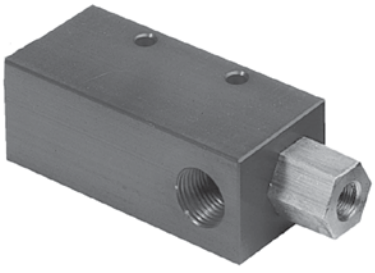
GAST

Vacuum Generators



The Gast Group **Difference**

For over 90 years, Gast Manufacturing has been providing innovative air solutions to a broad breadth of customers. With the relatively recent addition of JUN-AIR, we have expanded our capabilities and formed, "The Gast Group." Together, our diverse engineering background and pneumatic experience allow us to provide both component and system solutions to meet all of your pneumatic needs...all backed by our strong commitment to quality and customer support.

Products for Almost Any Application – Worldwide

We offer an extensive and versatile line of air-moving products, including vacuum pumps, compressors, air motors, gearmotors, vacuum generators, and regenerative blowers. We design and build these components for original equipment manufacturers worldwide, but we also develop complete pneumatic solutions to solve tough customer challenges.

To ensure fast, efficient delivery of products, Gast has a vast network of sales representatives/distributors throughout the United States and the world. Plus, we maintain direct sales and service facilities in Europe, Hong Kong, and Shanghai, China.

Unparalleled Design Expertise

Unlike other manufacturers, who might expect you to modify your pneumatic system to fit their available product(s), Gast is committed to finding the right product to meet your specific needs. If we don't have a high-quality, off-the-shelf product to fit your existing application or meet your anticipated needs, we'll propose customized cost-effective design options that will serve your special requirements. We can even develop and produce your complete pneumatic system for you.

Our experienced Research and Development engineers and Product engineers work together to analyze customer needs and use computer-aided design to generate timely solutions for air-handling problems. The design team has one goal: to create problem-solving solutions that capitalize on the latest available technology, meet all application requirements, and benefit from cost-effective production methods. The end result: products and solutions that are the best value in the marketplace for our customers.

A Lasting Commitment to Quality

We invest heavily in both equipment and people to maintain the consistent quality for which our products are known worldwide, and we have done so since day one. As early as 1983, we implemented a total quality process designed to ensure the quality of our products. In keeping with that tradition, Gast has achieved ISO 9001 certification, making us a member of the elite group of manufacturing companies in the world to receive that certification.

European Community Directives CE

With extensive sales outside the United States, Gast has pledged to conform to the European Community Directives. These directives contain essential requirements concerning health, safety, environment, and consumer protection for all products targeted for the European Community market. Currently, all Gast products available for sale in the European Community are in compliance with the Machinery, Low Voltage, and Electromagnetic Compatibility Directives.

Why use a Gast Vacuum Generator?

Compressed Air Driven
GAST vacuum generators are easy to install. They operate efficiently on shop air and avoid the possible spark associated with electric motors on critical applications. And, there's no RF noise generated to affect electrical/electronic systems either.

Economical to Operate
The innovative Gast multi-venturi design uses less compressed air, yet delivers substantially more vacuum flow than single-venturi units.

Compact Size
Allows the vacuum source to be located closer to the point of use. Shorter air lines cost less and quicken response.

Light-Weight Construction
Most models weigh less than one pound, providing maximum flexibility and mounting ease.

Superior Control
Vacuum levels are controlled by adjusting inlet pressure. Generators can be cycled on and off by controlling inlet pressure rather than by regulating the vacuum line through venting to atmosphere. Maximum performance and lowest noise is achieved at stated optimum inlet pressure.

Low Air Consumption
Multi-venturi design improves efficiency to achieve 90% vacuum (27 inHg against a barometric pressure of 29.92") while attaining high vacuum flow rates.

No Moving Parts
Expect extra long life with no lubrication required.

Quiet Operation
Generators can be used with exhaust silencers, resulting in low noise levels in the 60-65 dB range.

Minimal Maintenance
Plan for virtually no down time. The units can be flushed with soap and water and reassembled in 2 minutes – all without removing the generator from its mounting location.

Low Cost
Pricing that's well below foreign imports is only part of the picture. Combined with ease of installation, control and maintenance, it means that your total investment is far less when you use Gast Manufacturing vacuum generators.

Delivering unique performance, price, and versatility

When compressed air is forced through a conical nozzle, its velocity increases and a decrease in pressure occurs. This principle, discovered by 18th century physicist G.B. Venturi, can be used to generate vacuum economically without a single moving part.

Multi-Venturi Design
Gast Manufacturing Corporation's patented design of vacuum generators incorporates a series of venturi nozzles. Each nozzle has a progressively larger orifice selected to extract the maximum amount of energy from the compressed air while optimizing the levels of vacuum generated.

Normally, no special pre-filters are required because the venturi nozzles are aligned to allow "straight through" air flow. Thus, most air line contaminants easily clear the generator without clogging or buildup.

Packaged in compact, lightweight housings, the entire family of Gast multi-venturi vacuum generators are easy to use and provide outstanding performance at a price that makes sense for even the most demanding applications.

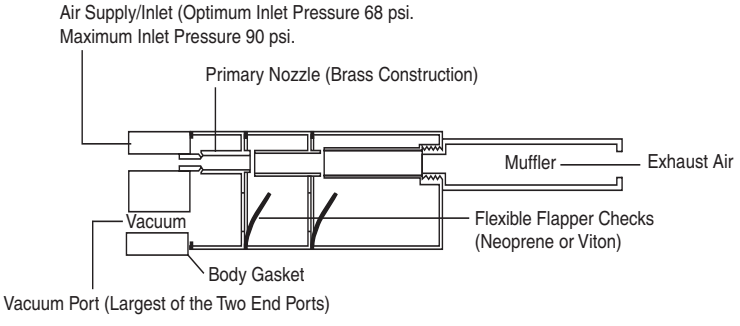
Two Families of High Performance Vacuum Generators
Select from either single-or multi-stage designs to achieve up to 27.0 inches of mercury with vacuum flow rates ranging from .2 CFM to 158 CFM.

Only two pipe connections are required: (1) compressed air supply, and (2) vacuum port. Both ports are contained in one head for ease of installation. Should field modification or repair ever be necessary, the body of the pump can be removed without disturbing any of the plumbing.

Multi-stage units are manufactured with brass venturi nozzles housed in either Delrin acetal or anodized aluminum vacuum stages. Delrin is a tough plastic resistant to compressor oils and a variety of chemicals. Anodized aluminum, also used on the single-stage models, offers the ultimate in chemical resistance and is ideal for severe duty, aggressive gas applications.

The finished assembly is then encased in an outer body shell of anodized aluminum tubing. Gaskets and check valves are neoprene or viton, depending on the model, tie rods are steel.

