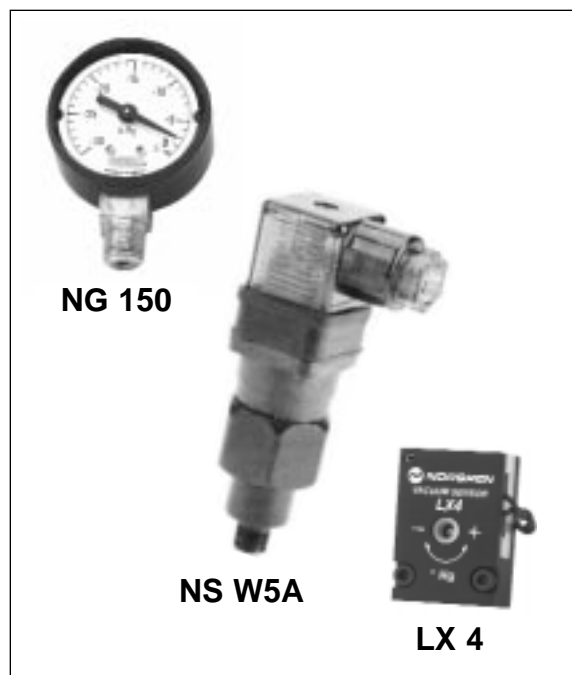


Accessories

Adjustable Vacuum Switches



- Ideal for use in automated systems to generate a low current electrical signal for input to a PLC or other logic controller.
- Usually open, diaphragm operated
- Utilize low-stressing deflecting contacts instead of sliding or pivoting parts.
- High reliability and long life

LX 4, LX 5

To reduce plumbing and ease installation, the vacuum sensors may be fastened directly to the MV 2, MV 3 and the MV 6 series of vacuum pumps.

LX 4SB, LX 5SB

For remote mounting, choose the LX 4SB or LX5SB subbase mounted versions.

NS 4, NS 5

Adjustable vacuum sensors.

NS W5A

Nema 6 enclosure (IP67)
Adjustable, 4" to 28" Hg.
Electrical connection– DIN 46350A
UL and CSA approved

Compact, sealed vacuum switch for automation and process control applications. Especially suited for hazardous applications including wash down and dust laden air.

Switch is field adjustable between 4" and 28"Hg. Adjusting screw is easily accessed below the DIN connector. Wiring can be either Normally Open or Normally Closed.

Vacuum Gauge

NG 150

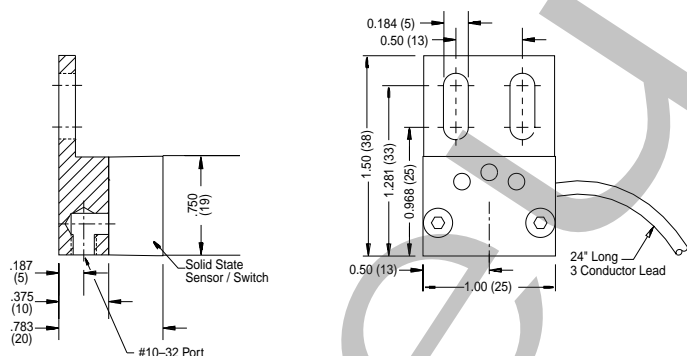
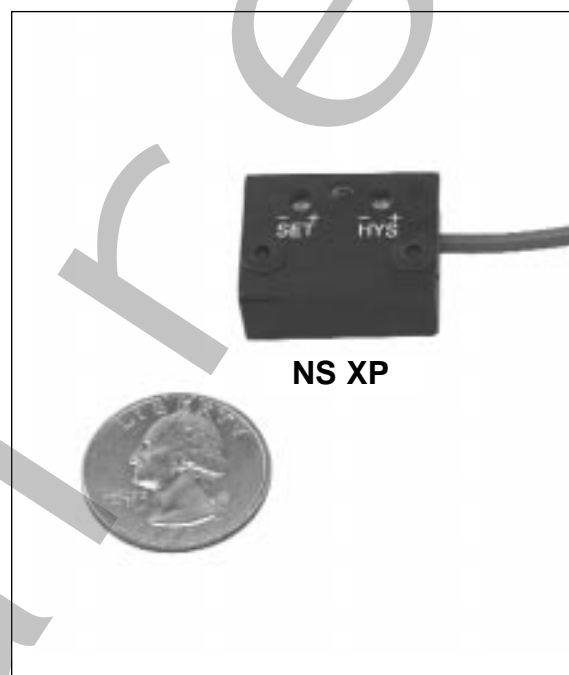
The NG 150 is a 0-30" Hg. vacuum with a 1-1/2" face and an 1/8" NPTM bottom mount connection.

