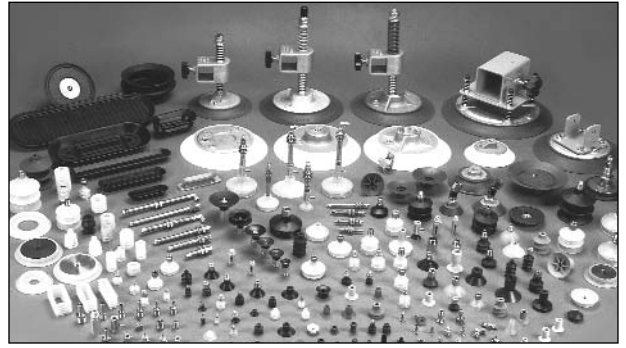


The Vacuum Resource[®] Book

From **ANVER** 





1

Section

Vacuum Cups and Accessories



The Best Solution for Material Handling.

Vacuum suction cups can hold, lift or turn virtually any kind of material in the production process. The contact between a suction cup and the object to be handled is soft and light, and the technique is simple and safe.

Choosing the Right Suction Cup.

It is very important to choose the most appropriate type of vacuum suction cup, to obtain optimal results. ANVER has cups suitable for round, inclined, curved and irregular surfaces, and with our range of products you can find the best solution for every task.

The selection of a suction cup depends on particular conditions such as surface quality and structural stability of the work piece to be lifted and the desired material, shape, etc. of the suction cup. However, a simplified formula can be used to generate a theoretical estimate based on a few known values.

The diameter of the suction cup can be determined using the following formula:

How to Calculate the Diameter of Suction Cup Needed

U.S. Units

$$D = 0.44 \times \sqrt{\frac{a/2.2 \times s}{v/29.5 \times c}}$$

D = Diameter - inches
a = Mass lbs.
c = Number of Cups
v = Vacuum - in. of Hg
s = Safety Factor (at least 2)

Metric Units

$$D = 11.2 \times \sqrt{\frac{m \times s}{b \times c}}$$

D = Diameter - mm
m = Mass - Kg
c = Number of Cups
b = Vacuum - bar
s = Safety Factor (at least 2)

Lifting Capacity:

The lifting capacity of a vacuum cup can be theoretically determined at sea level by using the following formula:

$$C = \frac{.393 \times D^2 \times V}{N}$$

C = Lifting Capacity (lbs.)
D = Cup Diameter (in.)
V = Vacuum Level (in. Hg)
N = Desired Safety Factor

Safety factor for horizontal lifting applications should be at least (2). Vertical lifting applications should have a safety factor of at least (4).

NOTE: This formula will give theoretical lifting capacity only. Actual lifting capacity should always be verified by user.



NOTE: A safety factor of at least 2 for horizontal lifts should always be used to compensate for numerous variables surrounding lifting applications while a safety factor of at least 4 should be used for vertical or tilting applications. A pull-off test should be performed at our factory to determine the absolute suction cup for your particular application. Contact one of our application engineers for more information.

The Widest Range of Cups.

You can find many types of vacuum suction cups, with different dimensions and forms, on our web site. Our technical department is at your disposal to consult in choosing the most suitable solution for your particular needs.

Advantages of ANVER Vacuum Suction Cups:

- The widest selection
- Different materials for various kinds of use
- Various temperature resistance levels
- Perfect adherence even in the presence of edges and angles