Efficient, reliable, straight-through venturi design (multi-stage model shown here)



Single- and Multi-stage Product **Overview**

Model Number	Air Flow CFM @ 0 inHg	Air Flow m³/h @ 1000 mbar	Maximum Vacuum inHg	Maximum Vacuum mbar	Air Consumption CFM @ psi	Air Consumption m³/h @ bar	Page Number
Single-stage High Vacuum Series							
*VG-005-00-00	.2	0,3	27	99	0.46 @ 30-75	0,78 @ 2,1-5,2	5
*VG-010-00-00	.95	1,6	26	133	1.60 @ 30-75	2,72 @ 2,1-5,2	5
*VG-015-00-00	2.2	3,7	27	99	3.50 @ 30-75	5,95 @ 2,1-5,2	5
*VG-020-00-00	4	6,8	26	133	6.40 @ 30-75	10,87 @ 2,1-5,2	5
Single-stage High Flow Series							
*VG-007-00-00	.46	0,78	16	420	.49 @ 70	0,83 @ 4,83	7
VG-012-00-00	1.6	2,7	16	420	1.90 @ 70	3,22 @ 4,83	7
*VG-022-00-00	6.8	11,6	17	420	7.09 @ 70	12.05 @ 4,83	7
VG-340-M0-00	34	57,8	15	455	26.40 @ 80	44,86 @ 5,52	7
Multi-stage High Vacuum Series							
*VG-065-00-00	6.8	11,6	25	99	2.7 @ 68	4,59 @ 4,69	9
*VG-130-00-00	12	20,4	26	99	4.9 @ 68	8,32 @ 4,69	9
*VG-260-00-00	17	28,9	26	133	7.0 @ 68	11,89 @ 4,69	9
Multi-stage High Flow							
*VG-075-00-00	12	20,4	20	335	3.4 @ 87	5,80 @ 6,00	11
*VG-140-00-00	16	27,2	20	335	5.5 @ 87	9,34 @ 6,00	11
Combined High Performance							
VG-260-02-00	34	57,8	26	133	14 @ 68	23,80 @ 4,69	13
VG-260-04-00	68	115,5	26	133	28 @ 68	47,58 @ 4,69	13
VG-260-08-00	136	231,1	26	133	56 @ 68	95,15 @ 4,69	13
*Metric models available for these models							
Accessories							15
Vacuum Cups and Information Regarding Vacuum Cups							16

Catalog Performance **Specifications**

The specifications listed are that of a unit at sea level with an ambient temperature of 70°F (21°C), operating with normal electrical current conditions. The figures stated in this catalog are nominal approximations for models without accessories. Intake filters and exhaust mufflers, and the accumulation of contaminants in them during operation, will decrease the flow of air as well as the achievable pressure.

The units that we list in this catalog are a small portion of what we actually make. Those listed are considered “standard units” and are normally available from stock in small quantities. Variations are produced for many customers and by providing us the application specifications we might find an existing unit that fits your requirement. If we don’t and the quantity is sufficient, we will design a “special unit” for the application.

Pictorial and dimensional data is subject to change without notice.

The information presented in this catalog is based on technical data and test results of nominal units. It is believed to be accurate and is offered as an aid in the selection of Gast products. It is the user’s responsibility to determine suitability of the product for intended use and the user assumes all risk and liability whatsoever in connection therewith.

Note: Unit shown without sound attenuator.

VG-005-00-00/*MG-005-00-00
27 inHg max. vacuum, .2 CFM open flow

VG-010-00-00/*MG-010-00-00
26 inHg max. vacuum, .95 CFM open flow

VG-015-00-00/*MG-015-00-00
27 inHg max. vacuum, 2.2 CFM open flow

VG-020-00-00/*MG-020-00-00
26 inHg max. vacuum, 4 CFM open flow

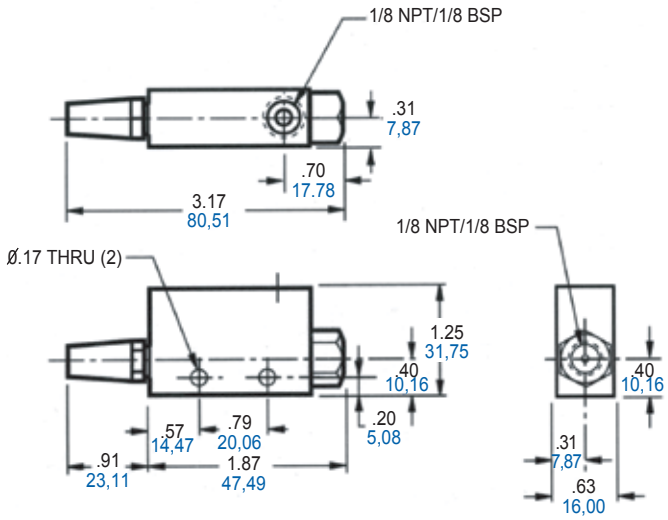
*Metric models sold in Europe are fitted with metric gauges

PRODUCT FEATURES
- Low cost vacuum source
- Compact size/easy to mount
- No moving parts/zero maintenance
- Very quiet operation

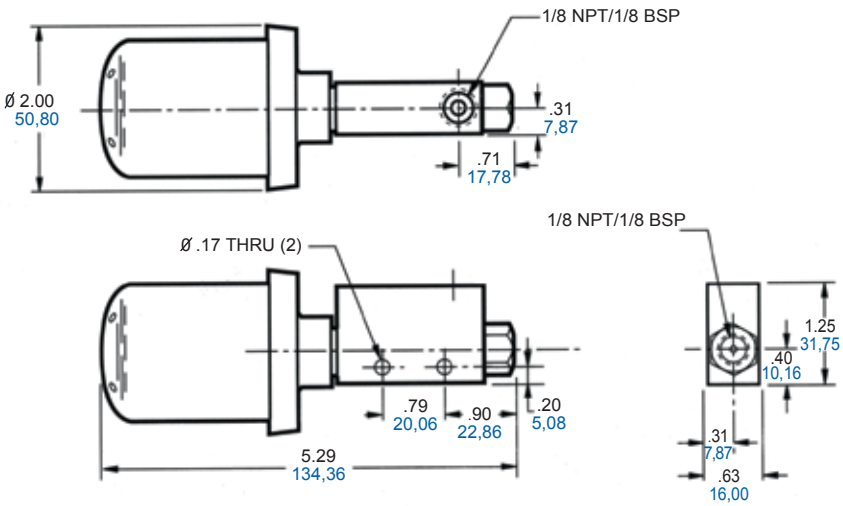
INCLUDES
- VG2016 sound attenuator (VG-005)
- B300Q sound attenuator (VG-010)
- VG2045 sound attenuator (VG-015)
- VG2055 sound attenuator (VG-020
- Metric version sold in Europe are fitted with metric gauges

