 90% MAX. VACUUM

The nozzle diameter is determined by the requested time to grip the part with help of the curve below.

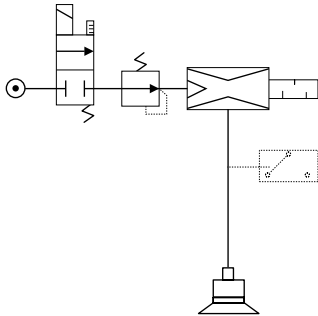
Emptying time for a 1 liter volume (given as an indication).





How to Order Continued

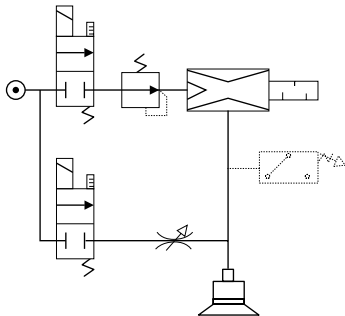
Simple vacuum pump, without blow-off



NGEM__X__RV_

- The basic vacuum pump
- Only one control signal

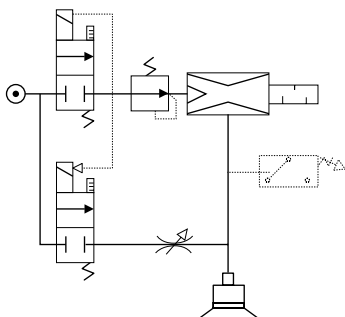
Vacuum pump with controlled blow-off



NGEM__X__SV_

- Blow-off controlled by external signal, with adjustable flow rate
- 2 control signals

Vacuum pump with automatic and timed blow-off



NGEM__X__TV_

- Blow-off controlled by the ejector shutdown and maintained for an adjustable time between 0 and 3 seconds, with adjustable flow rate
- Only one control signal

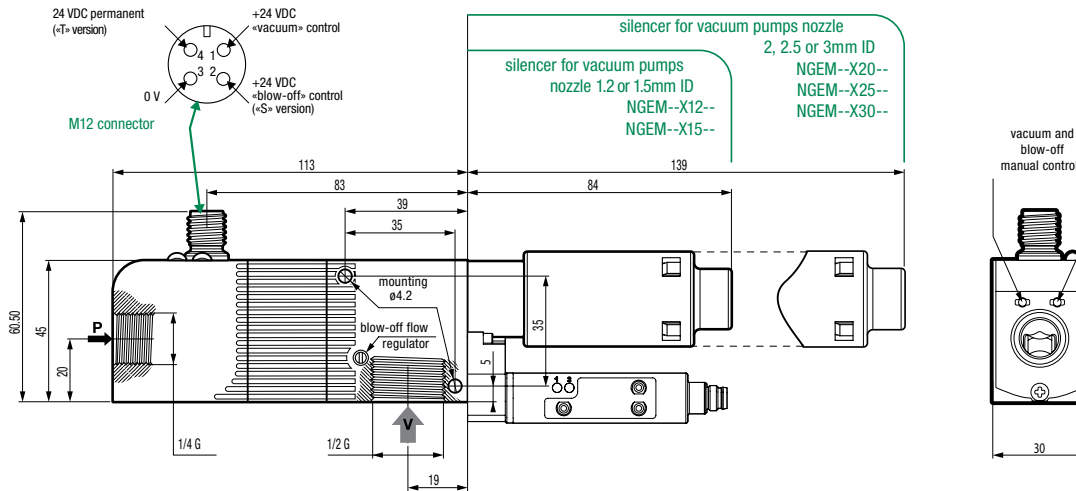
Your Options:

On request, the following specifications can be obtained:

- **Vacuum pump control by solenoid pilot N.O.**
With a solenoid pilot normally opened, the product remains gripped even in case of power failure.
- **Module with non-return valve on the vacuum network**
- **Module with integrated vacuum gauge**
- vacuum level display.
- **DIN connector 15mm module**



General Characteristics, Size and Connections



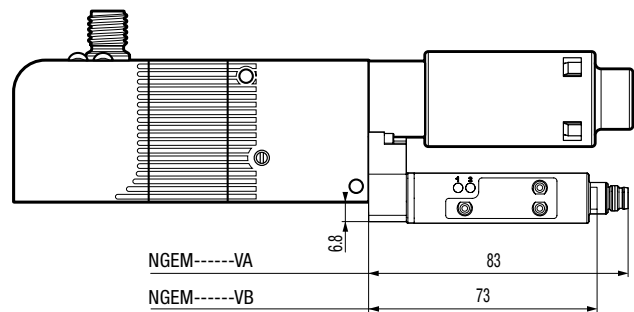
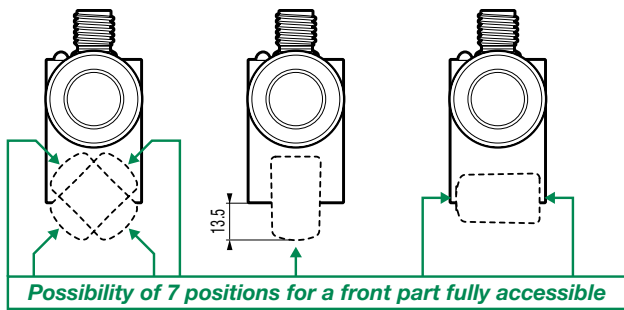
General Characteristics:

- C.A supply 5 μ filtered, non-lubricated air relevant to ISO 8573-1 class 4 standard
- Protection: class IP65
- Optimal working pressure: from 58 to 116 PSIG (4-8 bars)
- Blow-off:
 - network supply pressure
 - Adjustable flow rate
- Maximum vacuum: 60% or 90% according to model (refer page 8)
- Flow rate: from 50 to 385NI/mn according to model (refer page 8)
- Air consumption: from 65 to 385NI/mn according to model (refer page 7)
- Sound level: from 57 to 67dBA according to model (refer page 7)
- Voltage control: 24 V DC (regulated) +/- 10%
- Current draw: 30mA (0.7W) vacuum or blow-off
- Maximum working frequency: 2Hz
- Number of operations: 10 million cycles
- Weight: about 250g according to model
- Materials: PA 6-6 15%FG, POM, PC 15% FG, brass, aluminum, NBR
- Working temperature: from 50° to 140° F (10° to 60° C)

Electrical Connections: Refer to page 38.



Modules with adjustable electronic vacuum switch NGEM-VA or NGEM-VB

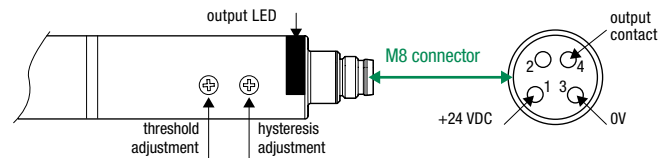
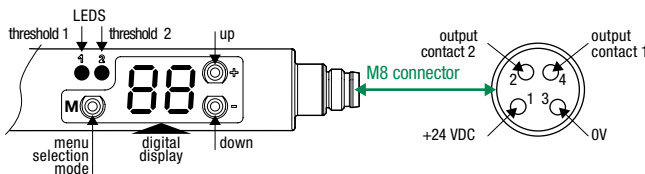


VACUUM SWITCH WITH DISPLAY, 2 OUTPUTS, NGEM-VA

- Compatible fluids: non-corrosive gases; dry, non-lubricated air
- Adjusting range: -1 ... 0 bar
- Hysteresis: adjustable from 0 to 99 %
- Maximum overpressure: 43.5 PSIG (3 bars)
- Repeatability: +/- 1 % of the range
- Output thresholds: 2 x NO/NC
- Switching capacity: 125mA transistor PNP
- Thresholds state display: 2 x LEDs
- Display unit: vacuum % (2 digits)
- Electrical connection: connector M8 (4 pins)
- Power supply: 18 to 30 VDC (regulated)
- Current draw: < 100mA
- Protection: IP 65
- Working temperature: 32° to 122° F (0° to 50° C)

ELECTRONIC VACUUM SWITCH, 1 OUTPUT, NGEM-VB

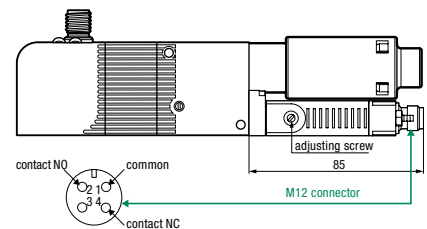
- Compatible fluids: non-corrosive gases; dry, non-lubricated air
- Adjusting range: -1 ... 0 bar
- Hysteresis: 0 to 30 % adjustment by potentiometer
- Maximum overpressure: 43.5 PSIG (3 bars)
- Repeatability: +/- 1 % of the range
- Output threshold: 1 x NO
- Switching capacity: 125mA transistor PNP
- Thresholds state display: 1 x LED
- Electrical connection: connector M8 (4 pins)
- Power supply: 18 to 30 VDC (regulated)
- Current draw: < 20mA
- Protection: IP 50
- Working temperature: 32° to 122° F (0° to 50° C)



Modules with electronic vacuum switch - NGEM-VC

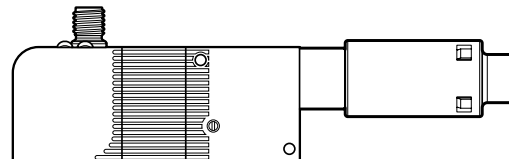
ELECTRIC VACUUM SWITCH NGEM-VC

- Compatible fluids: non-corrosive gases; dry, non-lubricated air
- Adjusting range: -350 to 850 mbar
- Hysteresis: 125 mbar
- Maximum overpressure: 29 PSIG (2 bars)
- Repeatability: 3 % of the range
- Output thresholds: 1 x NO, 1 x NC
- Switching capacity: 3A (breaking switch)
- Electrical connection: connector M12 (4 pins)
- Power supply: up to 125 Volts
- Protection: IP 40
- Operating temperature: 14° to 122° F (-10° to 50° C)
- Number of operation: 5 million cycles
- Maximum work rate: 30 cycles per minute



Modules without vacuum switch - NGEM-VO

This model, without vacuum switch, requires an independent vacuum switch on the vacuum network or with a vacuum gauge in the case of a manual tank emptying.





Accessories for Venturis

Silencers

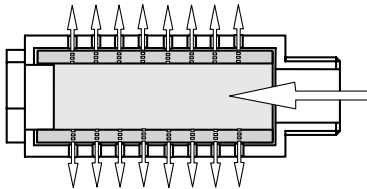
Numatics understands the importance of noise reduction and offers two silencer designs to meet your specific requirements.

The acoustic performance of the Numatics silencers is attributed to the shape of their internal structure and the utilization of high-tech sound-proofing materials.

Two designs are available.

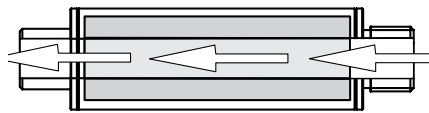
Diffuser Type Silencers:

Very good noise reduction.
Gentle diffusion of the air outlet.



Through Type Silencers:

Controlled noise reduction.
No head losses.



Diffuser Type Silencers, Series NSIL GV

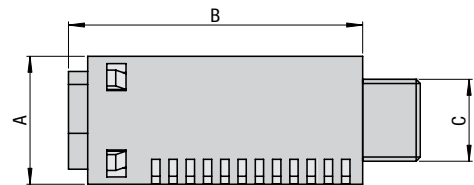
Sound reduction is achieved by the exhaust air passing through sound insulation material.

Models	ØA in (mm)	B in (mm)	ØC G	Weight oz (g)	Average noise* reduction dB(A)
NSIL GV 10M5F	.70 (18)	1.41 (36)	1/8	.18 (5)	30
NSIL GV 10	.70 (18)	1.41 (36)	1/8	.18 (5)	30
NSIL GV 15	.78 (20)	1.81 (46)	1/4	.35 (10)	35
NSIL GV 20	1.18 (30)	2.44 (62)	1/2	1.0 (29)	39

*Level measured at 1 meter.

General Specifications

- Material: POM
- Working Temperature: 14° to 122° F (-10° to 50° C)



Through Type Silencers, Series NSIL K-C

Lateral sound absorption allowing greater flow through less restriction.

Models	ØA in (mm)	B in (mm)	ØC G	Weight oz (g)	Average noise* reduction dB(A)
NSIL K 14 C	.78 (20)	2.67 (68)	1/4	.88 (25)	31
NSIL K 38 C	.78 (20)	4.67 (121)	3/8	3.2 (90)	33
NSIL K 12 C	1.18 (30)	4.67 (121)	1/2	3.3 (92)	33
NSIL K 12 CS	1.18 (30)	2.12 (54)	1/2	2.2 (61)	28
NSIL K 34 C	1.96 (50)	7.36 (187)	3/4	11 (310)	33
NSIL K 1 C	1.96 (50)	7.36 (187)	1"	11 (320)	33

*Level measured at 1 meter.

General Specifications

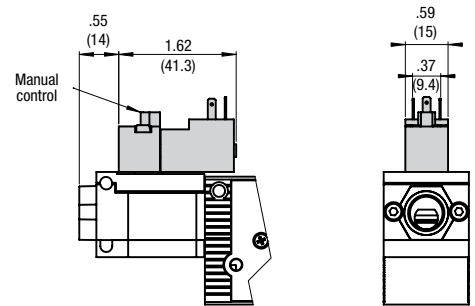
- Tube Material: Black Anodized aluminum
- Inner Material: Sound insulation textile
- Working Temperature: 14° to 122° F (-10° to 50° C)





Electric Control for Venturis NGVP

Ref	E1	E2	E3	E4	E5	E6
Voltage	24 V	220 V	24 V	110 V	48 V	24 V
Current	DC	AC	AC	AC	AC	DC
Power	1W	2,5VA	2,5VA	2,5VA	2,5VA	2W
Function	NC	NC	NC	NC	NC	NO
References	09503002	09503003	09503004	09503047	09503048	09503059



General Specifications

- Protection: IP 65 with connector 09503005
- Connector: Not supplied with control unit (09503005)
- Anti-interference Connector: Option NGVO CA, see page
- Manual Control: Pulse type (except E6)
- Interface seal under: 2 x O-ring, dia. 1.5 x 1 NBR not supplied
- Control unit: with control unit (ref. 09505001)



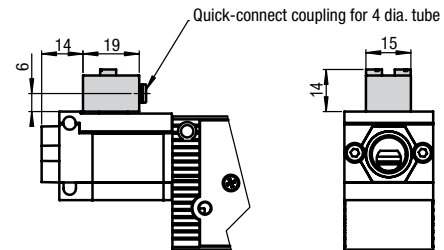
Pneumatic Control for Venturis, NGVP

Applications:

The pneumatic control unit is ideal for applications in hazardous environments and systems controlled by pneumatic logic.

General Specifications

- Integrated coupling: for calibrated tube, .15 in. (4 mm) dia.
- Supply pressure: 30 to 87 PSIG (2 to 6 bars)
- Control pressure: equal to or greater than inlet pressure
- Manual control: on request
- Interface seal under: 2 x O-ring, dia. 1.5 x 1 NBR not supplied
- Control unit: with control unit (ref. 09505001)

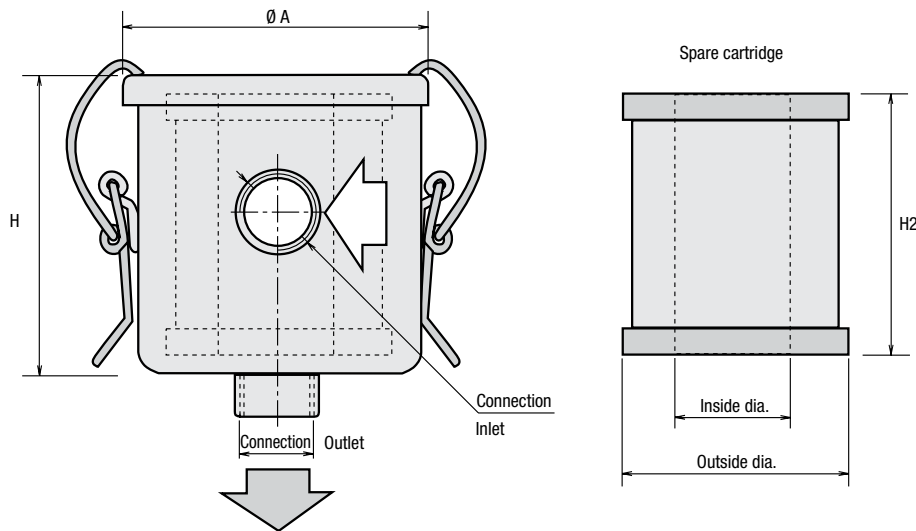


Reference: 095020001





Vacuum Filters, Series NFVI



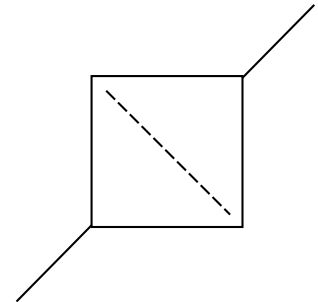
Applications:

Compatible with pneumatic vacuum generators (venturis) or electric vacuum pumps. Model NFVI 2 is perfectly suitable for suction turbines. Each filter is fitted with a treated, interchangeable cartridge to ensure the assembly's durability.

The filter element consists of a 5-micron filter (of paper for version C), which is enough to protect pumps and venturis in normal operating conditions.

Note: For filtering operations producing a lot of particulate, orientate the filter horizontally or with the top downwards.

Important: These filters are designed for use in vacuum systems. They will not withstand pressures higher than atmospheric pressure.



Models	A (mm)	H (mm)	Connection L	Flow Rate SCFM (l/min)	Weight oz (g)
NFVI 38	3.11 (79)	2.99 (76)	3/8 G	14.1 (400)	9.5 (270)
NFVI 12	3.97 (101)	3.38 (86)	1/2 G	21.2 (600)	21.2 (600)
NFVI 34	3.97 (101)	3.38 (86)	3/4 G	21.2 (600)	21.2 (600)
NFVI 114	5.31 (135)	3.78 (96)	1-1/4	49/85 (1400/2400)	37 (1050)
NFVI 114 G	6.81 (173)	6.14 (156)	1-1/4	49/85 (1400/2400)	65.3 (1850)
NFVI 2	7.91 (201)	10.15 (258)	2"	177 (5000)	138 (3900)

Filter Models

Model	Application
NFVI 38	NGVP 20
NFVI 12	NGVP 25-30-PVR 6 (6 m³/h)
NFVI 34	Vacuum Pumps - 10/16 m³/h
NFVI 114	Vacuum Pumps - 20/25 m³/h
NFVI 2	Blower



Vacuum Filters, Series NFVI

Filtering Principles:

Numatics offers the following three filtering principles.

Model C: filter element CE

- Paper cartridge with 5-micron filtering.
- Not compatible with very damp environments.

Model P: filter element PE

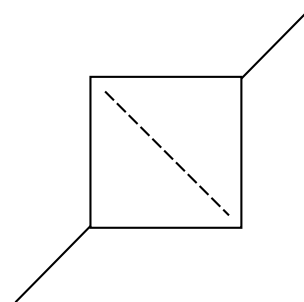
- Polyester cartridge with 3-micron filtering.
- Suitable for damp environments.

Model I: filter element IE

- Stainless steel cartridge with 60-micron filtering.
- Operation in very damp environments (water, liquid).

General Specifications:

- Body Material: stamped steel sheet
- Treatment: black paint
- Filtering: 5 micron with paper cartridge
3 micron with polyester cartridge
60 micron with stainless steel cartridge
- Head losses: 2 to 4% of vacuum on a new filters
5 to 7% of vacuum with average clogging



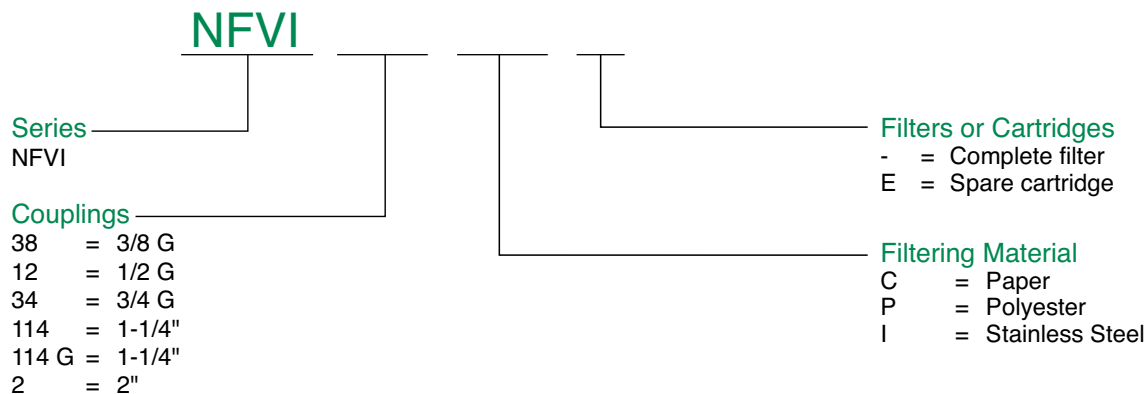
Accessories

Models	Spare Cartridge	Outside Ø (mm)	Inside Ø (mm)	H2 (mm)
NFVI 38	NFVI 38E	2.00 (51)	.90 (23)	2.24 (57)
NFVI 12	NFVI 12E	2.52 (64)	1.49 (38)	2.67 (68)
NFVI 34	NFVI 12E	2.52 (64)	1.49 (38)	2.67 (68)
NFVI 114	NFVI 114E	3.85 (98)	2.36 (60)	2.79 (71)
NFVI 114 G	NFVI 114GE	4.92 (125)	2.52 (64)	4.92 (125)
NFVI 2	NFVI 2E	5.86 (149)	3.46 (88)	8.70 (221)

Other Models:

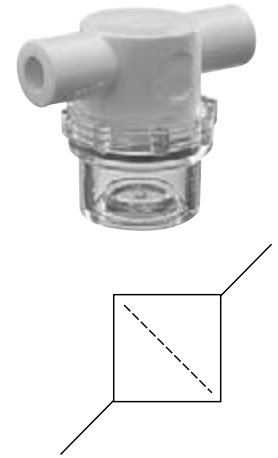
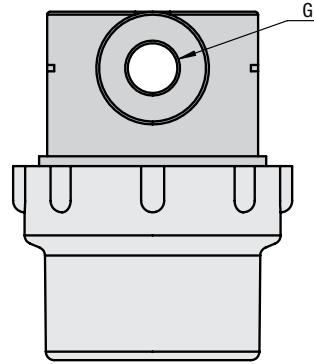
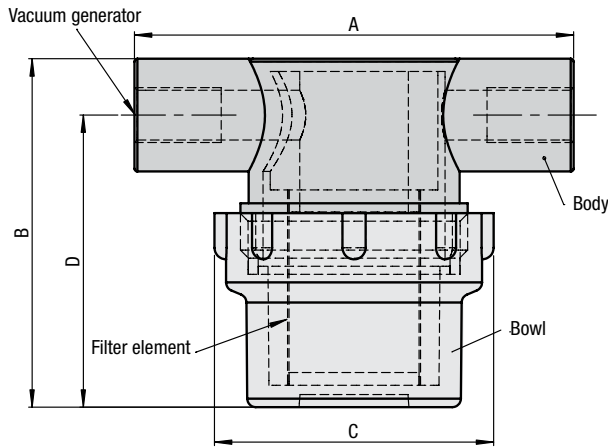
Vacuum filters in series NFVU M 14-38 for venturis NGVP 12 and 15. Vacuum filters in series NFVU G 38-12, in-line stainless steel cartridge for venturis NGVP 15 to 25 and small electric vacuum pumps NPVR 6.

How to Order





In-line Vacuum Filters, Series Nfvum and Nfvug



Applications:

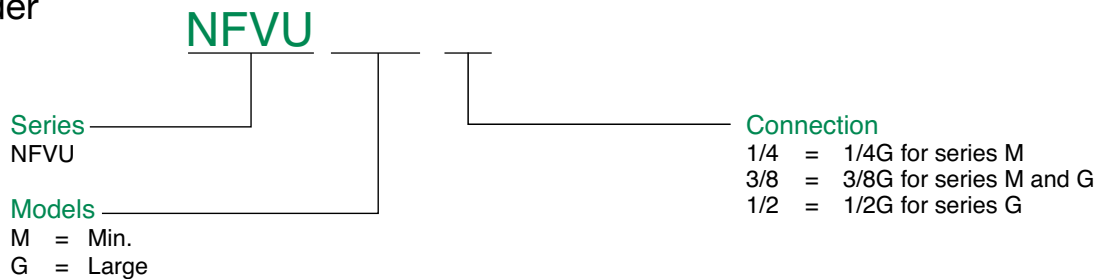
The advantage of this range of filters is that it is equipped with a transparent bowl so that element contamination is visible.

General Specifications:

- Body Material: Top: white polypropylene
Tank: transparent polycarbonate
- Filtering: stainless steel screen, 40 microns
- Temperature: 32° to 122° F (0° to 50° C)

Models	A (mm)	B (mm)	C (mm)	D (mm)	g G	Flow Rate SCFM (NI/min)
NFVUM 14	2.95 (75)	2.36 (60)	1.89 (48)	1.96 (50)	1/4	5.3 (150)
NFVUM 38	2.95 (75)	2.36 (60)	1.89 (48)	1.96 (50)	3/8	12.3 (350)
NFVUG 38	3.03 (77)	4.33 (110)	2.48 (63)	3.62 (92)	3/8	12.3 (350)
NFVUG 12	3.01 (77)	4.33 (110)	2.48 (63)	3.62 (92)	1/2	17.7 (500)

How to Order



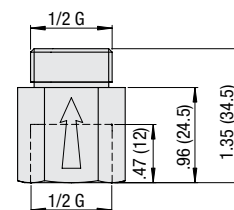
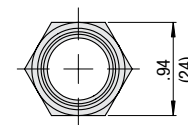
In-line Filter, Series Nfvl 12

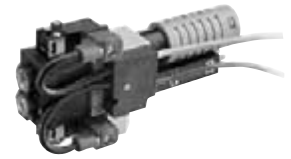
General Specifications:

- Body Material: nickel-plated brass
- Screen Material: stainless steel, 400 microns
- Weight: 1.8 oz (50g)

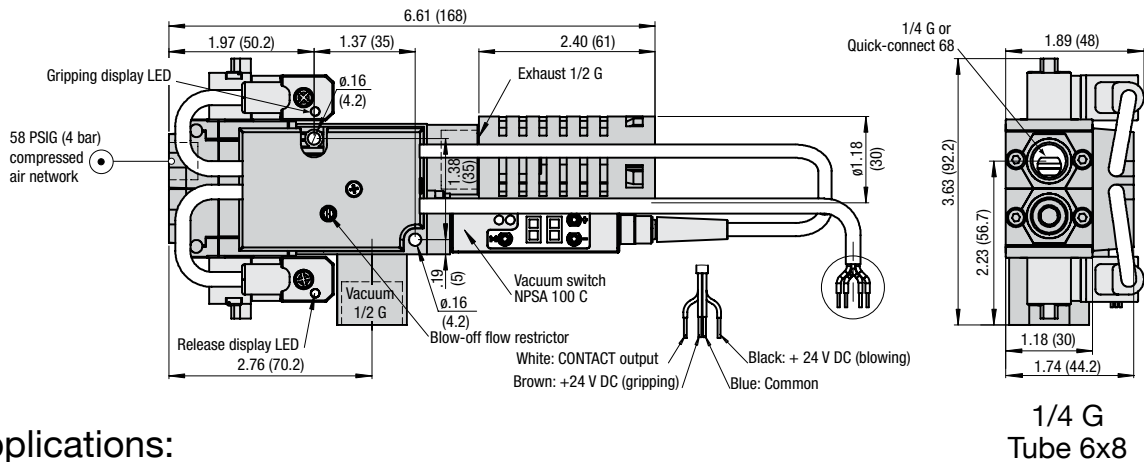
Optional Fitting:

The in-line filter, series NFVL 12, can also be fitted for option NGVO on venturis in series NGVP.





Regulated Venturis, Series NGVMAX Electric



Applications:

Communication between two components, the electronic vacuum switch and the gripping valve controller, allows the consumption of compressed air to be regulated and, above all, considerably reduced. This range of venturis is strongly recommended for the gripping and holding of non-porous materials and for medium or long cycles. An electrically controlled blow-off device is built in for the release function.

General Specifications

- Compressed Air: filtered, non-lubricated 30 to 87 PSIG (2 to 6 bars), optimal 58 PSIG (4 bars)
- Temperature: 32° to 140° F (0° to 60° C)
- Contact Output: PNP on-off, NO or NC, adjustable hysteresis
- Anti-interference: integrated with display LED
- Gripping flow rate: adjustment by flow rate reducer

Operating Principle:

When the selected vacuum level is reached the compressed air supply is automatically turned off. The built in check valve maintains the vacuum between the venturi and the gripped object.

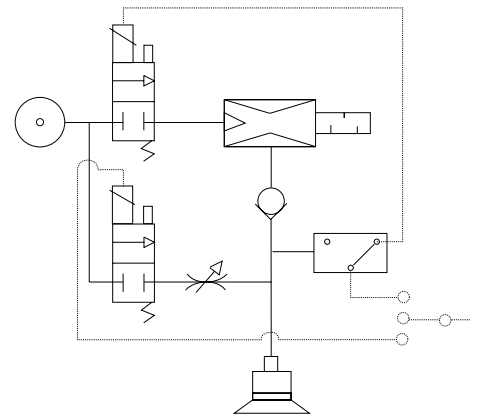
The vacuum switch ensures continuous analysis of vacuum requirements. As soon as the minimum threshold is reached, it opens the venturi and the preselected vacuum level is restored.

Important Note:

The NGVMAX E1 Series is equipped with an internal check valve enabling it to maintain the vacuum in the circuit between the venturi and the part. If there is an integrity loss or leak in the circuit the gripped object will be released.