Specifications

Part No	Size (inches)	Range	Hysteresis/Deadband	Input Voltage	Max. Current	Output	Operating Temp.	Port	Indicator	Electrical Connection
MECHANICAL SWITCHES										
NS 4	1x1x3/8 w/ 3/8x3/16øbarb	2-14.8"Hg.	1/2 % max value	500 VAC/ 24 VDC	10-20 mA	Sourcing	-40°-250°F	n/a	None	12" flying leads
NS 5	1x1x3/8 w/ 3/8x3/16øbarb	7.4-30"Hg.	1/2 % max value	500 VAC/ 24 VDC	10-20 mA	Sourcing	-40°-250°F	n/a	None	12" flying leads
LX 4	1x1.5x.75 thk	2-14.8"Hg.	1/2 % max value	500 VAC/ 24 VDC	10-20 mA	Sourcing	-40°-250°F	Optional Sub Base w/10-32	None	12" flying leads
LX 5	1x1.5x.75 thk	7.4-30"Hg.	1/2 % max value	500 VAC/ 24 VDC	10-20 mA	Sourcing	-40°-250°F	Optional Sub Base w/10-32	None	12" flying leads
NS W5A	1.84x4.26	4-28"Hg.	~ 20%	125-250 VAC 12 VDC 24 VDC	5 amp 7 amp 5 amp	Sourcing N/O or N/C	-40°-176°F	1/8" NPTM	None	DIN 43650A

Solid State Switches and Sensors

- Ultra miniature electronic vacuum and pressure sensing and switching devices utilize the latest electronic technology available.
- Provide precision control for feedback mechanisms or system monitoring
- Can be incorporated directly onto NORVAC's Fastvac vacuum pumps.
- Available for manifold applications where multiple sensing points for vacuum or pressure are required.
- For applications requiring feedback for batch or process control, the sensors are available as a 0-5Vdc or 4-20mA volt transducer device.
- Vacuum or pressure setpoints, and hysteresis are adjustable on all switches.


Ordering Information

Note 1: All solid state devices, *sold individually*, are mounted to a 1/8" thick base with a #10-32 female port. Optional male port adapters are available in 10-32 and 1/8" NPT.

Note 2: All solid state devices, *sold individually*, can be optionally mounted to a 3/8" thick remote mounting base with a #10-32 port. Adapters are not available.

Solid State Option Suffix:

32N	#10-32 Adapter
18N	1/8" NPTM Adapter
RMN	Remote Mount Base

Specifications

Part No	Size (inches)	Range	Hysteresis/Deadband	Input Voltage	Max. Current	Output	Operating Temp.	Port	Indicator	Electrical Connection
SOLID STATE SWITCHES										
NS XP	1x.75x.41 thk	0.5-30" Hg.	~ 0-15%	24 VDC	100mA	Sourcing	-40°-250°F	See notes 1&2	LED	3 conductor/24"
NS XN	1x.75x.41 thk	0.5-30" Hg.	~ 0-15%	24 VDC	100mA	Sinking	-40°-250°F	See notes 1&2	LED	3 conductor/24"
NS XL	1x.75x.41 thk	0.5-30" Hg.	~ 0-15%	24 VDC	100mA	Sinking w/pullup resistor	-40°-250°F	See notes 1&2	LED	3 conductor/24"
RS XP	1x.75x.41 thk	0-150 psi	~ 0-15%	24 VDC	100mA	Sourcing	-40°-250°F	See notes 1&2	LED	3 conductor/24"
RS XN	1x.75x.41 thk	0-150 psi	~ 0-15%	24 VDC	100mA	Sinking	-40°-250°F	See notes 1&2	LED	3 conductor/24"
RS XL	1x.75x.41 thk	0-150 psi	~ 0-15%	24 VDC	100mA	Sinking w/pullup resistor	-40°-250°F	See notes 1&2	LED	3 conductor/24"
SOLID STATE SENSORS										
NS SA	1x.75x.41 thk	0.5-30" Hg.	n/a	24 VDC	n/a	4-20mA	-40°-250°F	See notes 1&2	n/a	2 conductor/24"
NS SV	1x.75x.41 thk	0.5-30" Hg.	n/a	24 VDC	n/a	0-5 VDC	-40°-250°F	See notes 1&2	n/a	3 conductor/24"
RS SA	1x.75x.41 thk	0-150 psi	n/a	24 VDC	n/a	4-20mA	-40°-250°F	See notes 1&2	n/a	2 conductor/24"
RS SV	1x.75x.41 thk	0-150 psi	n/a	24 VDC	n/a	0-5 VDC	-40°-250°F	See notes 1&2	n/a	3 conductor/24"