Product Dimension - with Sound Attenuators (inches, mm) Reference only

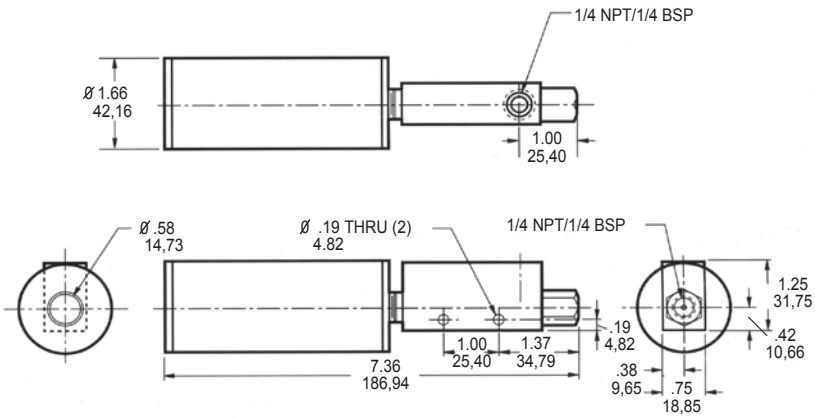
VG-005-00-00/MG-005-00-00



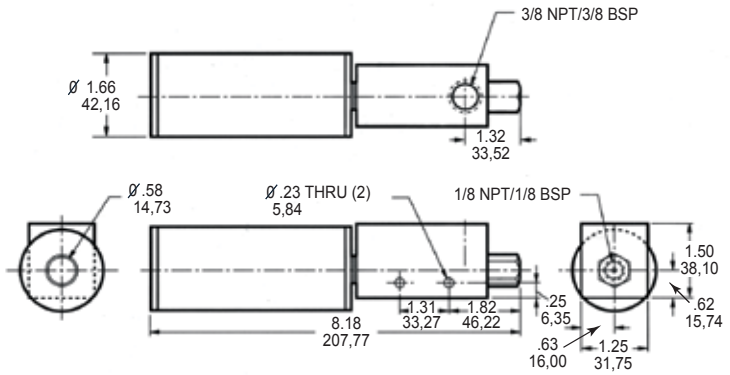
VG-010-00-00/MG-010-00-00



VG-015-00-00/MG-015-00-00



VG-020-00-00/MG-020-00-00



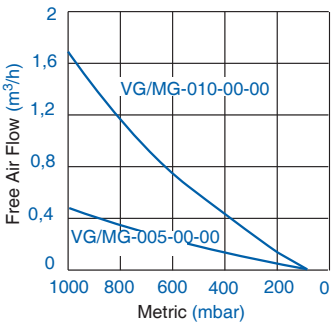
Product Specifications

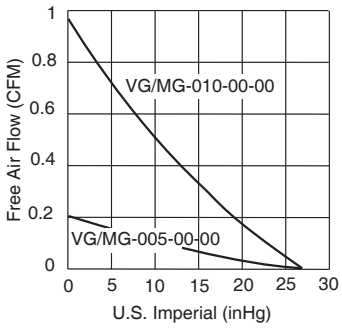
Model Number	Air Consumption @ Suggested Operating Pressure (30-75 psi) m³h @ mbar		Vacuum Port Size		Supply Air Port Size		Net Weight	
	CFM	m³h	NPT	BSP	NPT	BSP	oz	grams
VG-005-00-00, MG-005-00-00*	.46	0,78	1/8"	1/8	1/8"	1/8	3	85,05
VG-010-00-00, MG-010-00-00*	1.60	2,71	1/8"	1/8	1/8"	1/8	3	85,05
VG-015-00-00, MG-015-00-00*	3.50	5,90	1/4"	1/4	1/8"	1/8	6	170,10
VG-020-00-00, MG-020-00-00*	6.40	10,90	3/8"	3/8	1/8"	1/8	12	340,20

*Metric model

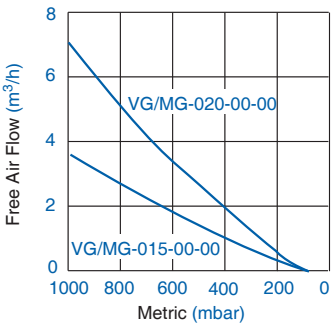
Product Performance

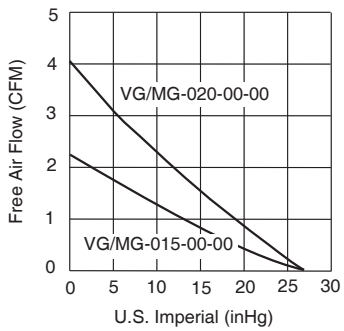
Models
VG-005/MG-005
VG-010/MG-010





Models
VG-015/MG-015
VG-020/MG-020





Note: Unit shown without sound attenuator

VG-007-00-00/*MG-007-00-00
16 inHg max. vacuum, .46 CFM open flow

VG-012-00-00
16 inHg max. vacuum, 1.6 CFM open flow

VG-022-00-00/*MG-022-00-00
17 inHg max. vacuum, 6.8 CFM open flow

VG-340-M0-00
15 inHg max. vacuum, 34 CFM open flow

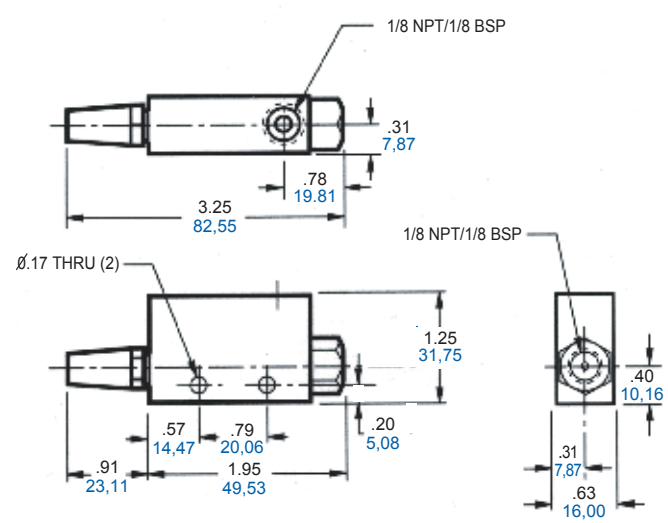
*Metric models sold in Europe are fitted with metric gauges

PRODUCT FEATURES
- Low cost vacuum source
- Compact size/easy to mount
- No moving parts/zero maintenance
- Quiet operation

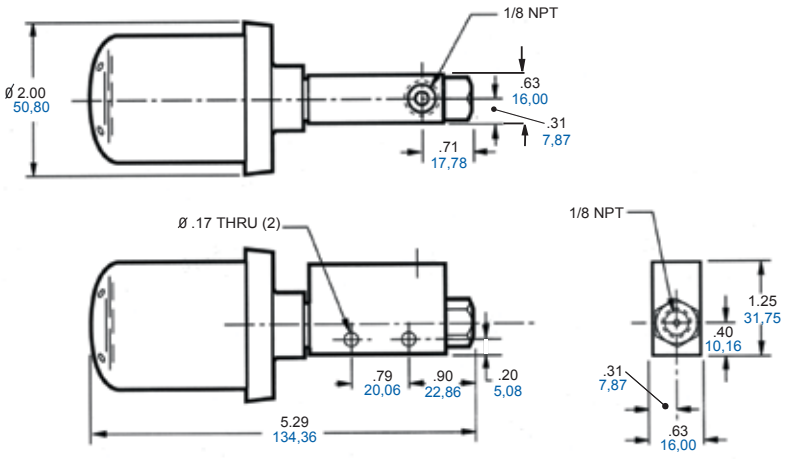
INCLUDES
- VG2016 sound attenuator (VG-007)
- B300Q sound attenuator (VG-012)
- VG2045 sound attenuator (VG-022)
- VG2140A sound attenuator (VG-280)
- Metric version sold in Europe are fitted with metric gauges