Characteristics:

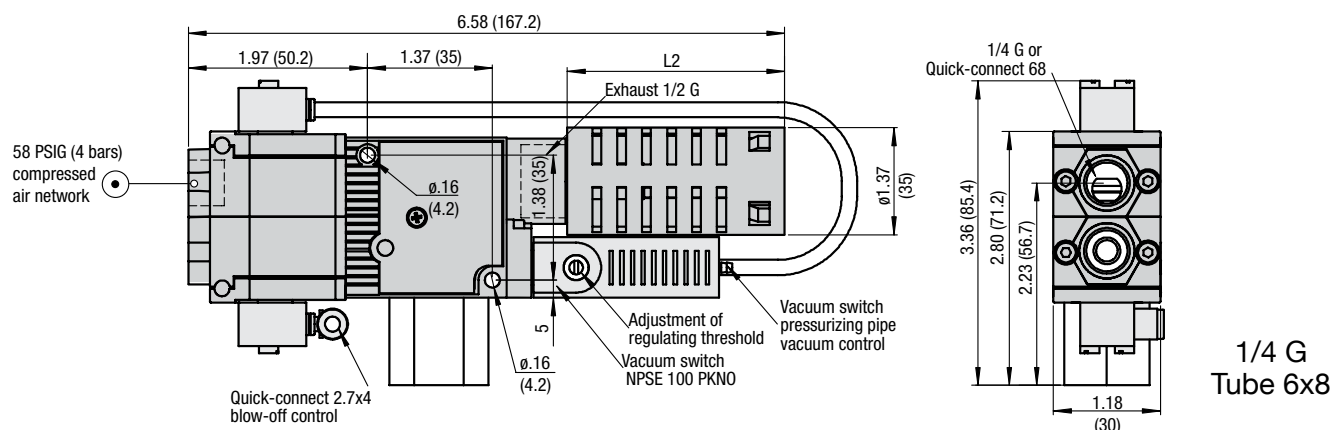
Characteristics	Max. Vacuum as %			Drawn-in air SCFM (NI/min)			L2 In (mm)		Weight oz (g)
	X	T	N	X	T	N	S	K*	
Models									
NGVMAX E1	50	75	90	12.71 (360)	8.47 (240)	7.06 (200)	2.36 (60)	4.76 (121)	18 (510)





Low Air Consumption Vacuum Generators

Regulated Venturis, Series NGVMAX Pneumatic



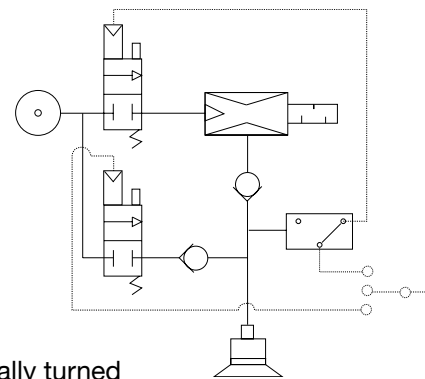
Applications:

Communication between two components, the pneumatic vacuum switch and the gripping valve controller, allows the consumption of compressed air to be regulated and, above all, considerably reduced. This range of venturis is strongly recommended for the gripping and holding of non-porous materials, and for medium or long cycles. A pneumatically controlled blow-off device is built in for the release function.

Note: The volume of piping must not exceed 10 litres. Please consult us for greater volumes.

General Specifications

- Compressed Air: filtered, non-lubricated 30 to 87 PSIG (2 to 6 bars) optimal 58 PSIG (4 bars)
- Temperature: 32° to 146° F (0° to 60° C)
- Vacuum Switch: NPSE 100 PK NO
- Pressure on vacuum switch: Equal to or greater than the venturi inlet pressure
- Hysteresis: 100 mbars max.



Operating Principle:

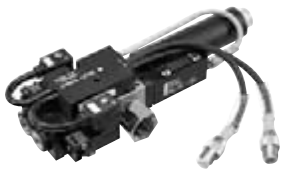
When the selected vacuum level is reached the compressed air supply is automatically turned off. The built-in check valve maintains the vacuum between the venturi and the gripped object. As soon as the minimum threshold is reached, it opens the venturi and the preselected vacuum level is restored.

Important Note:

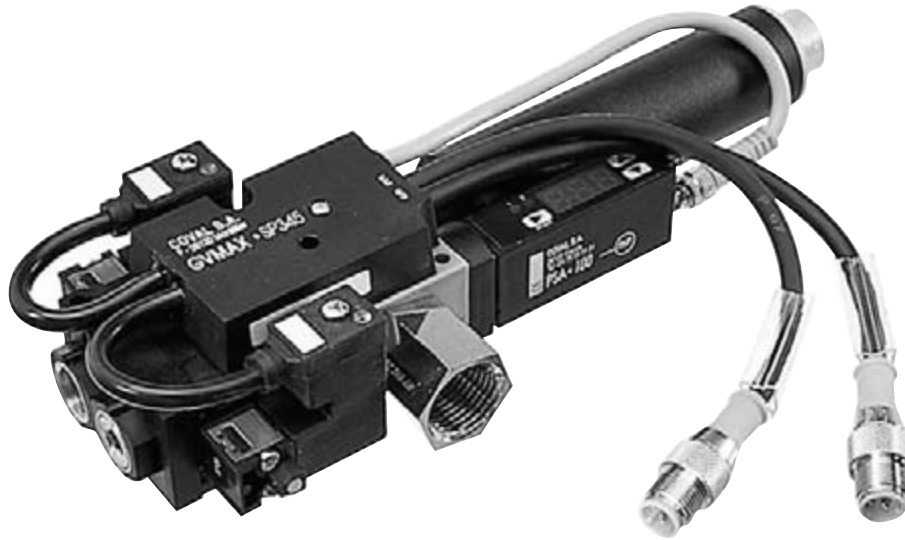
The NGVMAX P1 Series is equipped with an internal check valve enabling it to maintain the vacuum in the circuit between the venturi and the part. If there is an integrity loss or leak in the circuit the object will be released.

Characteristics:

Characteristics	Max. Vacuum as %			Drawn-in air SCFM (NI/min)			L2 In (mm)		Weight oz (g)
	X	T	N	X	T	N	S	K*	
NGVMAX P1	50	75	90	12.71 (360)	8.47 (240)	7.06 (200)	2.36 (60)	4.76 (121)	15.5 (440)



The Intelligent Venturi NGVMAX SP 345-V2



The regulated venturi NGVMAX SP 345-V2 has a number of integrated functions which meet the demand of automatic devices in industry : security, energy-saving and high performance.

The compactness of this venturi simplifies its integration to all production lines.

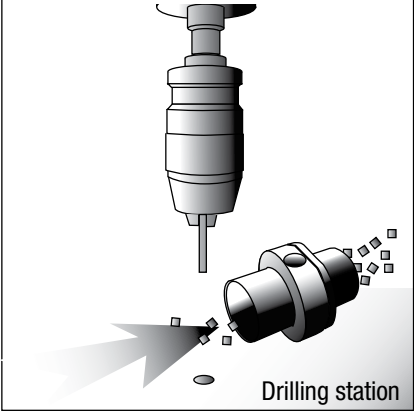
Its easy installation and maintenance allows the reduction of operation costs.

This venturi is highly requested by car manufacturers and in other fields as aeronautics, robotics etc.

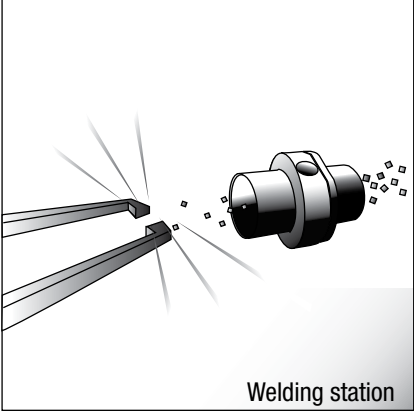


Air Amplifiers, Series NM-C

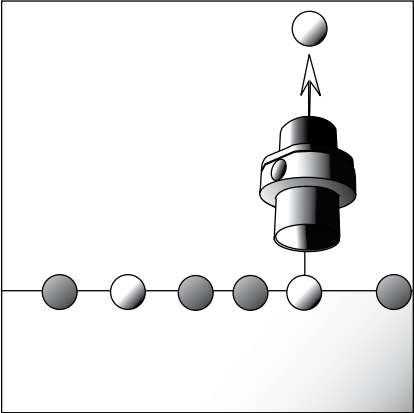
Blow-off, cleaning, waste suction:



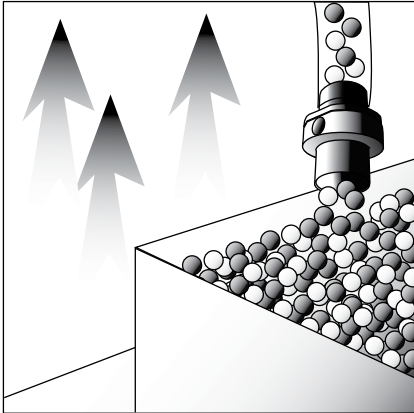
Evacuation of toxic vapors:



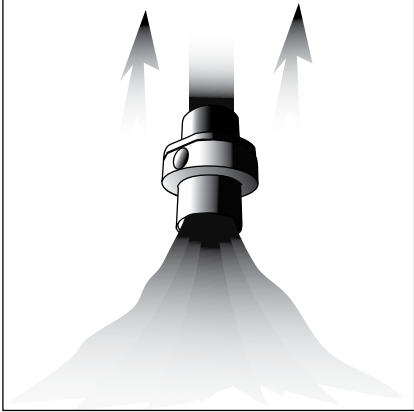
Sorting by weight:



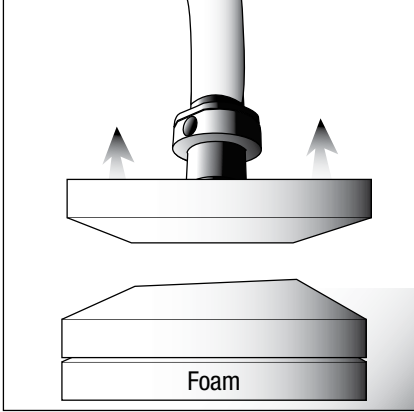
Transportation of products such as: rice, wheat grains, coffee, etc.:



Degassing, smoke removal:



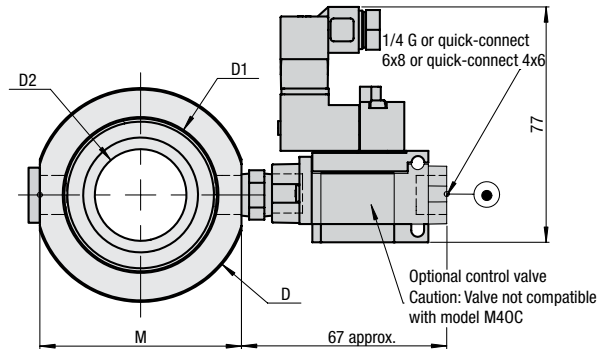
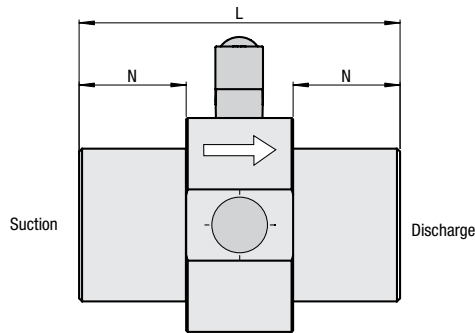
Gripping and/or unstacking of highly porous loads:



Optional vacuum switch NPG30, -100 to 100 mb, for part presence checking.



Air Amplifiers, Series NM-C



Applications:

- Gripping of extremely porous and light products : foams, carpets, baked goods, leather, etc.
- Transport of powders, granules, ...
- Transport of small light parts : paper clips, rice, coffee, etc.
- Smoke removal, depressurization of tanks, etc.

Operating Requirement:

5-micron filtration of the compressed air is required for model NM 6 C and 20-micron filtration is required for other models.

General Specifications

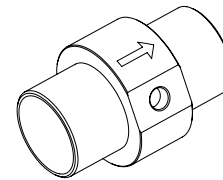
- Supply Pressure: dry, non-lubricated, 22 to 87 PSIG (1.5 to 6 bars)
- Maximum negative pressure: see tables on page 62.
- Materials: aluminum body
- Temperature: -4° to 176° F (-20° to +80° C)

Operating Principle:

Due to the COANDA effect (wall effect), the motor flux draws in ambient air. This physical phenomenon considerably amplifies the flow rate. Consequently, the very large drawn-in flow rate is obtained for a low consumption.

Special Materials:

- Possibility of special materials such as stainless steel or plastic, as per application specifications.
- The five standard models provide the best amplification ratio (consumption/drawn-in flow rate). Numatics can design models with a lower amplification ratio (higher consumption) and with a higher maximum negative pressure for the carrying of heavy items.
- Hard treatments are applied for the carrying of highly abrasive products such as sand.

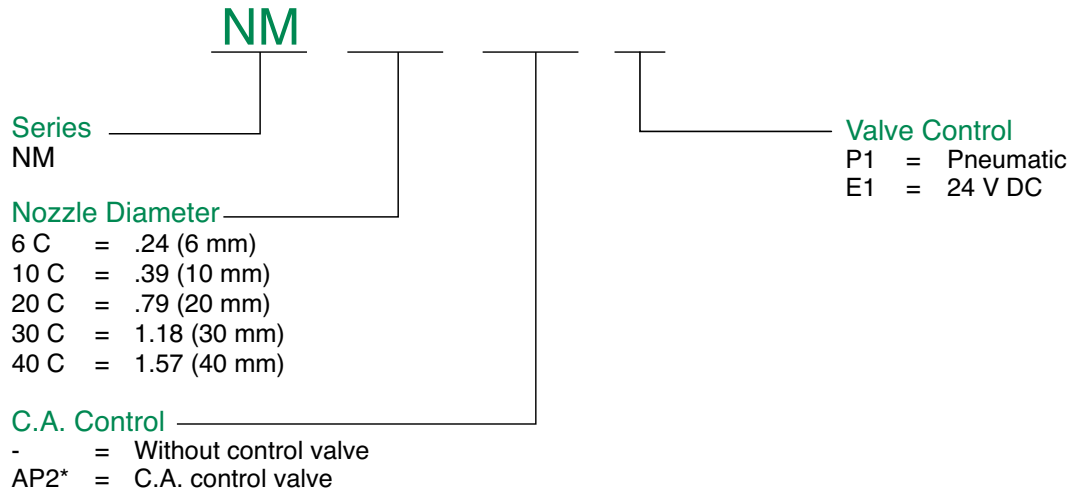


Characteristics:

Models	L in (mm)	N in (mm)	M in (mm)	C.A. G	D in (mm)	D1 in (mm)	D2 in (mm)	Weight oz (g)
NM 6 C	2.36 (60)	.78 (20)	1.41 (36)	1/8	1.57 (40)	.98 (25)	0.24 (6)	3 (80)
NM 10 C	2.36 (60)	.78 (20)	1.41 (36)	1/8	1.57 (40)	.98 (25)	0.39 (10)	3 (80)
NM 20 C	3.54 (90)	1.18 (30)	2.16 (55)	1/4	2.36 (60)	1.57 (40)	0.79 (20)	7.4 (210)
NM 30 C	4.13 (105)	1.37 (35)	2.59 (66)	1/4	2.75 (70)	1.96 (50)	1.18 (30)	10.2 (290)
NM 40 C	4.72 (120)	1.57 (40)	3.38 (86)	3/8	3.54 (90)	2.36 (60)	1.57 (40)	16.6 (470)



How to Order



*Valve NAP2 is not compatible with air amplifier NM 40 C.
Please Note: Reference page 64 for optional stainless steel version.



Air Amplifiers, Series NM-C

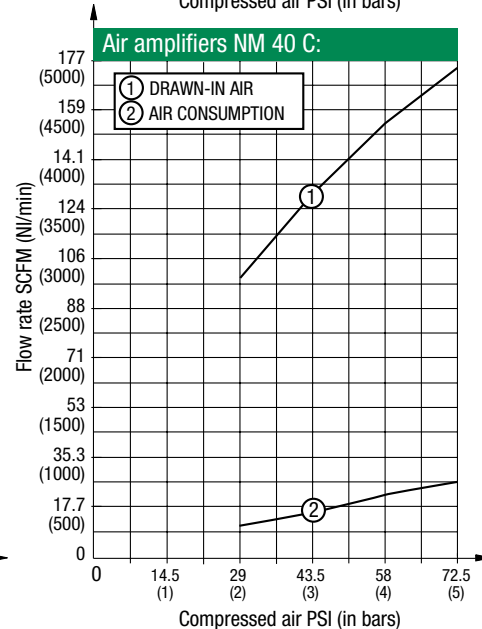
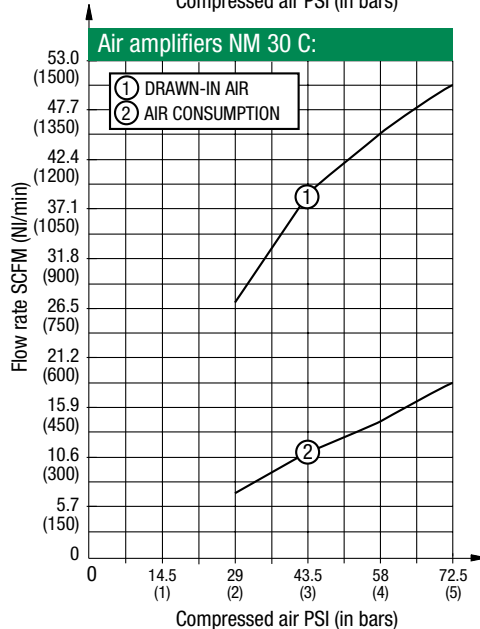
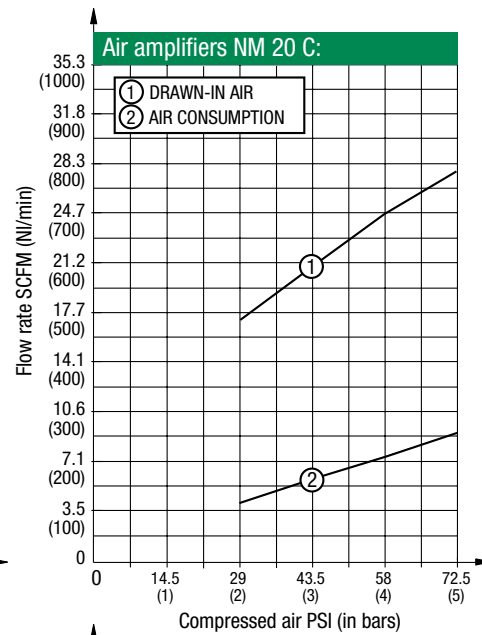
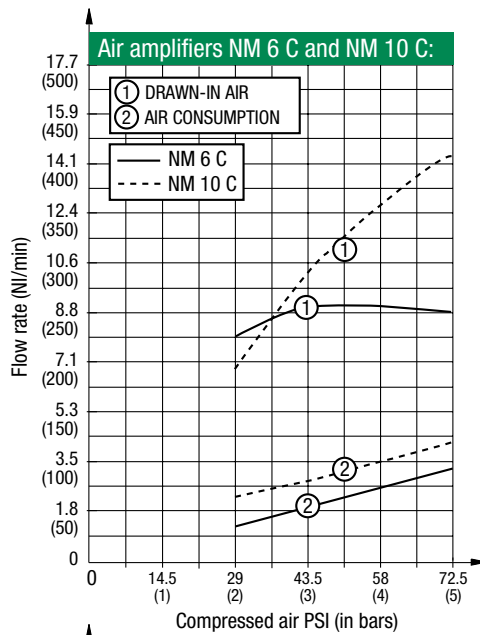
Maximum Negative Pressure/Supply Pressure:

Models	Supply pressure PSI (bars) / Max. negative pressure in (mm) (water column)			
	29 (2)	43.5 (3)	58 (4)	72.5 (5)
NM 6 C	35.4 (900)	59.1 (1500)	78.7 (2000)	102.4 (2600)
NM 10 C	7.9 (200)	19.7 (500)	27.6 (700)	39.4 (1000)
NM 20 C	8.1 (207)	12.2 (310)	15.7 (400)	20.1 (510)
NM 30 C	3.5 (90)	5.1 (130)	8.7 (220)	11.0 (280)
NM 40 C	5.5 (140)	7.9 (200)	11.2 (284)	14.2 (360)

Maximum Overpressure/Supply Pressure:

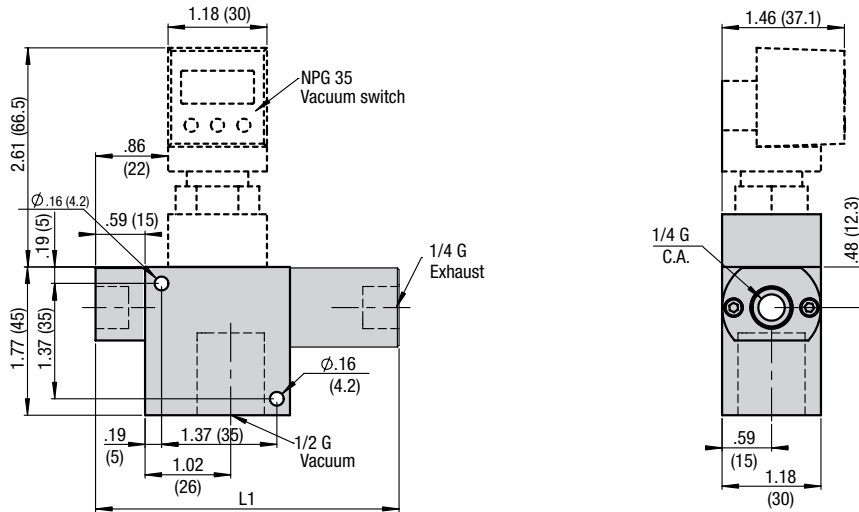
Models	Supply pressure PSI (bars) / Max. negative pressure in (mm) (water column)			
	29 (2)	43.5 (3)	58 (4)	72.5 (5)
NM 6 C	3.9 (100)	21.7 (550)	51.2 (1300)	78.7 (2000)
NM 10 C	15.7 (400)	27.6 (700)	59.1 (1500)	78.7 (2000)
NM 20 C	8.7 (220)	13.4 (340)	19.7 (500)	23.6 (600)
NM 30 C	1.8 (45)	2.8 (70)	3.9 (100)	6.3 (160)
NM 40 C	3.8 (96)	5.7 (145)	7.8 (199)	11.4 (290)

Curves for Air Amplifiers, Series NM-C





Stainless Steel Venturis, Series NGVP-I



Applications:

Using the same technology as standard vacuum generators, stainless steel venturis are compatible with and resistant to aggressive gases and liquids. These venturis are manufactured of stainless steel as well as of plastic, Teflon, etc.

- In environments where corrosive chemical products are present, such as lactic acid.
- Installation on machines cleaned by water jet.
- Electronic component manufacturing industries.

General Specifications

- Stainless steel 316L: this stainless steel is resistant, in particular, to lactic acid.

Models:

- Models NGVP 15 I and NGVP 25 I are in stock.
- Other models, 12, 20 and 30, can be manufactured on request.

On Request:

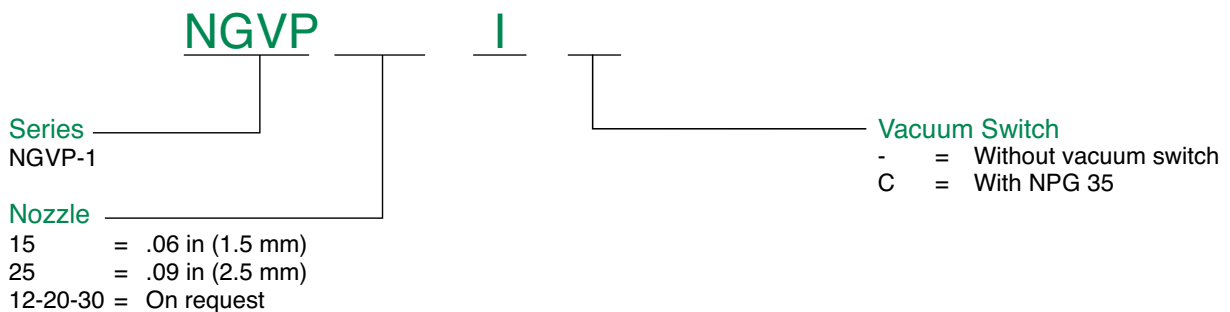
Installation of a vacuum switch NPG 35, in the corrosion resistant stainless steel version, for vacuum monitoring.

Note: The vacuum switch mounting position is adjustable which will allow optimal readability of the display.

Characteristics and Curves:

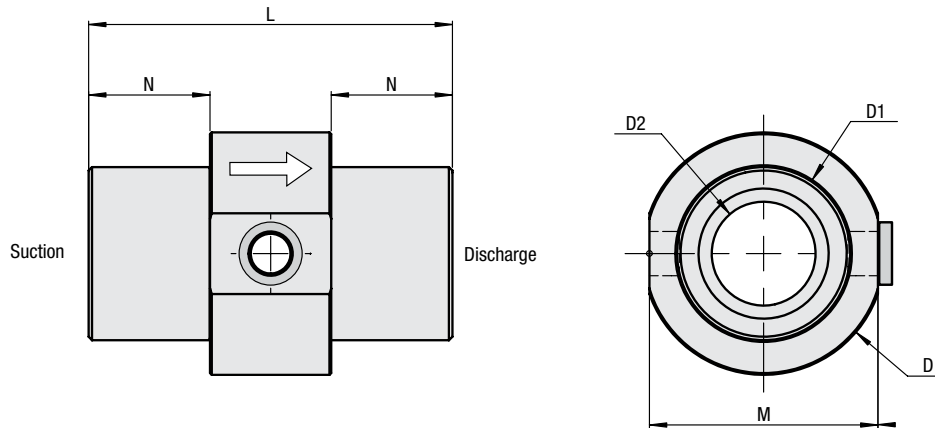
For characteristics and curves, see those for venturis NGVP 15 and NGVP 25.

How to Order





Stainless Steel Air Amplifier, Series NM-CI



Applications:

Using the same technology as standard air amplifiers, stainless steel amplifiers are compatible with and resistant to aggressive gases and liquids.

These vacuum generators are manufactured, on request, from stainless steel as well as plastic, Teflon, etc.

Models:

- In stock : models NM 10 CI, NM 20 CI, NM 40 CI. Other models on request.

Characteristics and Curves:

For characteristics and curves, See those for air amplifiers NM-C on pages 61 and 62.

General Specifications

- Stainless steel 316L.

Supplementary Stainless Steel Items

Applications:

According to the required quantities, Numatics provides practically the whole range of its products in stainless steel. Manufacturing prices, however, vary according to the following:

- Machining in very small quantities
- Machining in medium quantities and maintaining inventory.

Inserts:

For inserts in group 1 for suction cups NVP - NVSA - NVS dia. 0.27 to 1.44 in (7 to 29 mm)

NIM 21 I, stainless steel, male M5

For inserts in group 2 for suction cups NVP - NVSA - NVS dia. 1.18 to 2.72 in (30 to 69 mm)

NIM 41 I, crimped insert, 1/4 G male

NIM 60 I, insert, male M6

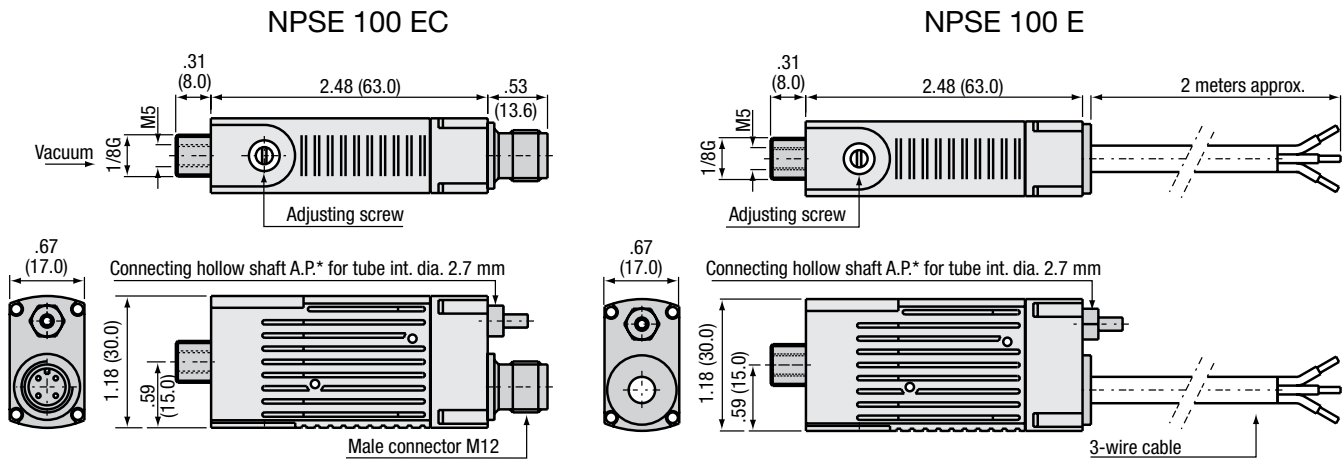
Venturis:

Model NGVA --- M5 manufactured with two M5 inserts in stainless steel.

Please consult us for other items.



Electric Vacuum Switch, Series NPSE 100 E



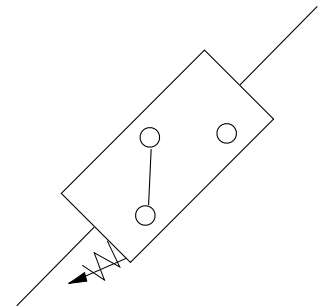
* A.P.: Atmospheric pressure

Applications:

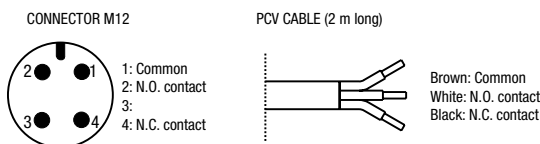
The vacuum switch with electric output, in series NPSE 100 E, allows the vacuum level in the system to be checked by means of a patented system. It can be adapted to all electric automatic controller systems. The choice between the N.O. and N.C. function is made when wiring.

General Specifications:

- Models: two versions: NPSE 100 E and NPSE 100 EC
- Compatible fluids: all non-corrosive gases
- Switching capacity: 250 V - 5 A with cable / 125 V - 3 A with connector M12
- Electrical connection: female connector M12 or 3-wire PVC cable, 2m long
- Adjusting range: -300 mb to -830 mb
- Accuracy: 3%
- Hysteresis: 125 mb
- Repeatability: < 3% of whole range
- Maximum work rate: 30 cycles per minute
- Authorized overpressure: 29 PSI (2 bars) (destructive at 72.5 PSI or 5 bars)
- Mechanical endurance: 5 x 10⁶ operations
- Materials: Body: Polyacetal - vacuum sensor: nitrile diaphragm
- Protection class: IP 54 with hollow shaft connected - IP 40 without hollow shaft
- Weight: 165 g: NPSE 100 E and 37 g: NPSE 100 EC
- Temperature: 14° to 176° F (-10° to +80° C)



Electrical Connection:

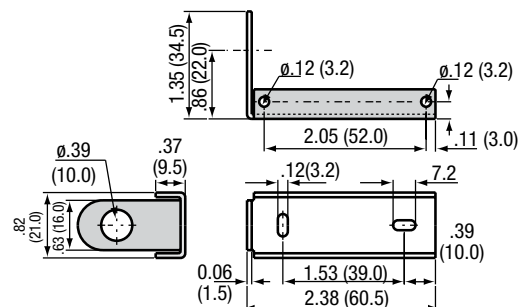


Connection for Version EC (M12):

See page 32.