Vacuum Cups and Suction Cups

Material Selection Guide

ANVER Material Blend Code	Common Material Name	Shore A Hardness* (Durometer) + / - 5	Temperature Range ** °F (°C)	Abrasion Wear Resistance	Oil, Grease Resistance	UV Weather Aging Resistance	Typical Color (Depends on Cup Style)
For most General Purpose Industrial Applications							
NBR	Nitrile (Buna-N)	40 - 60	-40° to +230° F (-40° to +110° C)	● ● ● ●	● ● ● ●	● ● ●	Black, Blue
	NBR is an excellent all around material for general industry. High overall value due to its top performance in many categories. Our proprietary blend which features the latest name brand ingredients have greatly increased the performance of this proven material.						
CR, NEO, NE, N50	Neoprene (Chloroprene)	40 - 60	-40° to +230° F (-40° to +110° C)	● ● ● ●	● ● ● ●	● ● ●	Blue, Red or Black
	N50 is an excellent hard wearing all around material for general industry with a nice rubber feel and memory.						
PUR	Polyurethane Anverflex™	30 - 65	-13° to +176° F (-25° to +80° C)	● ● ● ●	● ● ● ●	● ● ●	Blue, Green, White, all colors
	PUR is a tough, long wearing material. Suitable for many applications where heat is not a factor. Shiny gloss finish.						
For High Heat, Non-Marring Packaging and Food Use							
SIT	Silicone	40 - 60	-94° to +600° F (-70° to +316° C)	● ●	● ● ● ●	● ● ● ●	Translucent Clear
	SIT is excellent for high heat or food packaging. Soft and pliable, meets FDA Title 21 and German spec. BGVV (BGA) Part XV for contaminant-free load handling. Contains no dyes that can leach out when handling baked goods, drugs, glassware, hot products from molds, etc.						
SI	Silicone	40 - 60	-94° to +392° F (-70° to +200° C)	● ●	● ● ● ●	● ● ● ●	Solid White, Orange, Red
	SI is excellent for high heat applications such as mold part removal or where heat resistance is required for large cups/seals.						
S45, S60	Silicone	40 - 60	-58° to +401° F (-50° to +205° C)	● ●	● ● ● ●	● ● ● ●	Orange, Red
	S45 and S60 are excellent for EOAT high heat applications such as mold part removal from plastic injection machines requiring a soft touch. Higher durometer for bellows cups.						
For the Printing, Paper and Wood Industries							
NR	Natural (Gum) Rubber	35 - 50	-40° to +176° F (-40° to +80° C)	● ● ● ●	●	●	Tan, Grey, Green, Orange or Black
	NR is widely used in the printing/paper/wood industries. Low cost, wears well and does not gum up with ink or cut paper dust. Not for general use.						
Specialty Elastomers							
SSD	Static Dissipative Silicone	50 - 60	-76° to +401° F (-60° to +205° C)	● ●	● ●	● ●	Black, Grey (Carbon Filled)
	SSD is a specialized silicone with carbon that can handle heat and is static dissipative for high tech industries. It actually builds any static build-up out through a ground of the machine or other ground designed into the system.						
TPU	Thermal Polyurethane	75	-13° to +176° F (-25° to +80° C)	● ● ● ●	● ● ● ●	● ● ● ●	Translucent Brown (Darkens w/ Age)
	TPU is an extremely tough material which darkens with UV exposure. Long wearing but usually too expensive to justify its use. While initially promising a few years ago, TPU's expense premium has proven to far outweigh its increased performance over other recently improved materials.						
FPM	Viton® Fluorocarbon	60 - 65	-4° to +482° F (-20° to +250° C)	●	● ● ● ●	● ● ● ●	Usually Black, Blue
	FPM is specialized for high heat jobs. It has a stiff, somewhat dead feel for vacuum cups, and is relatively expensive which limits its vacuum cup use. High Heat Silicone has replaced Viton for most applications.						
VYL	Vinyl***	30 - 70	+32° to +158° F (0° to +70° C)	● ● ● ●	● ●	● ●	Clear Base Blue / other colors
	VYL is soft, low cost, and readily available in many grades for general light-duty use. The injection molded vinyl ANVER uses in its industrial vacuum cups is high quality, but you lose a key advantage of low cost to other materials.						
NM	ANVER Nomathane™	50 - 70	-32° to +356° F (-0° to +180° C)	● ● ● ●	● ● ● ●	● ● ●	Blue, Purple others
	NM is a new ANVER proprietary blend which is high wearing even in hot conditions. It is a silicone-free hybrid material which is non marking and will not leave any residue, mold release agent or ghost-mark on products which need to be painted after handling. This material also handles high temperature and is extremely long wearing making it ideal for the plastic injection molding industry. This material is priced similar to other top quality urethanes but it offers high overall value due to its excellent performance in many categories.						