Product Dimensions - with Sound Attenuators (inches, mm)
Reference only

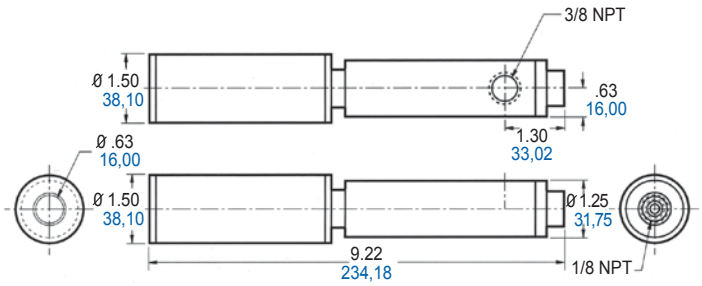
VG-007-00-00/MG-007-00-00



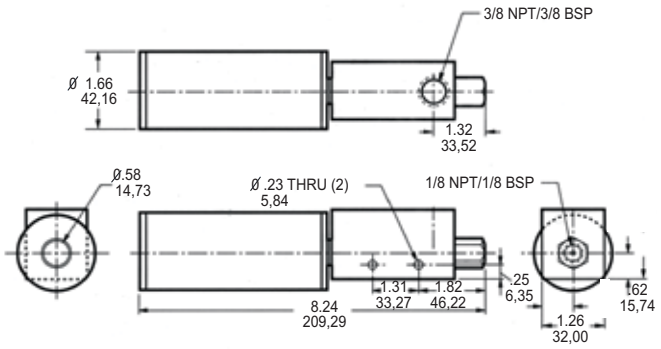
VG-012-00-00



VG-340-M0-00-00



VG-022-00-00/MG-022-00-00



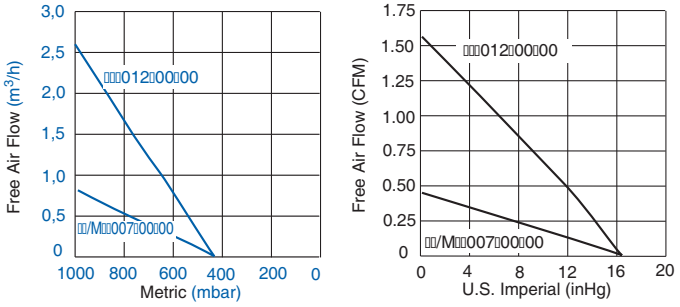
Product Specifications

Model Number	Suggested Operating Pressure	Air Consumption @ Suggested Operating Pressure (30-75 psi) m³h @ mbar		Vacuum Port Size		Supply Air Port Size		Net Weight	
		CFM	m³h	NPT	BSP	NPT	BSP	oz	grams
VG-007-00-00/MG-007-00-00*	70 psi	.49	0,83	1/8"	1/8	1/8"	1/8	3	85,05
VG-012-00-00	70 psi	1.90	3,23	1/8"	--	1/8"	--	3	85,05
VG-022-00-00/MG -022-00-00*	70 psi	7.09	12,05	3/8"	3/8	1/8"	1/8	12	340,20
VG-340-M0-00	80 psi	26.40	44,86	3/8"	--	1/8	--	8	226,80

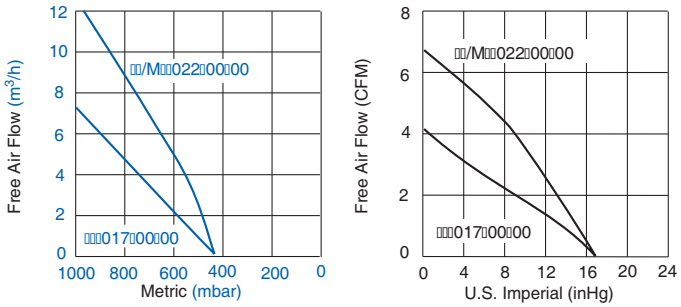
* Metric models

Product Performance

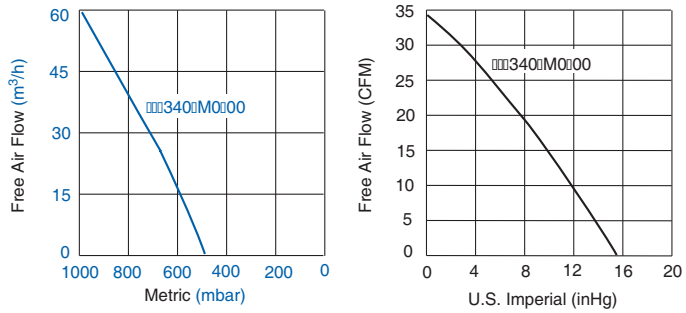
Models
VG-007/MG-007
VG-012



Models
VG-017
VG-022/MG-022



Models
VG-280
VG-340



Note: Unit shown without sound attenuator

**VG-065-00-00/*MG-065-00-00
25 inHg max. vacuum, 6.8 CFM open flow

**VG-0130-00-00/*MG-0130-00-00
26 inHg max. vacuum, 12 CFM open flow

**VG-260-00-00/*MG-260-00-00
26 inHg max. vacuum, 17 CFM open flow

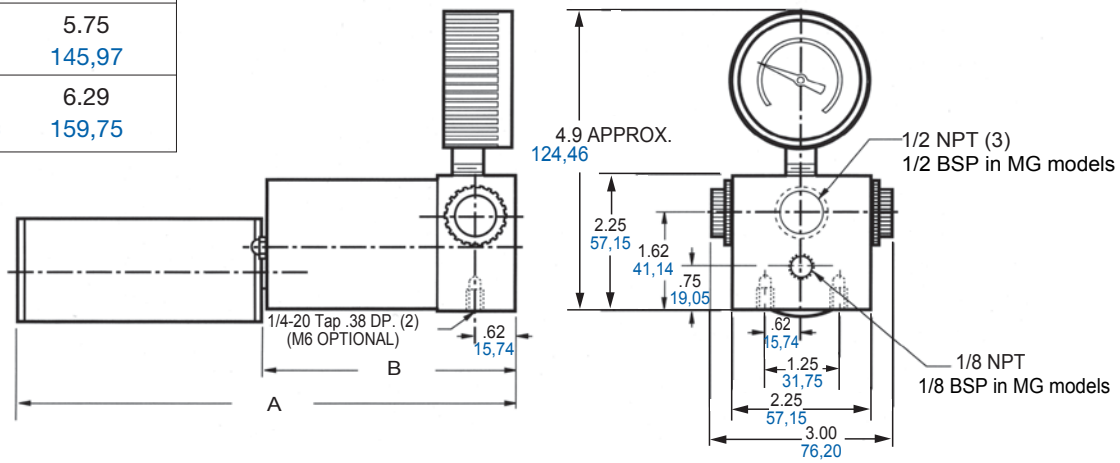
*Metric models sold in Europe are fitted with metric gauges
**These models are also available with optional viton gaskets and valves.