Connection for Version EC (M12):

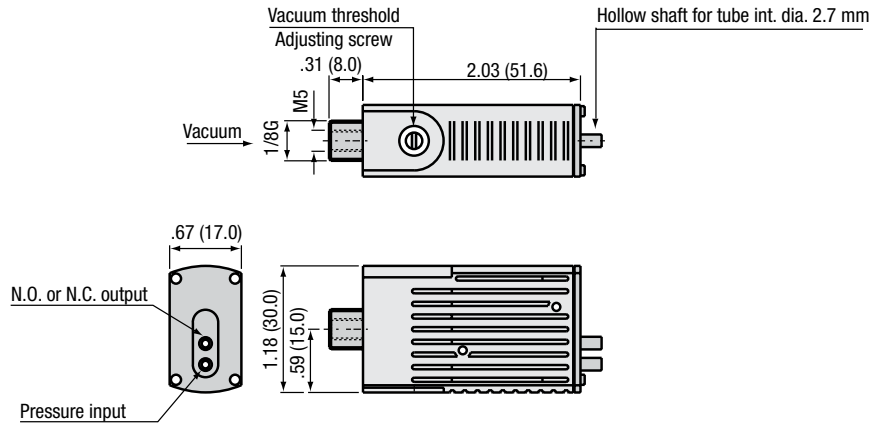
Clip reference NSPE F





Vacuum Switches

Pneumatic Vacuum Switch, Series NPSE 100 P

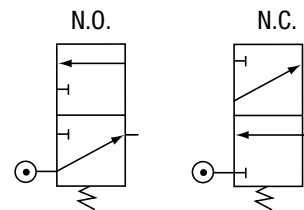


Applications:

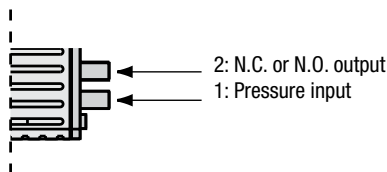
The vacuum switch with pneumatic output, in series NPSE 100 P, allows the vacuum level in the system to be checked by means of a patented system. This vacuum switch is available in two versions: N.O. version recommended for the air saving function on a venturi and N.C. version for the safety function (part present, etc.) and grafcet signal.

General Specifications:

- Models: two versions: N.O. and N.C.
- Compatible fluids: all non-corrosive gases
- Operating pressure: 30 to 87 PSIG (2 to 6 bars)
- Adjusting range: -300 mb to -830 mb
- Accuracy: 3%
- Hysteresis: 80 to 100 mb
- Repeatability: < 3% of whole range
- Maximum work rate: 30 cycles per minute
- Authorized overpressure: 2 bars (destructive at 5 bars)
- Mechanical endurance: 5 x 10⁶ operations
- Materials: Body: Polyacetal - vacuum sensor: nitrile diaphragm
- Weight: 32 g
- Temperature: 14° to 176° F (-10° to +80° C)
- Flow rate at 87 PSIG: 2.5 SCFM (6 bars: 70 NI/min)

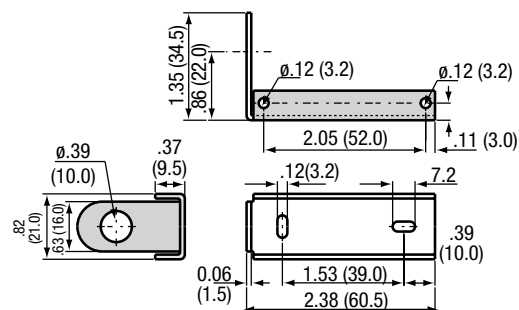


Pneumatic Connection:



Mounting of Vacuum Switch:

Clip reference NPSE F



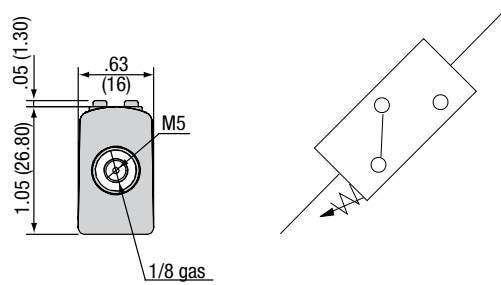
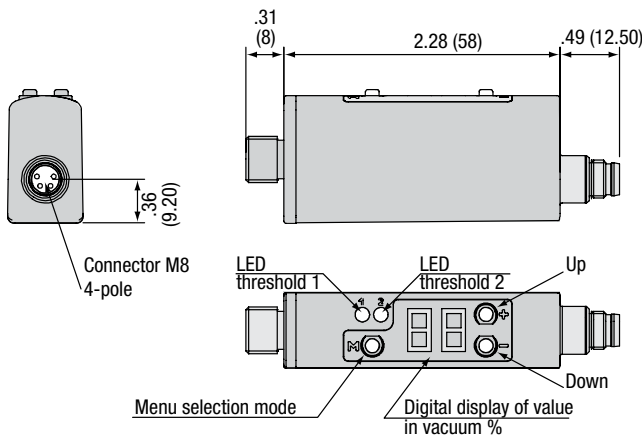
Special Design:

On request, factory preset version
Optional fitting NGVO on NGVP range.



Vacuum Switches

Display-Type Vacuum Switch, Series NPSA 100 C



- 2 configurable contact outputs
- Adjustable hysteresis
- M8 connector
- IP65
- LED display

Applications:

The electronic vacuum switch in series NPSA100C is the most efficient Numatics pressure measuring component. Thanks to its compact light weight design it allows easy installation on all machines and robots, etc. In addition, it provides display after vacuum level with two contact outputs and independent adjustments. Every step has been taken to facilitate its use : programming on front panel, adjustment by threshold and the hysteresis of each output can be adjusted independently of the others.

Accessories:

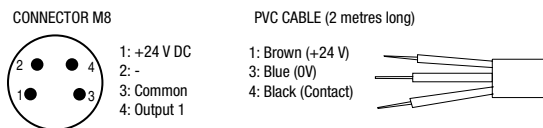
Straight or elbowed connector, see page 38.
Installation on venturi, series NGVP : NGVO PSA 100 C, see pages 34 and 35.

General Specifications:

- Compatible fluids: All non-corrosive gases, filtered, non-lubricated air
- Power supply: 18-30 VDC. pole changing protection
- Current draw: <100 mA
- Transistor output PNP: 125 mA 24 V DC, programmable N.O. or N.C.
- Output indicators: LED
- Output 1: Red LED
- Output 2: Green LED
- Programming: Key buttons
- Display: In vacuum % (2-digit, 7-segment red LED, 8.5 mm)
- Electromagnetic Compliance: Industrial standard, class B
- Body Material: Polyacetal
- Protection: IP 65
- Electrical Connection: M8-connector
- Pneumatic Connection: 1/8 G or M5
- Impact strength: 10 G XYZ
- Resolution display: 1%
- Resolution setting:

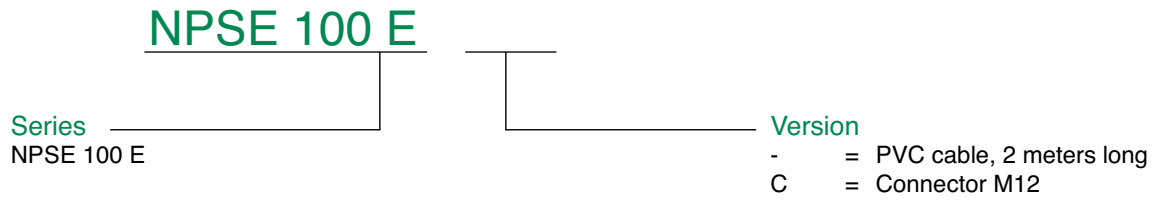
Models	Measuring range PSIG(bars)	Overpressure PSIG (bars)
NPSA 100 C	0 to -14.5 PSIG (0 to -1 bar)	58 (4)

Electrical Connection:

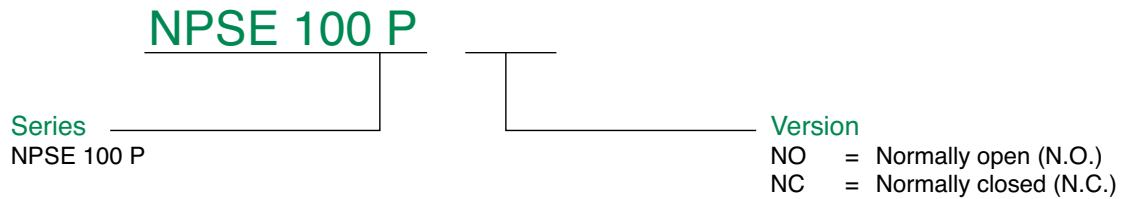




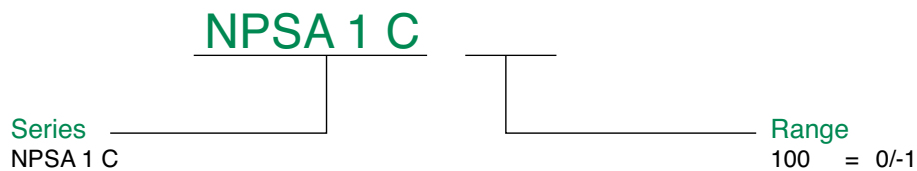
How to Order NPSE 100 E



How to Order NPSE 100 P



How to Order NPSA 1 C





Selecting a Suction Cup

A suction cup is a gripper that can be used to handle all types of objects of various weights, surface areas, shapes and dimensions, etc.

Here, we describe all the parameters to be taken into account in order to choose a suitable type of suction cup.

Shapes of Suction Cups

Flat Suction Cups:

- **Flat suction cups without stops:**
For the handling of flat or slightly curved, rigid and smooth objects, these suction cups withstand lateral loads and allow vertical handling.
- **Flat suction cups with stops:**
For the gripping of objects that are thin, flexible, deformable, etc, these suction cups increase resistance to lateral loads and horizontal handling operations.



NVP-NVPG

Bellows Type Suction Cups:

- **Bellows type suction cups:**
For the gripping of objects that are spherical, cylindrical or oval, etc.

These suction cups allow gripping at different levels, a ball joint effect, lifting motion, and angular gripping. Bags, etc.



NVSA-NVSAG

NVS

Diameters

This parameter is related to the strength of the suction cup and the available gripping area on the object.

The Numatics ranges combine to offer standard suction cups with diameters of between 0.04 in (1 mm) and 22.83 in (580 mm).



Standard Suction Cups

Materials

Material	Shore Hardness	Flexibility	Abrasion Resistance	U.V. and weather resistance	Resistance to oils	Temperature resistance in C°	Compatibility with food	Color
Neoprene NE	60	+	+	++	+	-10 to 80	-	Black
Nitrile NBR	60	+	+	-	++	0 to 80	-	Black
Translucent silicone SIT5	50	+++	-	+++	-	-40 to 220	+++	Transl.
Natural rubber NR	50	+++	++	--	--	-20 to 70	+	Grey
Siton® STN	60	+	+	-	++	0 to 160	-	Blue
Antistatic silicone SIA	60	++	-	+++	-	-20 to 200	+	Black
Polyurethane PU	60	+	+++	++	++	-20 to 80	-	Black
Vulkollan V	70	-	++++	++	++	-40 to 80	-	Green
Viton FPM	60	+	+	+++	+++	-20 to 250	-	Black

Numatics offers a new material called SITON®. SITON® is a silicone free material that does not stain and is especially suitable for the handling of hot items. Example of application: Removal of plastic parts from a mold that require painting.

Special Manufacture:

To respond to the specific needs of our customers, Numatics offers a range of special suction cups. These suction cups are specially shaped for eggs, paper, CDs, baked goods, light bulbs, bags, etc. and are made of specific materials: Siton®, Antistatic silicone, Polyurethane, etc. It should be noted that a Numatics offers a range can be designed for quantities of 500 to 1,000 units per order.

Calculation of Suction Cup Force:

The force of a suction cup is proportional to its area under vacuum and also depends on its general shape, its flexibility, its material and, above all, the level of vacuum reached in the internal chamber of the suction cup.

Selecting a Suction Cup:

- Theoretical force: $F(N) = \text{Suction cup area (cm}^2\text{)} \times \text{Percentage of vacuum (\%)} \times 0.1013$

The force shown in the Numatics suction cup tables is the actual practical force of the suction cup at 90% vacuum. In addition, the value shown includes a safety factor of 2.

- Actual force: As indicated by its name, this force represents the effective force of the suction cup in use. This is generally 50% less than the calculated theoretical force.

This difference is explained by the deformation of the suction cup during handling, which reduces the gripping area and by the surface finish of the part handled.

- Safety factor: All the forces are indicated in the tables showing the various suction cup ranges. These are actual forces at 90% vacuum calculated with a safety factor of: 2 for horizontal gripping and 4 for vertical gripping. In the case of applications involving high acceleration rates, the safety coefficient is calculated accordingly.



Parameters:

The following table gives the fullest possible list of parameters to be taken into account when choosing a suction cup.

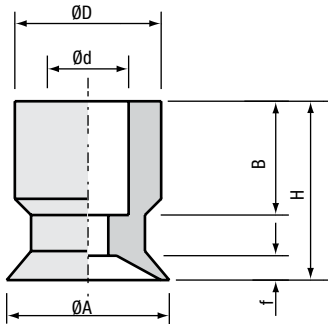
Shape of Load	Flat, Curved, Cylindrical, Oval, Spherical, etc.
Load Material	Porous, Sealed, Flexible, Rigid, Fragile, etc.
Load surface finish	Smooth, Grainy, Silicone-coated, Abrasive, etc.
State of Load	Damp, Oily, Dusty, Viscous, Dry, etc.
Weight of load	Heavy, Light, etc.
Temperature of load	From -40° to +482° F (-40° to +250° C) according to materials selected
Direction of grabbing	Horizontal, Vertical, Angular, Different levels, etc
Type of grip	Handling, Lifting, Holding, Unstacking, etc. of objects
Available gripping areas	
Duration of cycles	Accelerations



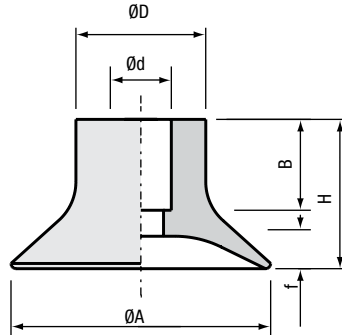
Standard Suction Cups

Flat Suction Cups, Series NVP, 5 to 95 mm Ø

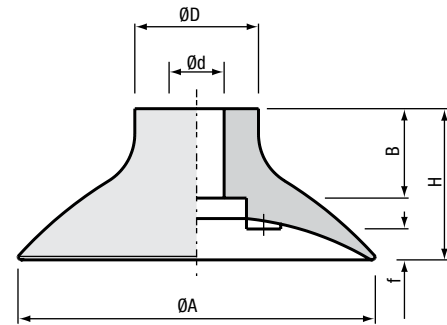
NVP 5 to 10



NVP 15 to 25



NVP 30 to 95



Applications:

The flat suction cups in series NVP are especially recommended for the handling of flat, rigid and smooth products.

Materials:

- NBR: Nitrile
- STN: Siton
- SIT5: Translucent silicone
- FPM: Viton
- NR: Natural rubber
- NE: Neoprene
- SIA: Antistatic silicone

Suction Cup Sections:

For minimum quantities of 50 pieces, these standard cups can be altered within the parameters of individual cup dimensions.

Special Designs:

To meet the specific needs of our customers, our design office develops ranges of special suction cups with special shapes for eggs, paper, CDs, pastries, light bulbs and bags, etc. and of specific materials; Siton, Polyurethane, etc. are available.

It should be noted that a suction cup mold can be designed for quantities of 500 to 1,000 units per order. Please contact Numatics to discuss your special requirements.



Flat Suction Cups, Series NVP, 5 to 95 mm Ø

Characteristics

Model	Ø A in (mm)	H in (mm)	Ø d in (mm)	Ø D in (mm)	f in (mm)	B in (mm)	Weight g	Int. Volume (cm³)	lbs (N)	Materials						
										NBR	SIT5	NR	STN	FPM	NE	SIA
NVP 5	.21 (5.5)	.35 (9)	.15 (4)	.27 (7)	.04 (1)	.27 (7)	0.3	0.03	.15 (0.65)	.	.					.
NVP 8	.29 (7.5)	.39 (10)	.19 (5)	.35 (9)	.05 (1.3)	.27 (7)	0.4	0.04	.34 (1.5)	.	.		.			.
NVP 10	.39 (10)	.41 (10.5)	.19 (5)	.35 (9)	.06 (1.5)	.27 (7)	0.5	0.05	.49 (2.2)	.	.					
NVP 15	.59 (15)	.43 (11)	.19 (5)	.35 (9)	.09 (2.25)	.27 (7)	0.7	0.18	1.2 (5.1)	.	.					
NVP 20	.78 (20)	.45 (11.5)	.18 (4.7)	.39 (10)	.11 (3)	.27 (7)	1.2	0.44	1.9 (8.5)	.	.	.	.	.	.
NVP 25	.98 (25)	.47 (12)	.17 (4.5)	.39 (10)	.11 (3)	.27 (7)	1.4	0.7	2.9 (13)	.	.					
NVP 30	1.18 (30)	.74 (19)	.31 (8)	.63 (16)	.10 (2.5)	.51 (13)	4	2.9	5.0 (22)	.	.					
NVP 35	1.37 (35)	.78 (20)	.31 (8)	.63 (16)	.11 (3)	.51 (13)	5.6	2.7	7.2 (32)	.	.			.		
NVP 40	1.57 (40)	.78 (20)	.31 (8)	.63 (16)	.11 (3)	.51 (13)	9	4	8.3 (37)	.	.					
NVP 50	2.04 (52)	.86 (22)	.31 (8)	.70 (18)	.17 (4.5)	.51 (13)	14	7	11.9 (53)	.	.	.	.
NVP 60	2.36 (60)	.86 (22)	.31 (8)	.70 (18)	.17 (4.5)	.51 (13)	16	7.3	18 (80)	.	.					
NVP 75	2.95 (75)	1.26 (32)	.47 (12)	.90 (23)	.17 (4.5)	.78 (20)	33	16	31.5 (140)	.	.	.				
NVP 95	3.74 (95)	1.49 (38)	.47 (12)	.98 (25)	.47 (12)	.78 (20)	50	47.5	38.2 (170)			.		.	.	

The values are representative of the mean characteristics of our products.

(*) Fr (in newtons): Actual practical force of the suction cup with a 90% vacuum and a safety factor of 2 inclusive.

(**): Reference of the range and installation diagram for connections.

How to Order

NVP 50 NBR**

Model

NVP 5
NVP 8
NVP 10
NVP 15
NVP 20
NVP 25
NVP 30
NVP 35
NVP 40
NVP 50
NVP 60
NVP 75
NVP 95

Material*

NBR = Nitrile
SIT5 = Translucent Silicone
NR = Natural Rubber
STN = Siton
FPM = Viton
NE = Neoprene
SIA = Antistatic Silicone

*Consult the chart above for available material for a specific model.

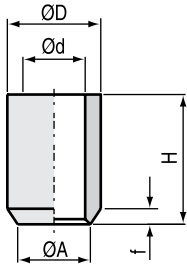
**Example: Model NVP 50 cup made from Nitrile.



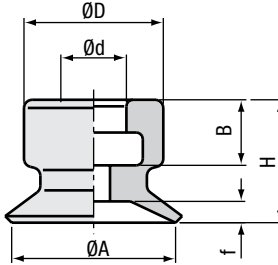
Standard Suction Cups

Extra-flat Suction Cups, Series NVPG, 1 to 200 mm Ø

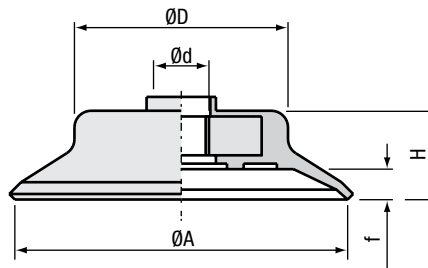
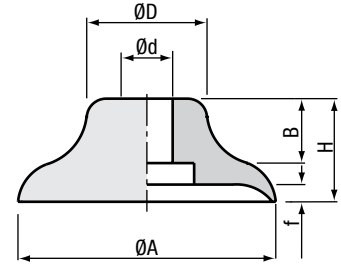
NVPG 1 to 1.5



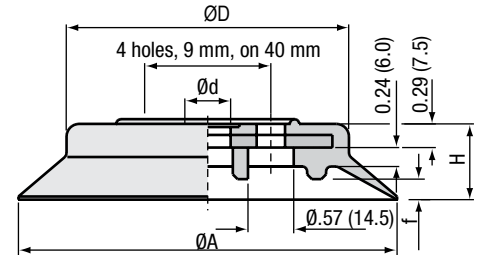
NVPG 2 to 10



NVPG 15 to 50



NVPG 60 and 95



NVPG 120 to 200

Applications:

The profile of extra-flat suction cups in series NVPG provides for accuracy in load gripping and increased cycle rates. These suction cups are used for flat surfaces only.

Suction Cup Sections:

For minimum quantities of 50 pieces, these standard cups can be altered within the parameters of individual cup dimensions.

Materials:

- NBR: Nitrile
- SI: Silicone
- PU: Polyurethane
- FPM: Viton
- SIA: Antistatic silicone



Extra-flat Suction Cups, Series NVPG, 1 to 200 mm Ø

Characteristics

Model	Ø A in (mm)	H in (mm)	Ø d in (mm)	Ø D in (mm)	f in (mm)	B in (mm)	Weight g	Int. Volume (cm³)	Fr lbs (N)	Materials				
										NBR	SI	PU	FPM	SIA
NVPG 1	.04 (1)	.06 (1.6)	.03 (0.8)	.05 (1.2)	.007 (0.2)			0.00015	.01 (.03)	•	•			
NVPG 1.5	.06 (1.5)	.10 (2.5)	.05 (1.2)	.07 (1.8)	.011 (0.3)			0.00053	.01 (.06)	•	•			
NVPG 2	.07 (2)	.15 (4)	.07 (2)	.15 (4)	.02 (0.5)	.09 (2.5)		0.00073	.02 (0.11)	•	•			•
NVPG 3.5	.13 (3.5)	.15 (4)	.07 (2)	.15 (4)	.02 (0.5)	.09 (2.5)		0.0022	.08 (0.34)	•	•		•	•
NVPG 5	.19 (5)	.25 (6.5)	.15 (4)	.29 (7.5)	.03 (0.8)	.15 (4)		0.005	.15 (0.67)	•	•			•
NVPG 6	.23 (6)	.25 (6.5)	.15 (4)	.29 (7.5)	.03 (0.8)	.15 (4)		0.008	.22 (0.98)	•	•			•
NVPG 8	.31 (8)	.27 (7)	.15 (4)	.31 (8)	.04 (1.2)	.15 (4)	0.26	0.03	.38 (1.7)	•	•	•		•
NVPG 10	.39 (10)	.29 (7.5)	.15 (4)	.34 (8.7)	.06 (1.5)	.15 (4)	0.36	0.07	.63 (2.8)	•	•	•	•	•
NVPG 15	.59 (15)	.31 (8)	.17 (4.5)	.47 (12)	.07 (1.9)	.07 (2)	0.9	0.2	1.5 (6.5)	•	•	•	•	•
NVPG 20	.78 (20)	.39 (10)	.17 (4.5)	.59 (15)	.09 (2.3)	.15 (4)	1.93	0.5	2.7 (12.2)	•	•	•	•	
NVPG 25	.98 (25)	.55 (14)	.23 (6)	.63 (16)	.11 (3)	.27 (7)	3	1.1	3.8 (16.7)	•	•	•		
NVPG 30	1.18 (30)	.47 (12)	.23 (6)	.59 (15)	.08 (2)	.27 (7)	4	1.4	5.1 (22.7)	•	•	•	•	
NVPG 35	1.37 (35)	.55 (14)	.23 (6)	.80 (20.5)	.11 (3)	.27 (7)	6.8	2.9	7.4 (33)	•	•	•		
NVPG 40	1.57 (40)	.55 (14)	.23 (6)	.92 (23.5)	.13 (3.5)	.27 (7)	8.4	3.8	10.8 (48)	•	•	•	•	
NVPG 50	1.96 (50)	.59 (15)	.31 (8)	1.14 (29)	.15 (4)	.27 (7)	13	5.3	16.9 (75)	•	•	•	•	
NVPG 60	2.36 (60)	.63 (16)	M10X125	1.49 (38)	.19 (5)		25	12	27.7 (123)	•	•	•	•	
NVPG 60S	2.36 (60)	.63 (16)	1/4G	1.49 (38)	.19 (5)		25	12	27.7 (123)	•	•	•	•	
NVPG 80	3.14 (80)	.70 (18)	M10X125	2.08 (53)	.23 (6)		55	26.9	44.5 (198)	•	•	•		
NVPG 80S	3.14 (80)	.70 (18)	1/4G	2.08 (53)	.23 (6)		55	26.9	44.5 (198)	•	•	•		
NVPG 95	3.74 (95)	.74 (19)	M10X125	2.67 (68)	.23 (6)		96	41	63 (280)	•	•	•		
NVPG 95S	3.74 (95)	.74 (19)	1/4G	2.67 (68)	.23 (6)		96	41	63 (280)	•	•	•		
NVPG 120	4.72 (120)	.96 (24.5)	.57 (14.5)	3.52 (89.5)	.23 (6)		242	141	82.1 (365)	•	•			
NVPG 150	5.90 (150)	1.20 (30.5)	.51 (13)	4.13 (105)	.35 (9)		480	230	132.6 (590)	•	•			
NVPG 200	7.87 (200)	1.39 (35.5)	.51 (13)	5.63 (143)	.49 (12.5)		840	384	236 (1050)	•	•			

The values are representative of the mean characteristics of our products.

(*) Fr lbs (in newtons): Actual practical force of the suction cup with a 90% vacuum and a safety factor of 2 inclusive.

(**): Reference of the range and installation diagram for connections.

How to Order

NVPG 35 **SI****

Series

NVPG 1 NVPG 40
 NVPG 1.5 NVPG 50
 NVPG 2 NVPG 60
 NVPG 3.5 NVPG 60S
 NVPG 5 NVPG 80
 NVPG 8 NVPG 80S
 NVPG 10 NVPG 95
 NVPG 15 NVPG 95S
 NVPG 20 NVPG 120
 NVPG 25 NVPG 150
 NVPG 30 NVPG 200
 NVPG 35

Material*

NBR = Nitrile
 SI = Silicone
 PU = Polyurethane
 FPM = Viton
 SIA = Antistatic Silicone

*(Consult the chart above for available materials for a specific cup.)

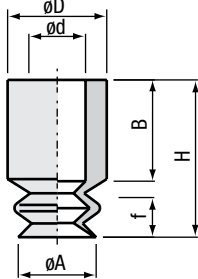
**Example: Model NVPG35 Cup made from silicone.



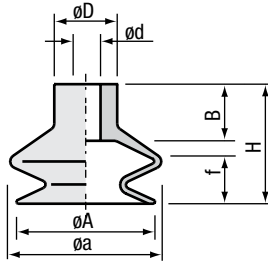
Standard Suction Cups

Bellow Type Suction Cups 1.5, Series NVSA, NVSAG, 5 to 150 mm Ø

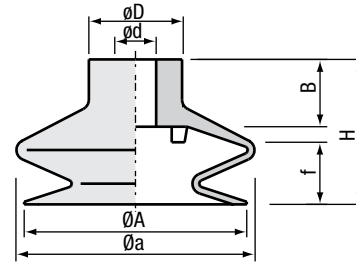
NVSA 5



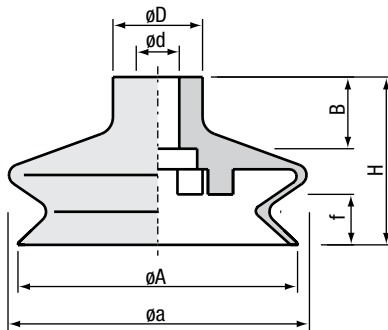
NVSA 11 to 33



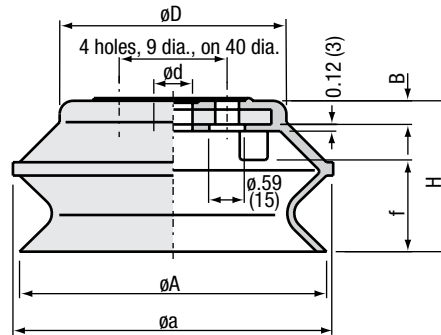
NVSA 43



NVSA 53 to 78



NVSAG 110 and 150



Applications:

The bellows type suction cups in series NVSA combine the advantages of flat suction cups (accuracy, positioning at stop) and the freedom offered by bellows (angle and flexibility). They offer flexibility, precision and small inside volume suitable for rapid cycles.

Materials:

- NBR: Nitrile
- STN: Siton
- SIT5: Translucent silicone
- NE: Neoprene
- NR: Natural rubber
- NBRA: Antistatic nitrile
- PU: Polyurethane

Suction Cup Sections:

For minimum quantities of 50 pieces, these standard cups can be altered within the parameters of individual cup dimensions.

Special Designs:

To meet the specific needs of our customers, Numatics offers a range of special suction cups with special shapes for eggs, paper, CDs, baked goods, light bulbs and bags, etc. and of specific materials: Siton, Vulkollan, polyurethane, etc. are available.

It should be noted that a special mold can be designed for quantities between 500 to 1,000 units per order.



Bellow Type Suction Cups 1.5, Series NVSA, NVSAG, 5 to 150 mm Ø

Characteristics

Model	Ø A in (mm)	H in (mm)	Ø a in (mm)	Ø d in (mm)	Ø D in (mm)	f in (mm)	B in (mm)	Weight g	Int. Volume (cm³)	Fr* lbs (N)	Materials				
											NBR	SIT5	NR	STN	SIA
NVSA 5	.21 (5)	.463 (11)	.23 (6)	.16 (4)	.27 (7)	.08 (2)	.27 (7)	0.5	0.04	.15 (0.68)	•	•			
NVSA 11	.43 (11)	.63 (16)	.48 (12.2)	.20 (5)	.39 (10)	.22 (5.5)	.35 (9)	0.7	0.225	.54 (2.4)	•	•	•	•	•
NVSA 14	.51 (13)	.63 (16)	.55 (14)	.16 (4)	.39 (10)	.20 (5)	.35 (9)	1	0.42	.79 (3.5)	•	•	•	•	
NVSA 16	.63 (16)	.75 (19)	.68 (17.3)	.20 (5)	.39 (10)	.33 (8.5)	.35 (9)	1.2	0.75	.83 (3.7)	•	•	•		
NVSA 20	.75 (19)	.63 (16)	.78 (20)	.16 (4)	.39 (10)	.20 (5)	.35 (9)	1.6	1.15	1.7 (7.7)	•	•	•	•	
NVSA 22	.86 (22)	.75 (19)	.94 (24)	.18 (4.7)	.39 (10)	.31 (8)	.35 (9)	1.8	1.4	1.9 (8.5)	•	•	•		
NVSA 25	.94 (24)	.90 (23)	.98 (25)	.18 (4.7)	.39 (10)	.47 (12)	.35 (9)	2.8	3.15	2.5 (11)	•	•	•	•	
NVSA 26	.99 (25)	.99 (25)	1.18 (30)	.32 (8)	.63 (18)	.24 (6)	.51 (13)	8	6.1	3.4 (15)	•	•			
NVSA 33	1.30 (33)	1.08 (27.5)	1.42 (36.2)	.31 (8)	.71 (18)	.43 (11)	.51 (13)	6.4	4.75	4.3 (19.2)	•	•	•	•	
NVSA 43	1.70 (43)	1.10 (28)	1.81 (46)	.31 (8)	.71 (18)	.49 (12.5)	.51 (13)	10	9.25	6.3 (28)	•	•	•	•	
NVSA 53	2.08 (53)	1.33 (34)	2.32 (59)	.31 (8)	.71 (18)	.59 (15)	.51 (13)	15	26.25	13.3 (59)	•	•	•	•	
NVSA 63	2.48 (63)	1.33 (34)	2.63 (67)	.31 (8)	.71 (18)	.59 (15)	.51 (13)	28	39	18.4 (82)	•	•	•		
NVSA 78	3.07 (78)	1.84 (46.8)	3.26 (83)	.47 (12)	.98 (25)	.55 (14)	.78 (20)	42	76	34.2 (152)	•	•	•		
NVSAG 110	4.33 (110)	2.16 (55)	4.78 (121.5)	.55 (14)	3.34 (85)	1.28 (32.5)	.35 (9)	320	280	59.6 (265)	•	•			
NVSAG 150	5.90 (150)	2.97 (75.5)	6.53 (166)	.51 (13)	4.72 (120)	1.55 (39.5)	.43 (11)	820	640	118 (523)	•	•			

The values are representative of the mean characteristics of our products.