NORVAC Vacuum Cups

Standard, Cleated, Bellows, and Oval vacuum cups



- Norgren NORVAC vacuum cups are available in four designs: standard, cleated, bellows, and oval.
- Available in vinyl, silicon, or polyurethane.
- Four mounting methods are available: flange, snap on or bolt, push on or clamp, and bellows mount.

Equation for calculating vacuum lifting force using vacuum cups:

Note: To convert ("Hg) vacuum level into PSI divide by 2.

$$\text{Vacuum Force (lbs.)} \times \text{Safety Factor} = \text{Vacuum Level (PSI)} \times \text{Surface Area (in.}^2\text{)}$$

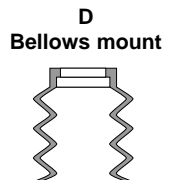
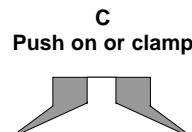
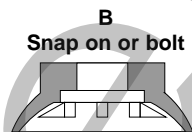
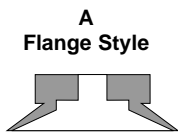
Specifications

Vinyl (excellent wear resistance): 32° to 125°F (0° to 50°C)

Silicon (good wear resistance, FDA approved): -50° to 400°F (-45 to 200°C)

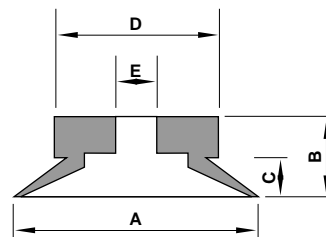
Polyurethane (chemically resistant): 32° to 125°F (0° to 50°C)

Mounting Styles



Standard Vacuum Cup

Standard cups are flexible and work well in applications that do not require lifting heavy loads. In food packaging for example, a standard cup can be used to apply a label to an uneven surface such as a package of chicken.



Standard Vacuum Cup Specifications

Standard Model No.	Effective Cup Area (in ²)	A (O.D.)	B	C	D	E	Style
NC 1	.01	.200	.225	.045	.225	.057	A
NC 165A	.05	.37	.25	.25	.37	.22	B
NC 25	.02	.61	.62	.10	.50	.19	B
NC 10	.30	1.00	.50	.28	.62	1/8 NPTF	B
NC 11	.40	1.19	.50	.28	.75	1/4 NPTF	B
NC 12	.60	1.44	.50	.50	.75	1/4 NPTF	B
NC 8	.44	1.50	.56	.38	.62	.23	B
NC 37A	.50	1.56	.81	.50	.87	1/4 NPTF	B
NC 168	.70	2.00	.69	.50	1.12	1/4 NPTF	B
NC 106	.80	2.50	.81	.50	1.12	1/4 NPTF	B
NC 30	1.10	3.09	1.44	.62	1.12	1/4 NPTF	C

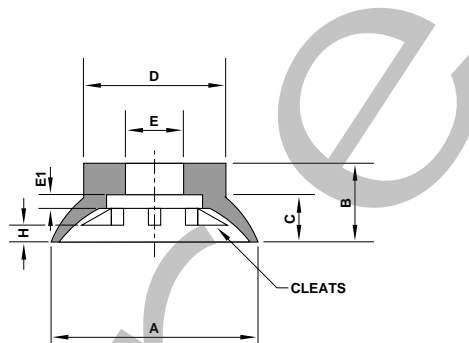


Accessories- Vacuum Cups

All Dimensions in Inches (mm)

Cleated Cup

Cleated cups have a rigid, low profile, and are designed to lift heavy loads. These cups perform well when gripping smooth, flat heavy objects such as sheet steel, glass (television picture tubes), and coated corrugated.