PRODUCT FEATURES
- Low air consumption
- Lightweight Delrin® plastic construction for chemical resistance
- Quiet operation

INCLUDES
- VG2045 sound attenuator (VG-065)
- VG2055 sound attenuator (VG-130, VG-260)
- AA640 vacuum gauge
- Metric version sold in Europe are fitted with metric gauges

Product Dimensions - Sound Attenuators (inches, mm)
Reference only

Model	A	B
VG-065-00-00	8.21	4.23
MG-065-00-00	208,53	107,35
VG-130-00-00	8.64	5.75
MG-130-00-00	219,45	145,97
VG-260-00-00	10.22	6.29
MG-260-00-00	259,58	159,75



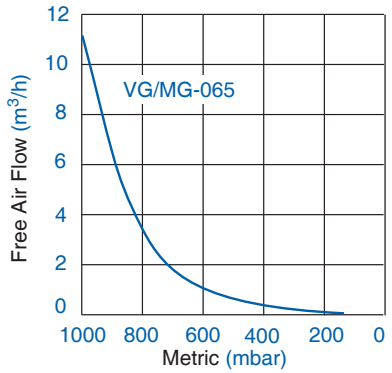
Product Specifications

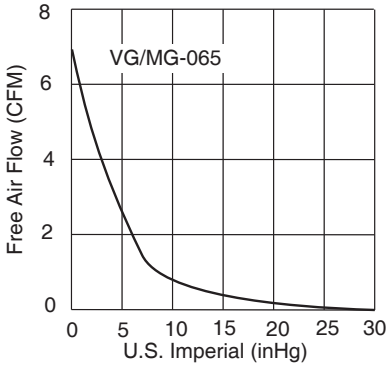
Model Number	Suggested Operating Pressure	Air Consumption @ Suggested Operating Pressure (30-75 psi) m³h @ mbar		Vacuum Port Size		Supply Air Port Size		Net Weight	
		CFM	m³h	NPT	BSP	NPT	BSP	lb/oz	Kg
VG-065-00-00/MG-065-00-00*	68 psi	2.7	4,60	1/2"	1/2	1/8"	1/8	1.3	0,54
VG-130-00-00/MG-130-00-00*	68 psi	4.9	8,33	1/2"	1/2	1/8"	1/8	1,4	0,57
VG-260-00-00/MG-260-00-00*	68 psi	7.0	11.90	1/2"	1/2	1/8"	1/8	1.6	0,62

* Metric models

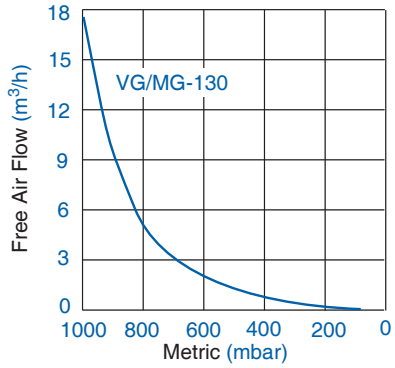
Product Performance

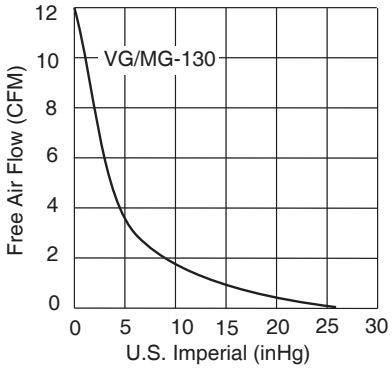
Models
VG-065
MG-065



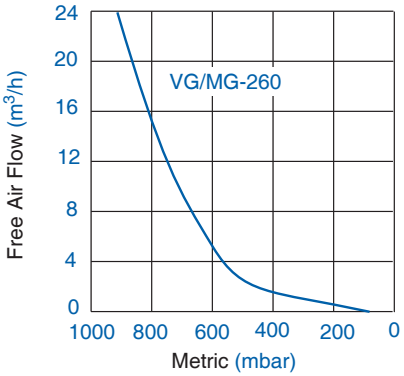


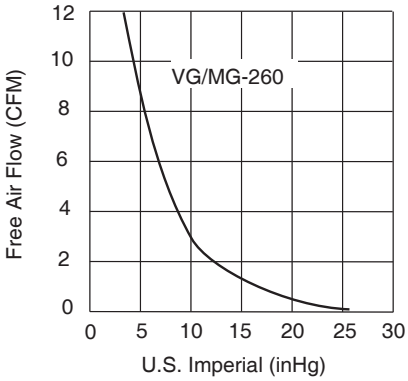
Models
VG-130
MG-130





Models
VG-260
MG-260





Note: Unit shown without sound attenuator

*VG-075-00-00/**MG-075-00-00

20 inHg max. vacuum, up to 12 CFM open flow

*VG-0140-00-00/**MG-140-00-00

20 inHg max. vacuum, up to 12 CFM open flow

*These models are also available with optional viton gaskets and valves.
**Metric models sold in Europe are fitted with metric gauges

PRODUCT FEATURES

- Low air consumption
- Lightweight Delrin® plastic construction for chemical resistance
- Quiet operation

INCLUDES

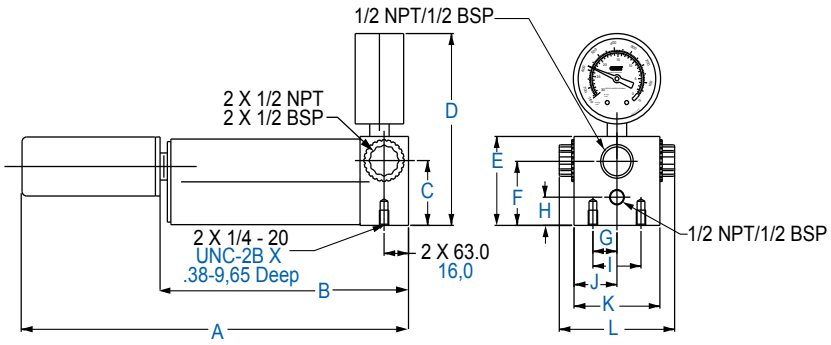
- VG2055 sound attenuator
- AA640 vacuum gauge
- Metric version sold in Europe are fitted with metric gauges

Product Specifications

Model Number	Suggested Operating Pressure	Air Consumption @ Suggested Operating Pressure (30-75 psi m³h @ mbar		Vacuum Port Size		Supply Air Port Size		Net Weight	
		CFM	m³h	NPT	BSP	NPT	BSP	lb/oz	Kg
VG-075-00-00/MG-075-00-00*	87 psi	3.4	5,78	1/2”	1/2	1/8”	1/8	1.4	0,57
VG-140-00-00/MG-140-00-00*	87 psi	5.5	9,35	1/2”	1/2	1/8”	1/8	1.6	0,62