(*) Fr lbs (in newtons): Actual practical force of the suction cup with a 90% vacuum and a safety factor of 2 inclusive. (**): Reference of the range and installation diagram for connections.

How to Order

NVSA43 NR**

Series

NVSA 5 NVSA 26
 NVSA 11 NVSA 33
 NVSA 14 NVSA 43
 NVSA 16 NVSA 53
 NVSA 18 NVSA 63
 NVSA 20 NVSA 78
 NVSA 22 NVSA 110
 NVSA 25 NVSA 150

Material*

NBR = Nitrile
 SIT5 = Translucent Silicone
 NR = Natural Rubber
 STN = Siton
 SIA = Antistatic Silicone

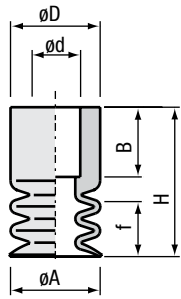
*(Consult the chart above for available materials for a specific cup.)

**Example: Model NVSA43
 Cup made from natural rubber.

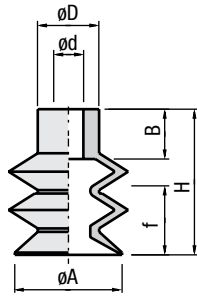


Standard Suction Cups

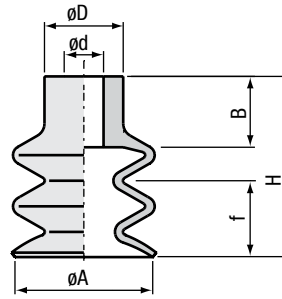
Bellows Type Suction Cups 2.5, Series NVS, 5 to 88 mm Ø



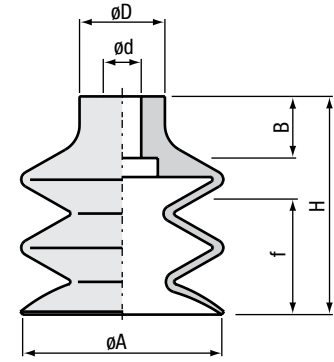
NVS 5 to 9



NVSP 14



NVS 12 to 25



NVS 32 to 88

Applications:

The bellows type suction cups in series NVS are recommended for the gripping of products on various planes (large deflection), as a replacement for spring systems, and spherical or cylindrical items gripped at an angle (ball joint effect).

Materials:

- NBR: Nitrile
- SIT5: Translucent silicone
- NR: Natural rubber
- NBRA: Antistatic nitrile
- STN: Siton
- SIA: Antistatic silicone
- PU: Polyurethane

Suction Cup Sections:

For minimum quantities of 50 pieces, these standard cups can be altered within the parameters of individual cup dimensions.

Suction Cup NVSP14:

Extremely flexible suction cup ideal for baked goods.

It is available in two materials: Translucent silicone, shore hardness 60 (SIT6), and Silicone, shore hardness 30 (SI3).

Special Designs:

To meet the specific needs of our customers, Numatics offers a range of special suction cups with special shapes for eggs, paper, CDs, baked goods, light bulbs and bags, etc. and are made of specific materials: Siton, Vulkollan, polyurethane, etc. It should be noted that a special mold can be designed for quantities between 500 to 1,000 units per order.



Bellows Type Suction Cups 2.5, Series NVS, 5 to 88 mm Ø

Characteristics

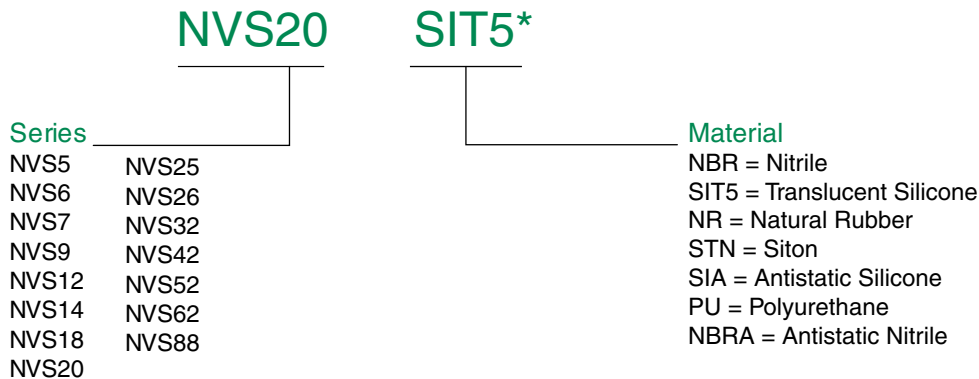
Model	Ø A mm	H mm	Ø d mm	Ø D mm	f mm	B mm	Weight g	Int. Volume (cm³)	lbs (N)	Materials						
										NBR	SIT5	NR	STN	SIA	PU	NBRA
NVS 5	.20 (5)	.53 (13.5)	.16 (4)	.27 (7)	.12 (3)	.31 (8)	0.5	0.04	.15 (0.66)	•	•					
NVS 6	.24 (6)	.52 (13.2)	.16 (4)	.27 (7)	.12 (3)	.27 (7)	0.5	0.04	.15 (0.68)	•	•					
NVS 7	.27 (7)	.55 (14)	.20 (5)	.35 (9)	.16 (4)	.23 (6)	0.5	0.0425	.29 (1.3)	•	•					
NVS 9	.35 (9)	.59 (15)	.20 (5)	.35 (9)	.12 (3)	.27 (7)	0.6	0.15	.34 (1.5)	•	•	•	•	•	•	•
NVS 12	.47 (12)	.83 (21)	.20 (5)	.39 (10)	.27 (7)	.35 (9)	1.1	0.54	.88 (3.9)	•	•	•				
NVS 14	.55 (14)	.90 (23)	.20 (5)	.39 (10)	.39 (10)	.35 (9)	1.4	0.975	.92 (4.1)	•	•	•	•			
NVSP 14	.55 (14)	.75 (19)	.16 (4)	.31 (8)	.35 (9)	.25 (6.5)	0.9	0.9	.83 (3.7)		•					
NVS 18	.69 (17.5)	.90 (23)	.20 (5)	.39 (10)	.39 (10)	.35 (9)	1.8	1.35	1.4 (6.1)	•	•	•	•			•
NVS 20	.79 (20)	.90 (23)	.18 (4.7)	.39 (10)	.39 (10)	.35 (9)	2.2	2	1.4 (6.4)	•	•	•				
NVS 25	.98 (25)	1.34 (34)	.18 (4.7)	.39 (10)	.79 (20)	.35 (9)	3.8	5.4	2.0 (9)	•	•	•	•			
NVS 32	1.26 (32)	1.47 (37.5)	.31 (8)	.70 (18)	.57 (14.5)	.51 (13)	9.4	10	3.8 (16.8)	•	•	•				
NVS 42	1.65 (42)	1.81 (46)	.31 (8)	.70 (18)	.86 (22)	.51 (13)	18.5	19.5	6.5 (29)	•	•	•	•			•
NVS 52	2.05 (52)	1.93 (49)	.31 (8)	.70 (18)	1.06 (27)	.51 (13)	24.6	36	9.0 (40)	•	•	•				
NVS 62	2.44 (62)	2.16 (55)	.31 (8)	.83 (21)	1.22 (31)	.51 (13)	50	72.5	12.8 (57)	•	•	•				•
NVS 88	3.46 (88)	9.44 (87.5)	.47 (12)	.98 (25)	1.90 (48.5)	.79 (20)	175	165	41.4 (184)	•	•	•				

The values are representative of the mean characteristics of our products.

(*) Fr (in newtons): Actual practical force of the suction cup with a 90% vacuum and a safety factor of 2 inclusive.

(**): Reference of the range and installation diagram for connections.

How to Order



*Sample: Cup Series NVS20 made from translucent silicone.

Note: Refer to the chart above for available materials for a specific cup.

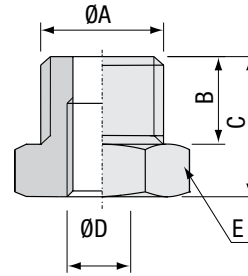


Inserts for Standard Suction Cups

Male Inserts, Seris NIM

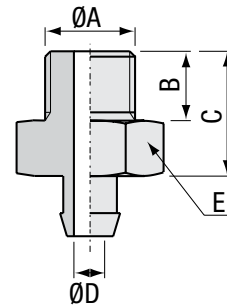
Adapters for Socket Head Screws:

Model	Ø A	B	C	Ø D	E
NIM18 M5F	1/8 G	.24 (6)	.41 (10.5)	M5	.51 (13)
NIM18 MGF(°)	1/8 G	.24 (6)	.41 (10.5)	M6	.51 (13)
NIM10 M6F(°)	M10	.27 (7)	.41 (10.5)	M6	.51 (13)
NIM14 M6F(°)	1/4 G	.31 (8)	.51 (13)	M6	.67 (17)
NIM14 F18	1/4 G	.31 (8)	.51 (13)	1/8 G	.67 (17)
NIM12 F18	1/2 G	.31 (8)	.55 (14)	1/8 G	.75 (19)
NIM38 F18	3/8 G	.39 (10)	.61 (15.5)	1/8 G	.94 (24)



With Hollow Shafts:

Model	Ø A	B	C	Ø D	E
NIM 11 A (°)	1/8 G	.29 (7.5)	.53 (13.5)	.14 (3.5)	.55 (14)
NIM 21 (°°) (°°°)	M5	.18 (4.5)	.37 (9.5)	.09 (2.5)	.27 (7)
NIM 22	M6	.20 (5)	.39 (10)	.14 (3.5)	.27 (7)
NIM 23	10-32	.18 (4.5)	.37 (9.5)	.09 (2.5)	.27 (7)
NIM 5 VPG 2	M5	.18 (4.5)	.31 (8)	.04 (1)	.31 (8)
NIM 5 VPG 5	M5	.18 (4.5)	.31 (8)	.09 (2.5)	.31 (8)
NIM 20	M3	.12 (3)	.20 (5)	.05 (1.2)	.19 (5)
NIMC 14	1/4 G	.39 (10)	1.22 (31)	.27 (7)	.67 (17)

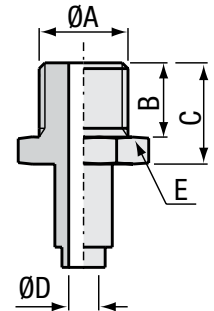
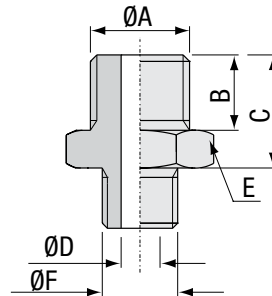


Threaded:

Model	Ø A	B	C	Ø D	Ø E	F
NIM14M10M	1/4 G	.39 (10)	.59 (15)	.20 (5)	.67 (17)	M10*

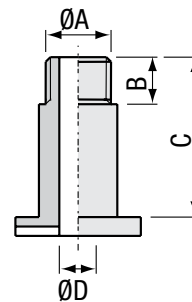
Riveted

Model	Ø A	B	C	Ø D	Ø E
NIM 41 (°°°)	1/4G	.43 (11)	.59 (15)	.17 (4.4)	.67 (17)
NIM 51	1/4G	.43 (11)	.67 (17)	.31 (8)	.82 (21)
NIM 52	3/8G	.43 (11)	.67 (17)	.31 (8)	.82 (21)



Socket Head Screws:

Model	Ø A	B	C	Ø D
NIM 50	M5	.20 (5)	.62 (16)	.11 (2.8)
NIM 5 M 15	M5	.20 (5)	.24 (6)	.09 (2.5)
NIM 5 M 20	M5	.16 (4)	.27 (7)	.09 (2.5)
NIM 60 (°°°)	M6	.27 (7)	.71 (18)	.14 (3.5)
NIM 68	M8	.31 (8)	.75 (19)	.21 (5.2)
NIM 6 M 25	M6	.20 (5)	.39 (10)	.14 (3.5)
NIM 6 M 50	M6	.24 (6)	.43 (11)	.14 (3.5)
NIM 80	1/8G	.31 (8)	1.02 (26)	.23 (6)
NM 85	M10**	.31 (8)	1.02 (26)	.23 (6)



(*) M10, pitch 125

(**) M10, pitch 150

(°) Available in version NPT

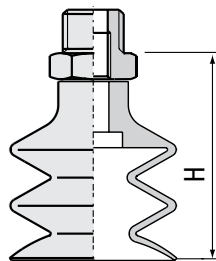
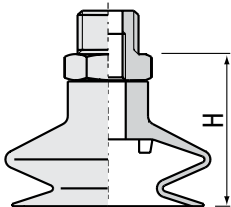
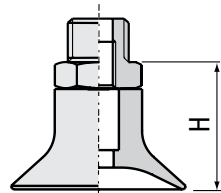
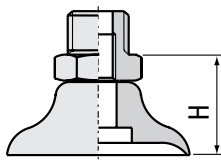
(°°) Possibility of incorporating a calibrated diameter jet to reduce leaks in case of use with multiple suction cup tank (0.45 mm diameter, standard, in stock)

(°°°) Available in stainless steel



Inserts for Standard Suction Cups

Table of Sizes: Suction Cups - Male Inserts



MODELS	M3 MALE (H)	M5 MALE (H)	M6 MALE (H)	M8 MALE(H)	M10 MALE (H)	1/8 MALE (H)	1/4 MALE (H)	3/8 MALE (H)	1/2 MALE (H)	EDGE 1/4 MALE (H)	EDGE 3/8 MALE (H)
NVPG 2		0.29 (7.5)									
NVPG 3.5		0.29 (7.5)									
NVPG 5		0.39 (10)									
NVPG 6		0.39 (10)									
NVPG 8		0.41 (10.5)									
NVPG 10		0.43 (11)									
NVPG 15		0.31 (8)				0.49 (12.5)					
NVPG 20		0.39 (10)				0.57 (14.5)					
NVPG 25			0.55 (14)		0.69 (17.5)	0.73 (18.5)	0.75 (19)				
NVPG 30			0.47 (12)		0.61 (15.5)	0.65 (16.5)	0.67 (17)				
NVPG 35			0.55 (14)		0.69 (17.5)	0.73 (18.5)	0.75 (19)				
NVPG 40			0.55 (14)		0.69 (17.5)	0.73 (18.5)	0.75 (19)				
NVPG 50			0.59 (15)		0.72 (18.5)	0.77 (19.5)	0.79 (20)				
NVPG 60							0.83 (21)				
NVPG 80							0.9 (23)				
NVPG 95							0.94 (24)				
NVP 5	0.43 (11)	0.55 (14)	0.55 (14)			0.59 (15)					
NVP 8		0.59 (15)	0.59 (15)			0.63 (15)					
NVP 10		0.61 (15.5)	0.61 (15.5)			0.65 (16.5)					
NVP 15		0.65 (16.5)	0.65 (16.5)			0.67 (17)					
NVP 20		0.67 (17)	0.67 (17)			0.7 (18)					
NVP 25		0.67 (17)	0.67 (17)			0.7 (18)					
NVP 30	0.75 (19)	0.75 (19)	0.75 (19)	0.75 (19)	0.88 (22.5)	0.92 (23.5)	0.94 (24)			0.9 (23)	
NVP 35	0.79 (20)	0.79 (20)	0.79 (20)	0.79 (20)	0.92 (23.5)	0.96 (24.5)	0.98 (25)			0.94 (24)	
NVP 40	0.79 (20)	0.79 (20)	0.79 (20)	0.79 (20)	0.92 (23.5)	0.96 (24.5)	0.98 (25)			0.94 (24)	
NVP 50	0.86 (22)	0.86 (22)	0.86 (22)	0.86 (22)	1 (25.5)	1.04 (26.5)	1.06 (27)			1.02 (26)	
NVP 60	0.86 (22)	0.86 (22)	0.86 (22)	0.86 (22)	1 (25.5)	1.04 (26.5)	1.06 (27)			1.02 (26)	
NVP 75						1.26 (32)	1.46 (37)	1.46 (37)	1.47 (37.5)	1.49 (38)	1.49 (38)
NVP 95						1.49 (38)	1.69 (43)	1.69 (43)	1.71 (43.5)	1.73 (44)	1.73 (44)
NVSA 5	0.51 (13)	0.62 (16)	0.62 (16)			0.67 (17)					
NVSA 11		0.83 (21)	0.83 (21)			0.87 (22)					
NVSA 14		0.83 (21)	0.83 (21)			0.87 (22)					
NVSA 16		0.94 (24)	0.94 (24)			0.98 (25)					
NVSA 20		0.83 (21)	0.83 (21)			0.87 (22)					
NVSA 22		0.94 (24)	0.94 (24)			0.98 (25)					
NVSA 25		1.1 (28)	1.1 (28)			1.14 (29)					
NVSA 33		1.08 (27.5)	1.08 (27.5)	1.08 (27.5)	1.22 (31)	1.26 (32)	1.28 (32.5)			1.24 (31.5)	
NVSA 43		1.1 (28)	1.1 (28)	1.1 (28)	1.24 (31.5)	1.28 (32.5)	1.3 (33)			1.26 (32)	
NVSA 53		1.34 (34)	1.34 (34)	1.34 (34)	1.47 (37.5)	1.51 (38.5)	1.53 (39)			1.5 (38)	
NVSA 63		1.34 (34)	1.34 (34)	1.34 (34)	1.47 (37.5)	1.51 (38.5)	1.53 (39)			1.5 (38)	
NVSA 78						1.85 (47)	2.05 (52)	2.05 (52)	2.06 (52.5)	2.09 (53)	2.09 (53)
NVS 5	0.61 (15.5)	0.72 (18.5)	0.72 (18.5)			0.77 (19.5)					
NVS 6	0.6 (15.2)	0.71 (18.2)	0.71 (18.2)			0.75 (19.2)					
NVS 7		0.75 (19)	0.75 (19)			0.79 (20)					
NVS 9		0.79 (20)	0.79 (20)			0.83 (21)					
NVS 12		1.02 (26)	1.02 (26)			1.06 (27)					
NVS 14		1.1 (28)	1.1 (28)			1.14 (29)					
NVSP 14		0.94 (24)	0.94 (24)			0.98 (25)					
NVS 18		1.1 (28)	1.1 (28)			1.14 (29)					
NVS 20		1.1 (28)	1.1 (28)			1.14 (29)					
NVS 25		1.53 (39)	1.53 (39)			1.57 (40)					
NVS 32		1.47 (37.5)	1.47 (37.5)	1.47 (37.5)	1.85 (41)	1.65 (42)	1.67 (42.5)			1.63 (41.5)	
NVS 42		1.81 (46)	1.81 (46)	1.81 (46)	1.95 (49.5)	1.99 (50.5)	2 (51)			1.97 (50)	
NVS 52		1.93 (49)	1.93 (49)	1.93 (49)	2.06 (52.5)	2.1 (53.5)	2.12 (54)			2.08 (53)	
NVS 62		2.16 (55)	2.16 (55)	2.16 (55)	2.3 (58.5)	2.34 (59.5)	2.36 (60)			2.32 (59)	
NVS 88						3.44 (87.5)	3.64 (92.5)	3.64 (92.5)	3.66 (93)	3.68 (93.5)	3.68 (93.5)

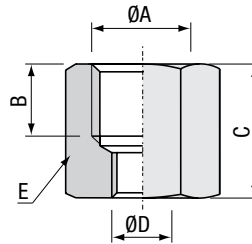


Inserts for Standard Suction Cups

Female Inserts, Series NIF

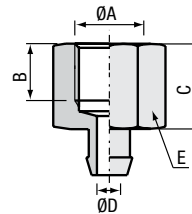
Adapters for Socket Head Screws:

Model	Ø A	B	C	Ø D	E
NIF18 M5F	1/8G	.29 (7.5)	.51 (13)	M5	.51 (13)
NIF18 M6F(°)	1/8G	.29 (7.5)	.51 (13)	M6	.51 (13)
NIF14 M6F(°)	1/4G	.43 (11)	.67 (17)	M6	.67 (17)
NIF14 F18	1/4G	.35 (9)	.75 (19)	1/8G	.67 (13)



With Hollow Shafts:

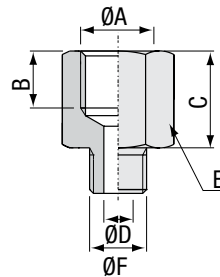
Model	Ø A	B	C	Ø D	E
NIF 10 A(°)	1/8G	.31 (8)	.47 (12)	3.5	.55 (14)



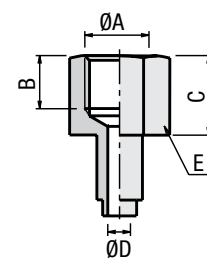
Threaded:

Model	Ø A	B	C	Ø D	Ø E	F
NIF 14 M10 M	1/4G	.39 (10)	.67 (17)	5	.67 (17)	M10*

Threaded



Riveted

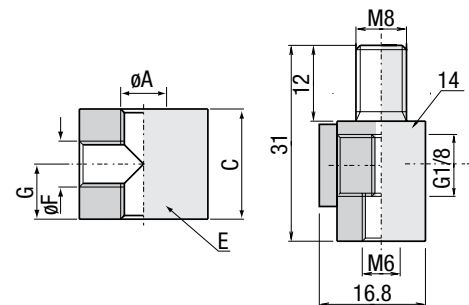


Riveted

Model	Ø A	B	C	Ø D	Ø E
NIF 40 (°°°)	1/4G	.39 (10)	.59 (15)	4.4	.67 (17)
NIF 50	1/4G	.39 (10)	.59 (15)	8	.83 (21)

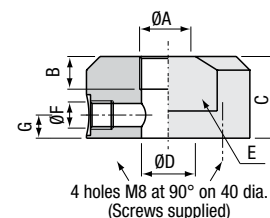
With Radial Outlet:

Model	Ø A	B	C	Ø D	E	Ø F	G
NIR M5	M5	-	.47 (12)	-	14x8	M%	.23 (6)
NIRP M6							



For Suction Cups NVPG 120 to 200 and NVSAG 110 and 150

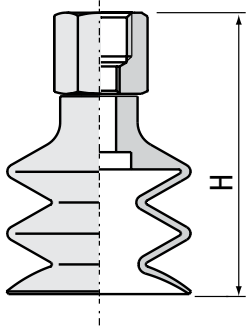
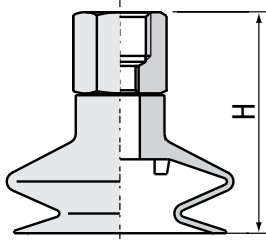
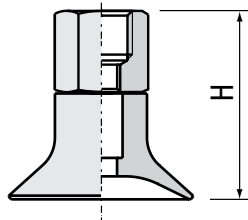
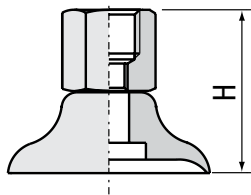
Model	Ø A	B	C	Ø D	E	Dia. F	G
NIF 12 120 (°°)	1/2G	.94 (24)	1.18 (30)	Ø 19	Ø 60	1/8G	.34 (8.7)
NIFS 12 120 (°°)	1/2G	.51 (13)	.51 (13)	-	Ø 65	-	-



- (*) M10, pitch 125
- (**) Hollow shaft outlet for pipe connection
- (°) Available in version NPT
- (°°) Insert comprising four M8 holes for the attachment of suction cups NVPG 120 to 200 and NVSAG 110 and 150
- (°°°) Available in stainless steel



Table of Sizes: Suction Cups - Female Inserts



MODELS	1/8 FEMALE (H)	1/4 FEMALE (H)	EDGE 1/4 FEMALE (H)	IF 12 120 (H)	IFS 12 120 (H)
NVPG 15	.83 (21)				
NVPG 20	.90 (23)				
NVPG 25	1.06 (27)	1.22 (31)			
NVPG 30	.98 (25)	1.14 (29)			
NVPG 35	1.06 (27)	1.22 (31)			
NVPG 40	1.10 (28)	1.22 (31)			
NVPG 50		1.25 (32)			
NVPG 60		1.30 (33)			
NVPG 80		1.38 (35)			
NVPG 95		1.42 (36)			
NVPG 120				2.14 (54.5)	1.47 (37.5)
NVPG 150				2.38 (60.5)	1.71 (43.5)
NVPG 200				2.58 (65.5)	1.91 (48.5)
NVP 5	.83 (21)				
NVP 8	.87 (22)				
NVP 10	.88 (22.5)				
NVP 15	.90 (23)				
NVP 20	.92 (23.5)				
NVP 25	.94 (24)				
NVP 30	1.25 (32)	1.41 (36)	1.33 (34)		
NVP 35	1.30 (33)	1.46 (37)	1.38 (35)		
NVP 40	1.30 (33)	1.46 (37)	1.38 (35)		
NVP 50	1.38 (35)	1.53 (39)	1.45 (37)		
NVP 60	1.38 (35)	1.53 (39)	1.45 (37)		
NVP 75		2.00 (51)	1.85 (47)		
NVP 95		2.24 (57)	2.09 (53)		
NVSA 5	.90 (23)				
NVSA 11	1.10 (28)				
NVSA 14	1.10 (28)				
NVSA 16	1.22 (31)				
NVSA 20	1.10 (28)				
NVSA 22	1.22 (31)				
NVSA 25	1.10 (28)				
NVSA 33	1.22 (31)	1.75 (44.5)	1.67 (42.5)		
NVSA 43	1.38 (35)	1.77 (45)	1.69 (43)		
NVSA 53	1.59 (40.5)	2 (51)	1.92 (49)		
NVSA 63	1.61 (41)	2 (51)	1.92 (49)		
NVSA 78	1.85 (47)	2.59 (66)	2.44 (62)		
NVSAG 110				3.34 (85)	2.67 (68)
NVSAG 150				4.15 (105.5)	3.48 (88.5)
NVS 5	1.00 (25.5)				
NVS 6	0.99 (25.2)				
NVS 7	1.02 (26)				
NVS 9	1.06 (27)				
NVS 12	1.29 (33)				
NVS 14	1.38 (35)				
NVSP 14	1.22 (31)				
NVS 18	1.38 (35)				
NVS 20	1.38 (35)				
NVS 25	1.81 (46)				
NVS 32	1.99 (50.5)	2.14 (54.5)	2.07 (52.5)		
NVS 42	2.32 (59)	2.48 (63)	2.40 (61)		
NVS 52	2.44 (62)	2.59 (66)	2.52 (64)		
NVS 62	2.67 (68)	2.83 (72)	2.75 (70)		
NVS 88		4.19 (106.5)	4.03 (102.5)		

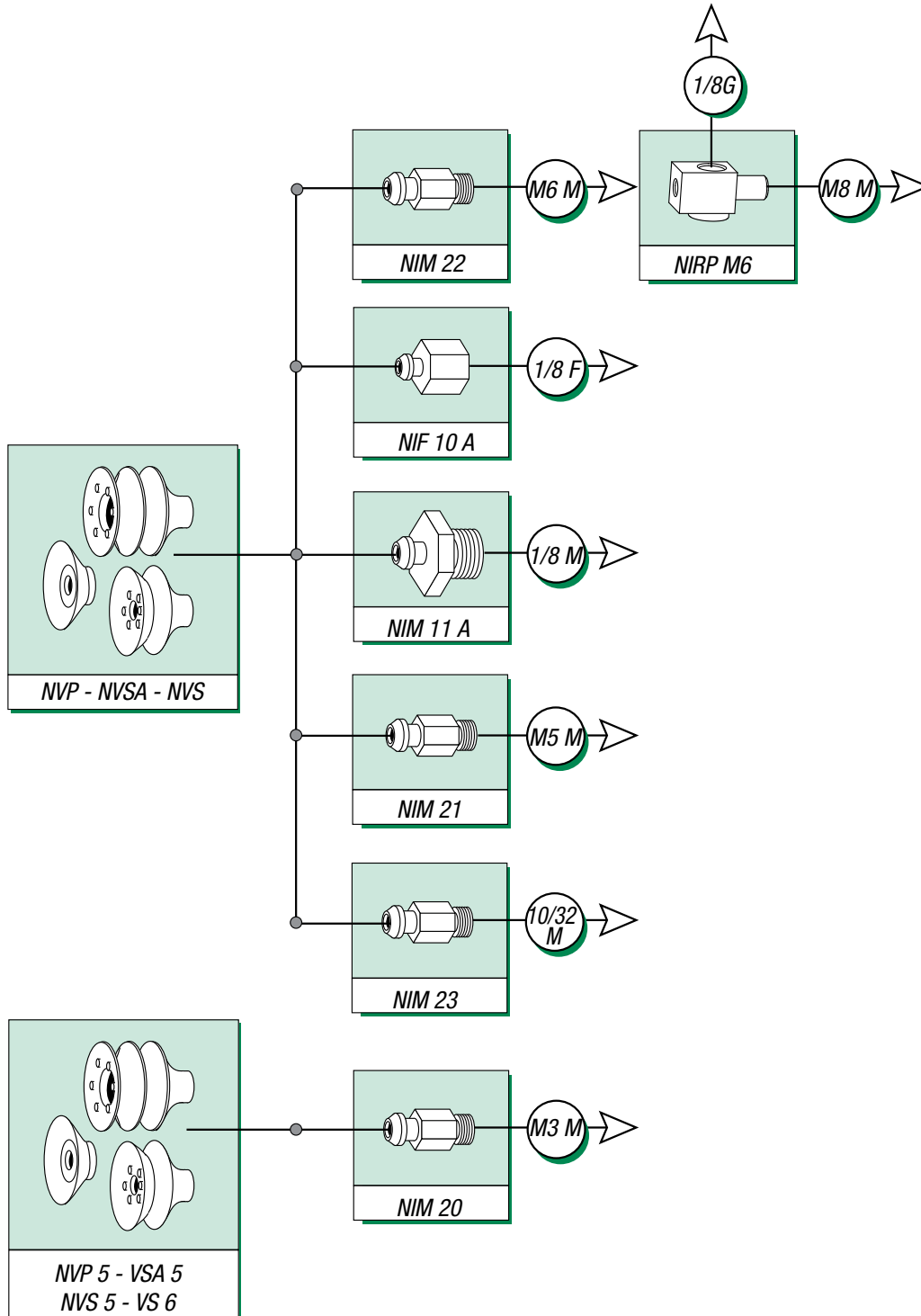


Inserts for Standard Suction Cups

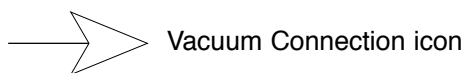
Installation Diagram - NVP-NVSA-NVS

Diameters from 5 to 25 mm

Group 1



Note: NIM21 type inserts (M5 male) with built-in jets are available for these suction cups. Please consult us.