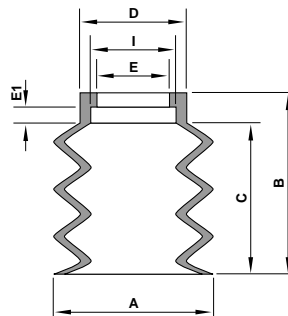
Cleated Vacuum Cup Specifications

Cleated Model No.	Effective Cup Area (in ²)	A (O.D.)	B	C	D	E	Style
NC 36B	.30	1.00	.36	.25	.56	.25	A
NC 2E	.37	1.37	1.06	.31	.62	.38	C
NC 59	1.30	2.00	.62	.25	1.56	1/4 NPTF	B
NC 49	2.10	2.44	1.94	.81	1.04	1/4 NPTF	C
NC 27A	2.40	3.25	1.06	.44	2.25	1/4 NPTF	B
NC 27	3.40	4.25	1.00	.50	3.00	1/4 NPTF	B
NC 63	5.60	4.75	1.18	1.00	1.62	3/8 NPTF	B
NC 34	10.40	6.25	1.18	.81	5.00	3/8 NPTF	B

All dimensions shown in inches

Bellows Cup- with 1, 2, 3, or 4 convolutions

Bellows cups have a pliable outer rim that will conform to curved or uneven surfaces while the bellows sections compensate for inconsistent stack heights. Under vacuum, the accordion-style bellows cup will collapse on contact. The collapsing action simulates a short cylinder stroke lifting the product for a short distance, possibly saving the need for a separate lifting mechanism.



Bellows Vacuum Cup Specifications

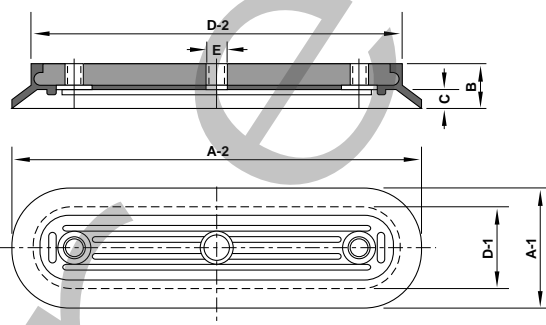
Bellows Model No.	Effective Cup Area (in ²)	A (O.D.)	B	C	D	E	Style
NCB 6	.01	.25	.43	.15	.15	.06	D-1
NCB 105	.04	.42	.62	.21	.32	.15	D-1
NCB 3	.05	.50	.56	.38	.31	.15	D-1
NCB 15	.07	.62	.81	.40	.35	.14	D-1
NCB 2	.11	.75	.68	.50	.51	.25	D-1
NCB 20P	.15	.87	.75	.50	.57	.20	D-1
NC 33A5	.16	.75	1.00	.75	.69	.44	D-3
NC 33A3	.20	.90	1.02	.62	.69	.44	D-2
NCB 1	.25	1.20	.85	.77	.56	1/8 NPTF	D-1
NC 33A2	.25	1.27	1.00	.87	.69	1/4 NPTF	D-2
NC 33A	.40	1.37	1.50	1.00	.65	1/4 NPTF	D-3
NC 32C	.78	2.00	1.68	.81	.75	1/4 NPTF	D-1
NC 32	6.70	3.5 x 5.0	1.75	1.25	2.0x3.5	3/8 NPTF	D-1
NC 124	.24	1.00	1.37	.62	.62	.37	D-1
NC 32D	1.00	2.00	1.86	1.12	.75	1/4 NPTF	D-2
NC 32B	2.00	2.75	2.00	1.28	1.00	1/4 NPTF	D-1
NC 130	4.90	3.31	2.38	2.18	2.38	3/4 NPTF	D-4

All dimensions shown in inches

Many other cup sizes available on request.