* Metric models

Product Dimensions (inches, mm)
Reference only

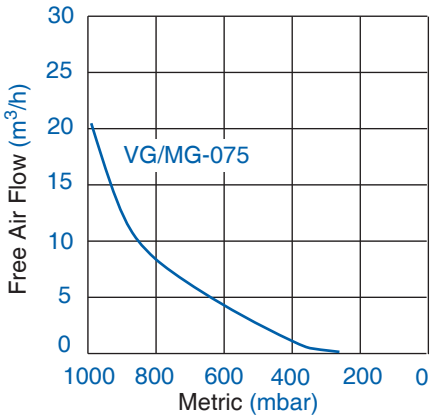


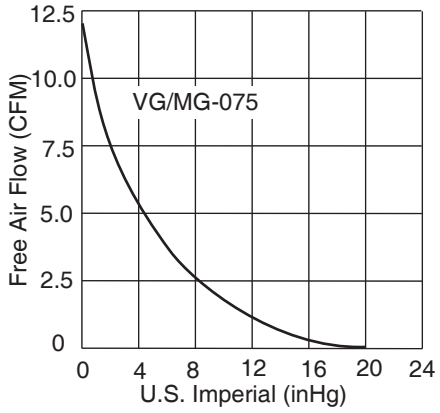
Model No.	A	B
VG-075-00-00	10.21	6.22
MG-075-00-00	259.3	158,00
VG-140-00-00	10.45	6.70
MG-140-00-00	265,3	170,18

C	D	E	F	G	H	I	J	K	L
1.61	4.78	2.21	159.0	.62	.70	1.24	1.11	2.21	2.97
41,01	121,34	56,25	40,5	15,75	17,84	31,5	28,12	56,25	75,55

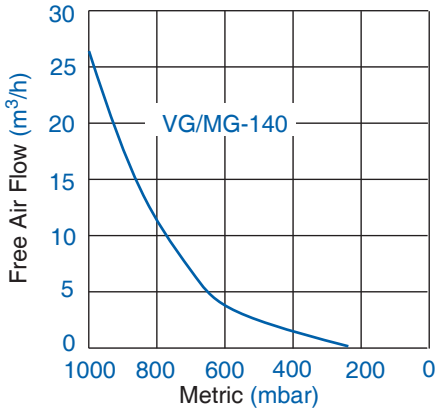
Product Performance

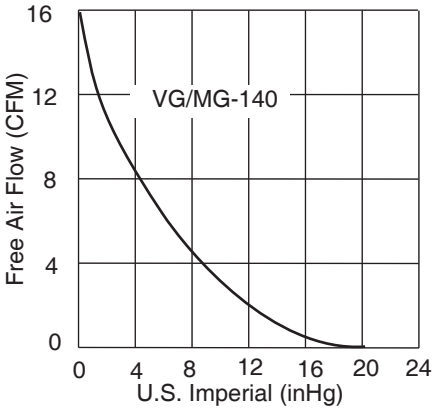
Models
VG-075/MG-075





Models
VG-140/MG-140





VG-260-02-00
26 inHg max. vacuum, 36 CFM open flow

VG-260-04-00
26 inHg max. vacuum, 71 CFM open flow

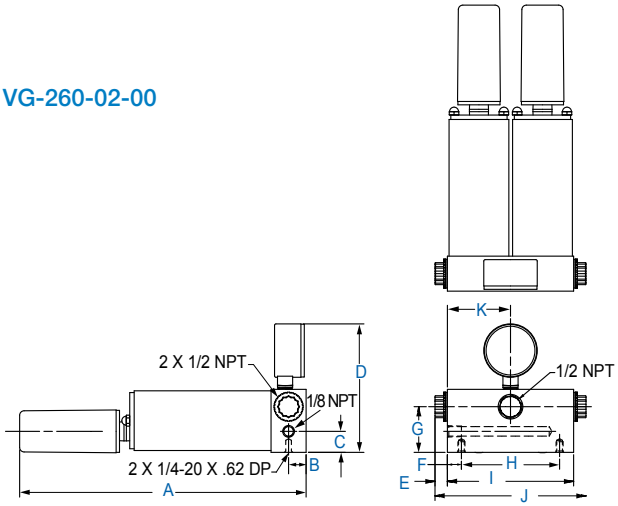
VG-260-08-00
26 inHg max. vacuum, 158 CFM open flow

PRODUCT FEATURES
- Low cost compared to competitive generators with similar performance
- Quiet operation
- Constructed of chemical resistant Delrin® plastic stages