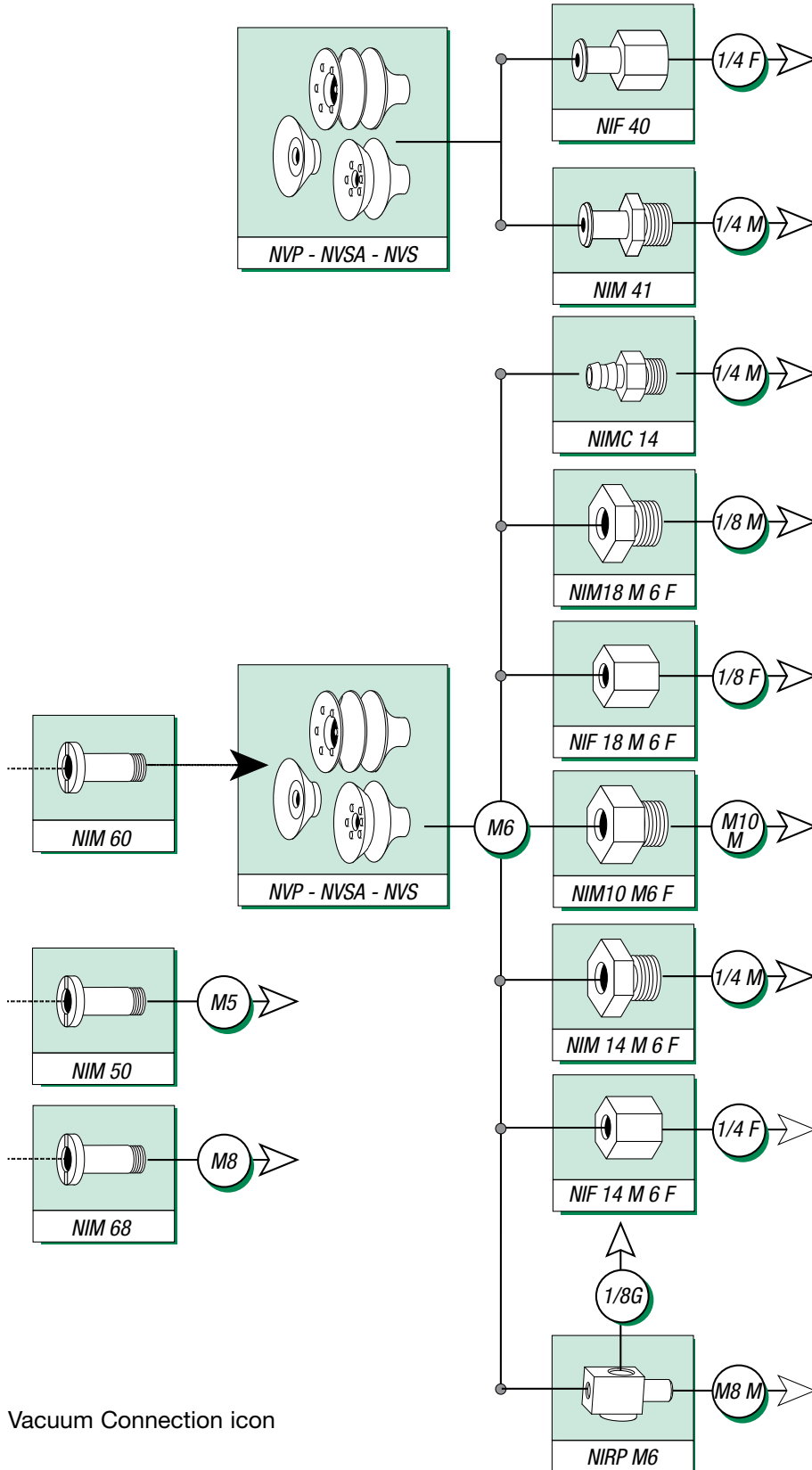


Inserts for Standard Suction Cups

Installation Diagram - NVP-NVSA-NVS

Diameters from 30 to 63 mm

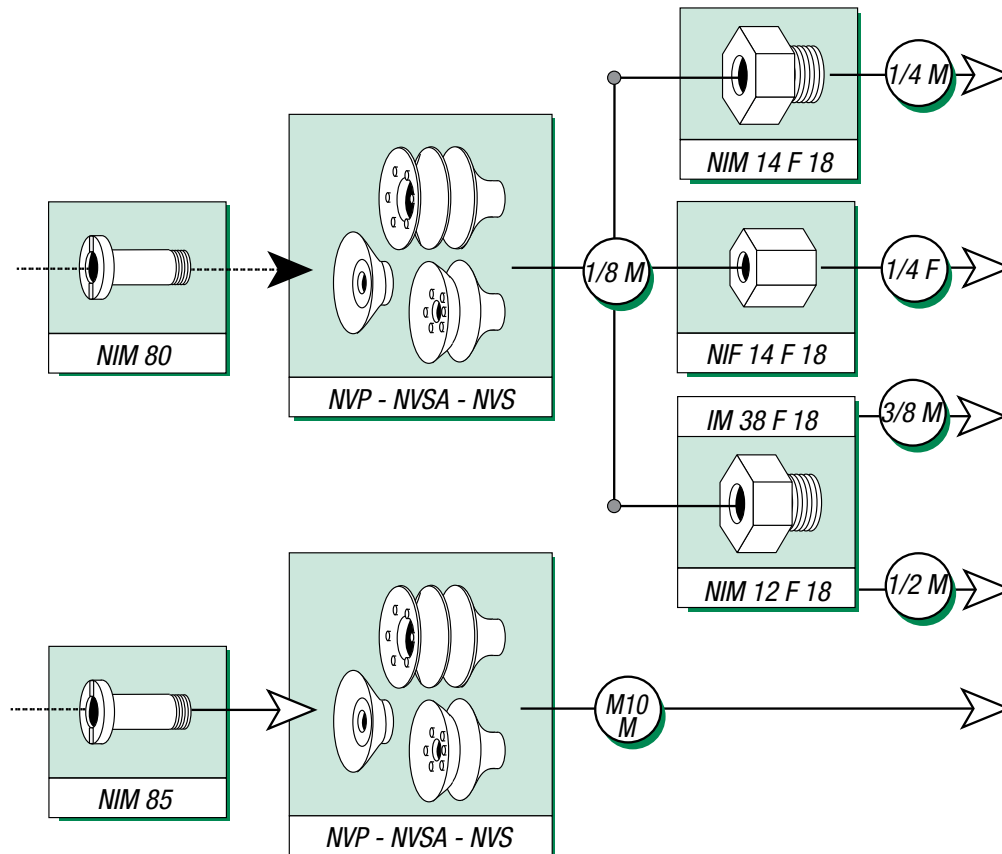
Group 2






Inserts for Standard Suction Cups

Installation Diagram - NVP-NVSA-NVS
Diameters from 75 to 95 mm
Group 3

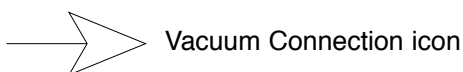
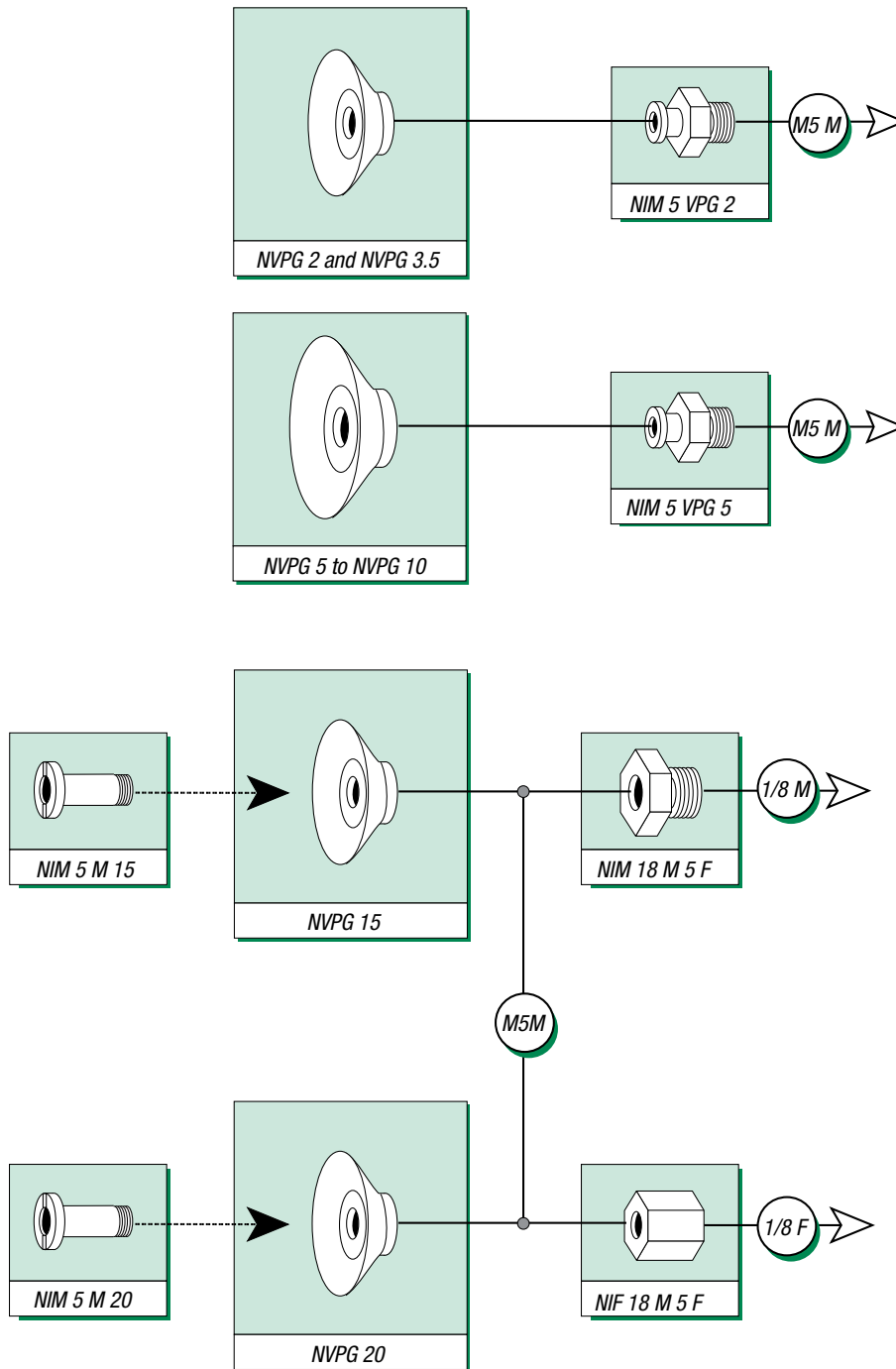


 Vacuum Connection icon



Inserts for Standard Suction Cups

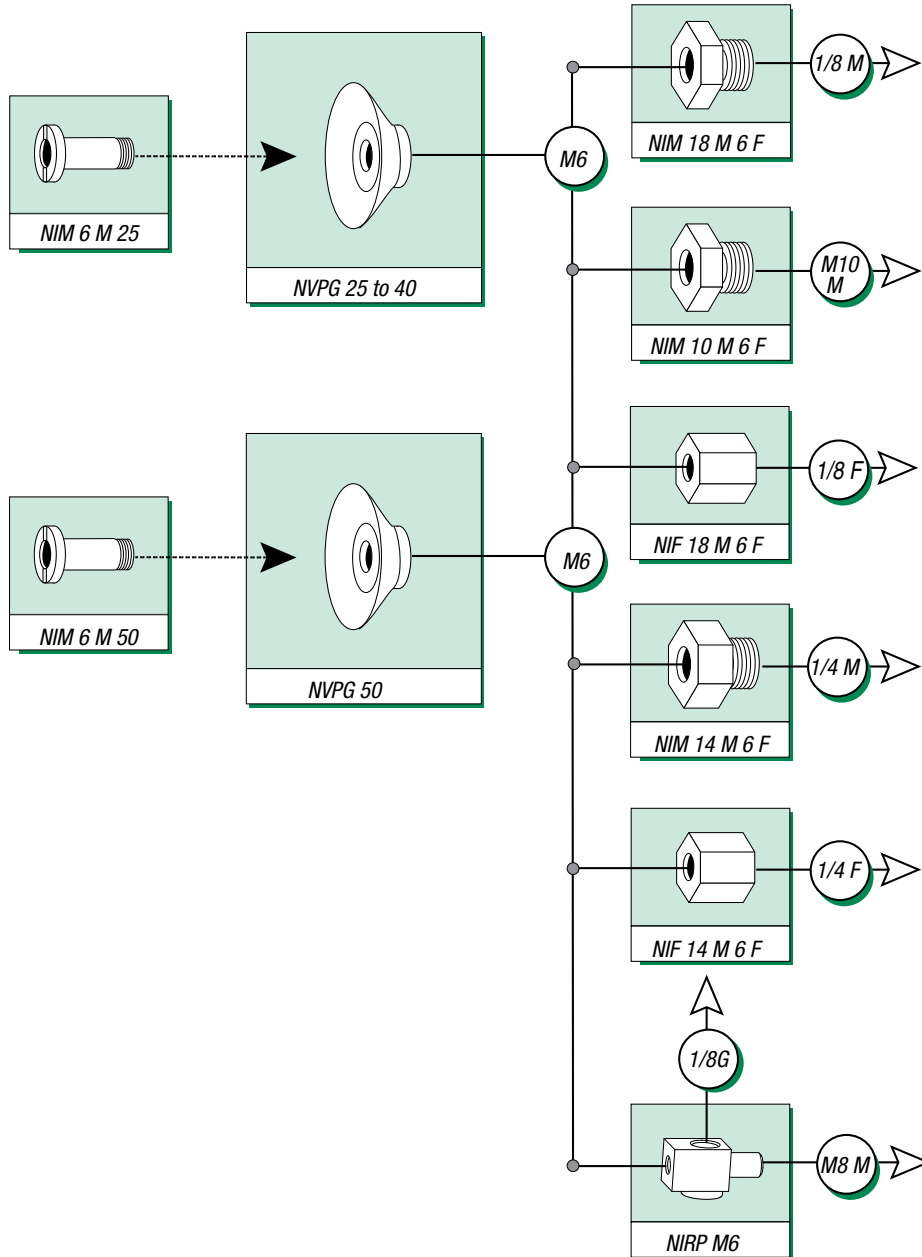
Installation Diagrams (A and B) - NVPG 2 and 20





Inserts for Standard Suction Cups

Installation Diagrams (C) - NVPG 25 to 50

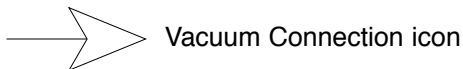
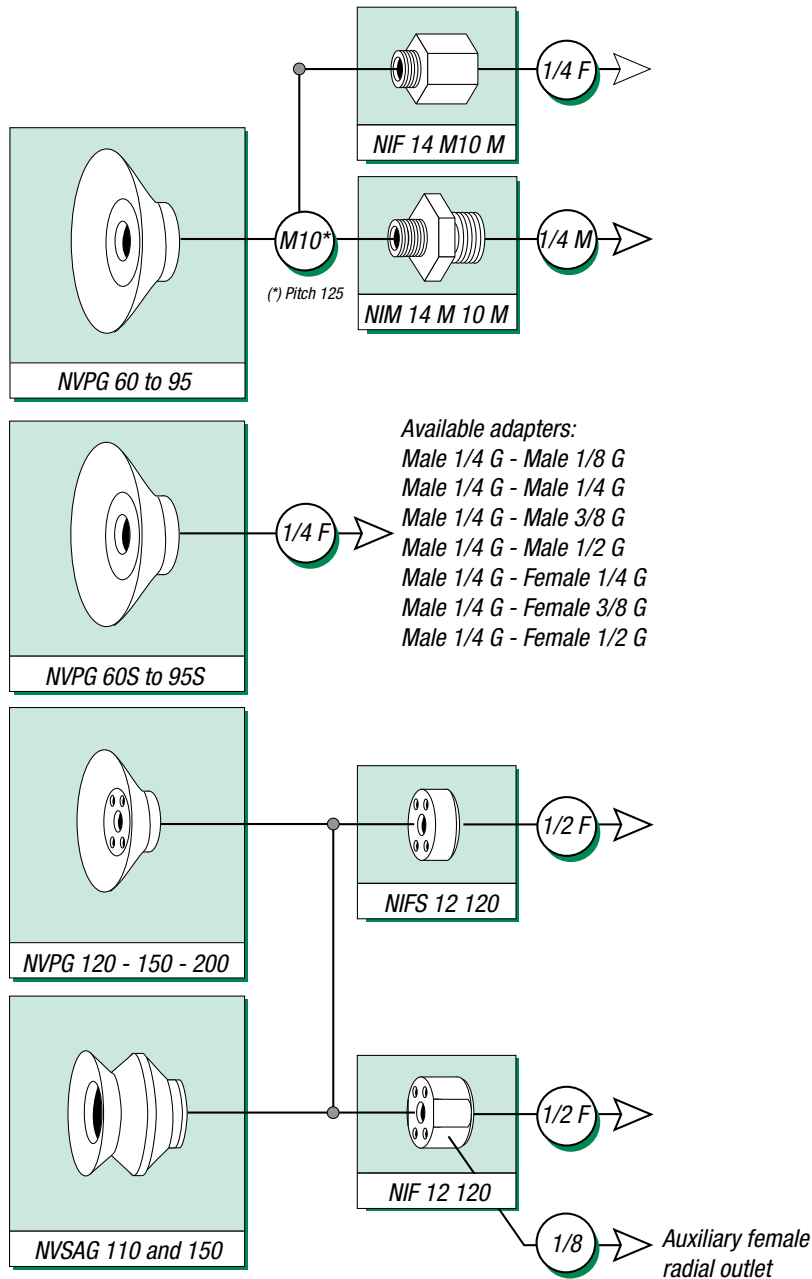


Vacuum Connection icon



Inserts for Standard Suction Cups

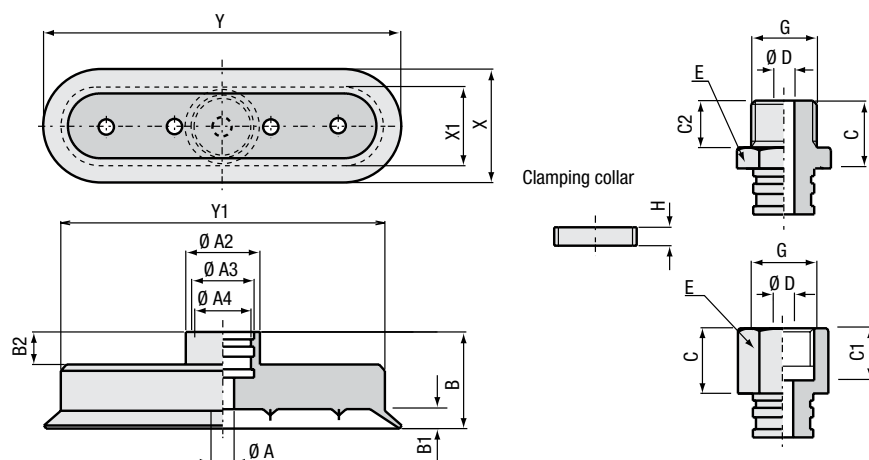
Installation Diagrams (D and E) - NVPG 60 to 200, NVSAG 110 and 150





Special Suction Cups

Oblong Suction Cups, Series NVPO



Applications:

This range of suction cups is used for the handling of long products, such as pens, tubes and bottles, and flat or cylindrical objects.

Materials:

- NBR: Nitrile
- SI: Translucent silicone

Accessories:

Anti-rotation spring systems, see page 102.

Characteristics:

Model	Ø A in (mm)	A2 in (mm)	A3 in (mm)	A4 in (mm)	B in (mm)	B2 in (mm)	B1 in (mm)	C in (mm)	C1 in (mm)	C2 in (mm)	D in (mm)
NVPO 357	0.04 (1)	0.24 (6)	0.12 (3)	0.08 (2)	0.24 (6)	0.14 (3.5)	0.003 (0.8)	0.2 (5)	–	0.12 (3)	0.04 (1)
NVPO 515	0.05 (1.2)	0.33 (8.5)	0.24 (6)	0.18 (4.5)	0.47 (12)	0.27 (7)	0.03 (1)	0.39 (10)	0.33 (8.5)	0.2 (5)	0.08 (2)
NVPO 618	0.06 (1.5)	0.33 (8.5)	0.24 (6)	0.18 (4.5)	0.47 (12)	0.27 (7)	0.05 (1.2)	0.39 (10)	0.33 (8.5)	0.2 (5)	0.08 (2)
NVPO 824	0.06 (1.5)	0.45 (11.5)	0.27 (7)	0.22 (5.5)	0.47 (12)	0.17 (4.3)	0.06 (1.5)	0.51 (13)	0.35 (9)	0.31 (8)	0.14 (3.5)
NVPO 1030	0.1 (2.5)	0.45 (11.5)	0.27 (7)	0.22 (5.5)	0.47 (12)	0.17 (4.3)	0.08 (2)	0.51 (13)	0.35 (9)	0.31 (8)	0.14 (3.5)
NVPO 1545	0.12 (3)	0.61 (15.5)	0.51 (13)	0.45 (11.5)	0.83 (21)	0.24 (6)	0.12 (3)	0.59 (15)	0.47 (12)	0.39 (10)	0.14 (3.5)
NVPO 2060	0.16 (4)	0.61 (15.5)	0.51 (13)	0.45 (11.5)	0.83 (21)	0.2 (5)	0.14 (3.5)	0.59 (15)	0.47 (12)	0.39 (10)	0.14 (3.5)
NVPO 2575	0.16 (4)	0.68 (17.5)	0.51 (13)	0.45 (11.5)	0.83 (21)	0.27 (7)	0.16 (4)	0.59 (15)	0.47 (12)	0.39 (10)	0.14 (3.5)
NVPO 3090	0.16 (4)	0.68 (17.5)	0.51 (13)	0.45 (11.5)	0.83 (21)	0.2 (5)	0.2 (5)	0.59 (15)	0.47 (12)	0.39 (10)	0.14 (3.5)

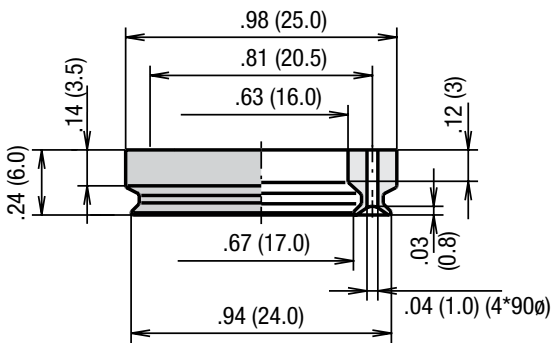
Models	G	H in (mm)	X in (mm)	X1 in (mm)	Y in (mm)	Y1 in (mm)	E –	F N
NVPO 357	M3	–	0.14 (3.5)		0.27 (7)	0.14 (3.5)	0.2 (5)	0.03 (0.75)
NVPO 515	M5	–	0.2 (5)	0.11 (2.8)	0.59 (15)	0.5 (12.8)	0.31 (8)	0.12 (3.15)
NVPO 618	M5	–	0.24 (6)	0.12 (3.2)	0.71 (18)	0.6 (15.2)	0.31 (8)	0.16 (4.2)
NVPO 824	1/8 G	0.16 (4)	0.31 (8)	0.18 (4.5)	0.94 (24)	0.81 (20.5)	0.55 (14)	0.31 (8)
NVPO 1030	1/8 G	0.16 (4)	0.39 (10)	0.22 (5.5)	1.18 (30)	1 (25.5)	0.55 (14)	0.49 (12.5)
NVPO 1545	1/4 G	0.16 (4)	0.59 (15)	0.33 (8.5)	1.77 (45)	1.51 (38.5)	0.67 (17)	1.11 (28.2)
NVPO 2060	1/4 G	0.16 (4)	0.79 (20)	0.49 (12.5)	2.36 (60)	2.06 (52.5)	0.67 (17)	1.61 (41.1)
NVPO 2575	1/4 G	0.16 (4)	0.98 (25)	0.69 (17.5)	2.95 (75)	2.66 (67.5)	0.67 (17)	3.09 (78.4)
NVPO 3090	1/4 G	0.16 (4)	1.18 (30)	0.83 (21)	3.54 (90)	3.18 (81)	0.67 (17)	4.44 (112.8)

Adaptable Inserts:

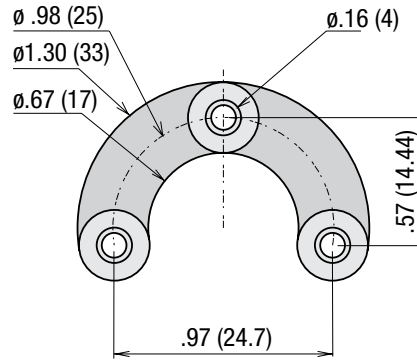
Reference	Connection	Male Reference	Female Reference	Clamping Collar
NVPO 357	M3	NIM 3 NVPO 24	–	–
NVPO 515 and 618	M5	NIM 5 NVPO 515	NIF 5 NVPO 515	–
NVPO 824 and 1030	1/8 G	NIM 18 NVPO 824	NIF 18 NVPO 824	NVPO COV18
NVPO 1545 to 3090	1/4 G	NIM 14 NVPO 1545	NIF 14 NVPO 1545	NVPO COV14



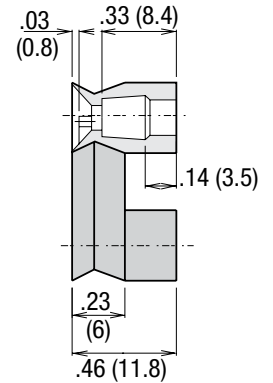
CD Handling Suction Cups



NVCD 24 SIT4

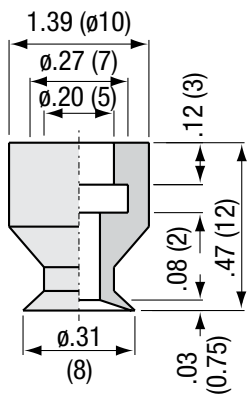


NVCD 34 SIT5



Other Models on Request:

NVCD17 SIT3, NVCD 24 G SIT4, NVCD 31 SIA and NVCD 36 SIT3, semi-lunar suction cups of translucent silicone.



NVPCD 8 SI

Characteristics:

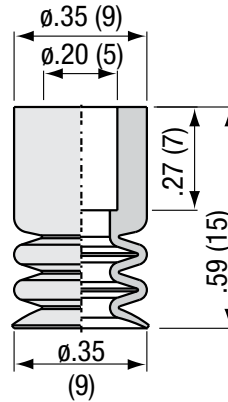
Deflection of 0, 75 mm

Material:

- Pink Silicone
- 50 shores (SI)

Insert:

NIM5VPG5



NVS 9 PU

Characteristics:

Deflection of 3 mm

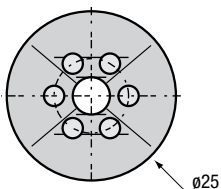
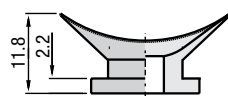
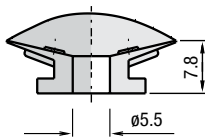
Material:

- Polyurethane (PU)

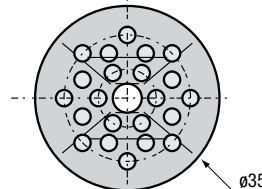
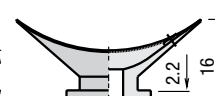
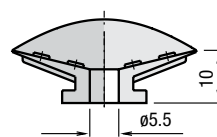
Insert:

Inserts group 1
Page 84

Curved Suction Cups, Series NVPAG



NVPAG 25 NR



NVPAG 3536 NR

References:

NVPAG 3536 NR
NVPAG 25 NR

Material:

Natural Rubber (NR)

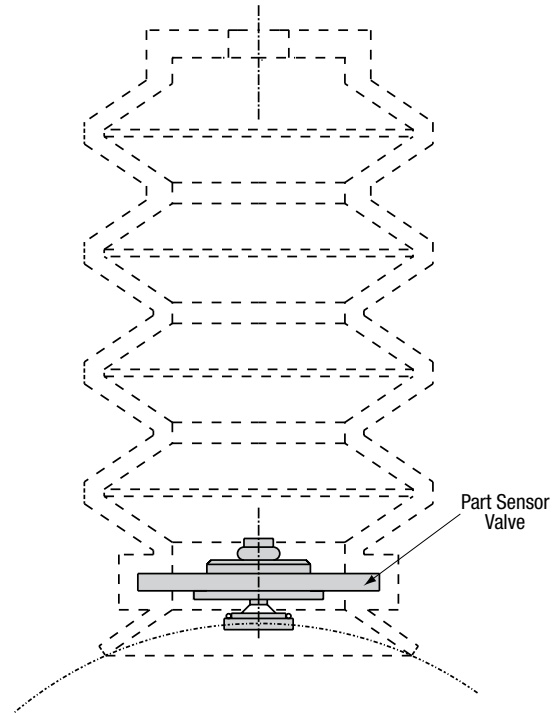
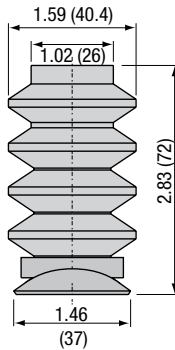
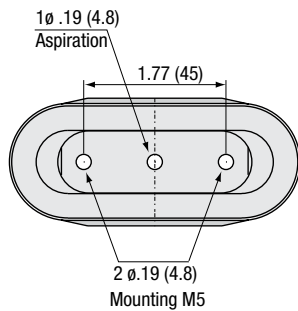
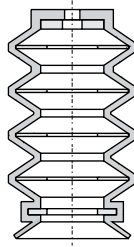
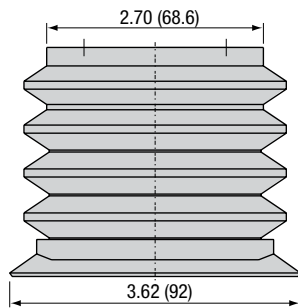
Color:

Light Grey



Special Suction Cups

Bottle Handling Suction Cup, Series NVSBO



Applications:

The NVSBO range of bottle handling suction cup has been developed for vertical and horizontal gripping from the side of the bottle. It is designed to suit a variety of bottles. Its high compression and its low internal volume allow 25 of these cups to be supplied by one vacuum generator of nozzle size .10 in (2.5 mm).