All Dimensions in Inches (mm)



Oval Cup

Like cleated cups, oval cups have heavy load handling capacity due to their rigid design and large vacuum work area. Oval cups have the largest lifting force because they provide the most surface area for a given cup footprint.

Oval Vacuum Cup Specifications

Oval Model No.	Effective Cup Area (in ²)	A1 x A2	B	C	D1 x D2	E	Style
NC 89	1.75	1.12 x 2.75	.87	.70	.78	1/4 NPTF	B
NC 83	4.50	1.56 x 4.09	.94	.50	1.15 x 3.6	1/4 NPTF	B
NC 87BL	.44	1.70 x 1.50	.50	.20	.62	1/8 NPTF	A
NC 183	6.00	2.0 x 6.0	1.00	.39	1.25 x 5.2	1/4 (2 Ports)	B
NC 90	12.00	3.0 x 8.0	1.12	.53	2.12 x 7.1	3/8 (2 Ports)	B

Ultraminiature Vacuum Cup Specifications

Ultraminiature Model No.	Effective Cup Area (in ²)	A (O.D.)	B	C	D	E	Options
NCVI 062	.003	.063	.126	.006	.055	.025	B/ESD/V
NCVI 125	.02	.125	.120	.020	.070	.030	B/ESD/R/U/V
NCVI 250	.05	.250	.200	.040	.100	.045	B/ESD/R/U/V
NCVI 375	.11	.375	.250	.070	.130	.060	B/ESD/R/U/V
NCVI 500	.19	.500	.300	.110	.160	.060	B/ESD/R/U/V
NCVI 625	.30	.625	.310	.110	.160	.060	B/ESD/R/U/V
NCVI 750	.44	.750	.320	.130	.160	.060	B/ESD/R/U/V

Options

- B** = Non-Marking Static Dissipative. Temperature range: -4°F to 248°F (-20°C to 120°C)
- ESD** = ESD Safe High Temperature. Temperature range: -67°F to 446°F (-55°C to 250°C)
- R** = Red Silicone High Temperature. Temperature range: -67°F to 482°F (-55°C to 350°C)
- U** = Blue Silicon High Temperature. Temperature range: -67°F to 482°F (-55°C to 350°C)
- V** = Probe (cup holders) available.

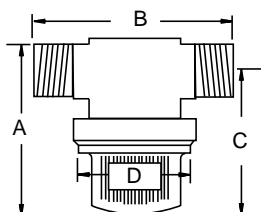
Many other cup sizes available on request.



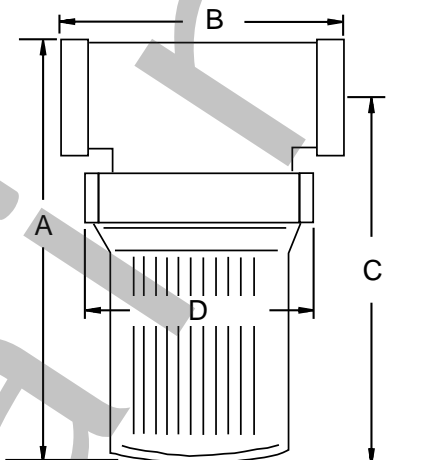
Accessories- In-line Vacuum Filters

All Dimensions in Inches (mm)

Compact in-line filters for adverse conditions provide the added protection of 10 micron filtration and have a 150 psi pressure rating. Filters are constructed from rugged injection molded nylon and plastic. NORVAC offers eight different design configurations for maximum placement versatility and easy installation.