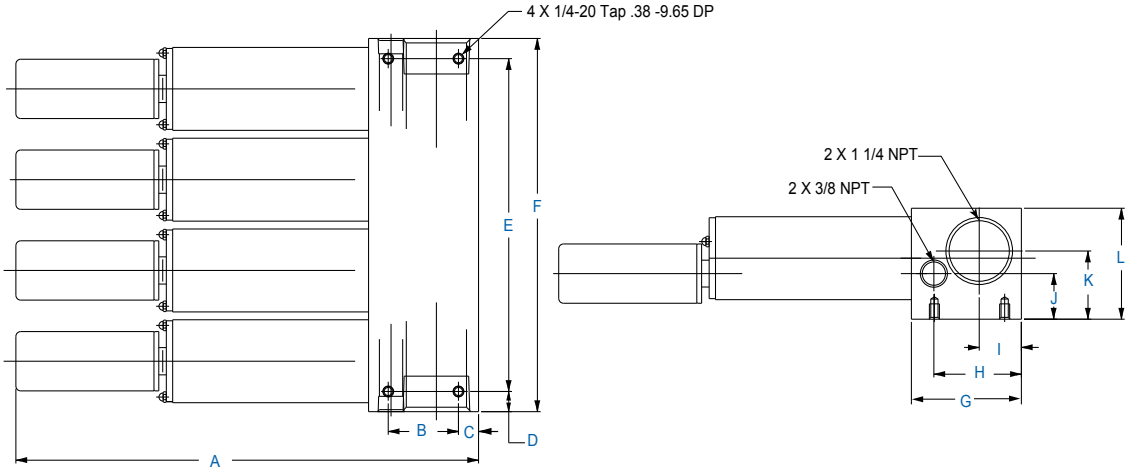
INCLUDES
- VG2055 sound attenuator

Product Dimension - with Sound Attenuators
(inches, mm) Reference only

VG-260-02-00

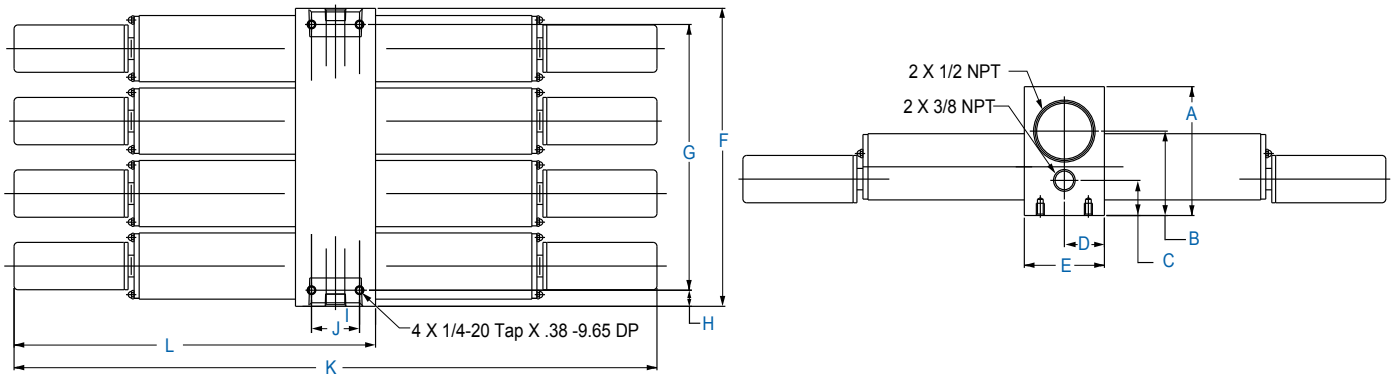


VG-260-04-00



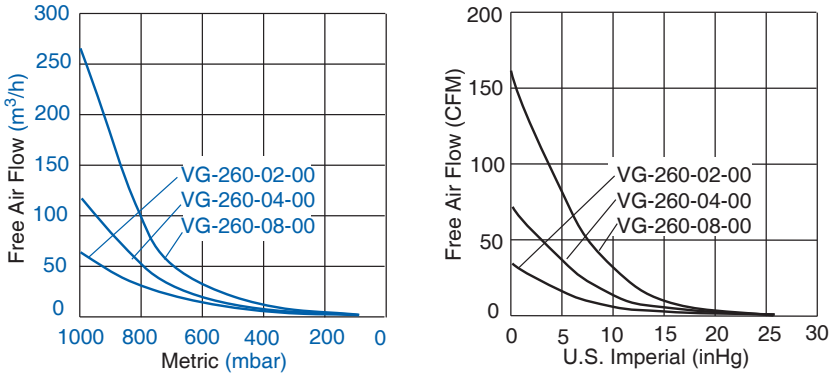
A	B	C	D	E	F	G	H	I	J	K	L
11.53	1.75	.50	.50	8.25	9.25	2.74	2.18	1.05	1.13	1.69	2.75
292,76	44,45	12,7	12,7	209,55	234,95	69,6	55,37	26,67	28,7	12,93	69,85

VG-260-08-00



A	B	C	D	E	F	G	H	I	J	K	L
4.00	2.62	1.09	1.25	2.50	9.25	8,25	.50	.50	1.50	20.07	11.29
101,6	66,55	27,69	31,75	63,5	234,95	209,55	12,7	12,7	38,1	509,83	286,66

Product Performance



Product Specifications

Model Number	Suggested Operating Pressure	Air Consumption @ Suggested Operating Pressure (30-75 psi) m³h @ mbar		Vacuum Port Size		Supply Air Port Size		Net Weight	
		CFM	m³h	NPT	BSP	NPT	BSP	lb/oz	Kg
VG-260-02-00	68 psi	1.4	2,55	1/2"	—	1/8"	—	3.0	1,36
VG-260-04-00	68 psi	2.8	4,76	1 1/4"	—	3/8"	—	11.0	5,00
VG-260-08-00	68 psi	5.6	9,52	1 1/2"	—	3/8"	—	16.8	7,48

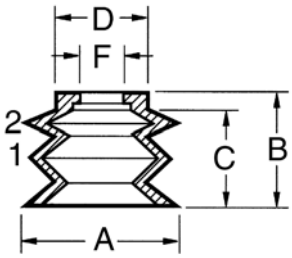
Replacement Parts

Replacement Parts	Part Number	Description	Used on
Vacuum Gauge	AA640	2” Dial face vacuum gauge 0-30 inHg, 1/4” NPT bottom mounting	Multi-stage configurations
Silencers	B300Q	1/8” NPT plastic enclosure with replaceable felt lining	VG-010-00-00 VG-012-00-00
	VG2016	1/8” NPT sintered bronze muffler	VG-005-00-00 VG-007-00-00
	VG2045	1/4” NPT PVC enclosure with non-replaceable felt lining	VG-015-00-00, VG017-00-00 VG-065-00-00
	VG2055	3/8” NPT PVC enclosure with non-replaceable felt lining	VG-020-00-00, VG-022-00-00 VG-075-00-00, VG-130-00-00 VG-140-00-00, VG-260-00-00
	VG2140	1/2” NPT PVC enclosure with non-replaceable felt lining	VG-340-M0-00
Repair Kit	K549	Replacement gaskets and valves	Aluminum body multi-stage models (on combinations use 1 per generator)
	K586	Replacement gaskets and valves	Plastic body multi-stage models, viton (on combinations use 1 per generator)

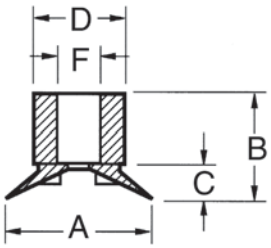
GAST Vacuum Cups to 5 7/8” Diameter

PRODUCT FEATURES

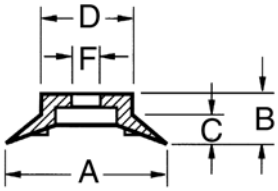
- Flat and bellows options for a variety of lifting surfaces
- Durable, tear-resistant vinyl material
- Threaded or ‘slip-fit’ mounting options available



Bellows style cups can be used for irregularly shaped surfaces or for situations where a vertical offset motion is desired.



Flat cups with a slip style mounting should be used for light duty applications when threaded connections are not present or practical.



Flat cups with a threaded mounting should be used for heavy lifting applications.

Part Number	Style	Mounting	A	B	C	D	F	Cleats
VG2095	Bellows	.36” Slip	1.0	1.42	.62	.62	.38	Yes
VG2097	Bellows	.25” FNPT	2.0	1.86	1.12	.75	.25	No
VG2099	Flat	.375” FNPT	3.25	1.06	.44	2.25	.375	Yes
VG2100	Bellows	.375” FNPT	3.31	2.38	2.18	2.38	.375	No
VG2101	Flat	.375” FNPT	4.75	1.18	1.0	1.62	.375	Yes
VG2102	Flat	.5” FNPT	5.87	.78	.78	5.06	.5	Yes

Miscellaneous Information on Vacuum Cups

Lifting Force in Pounds (Safety Factor F = 1)

Cup	10 inHg	15 inHg	20 inHg	27 inHg
VG2095	3.8	5.8	7.8	10
VG2097	15	23	30	41
VG2099	40	61	81	110
VG2100	42	63	84	114
VG2101	87	130	174	235
VG2102	132	199	265	358

Selecting and Sizing Vacuum Cups

One of the keys to getting the most performance out of vacuum pumps and generators is selecting the right size, number, and type of vacuum cups.

Selecting the right size is at first glance a fairly straightforward process. Cup diameters are generally selected based on the weight of the object to be lifted. Most manufacturers will supply charts (see next page) that you can use, to quickly find the lifting force of any size vacuum cup. Or, you can use the following formula to calculate the theoretical lifting force of any size vacuum cup:

W = Force in lbs
C = Area of cup (in 2)
P = Vacuum level - inHg
F = Safety Factor
W = (C x P x 14.7) / (F x 29.92)

The key word here, of course, is theoretical. While the chart and formula will get you in the ball park, selecting the right size cup means taking several variables into consideration.

For example, keep in mind that it's best not to start with the smallest diameter vacuum cup that you can buy. It will take a lot of vacuum to make it work. Try to use the largest cup possible to ease the requirements on your vacuum pump. It's far easier and more economical to get an adequately-sized vacuum cup than to overwork your vacuum pump. This helps ensure long pump life.