Characteristics:

1.50 in (38 mm) compression compensates for difference in levels when handling bottles from crates. Force* of 18 lbs. (80 Newtons). (* Fr lbs (in newtons) : Actual practical force of the suction cup with a 90% vacuum including a safety factor of 2

Specifications:

The four bellows give extra flexibility in three axis to facilitate bottle gripping. Furthermore, internal supports of stainless steel ensure precise holding during movement and avoid lateral distortion of the suction cup. This cup fits on most robotic heads because of its grooved centers of 45 mm for multiple mounting on profiles.

Options:

NCAV.SBO valve mounted on the internal reinforcement of the suction cup will maintain vacuum within the system if a bottle is not present.

How to Order

VSBO4095

D5

Series

VSBO4095

Materials

NBR = Nitrile

NR = Natural Rubber

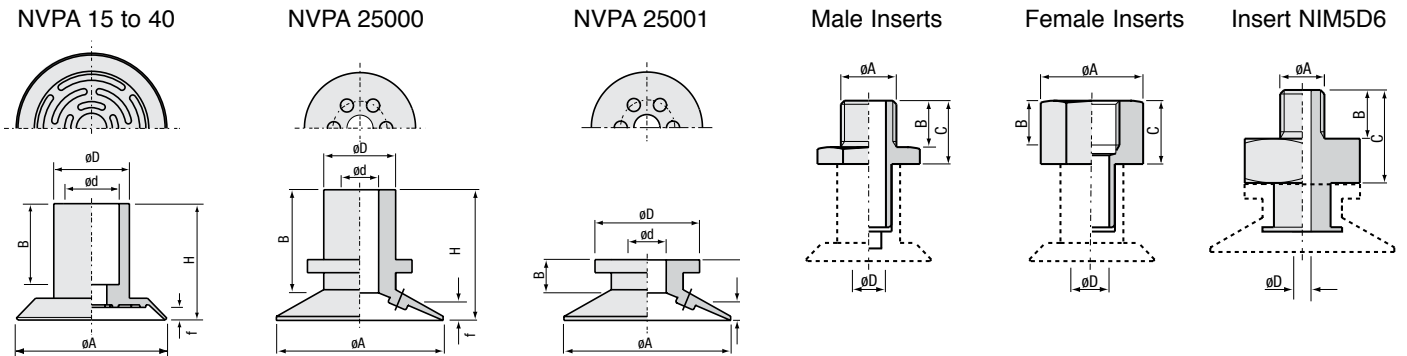
Options

P = Internal Plastic Reinforcement

CAVBO = Part Sensor Valve



Paper Handling Suction Cups, Series NVPA



Applications:

Suction cups for paper, in series NVPA, are made of natural rubber (NR) to ensure resistance to abrasion caused by paper and cardboard or of silicone (SIT5) for compatibility with food.

Characteristics:

Model	Ø A in (mm)	H in (mm)	Ø d in (mm)	Ø D in (mm)	f in (mm)	B in (mm)	Fr* N	Male Inserts				Female Inserts		Materials			
								1/8 G	1/4 G	M5	M6	1/8 G	1/4 G	SIT5	NR		
NVPA 15	.59 (15)	.38 (9.8)	.20 (5)	.35 (9)	.03 (0.8)	.27 (7)	4	NIM11A		NIM21	NIM22	NIF10A			•	•	
NVPA 20	.79 (20)	.40 (10.3)	.20 (5)	.39 (10)	.05 (1.3)	.27 (7)	6	NIM11A		NIM21	NIM22	NIF10A				•	
NVPA 25	.98 (25)	.42 (10.8)	.20 (5)	.39 (10)	.07 (1.8)	.27 (7)	9	NIM11A		NIM21	NIM22	NIF10A				•	
NVPA 30	1.18 (30)	.90 (23)	.43 (11)	.59 (15)	.10 (2.5)	.63 (16)	13		NIM51SP143				NIF50SP143		•	•	
NVPA 35 A	1.37 (35)	.90 (23)	.43 (11)	.59 (15)	.10 (2.5)	.63 (16)	17		NIM51SP143				NIF50SP143			•	
NVPA 40	1.57 (40)	.79 (20)	.31 (8)	.63 (16)	.08 (2)	.59 (15)	29		NIM41				NIF40			•	
NVPA 25000	1.00 (25.5)	.79 (20)	.23 (5.8)	.43 (11)	.12 (3)	.62 (15.8)	10									•	•
NVPA 25001	1.00 (25.5)	.37 (9.5)	.23 (5.8)	.63 (16)	.12 (3)	.20 (5.1)	10	NIM11ASP082		NIM5D6		NIF10ASP082				•	•

Specifications For Inserts (Inserts Ordered Separately):

Male Inserts					Female Inserts				
Model	Ø A	B	C	Ø D	Model	Ø A	B	C	Ø D
	in (mm)	in (mm)	in (mm)	in (mm)		in (mm)	in (mm)	in (mm)	in (mm)
NIM11A	1/8 G	.29 (7.5)	.53 (13.5)	.14 (3.5)	NIF10A	1/8 G	.31 (8)	.47 (12)	.14 (3.5)
NIM21	M5	.17 (4.5)	.37 (9.5)	.10 (2.5)	NIF50SP143	1/4 G	.39 (10)	.59 (15)	.31 (8)
NIM22	M6	.20 (5)	.39 (10)	.14 (3.5)	NIF40	1/4 G	.31 (8)	.59 (15)	.17 (4.4)
NIM51SP143	1/4 G	.43 (11)	.67 (17)	.31 (8)	NIF10ASP082	1/8 G	.39 (10)	.47 (12)	.14 (3.5)
NIM41	1/4 G	.43 (11)	.59 (15)	.17 (4.4)					
NIM11ASP082	1/8 G	.28 (7.5)	.53 (13.5)	.14 (3.5)					
NIM5D6	M5	.22 (5.5)	.39 (10)	.08 (2)					

How to Order

Series

NVPA 15
 NVPA 20
 NVPA 25
 NVPA 30
 NVPA 35A
 NVPA 40
 NVPA 25000
 NVPA 25001

Materials

SIT5 = Silicone
 NR = Natural Rubber



Special Suction Cups

Bag Opening Suction Cups, Series NMVS

Applications:

The suction cups in series NMVS are specially designed for the handling, opening and gripping of bags, etc.

Materials:

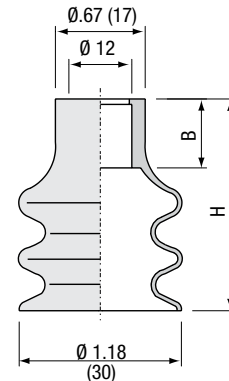
- PVC: Polyvinyl chloride
- SIT: Translucent silicone (food compatible)

Inserts:

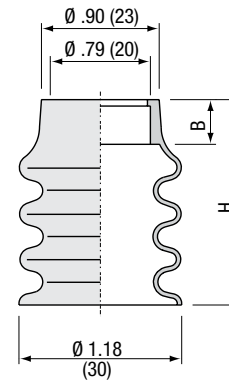
Male and female, 1/4 G BSP
 Add IM14 or IF14 at the end of the suction cup reference in your order.
 Insert for suction cup NMVS 3025 SIT: Ref. NIM 80.

Characteristics:

Model	Ø A	H	Materials	
	mm	mm	SIT	PVC
NMVS 3025 B	1.61 (41)	.55 (14)		•
NMVS 3025 SIT	1.81 (46)	.75 (19)	•	
NMVS 3035 B	1.81 (46)	.31 (8)		•



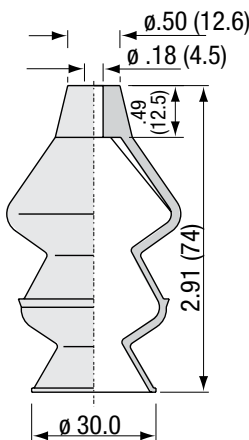
NMVS 3025 B
 NMVS 3025 SIT



NMVS 3035 B

Egg Handling Suction Cups, Series NVSO

NVSO 30 SI



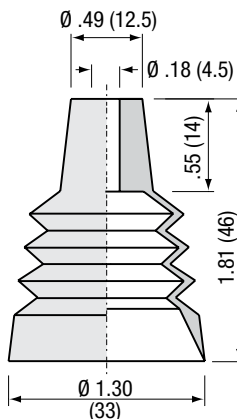
Reference:

NVSO 30 SI

Material:

- Red silicone
- 35 Shore (SI)

NVSO 33 SIT6



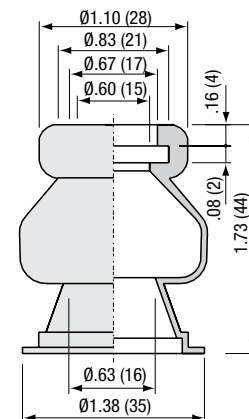
Reference:

NVSO 33 SIT6

Material:

- Translucent silicone (SIT 60 Shore)

NVSO 35 NR



Reference:

NVSO 35 NR

Material:

- Natural Rubber (NR)



Food Handling Suction Cups, Series NVSD

Materials:

Translucent silicone: compatible with food industry and resistant to high temperatures.

Inserts:

NVSD 25 SI : No insert.

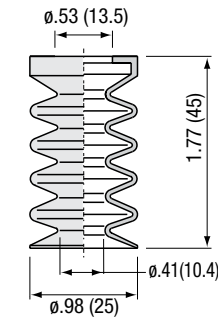
NVSD 32 SI : Inserts group 2 page 85.

NVSD 38 SI : No insert.

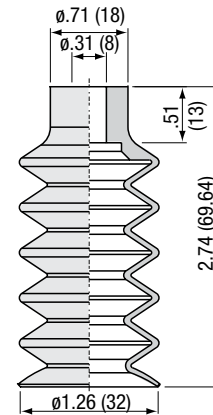
Characteristics:

Model	Deflection in (mm)	Max. vacuum %
NVSD 25 SI	.95 (24)	90
NVSD 32 SI	.98 (25)	90
NVSD 38 SI	.83 (21)	15

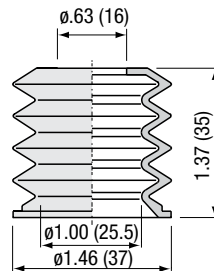
NVSD 25 SI



NVSD 32 SI



NVSD 38 SI



Pastry Handling Suction Cups, Series NVSP

Materials:

Translucent silicone
50 shores (SIT5).

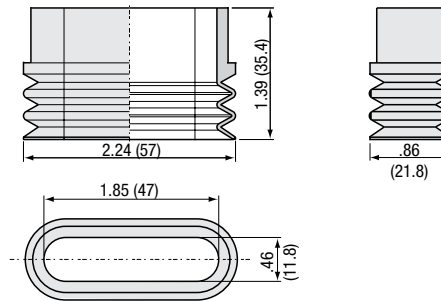
Inserts:

No insert available.

Characteristics:

Model	Deflection in (mm)	Max. vacuum %
NVSP 2258 SIT5	.20 (5)	20

NVSP 2258 SIT5



Materials:

Translucent silicone
50 shores (SIT5).

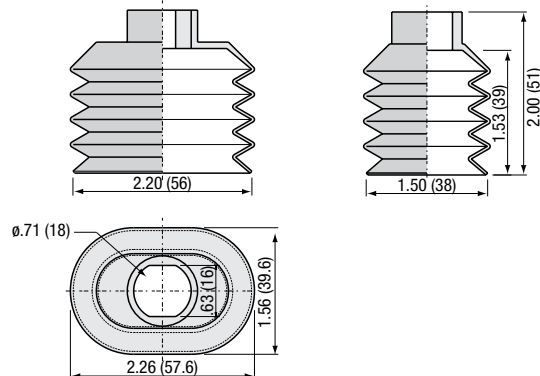
Inserts:

NM14VSP3856

Characteristics:

Model	Deflection in (mm)	Max. vacuum %
NVSP 3856 SIT5	.20 (5)	20

NVSP 3856 SIT5





Special Suction Cups

Heavy Load Suction Cups

Applications:

Numatics proposes a wide range of suction cups allowing the horizontal and vertical handling of thin or structured steel, aluminium and copper sheets, wood and granite sheets, rough or machined wood panels, and laminated panels, etc.

New Steel Suction Cups:

Round or rectangular steel suction cups fitted out with the new Numatics foam seal are very easy to change (it is fixed by collar and clamp, without tedious gluing).

Applications: Horizontal gripping of rough parts such as concrete and wood.

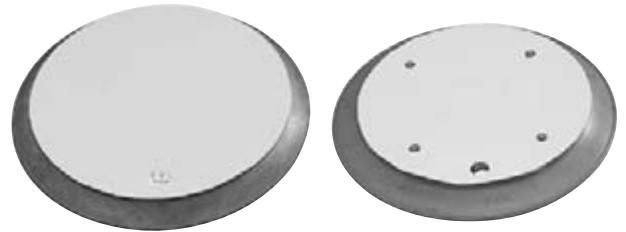


Flat Suction Cups, Series NVC, NSPL, NVPJE:

Suction cups with elastomer seal vulcanized to the support and internal stops allowing vertical gripping.

Diameters 9.45 in (240 mm), 13.38 in (340 mm), 15.75 (400 mm), 19.68 in (500 mm) and 23.62 in (600 mm).

Applications: Gripping of smooth and non-porous parts.



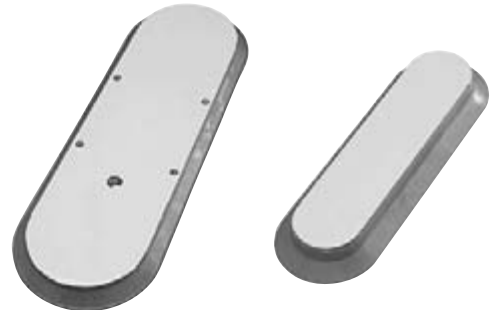
Oblong Suction Cups, Series NVPO:

Oblong suction cups with elastomer seal vulcanized to the support and internal stops.

Their shape can optimize the gripping area.

Dimensions 2.16 x 3.35 x 3.14 x 14.57 in (55 x 85 to 80 x 370 mm)

Applications: For all narrow loads.



In addition, Numatics supplies spring systems suitable for the various series of suction cups described above.

Please contact Numatics for a free evaluation and recommendation for your specific application.



NC Series - High Performance Vacuum Cups



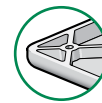
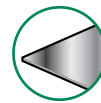
Main Advantages

- High resistance to sliding and during acceleration
- A complete range of shapes and diameters for an optimum match to each application
- Anti-sliding offsets to guarantee a more secured grip on oily sheet metal
- Specially adapted for Robot to Robot applications
- Thin-wall part handling with no deformation due to integrated central blockers
- Reduced weight for end of arm tooling due to integrated plastic mounting insert
- Sealing edges
- Mounting sealing guaranteed by :
 - sealing o-ring on cylindrical vacuum cups M 3/8G and 32 mm square mount
 - integrated sealing on oval vacuum cups M 3/8G
- Visual wear indicator

Application Fields

The Numatics NC series vacuum cups are ideal for rapid high cycle applications on robots due to their high resistance to sliding during acceleration as well as their reduced weight.

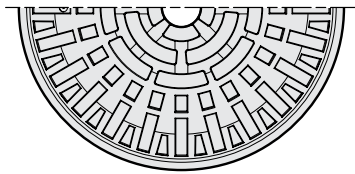
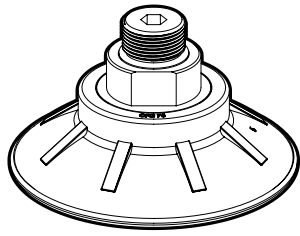
The NC Series vacuum cups are recommended for the handling of sheet metal, glass and plastic in Stamping, BIW, Glass and assembly plants.





NC Series Vacuum Cups

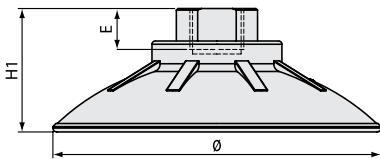
NCFC Series Flat Cup



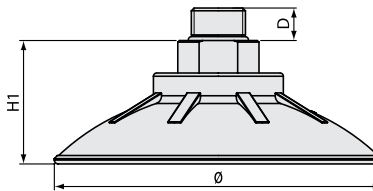
Model	Ø rest in (mm)	Ø gripping in (mm)	Volume (cm ³)	Force lbs (N)	Force lbs (N)	R _{min} in (mm)	R _{min} in (mm)	Ø air flow in (mm)	tool (mm)
NCFC 35	1.46 (37)	1.52 (38.5)	2.46	11.24 (50)	11.24 (50)	2.28 (58)	2.28 (50)	0.25 (6.3)	wrench 22 + hex 6
NCFC 50	2.00 (51)	2.13 (54)	8.37	22.48 (100)	22.48 (100)	2.60 (66)	2.05 (52)	0.25 (6.3)	wrench 22 + hex 6
NCFC 75	2.99 (76)	3.15 (80)	25.03	45 (200)	38 (170)	3.93 (100)	2.28 (58)	0.25 (6.3)	wrench 22 + hex 6
NCFC 100	3.98 (101)	4.16 (105.7)	57.61	78.7 (350)	60.7 (270)	4.72 (120)	3.54 (90)	0.25 (6.3)	wrench 22 + hex 6
NCFC 125	5.00 (127)	5.20 (132)	119.7	124 (550)	108 (480)	6.30 (160)	4.53 (115)	0.25 (6.3)	wrench 22 + hex 8

Model	H1 in (mm)	D in (mm)	E in (mm)	f ⁽²⁾ in (mm)	Weight (g)		
					F 3/8G	M 3/8G	C32
NCFC 35	0.98 (25)	0.39 (10)	0.50 (12.6)	0.12 (3)	14	18	36.2
NCFC 50	1.18 (30)	0.39 (10)	0.50 (12.6)	0.22 (5.5)	25	29	47.2
NCFC 75	1.30 (33)	0.39 (10)	0.50 (12.6)	0.31 (8)	40	45	62.2
NCFC 100	1.50 (38)	0.39 (10)	0.50 (12.6)	0.39 (10)	67	72	89.2
NCFC 125	1.73 (44)	0.39 (10)	0.50 (12.6)	0.55 (14)	119	124	141.2

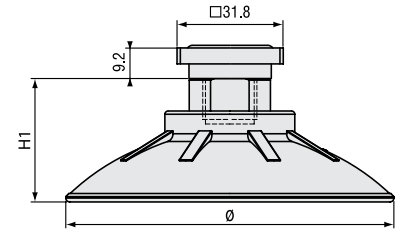
(1) Force measured with a 65% vacuum on dry, smooth and flat sheet metal without safety factor.
 (2) f: vacuum cup deflection



3/8G Female mounting

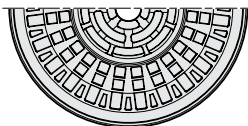
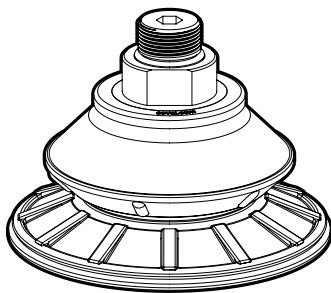


3/8G Male mounting



32 Square mounting

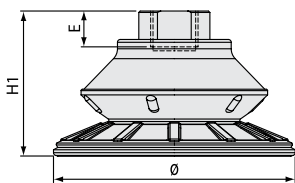
NCBC Series 1.5 Bellows Cup



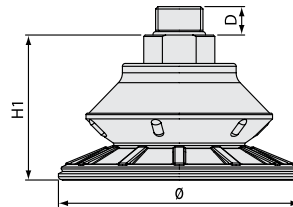
Model	Ø rest in (mm)	Ø gripping in (mm)	Volume (cm ³)	Force lbs (N)	Force lbs (N)	R _{min} in (mm)	R _{min} in (mm)	Ø air flow in (mm)	tool (mm)
NCBC 30 (3)	1.26 (32)	1.34 (34)	5	9 (40)	9 (40)	1.18 (30)	1.26 (32)	0.25 (6.3)	wrench 22 + hex 6
NCBC 45	1.85 (47)	1.92 (48.7)	11.47	15.8 (70)	20.2 (90)	1.42 (36)	1.77 (45)	0.25 (6.3)	wrench 22 + hex 6
NCBC 60	2.44 (62)	2.54 (64.5)	25.31	31.5 (140)	29.2 (130)	1.73 (44)	2.44 (62)	0.25 (6.3)	wrench 22 + hex 6
NCBC 85	3.35 (85)	3.46 (88)	66.54	51.7 (230)	54 (240)	2.56 (65)	4.53 (115)	0.25 (6.3)	wrench 22 + hex 6
NCBC 115	4.53 (115)	4.69 (119)	141.47	94 (420)	87.7 (390)	3.31 (84)	5.51 (140)	0.25 (6.3)	wrench 22 + hex 8

Model	H1 in (mm)	D in (mm)	E in (mm)	f ⁽²⁾ in (mm)	Weight (g)		
					F 3/8G	M 3/8G	C32
NCBC 30 (3)	1.22 (31)	0.39 (10)	0.50 (12.6)	0.31 (8)	14	19	36.2
NCBC 45	1.42 (36)	0.39 (10)	0.50 (12.6)	0.43 (11)	22	26	44.2
NCBC 60	1.61 (41)	0.39 (10)	0.50 (12.6)	0.55 (14)	32	37	54.2
NCBC 85	2.01 (51)	0.39 (10)	0.50 (12.6)	0.87 (22)	64	69	86.2
NCBC 115	2.09 (53)	0.39 (10)	0.50 (12.6)	0.94 (24)	103	107	125.2

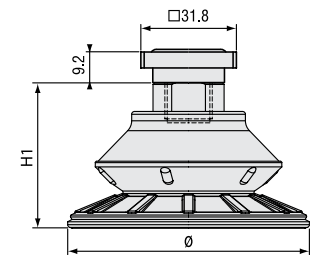
(1) Force measured with a 65% vacuum on dry, smooth and flat sheet metal without safety factor.
 (2) f: suction cup deflection
 (3) Specific model available with M3/8 mounting and air-flow Ø 9,5mm: CBC30 M38G SP624



3/8" NPT and 3/8G Female mounting



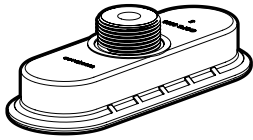
3/8G Male mounting



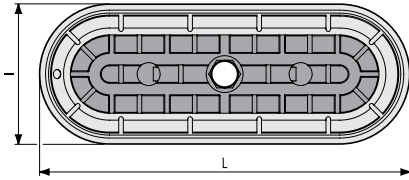
32 mm Square mounting



NCOFC Series Oval Flat Cup

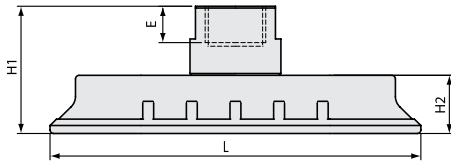


Model	Dim. rest (l x L mm)	Dim. gripping (l x L mm)	(cm ²)	lbs (N)	lbs (N)	R _{min} in (mm)	R _{min} in (mm)	Ø air flow in (mm)	tool (mm)
NCOFC 2565	25x65	26.8x67	9.98	15.7 (70)	15.7 (70)	0.98 (25)	0.98 (25)	0.24 (6)	hex 6
NCOFC 3080	30x80	31.5x82	19.44	24.7 (110)	20.3 (90)	1.57 (40)	1.26 (32)	0.24 (6)	hex 6
NCOFC 4080	40x80	42x82	49.25	31.5 (140)	27 (120)	2.36 (60)	1.57 (40)	0.24 (6)	hex 6
NCOFC 50100	50x100	52.5x102.5	93.57	51.7 (230)	54 (240)	2.76 (70)	1.97 (50)	0.24 (6)	hex 6

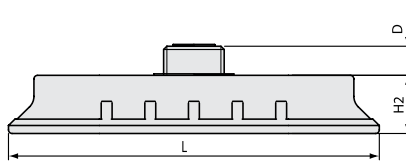


Model	H1 in (mm)	H2 in (mm)	D in (mm)	E in (mm)	f ⁽²⁾ in (mm)	F 3/8G	M 3/8G	C32
NCOFC 2565	1.24 (31.5)	0.49 (12.5)	0.31 (8)	0.39 (10)	0.12 (3)	24	17	35
NCOFC 3080	1.26 (32)	0.51 (13)	0.31 (8)	0.39 (10)	0.12 (3)	29	22	40
NCOFC 4080	1.34 (34)	0.59 (15)	0.31 (8)	0.39 (10)	0.18 (4.5)	30	23	41
NCOFC 50100	1.38 (35)	0.63 (16)	0.31 (8)	0.39 (10)	0.24 (6)	43	36	54

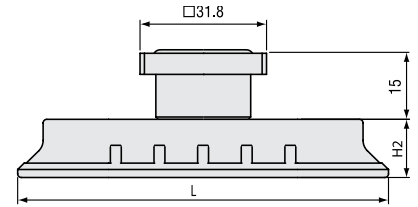
(1) Force measured with a 65% vacuum on dry, smooth and flat sheet metal without safety factor.
 (2) f: vacuum cup deflection



3/8" NPT and 3/8G Female mounting

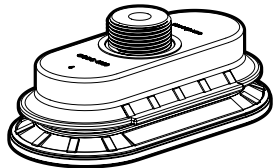


3/8G Male mounting

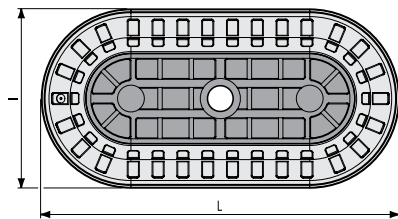


32 mm Square mounting

NCOBC Series 1.5 Bellows Oval Cup

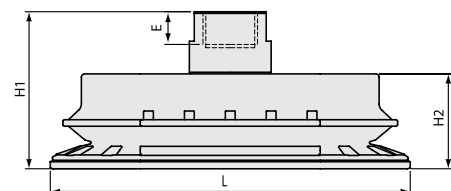


Model	Dim. rest (l x L mm)	Dim. gripping (l x L mm)	(cm ²)	lbs (N)	lbs (N)	R _{min} in (mm)	R _{min} in (mm)	Ø air flow in (mm)	tool (mm)
NCOBC 3065	31x65	32.3x67	3.78	13.5 (60)	13.5 (60)	0.98 (25)	1.18 (30)	0.24 (6)	hex 6
NCOBC 4080	40x80	41.5x82	6.08	24.7 (110)	27 (120)	1.50 (38)	1.46 (37)	0.24 (6)	hex 6
NCOBC 55110	55x110	57x112.5	11.03	38.2 (170)	42.7 (190)	2.28 (58)	2.24 (57)	0.24 (6)	hex 6
NCOBC 70140	70x140	72x143	22.25	67.4 (300)	67.4 (300)	2.83 (72)	2.68 (68)	0.24 (6)	hex 6

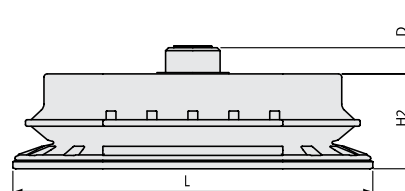


Model	H1 in (mm)	H2 in (mm)	D in (mm)	E in (mm)	f ⁽²⁾ in (mm)	F 3/8G	M 3/8G	C32
NCOBC 3065	1.54 (39)	0.79 (20)	0.31 (8)	0.39 (10)	0.29 (7)	31	25	43
NCOBC 4080	1.61 (41)	0.87 (22)	0.31 (8)	0.39 (10)	0.35 (9)	37	31	49
NCOBC 55110	1.89 (48)	1.14 (29)	0.31 (8)	0.39 (10)	0.51 (13)	68	62	80
NCOBC 70140	1.93 (49)	1.18 (30)	0.31 (8)	0.39 (10)	0.63 (16)	103	97	115

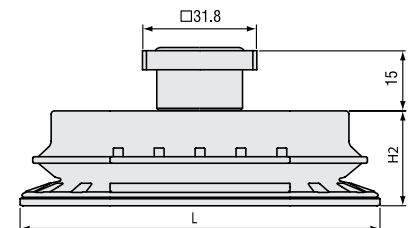
(1) Force measured with a 65% vacuum on dry, smooth and flat sheet metal without safety factor.
 (2) f: vacuum cup deflection



3/8" NPT and 3/8G Female mounting



3/8G Male mounting



32 mm Square mounting



NC Series Vacuum Cups

Materials

The Numatics NC series vacuum cups are made from an elastomer with a carbon fiber fitting.

These materials guarantee the Numatics NC series vacuum cups long life, high resistance to oils and heat resistance up to 212°F (100°C).

- Vacuum cups: NBR nitrile 55 shores (high resistance to oils).
- Mounting insert: polyamide PA 6.6 ensuring a reduced weight (3/8G Male or Female mounting).
- Sealing o-ring: NBR blue nitrile.
- Square mounting: aluminium

Range

The Numatics NC Series high performance vacuum cups are available in a complete range of shapes, dimensions and couplings in order to meet all your needs.

Shapes

NCFC
flat cup



NCBC
1.5 bellows cup



NCOFC
oval flat cup



NCOBC
1.5 bellows oval cup



Couplings

NM38G
3/8G male coupling



NF38G
3/8G female coupling



NC32
32mm square coupling



NCBC 30 M38G SP624

In order to meet the specific needs of lifting devices users in Stamping facilities, Numatics has designed a suction cup Ø30 mm, with air-flow ø 9.5mm allowing the reduction of pressure drops in the vacuum network on the lifting device supply port. This cup can be identified by the black sealing o-ring.