NF125LPM (1.9 OZ)
NF250LPM (2 OZ)
NF375LPM (2 OZ)



NF500F (5.6 OZ)
NF750F (5.6 OZ)
NF1000F (7.8 OZ)

Specifications

Part Number	Description	Ports	A	B	C	D	Replacement Element
NF 125LPM	1/8" Male Low Profile	1/8"NPTM	2.4	3.1	2.0	1.9	NE1
NF 250LPM	1/4" Male Low Profile	1/4"NPTM					
NF 375LPM	3/8" Male Low Profile	3/8"NPTM					
NF 250F	1/4" Female Filter	1/4"NPTF	3.7	3.0	3.25	1.9	NE1L
N3 75F	3/8" Female Filter	3/8"NPTF	3.7	3.0	3.25	1.9	
NF 500F	1/2" Female Filter	1/2"NPTF	5.35	3.6	4.8	2.95	NE2
NF 750F	3/4" Female Filter	3/4"NPTF	5.35	3.6	4.8	2.95	NE3
NF 1000F	1" Female Filter	1"NPTF	6.35	5.0	5.6	4.1	

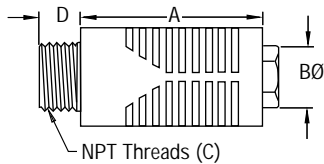
NORVAC's unique single stage vacuum pumps do not require filters for maximum operating efficiency. Filters are recommended for use in only the most adverse operating conditions to provide additional, in-line protection and user satisfaction.



NORVAC silencers are extremely effective in reducing air exhaust noise from venturi pumps and other pneumatic devices. The NAA, NST, and NFA51 Series reduce noise levels by up to 30 dB while allowing high flow rates with minimal back pressure.

NAA Series

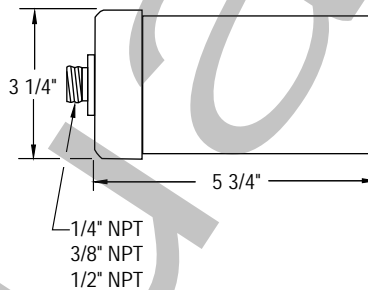
The NAA Series silencers are compact, lightweight and have excellent noise reduction characteristics with minimal resistance to air flow. NAA Series silencers are almost one third smaller than comparable products providing considerable space savings. The large surface of the felt element resists contamination far more than other materials such as sintered bronze, steel mesh, or porous polyethylene.



NFA51 Series

The NFA51 Series silencers offer remarkable noise reduction for high volume exhaust applications without causing back pressure. Silencers are ideal for quieting large air valves that must exhaust quickly to maintain high cycle rates. NORVAC uses the NFA51 silencers on their high flow venturi vacuum pumps where even small amount of back pressure would decrease performance.

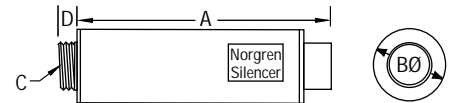
A threaded connection provides easy installation for replacement element, P/N RF51



NST Series

The NST-Series' straight-through design eliminates clogging by allowing contaminants to pass directly through the silencer. Each silencer is tuned in proportion to its exhaust flow to minimize noise and reduce frequency vibration. As air passes through the silencer, noise is absorbed by the dense felt liner. This reduces high pitch exhaust noise to a gentle, low frequency flow of air.

Even in the most adverse conditions, contaminants pass through the silencer making the NST- Series ideal for silencing venturi pumps that are continuously ingesting dirt and debris.