CODE: Poor ● Good ● ● Very Good ● ● ● Excellent ● ● ● ●

Notes: * Various cup designs have different Durometers. Also note that a variance of +/- 5 in Shore Hardness or Durometer is the industry standard for all rubber products.

** The maximum temperature given is always for a momentary pick and place lift and not for a constant attach situation.

*** Some materials such as Urethane or Vinyl have more general names which is like saying Rubber or Plastic. Within that name there are dozens of types and grades and it is difficult to make comparisons. For example, Vinyl is used for children's toys, wall hanging cups, soap dish mounts, but also high end products. It is often difficult to determine the quality you are receiving. We have found that only injection molded, pressurized and vulcanized vinyl is suitable for industrial-duty vacuum cups.



ANVER® Proprietary Designed Elastomer Materials for Vacuum Cups and Suction Cups

Our success as a leader and innovator in Vacuum Technology is due to the many important advances that we have made and continue to make in the selection of the elastomers used in our Vacuum Cups.

What is an Elastomer Vacuum Cup?

An elastomer is any type of polymer that has rubber-like properties of which there are dozens of material names. An elastomeric compound, consisting of a blend of a base polymer and other ingredients, is a material that has been designed to meet specific functional requirements.

A Vacuum Cup is only as good as its specific recipe or mixture of elastomeric compounds. The more expensive materials, available from the chemical product market leaders, usually result in the highest quality product consistency, which is why we stick with only ingredients from these suppliers. Each compound listed below is a specific blend of approx. a dozen line items, not a single ingredient as many people have come to believe. The following ingredients make up a typical Vacuum Cup formulation:

- Polymers** the basic gum-like component of a compound, provide certain chemical and mechanical properties in the final product.
- Fillers** reinforcing agents that enhance chemical and mechanical properties; adding carbon for example
- Vulcanization agents** to cross-link the polymers.
- Accelerators** to modify the rate of vulcanization.
- Activators** to initiate the vulcanization.
- Plasticizers** to soften or improve processing.
- Processing aids** to ease handling during mixing, extrusion, calendaring, or molding; and various mold release agents, sprays etc.
- Age-resistors** to reduce or retard aging.
Keep in mind that all rubber products have a defined working shelf life.
- Miscellaneous ingredients** such as blowing agents, pigments, retarders and odorants, all have specific purposes but are not necessarily required.

Consistent Quality Control

At ANVER, we take measures to control quality throughout every phase of the development process. By specifying the highest quality ingredients, auditing incoming raw materials, establishing good relationships with our suppliers, and insisting on quality and uniformity in the goods we purchase, we can ensure the consistency of our elastomeric Vacuum Cups, from initial development to final production. You will find that all of our vacuum cups offer high quality and top value in every market segment.

We mold with many other specialty materials, including Ethylene Propylene Diene Methylene (EPDM) and Electro Static Limiting ESD, (this is a plastic blend material which acts to limit the build-up of static charge by virtue of a more slippery surface, which reduces surface friction). Contact the factory for details.
Viton® is a registered trademark of DuPont Dow Elastomers.



Vacuum Cups and Suction Cups

Generic P-Style / FP Series Flat Vacuum Cups



ANVER-Made Generic Replacements of P-Style Vacuum Cups and Suction Cups

Vacuum Cup Description and Part Number	Dimensional Dwg.	Static* Dia. in. (mm)	Static* Height in. (mm)	Load Capacity at 24 in. Hg (609.6mm Hg) 2:1 safety factor lb (kg)	Pull-Off Capacity at 27 in. Hg (685.6mm Hg) 1:1 safety factor lb (kg)
FP Cups					
FP200 SEALING RING A-3350148		9.0 (228)	0.8 (20)	266 (27)	600 (27)
FP300 SEALING RING A-3350153		13.3 (338)	0.9 (24)	622 (27)	1400 (27)
FP Cups with Fitting					
FP200 CUP & FITTING A-3350072		9.4 (240)	1.1 (27)	266 (27)	600 (27)
FP300 CUP & FITTING A-3350073		13.8 (350)	1.2 (31)	622 (27)	1400 (27)

► This spec sheet was adapted for print from our website. Additional information and photos are available at www.anver.com. 2030301