How to Order

Series

NCFC 35	NCOFC 2565
NCFC 50	NCOFC 3080
NCFC 75	NCOFC 4080
NCFC 100	NCOFC 50100
NCFC 125	NCOBC 3065
NCBC 30	NCOBC 4080
NCBC 45	NCOBC 55110
NCBC 60	NCOBC 70140
NCBC 85	
NCBC 115	

Thread Type

M = Male
F = Female

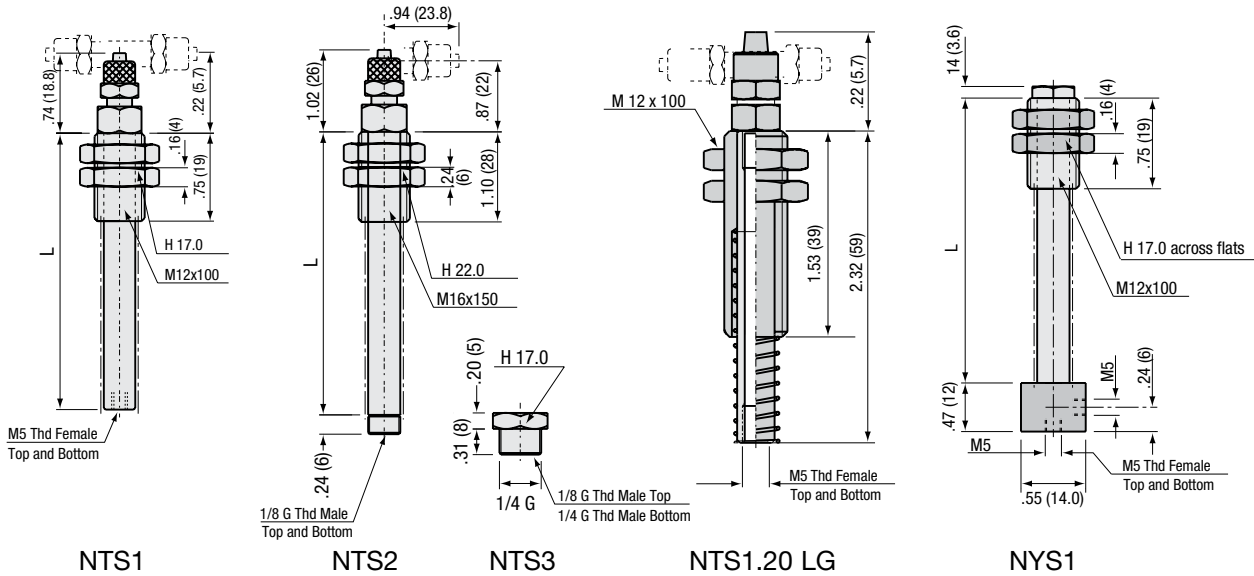
Thread

38G = 3/8 G
38N = 3/8" NPT – (only available on female type thread.)



Spring Systems, Series NTS and NYS

Fittings shown are reference only, not supplied with NTS series product.



Applications:

Compensated spring systems in series NTS and NYS are recommended for the horizontal handling of parts at different levels. The spring function also ensures that the gripping points are applied on the same plane during gripping by multiple suction cups.

Materials:

- Spring Material: Stainless steel
- Tube Material: Zinc-plated steel
- Slider Material: Brass

Fitting of Suction Cups:

To select the appropriate spring system according to the suction cup reference, see the installation diagrams. Pages 84 and 85.

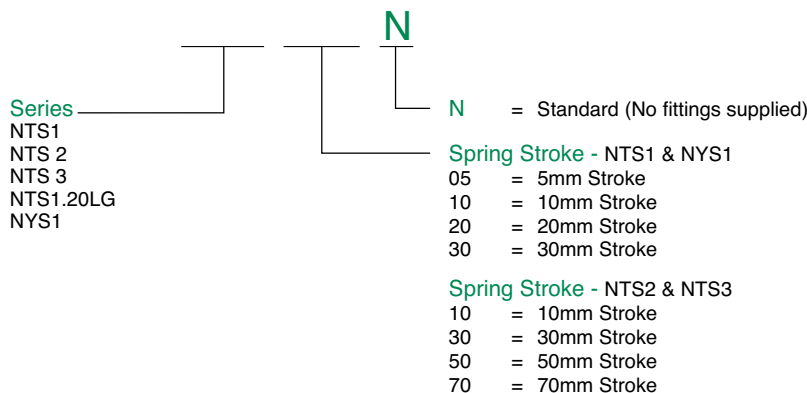
Advantage of NTS1.20LG:

The adjustment height is twice that of the standard spring system NTS1 and its spring is protected.

Characteristics:

MODELS	NTS1	NTS1	NTS 1	NTS 1.20 LG	NTS 1	NTS 2	NTS 2	NTS 2	NTS 2	NTS 3	NTS 3	NTS 3
STROKE	0.2 (5)	0.39 (10)	0.79 (20)	0.79 (20)	1.18 (30)	0.39 (10)	1.18 (30)	1.97 (50)	2.75 (70)	0.39 (10)	1.18 (30)	1.97 (50)
L	1.14 (29)	1.53 (39)	2.32 (59)	2.32 (59)	3.11 (79)	1.89 (48)	3.46 (88)	5.04 (128)	6.61 (168)	1.89 (48)	3.46 (88)	5.04 (128)

How to Order

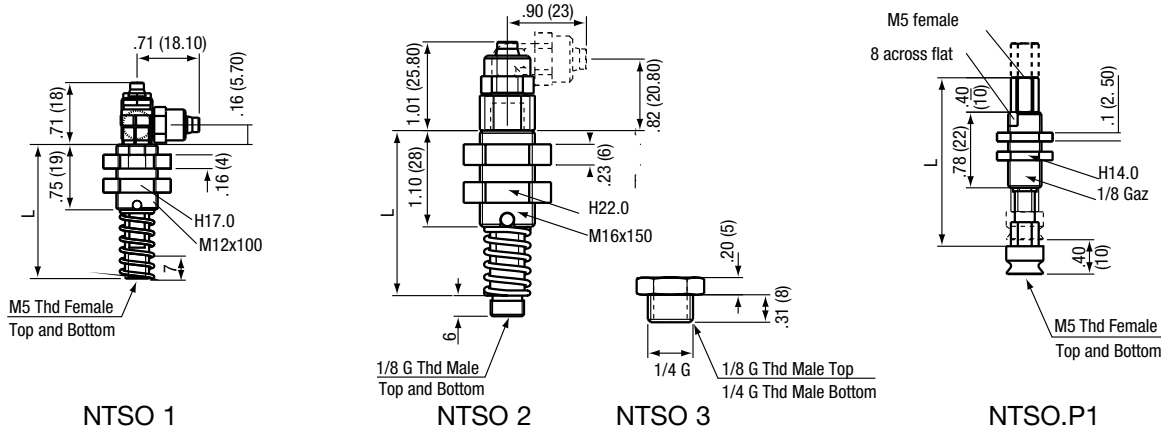




Suction Cup Accessories

Anti-Rotation Spring Systems, Series NTSO

Fittings shown are reference only, not supplied with NTSO series product.

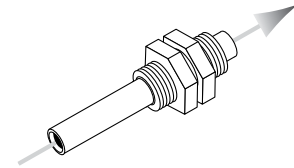


Applications:

The anti-rotation spring systems, series NTSO, are standard spring systems. They allow a horizontal manipulation of parts on different levels. The anti-rotation function guarantees repeated part position.

Materials:

- Spring: Stainless steel
- Tube: Zinc-plated steel
- Slider: Brass



Fitting of Suction Cups:

To select the appropriate spring system according to the suction cup, refer to pages 74 to 79 for coupling selection.

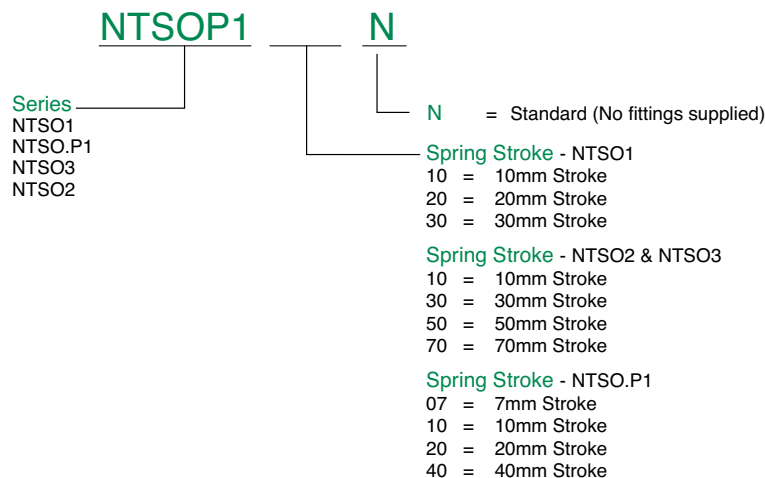
Advantage of NTSO.P1:

The NTSO.P1 is an anti-rotation spring-system, designed for applications demanding precise part positioning.

Characteristics:

MODELS	NTSO.P 1	NTSO1	NTSO1	NTSO1	NTSO2	NTSO2	NTSO2	NTSO2	NTSO3	NTSO3	NTSO3	NTSO
STROKE	0.4 (10)	0.4 (10)	0.79 (20)	1.18 (30)	0.04 (10)	1.18 (30)	1.97 (50)	2.75 (70)	0.4 (10)	1.18 (30)	1.97 (50)	2.75 (70)
L	1.93 (49)	1.53 (39)	2.32 (59)	3.11 (79)	1.88 (48)	3.46 (88)	5.04 (128)	6.61 (168)	1.89 (48)	6.46 (88)	5.04 (128)	6.61 (168)

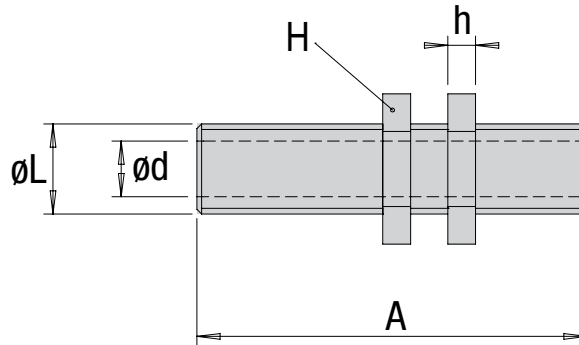
How to Order





Suction Cup Accessories

Extensions, Series NL



Applications:

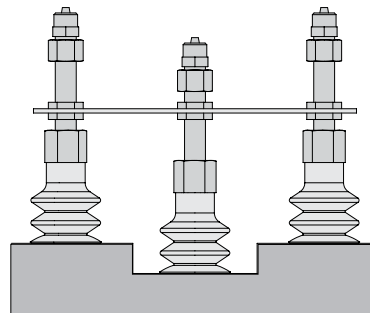
The extensions in series NL allow gripping on various levels from the same installation plate. These extensions can be adjusted at different heights. This system is especially useful for 2.5 bellows type suction cups, as height adjustment is made easier by the deflection of the suction cup. For flat suction cups with a small deflection, it is preferable to use spring systems (see page 101).

Specifications:

- Threaded rod and nut = Brass
- Coupling = Nickel-plated brass

Fitting of Suction Cups:

Possibility of NT coupling: please consult us.

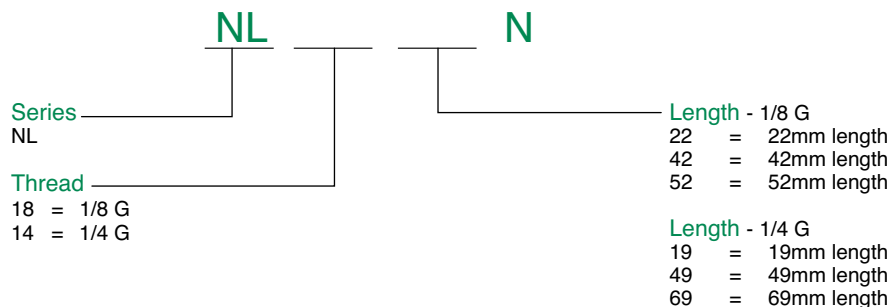


Characteristics:

Models L	A* in (mm) TS1		h in (mm)	H in (mm)	d in (mm)	
1/8 G	.20 (22)	1.65 (42)	2.05 (52)	.12 (3)	.55 (14)	.24 (6)
1/4 G	.75 (19)	1.93 (49)	2.72 (69)	.16 (4)	.75 (19)	.35 (9)

(*) Other lengths on request for quantities of more than 10 items.

How to Order





Suction Cup Accessories

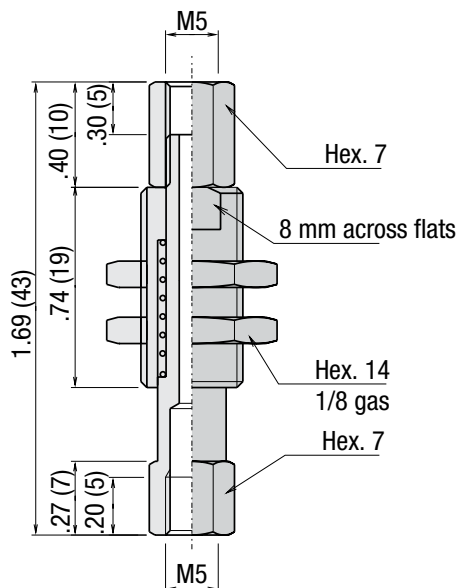
Compact Spring System, Series NTS 1.17

Specifications:

- Stroke = .28" (7mm)
- Spring material = Stainless steel
- Slider material = Nickel-plated brass
- Nut material = Brass
- Spring force N/mm = 0.68
- Force at rest = 1.3
- Weight = 17 g

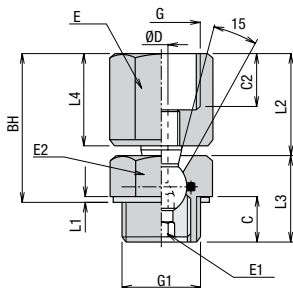
Fitting of Suction Cups:

The spring system in series NTS 1.17 can be installed on all suction cups in group 1 (NVP, NVSA, NVS with diameters of between 5 and 25 mm) for NIM21 and on suction cups in series NVPG 5 to 20.

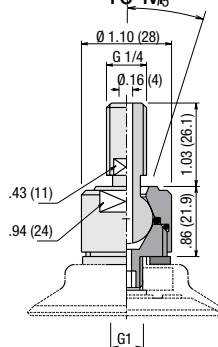


Axial Ball Joints, Series NIMUKGL, NIMU

NIMU KGL 18
NIMU KGL 14
NIMU KGL 12



NIMU 14 M
10 M₅



Applications:

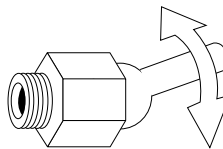
Ball joints in series NIMU and NIMUKGL are recommended for the gripping of curved or rotating products. Fitted on a flat suction cup, they transmit more force than a bellows type suction cup. Model NIMU 14 M10M is designed to be installed on suction cups in series NVPG 60 to 95.

Specifications:

- Ball joint material = Zinc-plated steel and brass
- Seal material = Nitrile (NBR)

Accessories:

Ball joints in series NIMUKGL are installed on spring systems in series NTS 2-3.



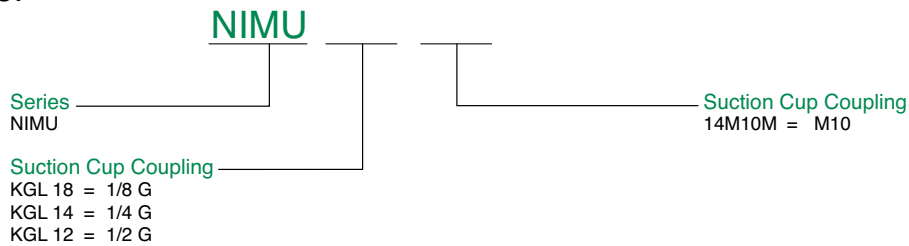


Axial Ball Joints, Series NIMUKGL, NIMU

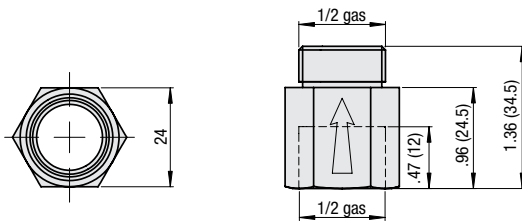
Characteristics:

MODELS	C2 in (mm)	D in (mm)	C in (mm)	G=G1	L1 in (mm)	L2 in (mm)	L3 in (mm)	L4 in (mm)	E in (mm)	E1 in (mm)	E2 in (mm)	BH in (mm)	L7 in (mm)	A.F.* N
NIMUKGL 18	0.33 (8.5)	0.08 (2)	0.27 (7)	1/8" G	0.06 (1.5)	0.59 (15)	0.67 (17)	0.53 (13.5)	0.55 (14)		0.55 (14)	1.04 (26.5)		15
NIMUKGL 14	0.47 (12)	0.14 (3.5)	0.39 (10)	1/4" G	0.06 (1.5)	0.87 (22)	0.94 (24)	0.77 (19.5)	0.75 (19)		0.75 (19)	1.48 (37.5)		75
NIMUKGL 12	0.55 (14)	0.16 (4)	0.47 (12)	1/2" G	0.06 (1.5)	1.08 (27.5)	0.9 (23)	0.97 (24.7)	0.94 (24)	0.24 (6)	0.94 (24)	1.57 (40)		125
NIMU 14 M10M	0.75 (19)	0.16 (4)	0.37 (9.5)	M10	0.27 (7)	1.18 (30)	1.18 (30)		0.67 (17)	0.94 (24)	0.2 (5)	1.47 (36.5)	0.14 (3.5)	100

How to Order

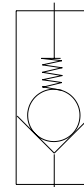


Non-Return Valve, Series NCAV



Applications:

Specially designed for vacuum functions, the Numatics non-return valve corresponds to a feed-through section equivalent to a hole with a diameter of .38 in (9.6 mm). The Non-Return valve offers silent operation and the diaphragm automatically closes ensuring a sealed system.



Specifications:

- Valve material = Nitrile
- Body material = Nickel-plated brass
- Operating temp. = 60°C max.

NCAV 12 D - NCAV 12 E:

The difference between these two components lies in their sealing.

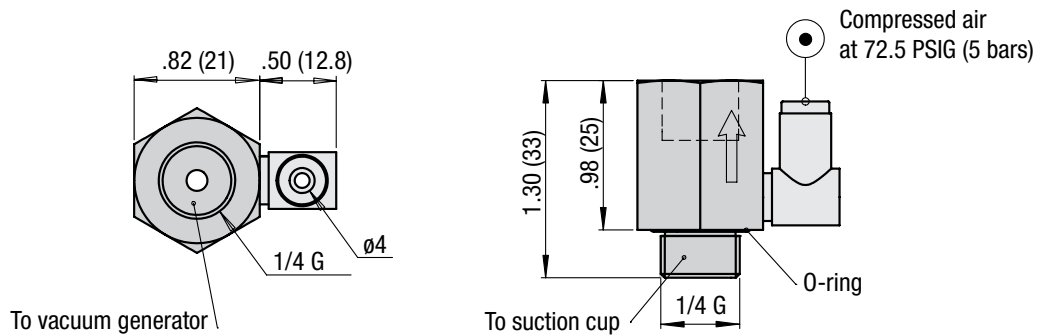
- NCAV 12 D: large feed-through / small leak rate
- NCAV 12 E: small feed-through / sealed

(for a vacuum source with a suction of up to 2.47 SCFM (70 NI/min).



Suction Cup Accessories

Controlled Valve, Series NCSP



Applications:

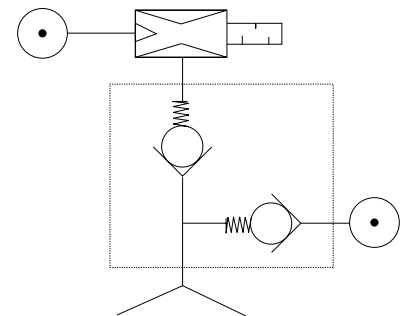
The NCSP Series valve is useful in the event of loss of vacuum or an emergency stop. The valve seals the vacuum in the suction cup. Part release is achieved by a remote signal. Release is obtained by connecting the ancillary coupling to the pressure.

Specifications:

- Valve = Nitrile (NBR)
- Body = Anodized aluminum
- Filter = Stainless steel screen, 200 micrometers

Fitting:

- One valve per suction cup.
- Use a vacuum generator of version T, with 75% vacuum.
- Release pressure of at least 72.5 PSIG (5 bars).



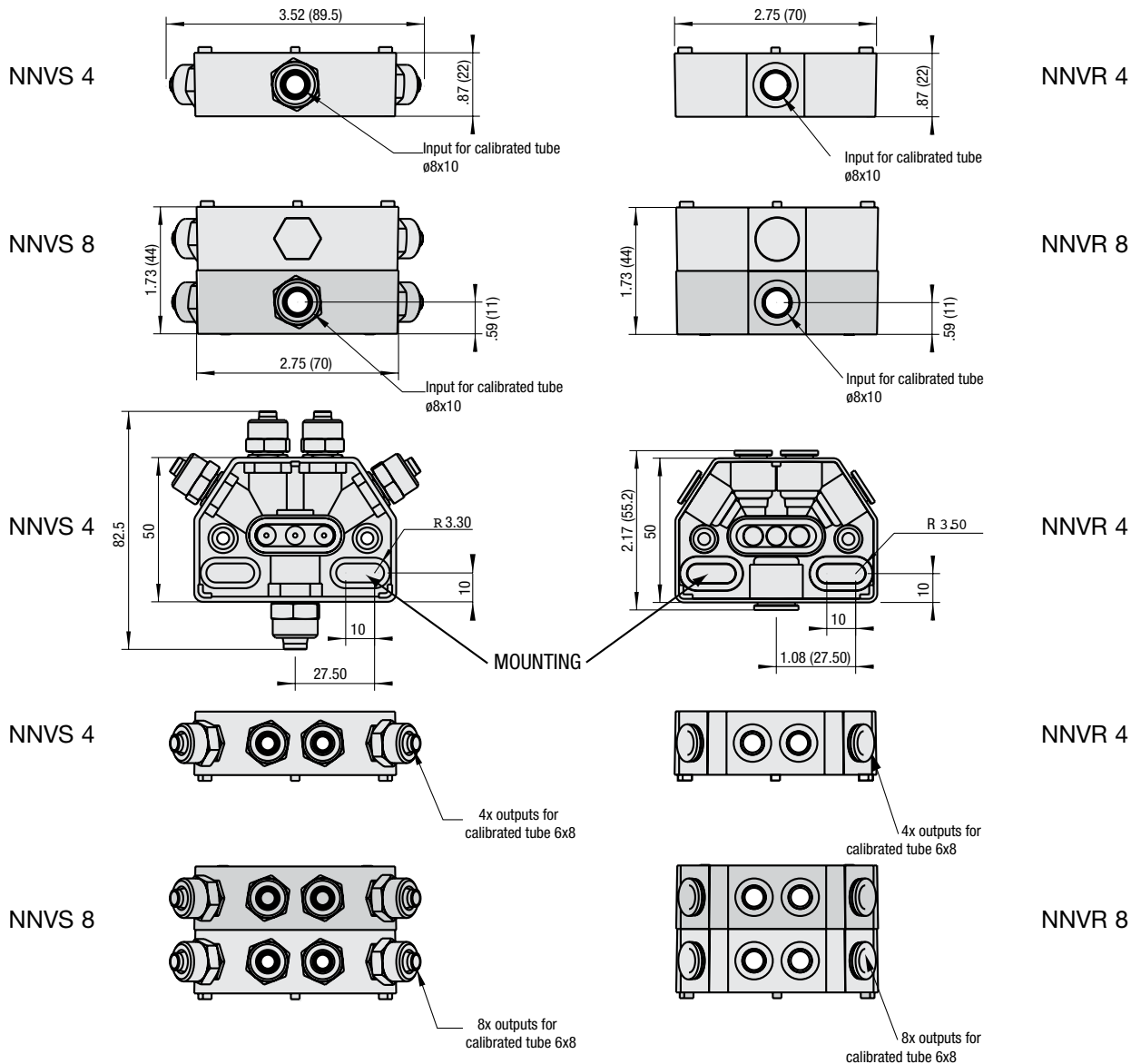
How to Order





Vacuum Manifolds, Series NNVS - NNVR

NNVS Compression fittings included - NNVR Push to Connect fittings included



Applications:

The vacuum manifolds in series NVS and NVR allow distribution of the vacuum in 4 to 8 ports.

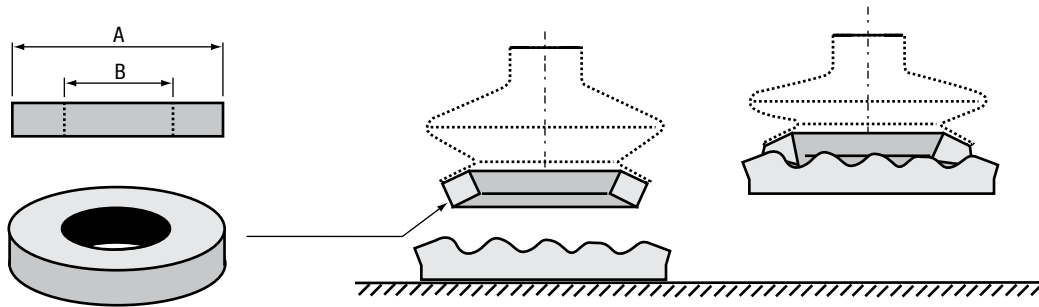
Specifications:

	NNVS 4	NNVS 8	NNVS4	NNVR 8
Weight	3.53 oz (100 g)	7.05 oz (200 g)	1.76 oz (50g)	3.53 oz (100 g)
Body material and color	PA 6.6-30% fibreglass-black			
Coupling material	Nickel-plated brass			
Type of tube	Calibrated polyamide or P.U.R.			
Operating pressure	Only for vacuum		Maxi vacuum and pressure 145 PSI (10 bars)	



Suction Cup Accessories

Foam Strips



Applications:

Foam strips are suitable for the gripping of products with an irregular or striated surface.

- Sawn wood, metal sheets, flat surfaces with bumps or hollows.
- All grainy surfaces on which the lip of the suction cup cannot grip properly.

Ring-Type Foam Strips, Series NVSBM:

• Materials:

Nitrile (NBR - Black color)

Thicknesses .20 in (5 mm) or .40 in (10 mm) according to suction cup diameters.

Good resistance to oils.

The nitrile foam strip can be bonded on nitrile suction cups only.

Silicone (SI - White color)

Thicknesses .07 in (2 mm) or .20 in (5 mm) according to suction cup diameters.

Temperature resistant up to 160°C. Leaves no mark on the products handled.

Do not use the silicone foam strip for the gripping of products before painting or lacquering.

The silicone foam strip can be bonded onto silicone suction cups only.

(Bonding is guaranteed if provided by the factory).

• Bonding:

It is recommended the bonding is performed by Numatics.

Characteristics:

Materials Suction Cup Ø in (mm)	Nitrile References	Thickness in (mm)	Dimensions		Silicone References	Thickness in (mm)	Dimensions	
			Ø A	Ø B			Ø A	Ø B
.98 (25) dia.	-	-	-	-	NVSBM 25 SI	.08 (2)	.98 (25)	.51 (13)
1.26-1.30 (32-33) dia.	NVSBM 32 NBR	.20 (5)	1.26 (32)	.86 (22)	NVSBM 32 SI	.08 (2)	1.26 (32)	.75 (19)
1.65-1.69 (42-43) dia.	NVSBM 42 NBR	.20 (5)	1.65 (42)	1.10 (28)	NVSBM 42 SI	.20 (5)	1.65 (42)	.79 (20)
2.05-2.09 (52-53) dia.	NVSBM 53 NBR	.40 (10)	2.09 (53)	1.30 (33)	NVSBM 53 SI	.20 (5)	2.09 (53)	1.30 (33)
2.44-2.48 (62-63) dia.	NVSBM 62 NBR	.40 (10)	2.44 (62)	1.65 (42)	NVSBM 62 SI	.20 (5)	2.44 (62)	1.65 (42)
3.07 (78) dia.	NVSBM 78 NBR	.40 (10)	3.07 (78)	2.28 (58)	NVSBM 78 SI	.20 (5)	3.07 (78)	2.12 (54)
3.46 (88) dia.	NVSBM 88 NBR	.40 (10)	3.46 (88)	2.68 (68)	NVSBM 88 SI	.20 (5)	3.46 (88)	2.52 (64)

It is preferable to choose bellows type suction cups for the bonding of the above-mentioned foam strips as the angle of the lip is more suitable for this type of gripping. Consult us for other models from a minimum of 10 items.



Foam Strips

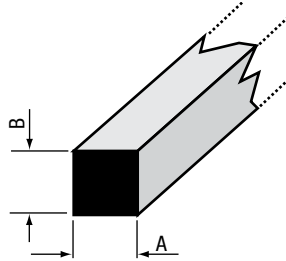
Nitrile Foam Strip: 10 m roll

• Bonding:

Fitting by contact adhesive or flush mounting at a depth suitable for the required height and possible flush mounting of the seal for the vacuum: 50% to 70% of new height.

• Substrate:

All substrates, especially steel, aluminium, etc.
Sealed recesses.



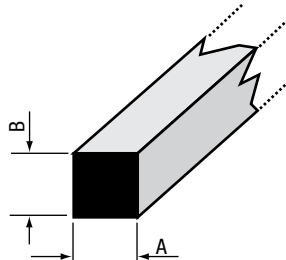
References	A in (mm)	B in (mm)
NBM 1010	.39 (10)	.39 (10)
NBM 1515	.59 (15)	.59 (15)
NBM 2020	.79 (20)	.79 (20)
NBM 3030	1.18 (30)	1.18 (30)
NBM 5050	1.96 (50)	1.96 (50)

Silicone Foam Strip

Temperature resistance: 320° F (160° C)

Do not use on parts before they are painted.

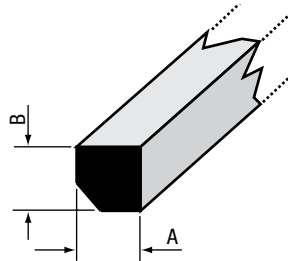
Sealed recesses.



References	A in (mm)	B in (mm)
NBM SI 3030	1.18 (30)	1.18 (30)

Nitrile Bevelled Foam Strip: 10 m roll

Bevelling improves grip for products with irregular surfaces. Sealed recesses.

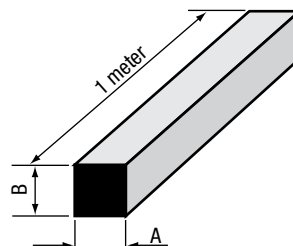


References	A in (mm)	B in (mm)
NBM 2020 SPTR	.79 (20)	.79 (20)
NBM2030 SPTR	.79 (20)	1.18 (30)
NBM 3030 SPTR	1.18 (30)	1.18 (30)

Natural Rubber Foam Strip: 1 m long:

Fitting by flush mounting.

For use with turbine (high suction flow rate) for the gripping of products with very irregular surfaces.



References	A in (mm)	B in (mm)
NBMS3025	1.18 (30)	.98 (25)

Reference of contact adhesive: BOSTIK 1400 (neoprene adhesive)



Miscellaneous Gripping

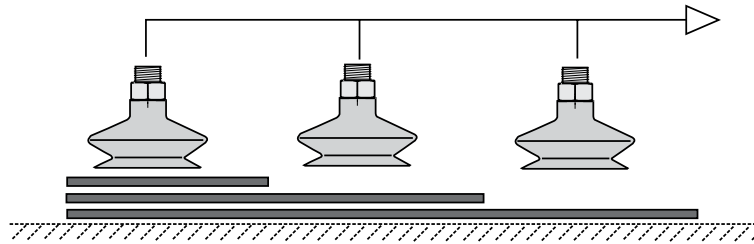
Principle:

In many cases on multiple-suction cup installations, some of the suction cups are not covered by the product or products to be handled. This can interfere with, or prevent, the gripping function of the suction cups that are covered.