Specifications

Silencer	Dimensions				Construction Pressure				Max. Op. Media		Noise Level measured 4.5 ft. from silencer
	A	B Ø	C	D	Body	Baffle	Screen	Filter			
NA A2	1.052	.604	1/8" NPT	.234	Nylon	Nylon	Nylon	Felt	150 psig	air	68dBA
NA A4	1.265	.706	1/4" NPT	.326	Nylon	Nylon	Nylon	Felt	150 psig	air	68dBA
NA A6	1.833	.955	3/8" NPT	.429	Nylon	Nylon	Nylon	Felt	150 psig	air	72dBA
NF A5114	5.75	3.25	1/4" NPT	.5	Steel	Foam	Steel	Paper	150 psig	air	72dBA
NF A5138	5.75	3.25	3/8" NPT	.5	Steel	Foam	Steel	Paper	150 psig	air	72dBA
NF A5112	5.75	3.25	1/2" NPT	.5	Steel	Foam	Steel	Paper	150 psig	air	72dBA
NS T4A	3.95	1.00	1/4" NPT	.40	Alum.	—	—	Felt	150 psig	air	68dBA
NS TAA4	3.00	.75	1/4" NPT	.40	Alum Nylon	Felt Nylon	Nylon	Felt	150 psig	air	68dBA
NS T4	2.35	.75	1/4" NPT	.4	Alum	—	—	Felt	150 psig	air	68dBA
NS T6A	3.95	1.00	3/8" NPT	.4	Alum.	—	—	Felt	150 psig	air	68dBA
NN ST8A	3.95	1.00	1/2" NPT	.4	Alum.	—	—	Felt	150 psig	air	68dBA
NS T6B	5.20	1.25	3/8" NPT	.4	Alum.	—	—	Felt	150 psig	air	68dBA
NS T8B	5.20	1.25	1/2" NPT	.4	Alum.	—	—	Felt	150 psig	air	76dBA
NS T12C	7.44	2.00	3/4" NPT	.5	Alum.	—	—	Felt	150 psig	air	76dBA
NS T16C	7.44	2.00	1" NPT	.5	Alum.	—	—	Felt	150 psig	air	76dBA

Noise levels are based on the silencer being attached to a Norvac venturi pump.



There are two types of vacuum applications

Pick and Place – Material Handling

Referred to here as the lifting, gripping, rotating and positioning of an object through the use of a vacuum pump and vacuum cup

Use the Equation: **Force = Pressure x Area**

to Determine:

1. Lifting capacity of the pump and cup,
2. Required vacuum area, i.e. diameter of cup,
3. Required vacuum level of vacuum pump.

WHERE:

F is the weight of the object in pounds (lbs) multiplied by a safety factor (See page 12)

P is the expected vacuum level in PSI, remember to convert "Hg" to PSI by dividing by 2

A is the area of the vacuum cup in sq. inches. Use the equation, $Area = \frac{\pi d^2}{4}$

2 Vacuum Level Ranges - "H" for High Vacuum and "M" for Medium Vacuum.

- "H" - Series (28" Hg) for non-porous material to generate maximum holding force.

Hint: Try P = 12.5 PSI (25" Hg) as a starting value when using equation, $F = P \times A$.

- "M" - Series (20" Hg) for porous material to generate medium holding force while overcoming leakage and saving compressed air.

Hint: Try P = 8 PSI (16" Hg) as a starting value using equation, $F = P \times A$.

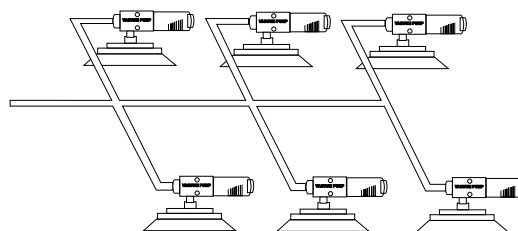
Systems Speed:

Cycle rate of the pump and cup system is determined by the evacuation speed of the venturi, see "Vessel Evacuation" below.

Inexact Science

When handling porous materials such as corrugated or heavy fabric it is hard to choose the exact pump required because the leakage rate is not normally known. Therefore, it is best to run a benchtop trial to test the ability of the pump to overcome the leakage. For existing systems, consult NORVAC for the equivalent pump size. In new applications, take advantage of NORVAC's free 30 day trial to ensure proper pump selection.

Increase safety, reliability and speed by using one small Fastvac pump at each cup location. Should one cup fail the others will not be affected.



Vessel Evacuation

In many process applications it is necessary to evacuate a vessel for the purpose of purging gases, leak testing, degassing viscous fluids or the vessel may simply be the length of tubing between the pump and cup. Knowing the evacuation speed will help determine process completion time or the production rate of a pick and place system.

Evacuation speed is directly related to the vacuum flow of the pump. To use the chart of evacuation speed listed for each venturi identify operating conditions;

Notice that the charts are based on a one cubic foot volume. Evacuation speed is linear with volume, therefore a 2 cu. ft. volume will take twice as long to evacuate.

1. Volume to be evacuated (Cu. Ft.), 1728 cu. in. = 1 cu. ft.
2. Desired vacuum level ("Hg),
3. Time to reach vacuum level (seconds).