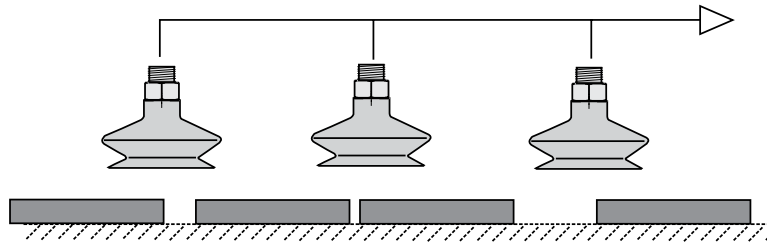
Examples:

Examples of this situation with diagrams:

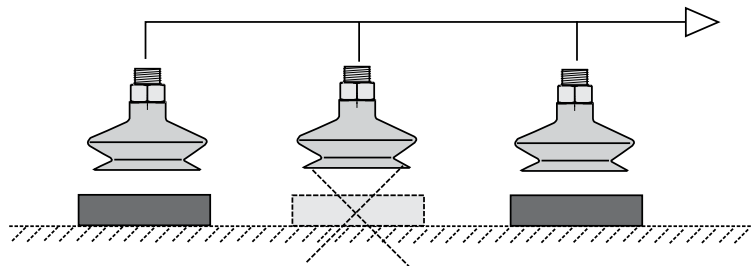
- Gripping by a suction cup boom for plates or sheets, with varying dimensions.



- Uncertain positioning of the part or parts.



- Gripping of a number of parts that are not necessarily all present.



Solutions:

- Independent venturi:

The installation of an ejector for each suction cup.
Refer to pages 7 to 18 for Series NVR and NGVA.

- Orifice:

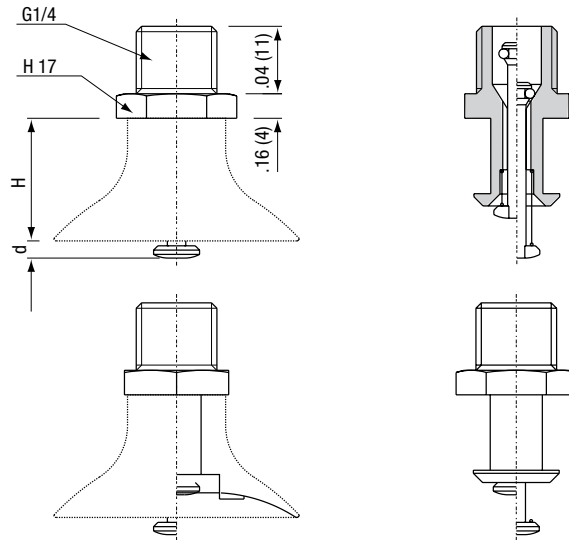
Orifices are integrated inside the suction cup insert to limit the leakage when a part is not present.
Please consult us for further information concerning orifice diameters.

- Mechanical or ball type feelers:

See the following pages. Numatics offers four solutions according to the application.



Mechanical Feelers, Series NPMG2



Applications:

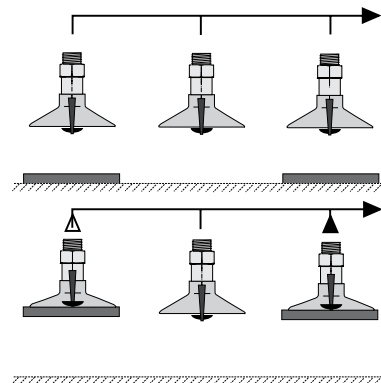
The mechanical feelers in series NPMG2 are installed on flat suction cups in series NVP with diameters of between 30 and 60 mm of all materials (suction cups in group 2). The mechanical feeler protrudes on the suction cup and shuts off the vacuum. The feeler is actuated by contact with the object and opens.

Specifications:

- Body = Nickel-plated brass
- Spring = Stainless steel
- Feeler = DELRIN brass

Advantages:

- Simple installation and operation
- Very good sealing for non-covered suction cups.
- Little risk of marking of very fragile objects as the feeler has a dished face.



Drawbacks:

- Failure to operate in the case of feelers actuated on a suction cup that is not completely covered by the part to be gripped.

Leak Rate:

No leakage if all the suction cups are correctly positioned. This results in substantial saving of power on the vacuum source i.e. venturis, vacuum pumps...

Accessories:

Installation on spring or ball joint systems, see pages 90 to 92.

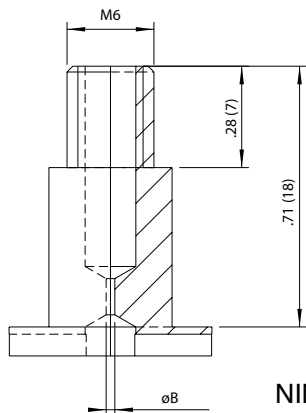
Characteristics:

Suction Cups	NVP 30 in (mm)	NVP 35 in (mm)	NVP 40 in (mm)	NVP 50 in (mm)	NVP 60 in (mm)
Height d*	.15 (3.9)	.11 (2.9)	.11 (2.9)	.003 (0.9)	.003 (0.9)
Height H*	.75 (19)	.79 (20)	.79 (20)	.87 (22)	.87 (22)

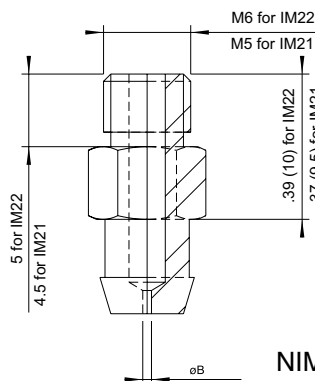


Suction Cup Accessories

Series NVP - NVSA - NVS 5–25mm & 30–63mm



NIM60



NIM21 & 22

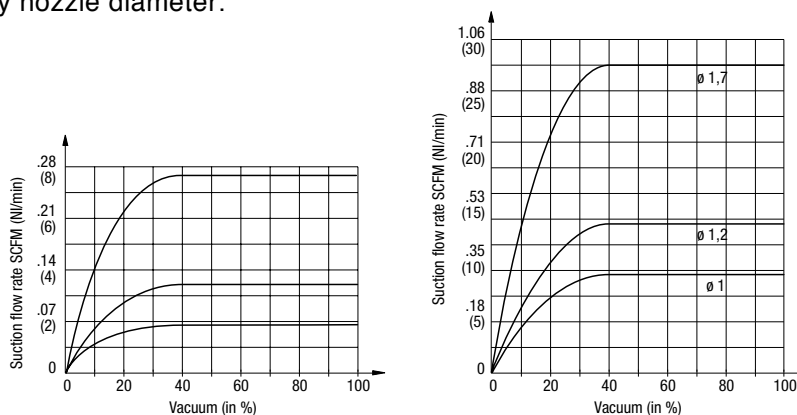
Applications:

These inserts are designed for applications which are made up of a large number of suction cups connected to only one vacuum generator (vacuum chamber technology), and more particularly when gripping several parts that are not all present. The use of jet inserts limits the leak rate and allows the optimal vacuum generator size to be used. "Caution: do not use this type of inserts in dusty atmosphere applications".

List of jet inserts on a standard basis in mm:

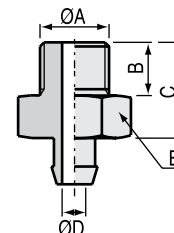
Type NIM60	ø B mm	Type NIM21	ø B mm	Type NIM22	ø B mm
NIM60 SP335	0.6	NIM60 SP058	0.45	NIM60 SP464	0.6
NIM60 SP387	1.2	NIM60 SP094	0.6		
NIM60 SP461	0.9				
NIM60 SP483	1				
NIM60 SP510	1.7				

Maximum flow rate by nozzle diameter:



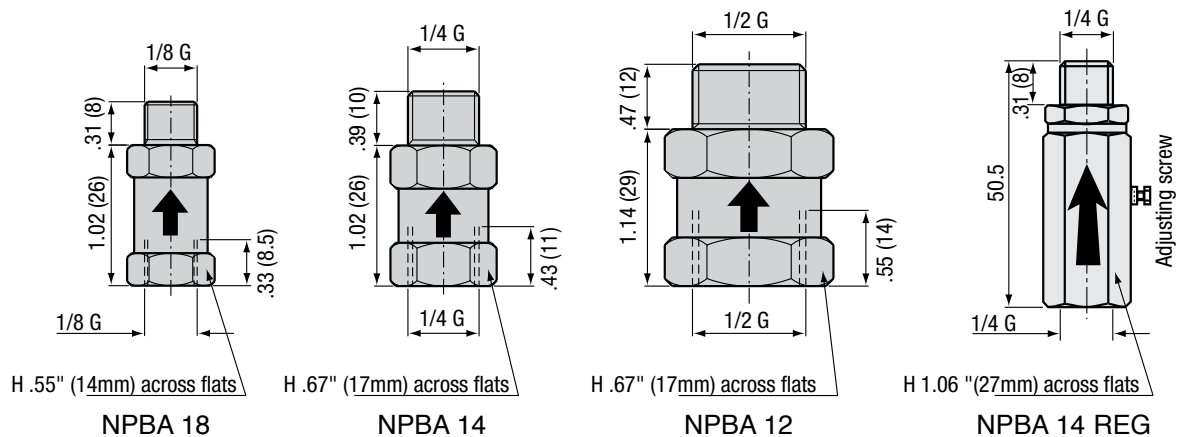
Male inserts, Series NIM 20 – NIM 24 – NIM C 14

Models	øA	B	C	øD	E
NIM20	M3	0.11 (3)	0.19 (5)	0.05 (1.4)	0.19 (5)
NIM24	M5	0.17 (4.5)	0.27 (7)	0.09 (2.5)	0.39 (10)
NIM14	1/4 G	0.39 (10)	0.7 (18)	0.27 (7)	0.66 (17)





Automatic Shut-Off Valves, Series NPBA



Applications:

With a centralized vacuum and no load under the suction cup, the feeler shuts off the vacuum inlet by means of the suction flow.

Advice:

During release, blow-off with compressed air in order to enhance the release of parts and to clean the feelers.

Advantages:

- Simple to install.
- Compatible with all suction cup shapes.

Drawbacks:

- Vertical position is required.
- Constant minimum leak on non-covered suction cups.

Adjustable Feeler, Series NPBA 14 Reg:

The adjustable feeler allows accurate adjustment of the leak rate when rapid gripping is required with respect to the internal volume of the suction cup.

Leak Rate:

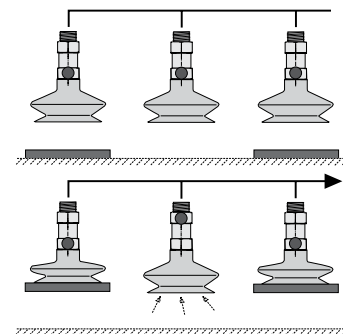
By design and for the feeler to operate correctly, there is a constant leak when no part to be handled is present. To calculate the suction flow rate of the vacuum source, allowance must be made for the following leak rates at 0.6 bar (per part):

NPBA 18 : 0,43 m3/h NPBA 12 : 1,4 m3/h

NPBA 14 : 0,47m3/h NPBA 14 reg : from 0.2 to 4.3 m3/h

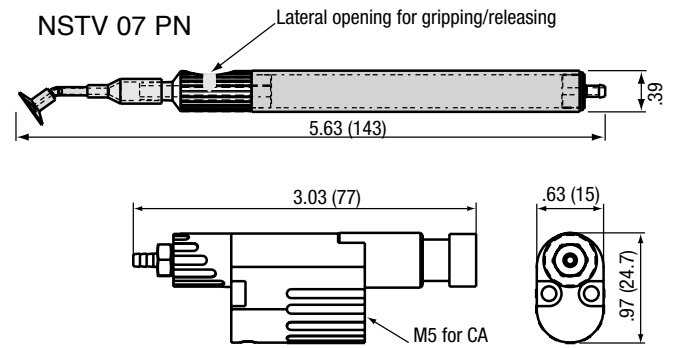
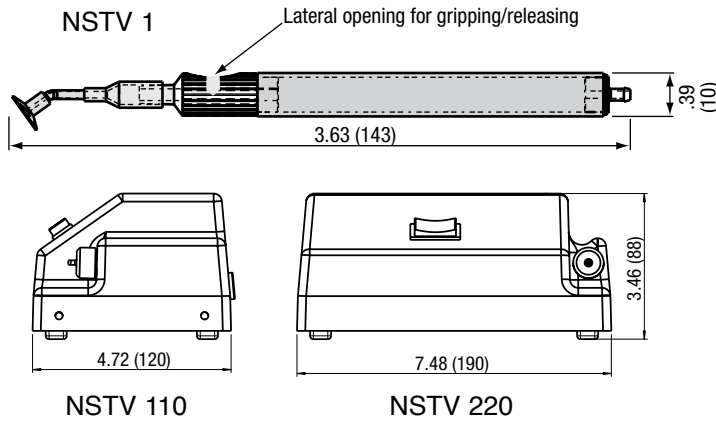
Accessories:

Installation on spring systems.





Vacuum Pen, Series NSTV



Characteristics:

The vacuum pen in series NSTV allows handling, mounting or assembly with high precision and meticulous care most fragile objects like surface mounted devices, titanium plates, lenses...

Principle:

By plugging the lateral opening on the top of the pen, the vacuum is generated allowing the part to be gripped. To release of the part, you only have to remove your finger from the opening.

Specifications:

- Pen material = Aluminum - Nickel plated brass
- Connection tube material = PVC
- Needle material = Aluminum - others on request
- Suction cup material = Translucent silicone - antistatic silicone - others on request
- Temperature = 220°C maximum (suction cup contact)

NSTV 1:

- 1 pen
- 1 angled needle
- 1 meter tube I.D. 2mm
- 1 suction cup batch :
- 3 NVPST 3 SIT5
- 3 NVPST 6 SIT5
- 3 NVPST 10 SIT5
- Vacuum source : customer

NSTV 07 PN:

- NSTV 1
- with NGVA 07 M5 NSPO
- Vacuum source: venturi

NSTV 1

- with an electric vacuum unit
- Vacuum source: electric vacuum pump 1120V or 220 50H

Characteristics:

Necessary flowrate	.18 SCFM (5NI/min)
Minimum vacuum level	Following application

NSTV 110-220:

Characteristics:

Maximum flowrate	.42 SCFM (12 NI/min)
Minimum vacuum level	82%
Maximum noise level	60 dB(A) at 1m

Characteristics:

Maximum flowrate	.42 SCFM (12 NI/min)
Minimum vacuum level	25%
Maximum noise level	50 dB(A) at 1m



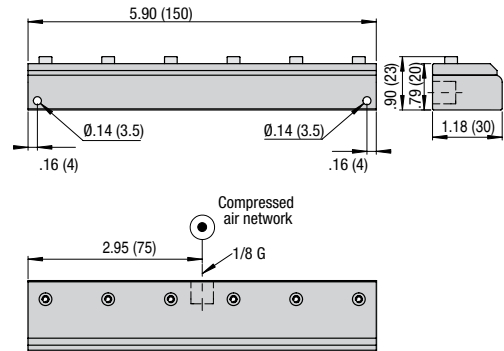
Air Curtain, Series NRDA 150

Applications:

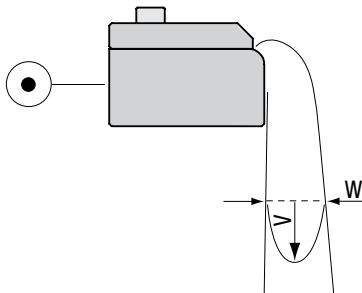
High impact jet to dry products or liquids (ie.ink). It is also ideal for cooling and cleaning.

Characteristics:

SUPPLY PRESSURE PSI	at 5.90 In		at 23.62 In		at 47.24 In	
	V Ft/min	W In	V Ft/min	W In	V Ft/min	W In
29	2227.69	2.24 (57)	1371.39	5.51 (140)	928.48	5.7 (145)
43.51	3343.17	2.36 (60)	2057.08	6.3 (160)	1394.35	6.85 (174)
58.01	4455.38	2.56 (65)	2742.78	9.45 (240)	1856.95	9.25 (235)
72.51	5570.86	2.56 (65)	3428.48	10.2 (259)	2322.83	14.17 (360)
87.02	6683.07	2.75 (70)	4114.17	10.24(260)	27.85.43	16.14 (410)



Operating Principle:



V: Peak speed of flow in m/min
W: width of flow in mm

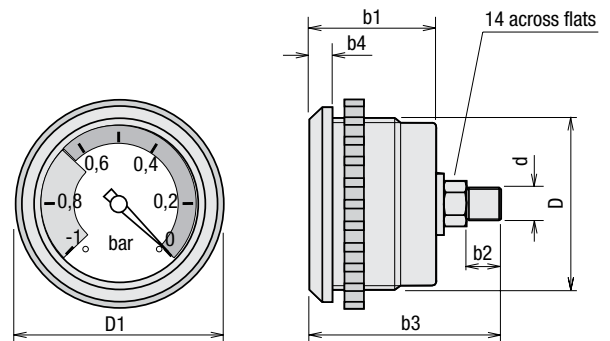
Vacuum Gauge, Series NVAF 111

Applications:

Vacuum gauges in series NVAF 111 are recommended for the visual display of a vacuum level for maintenance, checking and adjustment. On option, they can be fitted on venturis in series NGVP, reference NGVO NVAF11140. See page 28.

Specifications:

- Damping = By patented silicone movement
- Flange = Chrome-plated
- Measurement = Bourdon tube of CuSn
- Accuracy = cl.2.5 (±2.5% of max. scale value)
- Housing = ABS, black
- Temperature = 32° to 140° F (0° to 60° C)
- Recess fitting = Bushing included in supply
- Option = Customized Dial. (consult factory)

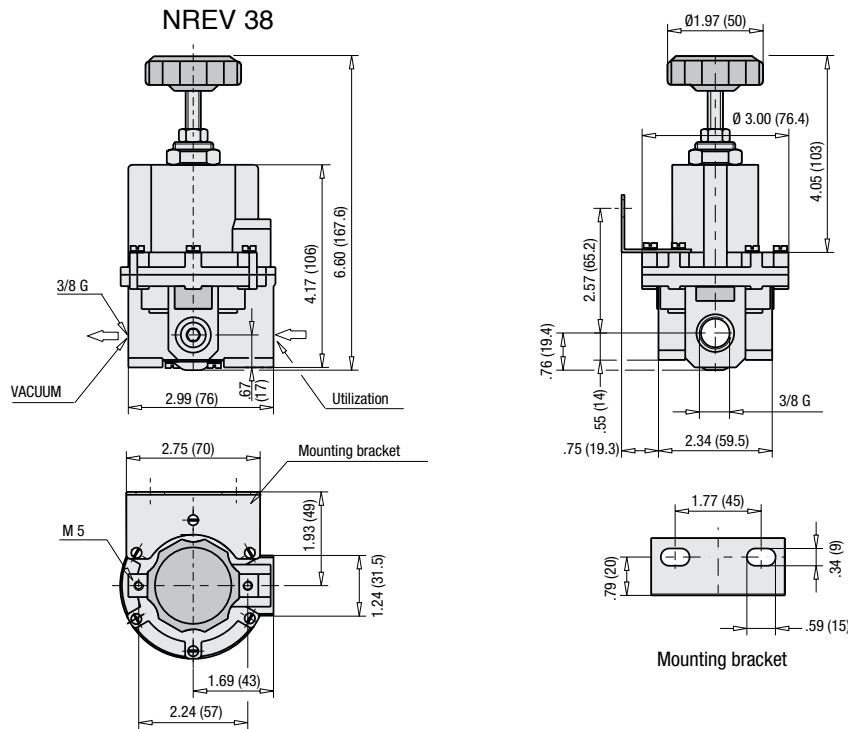


Characteristics:

Reference	D*	D1	b1	b2	b3	b4	d
	in (mm)	in (mm)	in (mm)	in (mm)	in (mm)	in (mm)	G male
NVAF 111 40	1.57 (40)	1.69 (43)	1.28 (32.5)	.47 (12)	2.04 (52)	.16 (4)	1/8
NVAF 111 50	1.97 (50)	2.12 (54)	1.28 (32.5)	.47 (12)	2.04 (52)	.16 (4)	1/4
NVAF 111 63	2.48 (63)	2.68 (68)	1.28 (32.5)	.47 (12)	2.04 (52)	.16 (4)	1/4



Vacuum Regulator, Series NREV 38

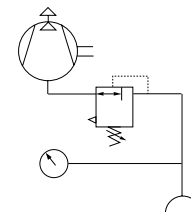


Applications:

Connected up to a vacuum pump or a venturi, the NREV series vacuum regulator ensures an accurate and stable vacuum in a system. Its adjustment knob allows extremely fine adjustment, 0.13 mbar.

Specifications:

- Diaphragm = VITON
- Material = Lacquered aluminum casting
- Adjustment = By threaded pin
- Mounting Bracket = Included

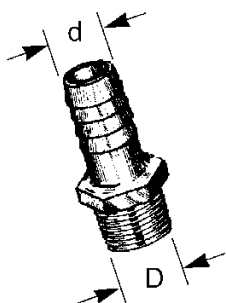


Characteristics:

Model	Adjustment Range in mbar	Adjustment Accuracy in mbar	Feed-Through Flow Rate Nm ³ / h
NREV38	-13.3 to -1000	±0.13	16.2

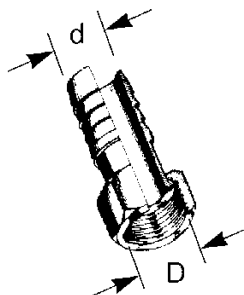


Accessories: Couplings



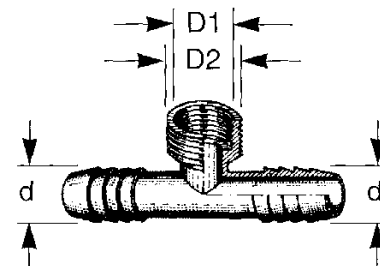
Reference: NRVM

Reference	D in	d* in (mm)
NRVM 1014	1/4	.40 (10)
NRVM 1038	3/8	.40 (40)
NRVM 1538	3/8	.59 (15)
NRVM 1512	1/2	.59 (15)
NRVM 2012	1/2	.79 (20)
NRVM 2034	3/4	.79 (20)



Reference: NRVF

Reference	D in	d* in (mm)
NRVF 1038	3/8	.40 (10)
NRVF 1512	1/2	.59 (15)
NRVF 2034	3/4	.79 (20)



Reference: NRVT

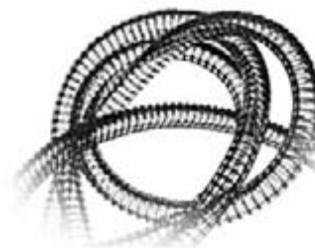
Reference	D1 (inch.)	D2 (inch)	d* (mm)
NRVT 1012	1/2	3/8	.40 (10)
NRVT 1534	3/4	1/2	.59 (15)

Accessories: Vacuum Tubes

Reference: NTRV

Reference	Inside Ø in (mm)	Outside Ø in (mm)	r* in (mm)
NTRV 10	.39 (10)	.63 (16)	1.18 (30)
NTRV 15	.61 (15.5)	.87 (22.5)	1.18 (30)
NTRV 20	.77 (19.5)	1.08 (27.5)	2.36 (60)

Vacuum tube NTVR can withstand a 90% vacuum at an ambient temperature of 86° F (30° C). Color: crystal



Accessories: Clamping Collars

Reference: NCOV

Reference	Tube ref.	L in (mm)
NCOV 10	NTVR 10	.27 (7)
NCOV 15	NTVR 15	.27 (7)
NCOV 20	NTVR 20	.27 (7)

Other dimensions and shapes are available on request.



Conversion Table

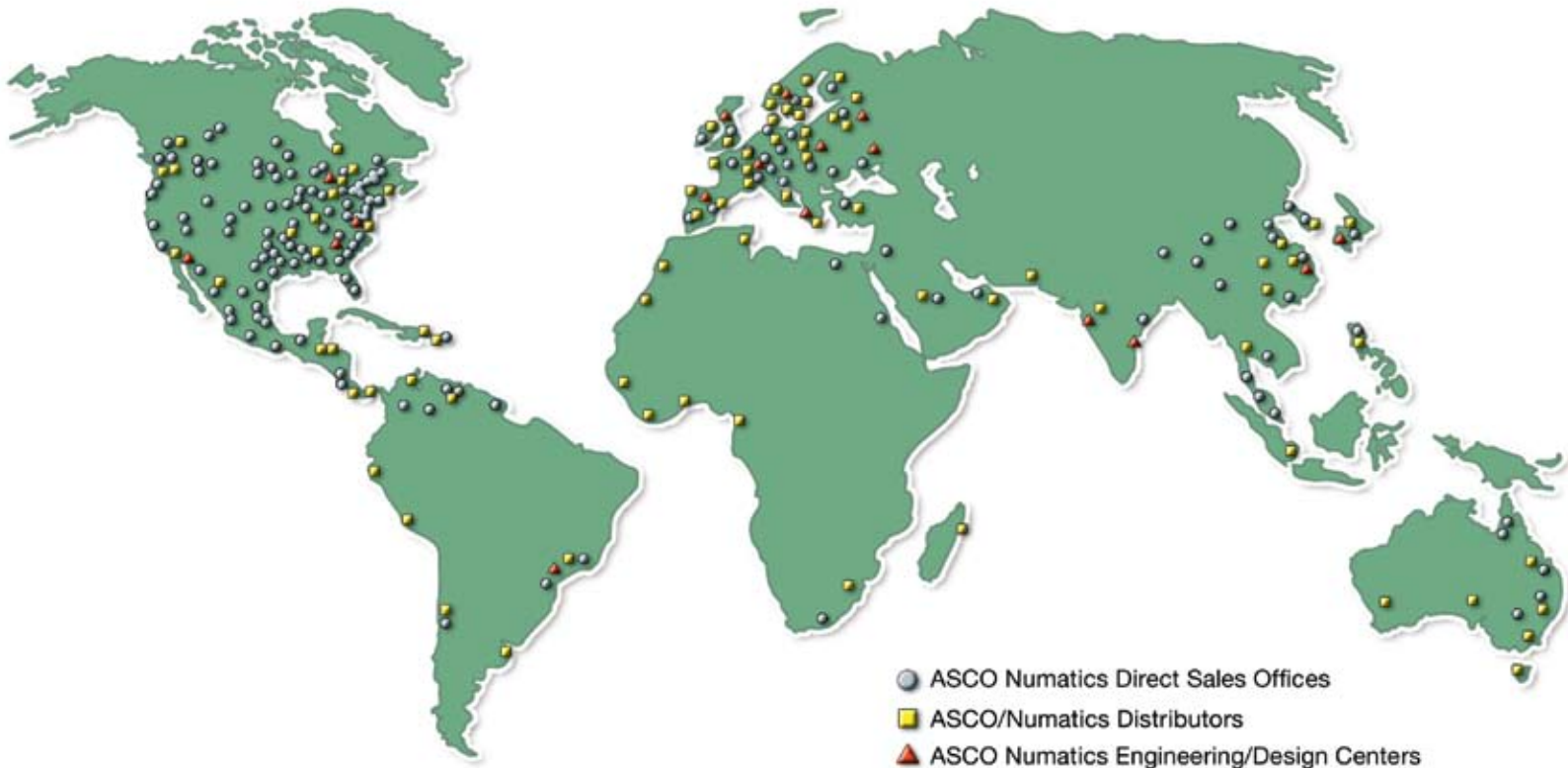
Conversion Table

Metric / Standard Conversions

Metric to English			English to Metric			Key	
Area			Area			μm	micron (micrometer)
mm ²	x	0.0016 = in ²	in ²	x	645.16 = mm ²	mm	millimeter
cm ²	x	0.1550 = in ²	in ²	x	6.4516 = cm ²	cm	centimeter
m ²	x	10.765 = ft ²	ft ²	x	0.0929 = m ²	m	meter
Energy			Energy			mils	0.001 inch
Nm/s	x	0.7375 = ft lb	ft lb	x	1.356 = Nm/s	in	inch
J	x	0.7375 = ft lb	ft lb	x	1.356 = J	ft	foot
MJ	x	0.2778 = kWh	kWh	x	3.6 = MJ	cc	cubic centimeter
Flow Rate			Flow Rate			l	liter
NI/min	x	0.035 = SCFM	SCFM (ft ³ /min)	x	28.57 = NI/min	g	gram
m ³ /h	x	0.588 = SCFM	SCFM	x	1.699 = m ³ /h	kg	kilogram
Force			Force			oz	ounce
gf	x	2.205 x 10 ³ = lbf	lbf	x	453.6 = gf	lb	pound
kgf	x	2.2046 = lbf	lbf	x	0.4536 = kgf	gf	gram-force
N	x	0.2248 = lbf	lbf	x	4.4482 = N	kgf	kilogram-force
Length			Length			N	newton
μm	x	0.0394 = mils	mils	x	25.4 = μm	lbf	pound-force
mm	x	0.0394 = in	in	x	25.4 = mm	Nm	newton-meter
cm	x	0.3937 = in	in	x	2.54 = cm	Kg m	kilogram-meter
m	x	3.2810 = ft	ft	x	0.3048 = m	ft lb	foot-pound
Power			Power			psi	pounds per square inch
kW	x	1.341 = hp	hp	x	0.7457 = kW	kPa	kilopascals
Pressure			Pressure			atm	atmospheres
kPa	x	0.145 = psi	psi	x	6.897 = kPa	J	joule
bar	x	14.50 = psi	psi	x	0.06897 = bar	MJ	megajoule
atm	x	14.7 = psi	psi	x	0.068 = atm	W	watt
in Hg	x	0.491 = psi	psi	x	2.036 = in Hg	kW	kilowatt
Temperature			Temperature			kWh	kilowatt-hour
°F	=	(1.8 x °C) + 32	°C	=	(°F - 32) x 0.555	hp	horsepower
Torque			Torque			°C	degrees Centigrade
Nm	x	0.7375 = ft lb	ft lb	x	1.3559 = Nm	°F	degrees Fahrenheit
Volume			Volume			s	seconds
mm ³	x	6.10 x 10 ³ = in ³	in ³	x	16.387 = mm ³	NI/min	Normal liters per min.
cm ³ (cc)	x	0.0610 = in ³	in ³	x	16.387 = cm ³ (cc)	SCFM	Std. cubic feet per min.
m ³	x	35.320 = ft ³	ft ³	x	0.0283 = m ³		
l	x	0.0353 = ft ³	ft ³	x	28.329 = l		
Weight			Weight				
g	x	0.0353 = oz	oz	x	28.329 = g		
g	x	0.2205 = lb	lb	x	453.51 = g		
kg	x	2.2046 = lb	lb	x	0.4536 = kg		

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WORLD HEADQUARTERS

USA

Numatics, Incorporated

46280 Dylan Drive
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