It is also much more economical. High levels of vacuum increase energy requirements dramatically. Going from 60% to 90% of vacuum (18 inHg versus. 27 inHg) may increase vacuum force by a factor of 1.5, but the energy needed to produce that force increases by a factor of 10.

Choosing a slightly larger cup also adds safety to your system. A safety factor should always be used in actual cup sizing too, even though cup diameter increases about 10% during use. If the object is lifted vertically, a safety factor of four (4x) should be used. For horizontal movement, a safety factor of two (2x) is recommended.

Acceleration during the lift is another important factor to consider when sizing vacuum cups. Formulas exist to calculate the affect of acceleration, but they are very difficult to work with. It is easiest and perhaps best to use a higher safety factor and carefully test cups in these applications.

Calculating the Lifting Force of Suction Cups

Below is a convenient chart that will give you the calculated theoretical weights of different diameter suction cups will lift using various degrees of vacuum.

In using this chart, keep in mind that it's best not to start with the smallest diameter suction cup you can buy, because you'll need lots of vacuum to make it work. Try to use the largest cup possible to ease the load on your vacuum pump. It's far easier and more economical to get an adequate-sized suction cup than to overload your vacuum pump. This way, you'll help assure a long pump life.

To use this chart, first determine the weight you want to lift. Weight figures in pounds are shown in the nine vertical columns under the "inches Hg vacuum" heading. Then locate the weight figures closest to your needs under one of the columns listing the appropriate amount of vacuum you have available.

The proper suction cup diameter for the weight you wish to lift can then be determined by looking at the figures in the "suction cup diameter" column at the left, opposite the weight figures you have chosen.

Figures shown in the chart are the theoretical calculated ones for these weights. Therefore, after you find what suction cup diameter you need under these theoretical conditions, you should add a safety factor commensurate with your particular lifting application. For example, you should allow for conditions such as the type of load you are picking up, the conditions under which you are picking up the load, the suction cups used, and the vacuum you have available.

Choosing a slightly larger cup also adds safety to your system. A safety factor should always be used in actual cup sizing too, even though cup diameter increases about 10% during use. If the object is lifted vertically, a safety factor of four (4x) should be used. For horizontal movement, a safety factor of two (2x) is recommended.

Acceleration during the lift is another important factor to consider when sizing vacuum cups. Formulas exist to calculate the affect of acceleration, but they are very difficult to work with. It is easiest and perhaps best to use a higher safety factor and carefully test cups in these applications.

It's not uncommon to apply a 200 to 500 percent extra margin of lifting power. Each situation is different, of course.

Since different shape suction cups are available, we're also including the following two formulas to help you calculate lifting force.

Using the formula:

lbs = Area (sq. in.) X .49 (inHg); lbs = Pi 2 X .49 (inHg)

Calculated Lifting Force in Pounds

SUCTION CUP DIAMETER	5 inHg	10 inHg	15 inHg	20 inHg	22 inHg	24 inHg	26 inHg	27 inHg	28 inHg
1”	2	4	6	8	8.5	9	10	10.5	11
2”	8	15	23	31	34	37	40	42	43
3”	17	35	52	69	76	83	90	94	97
4”	31	62	93	123	136	148	160	167	173
5”	48	96	145	193	212	231	251	260	270
6”	69	139	208	278	306	333	361	375	389
7”	95	189	284	378	416	454	491	510	529
8”	123	247	370	494	543	593	642	667	691
9”	156	312	469	625	687	750	812	843	875
10”	193	386	579	772	849	926	1003	1042	1080
11”	233	467	700	934	1027	1120	1214	1260	1307
12”	278	556	833	1111	1222	1333	1444	1500	1556
13”	378	756	1134	1512	1664	1815	1966	2042	2117
15”	434	868	1302	1736	1910	2083	2257	2344	2430

Material Affects Size of Cups

The material of the object being moved will also affect cup diameter. For example, to lift very porous materials such as corrugated cartons or denim material you should use smaller diameter cups. Larger cups may result in leakage. You can, however, use larger cups if you are using a high-flow pump because the greater flow capabilities will compensate for the inherent leakage of larger cups.

The type of material being moved can also affect the number of cups used. With thin metal plates, for example, you need six or eight evenly distributed cups instead of just two or three needed to lift the actual weight of the plates. This prevents damage to the sheet metal from bowing during lifting.

The configuration of the work piece is also important. An irregularly-shaped object can be lifted, but care must be taken to select proper diameter cups. Plus, the cups must be distributed so that the object is balanced around the center of gravity during lifting. Items with curved surfaces may even require bellows cups so that the cup conforms to the curves.

Caution: The metallic stem of the pad should not come in contact with the surface of the object being lifted. In addition, vacuum should be kept as low as possible.

Chemical and Solvent Resistance for Gast Vacuum Cups

Symbols Used to Indicate Oil, Chemical, and Solvent Resistance are as Follows:

E Excellent - Little if any deteriorating effect.
NR Not recommended - Causes strong deteriorating effect.
SS Strong solvent - Causes severe swelling and strength loss - only use for superficial washing.
MS Mild solvent - Causes minor swelling after long exposure use for limited washing.
SE Swells Elastomer - Swells elastomer after long exposure.

Acetic Acid, dil	E	Cocoanut Oil	E	Methyl Ethyl Ketone	SS	Sodium Hydroxide	E
Acetone	SS	Copper Chloride	E	Methyl Butyl Ketone	SS	Sodium Hypochlorite	NR
Aluminum Chloride	E	Copper Sulfate	E	Milk	E	Sodium Nitrate	E
Aluminum Sulfate	E	Corn oil	E	Mineral Oils	E	Sodium Perborate	E
Alums	E	Cottonseed Oil	E	Mineral Spirits	MS	Sodium Peroxide	NR
Ammonium Carbonate	E	*Cresol	E	Molasses	E	Sodium Phosphates	E
Ammonium Chloride	E	Cresote	E	Mustard	E	Sodium Silicate	E
Ammonium Hydroxide	E	Denatured Alcohol	E	Naptha	MS	Sodium Sulfate	E
Ammonium Nitrate	E	Diesel Oil	E	Nickel Chloride	E	Sodium Sulfide	E
Ammonium Nitrite	E	Ethyl Alcohol	E	Nickel Sulfate	E	Sodium Thiosulfate	E
Ammonium Persulfate	NR	Ethyl Cellulose	E	Nitric Acid, dil	NR	Soya Bean Oil	E
Ammonium Phosphate	E	Ethylene Glycol	E	Oleic Acid	E	Stannic Chloride	E
Ammonium Sulfate	E	Ferric Chloride	E	Olive Oil	E	Stearic Acid	E
Ammonium Sulfide	E	Ferric Sulfate	E	Oxalic Acid	E	Sugar Beet	E
Asphalt	E	*Fermic Acid	E	Palmitic Acid	E	Sugar Cane	E
Barium Chloride	E	Fuel Oil	E	Parafin	E	Sulfur	E
Barium Hydroxide	E	Furfural	SS	Perchloric Acid	NR	Sulfuric Acid, dil	E
Barium Sulfide	E	Gasoline	E	Petroleum Oils	E	Sulfurous Acid	E
Beet Sugar Liquors	E	Glue	E	*Phenol	E	Tannic Acid	E
Benzene (Benzol)	MS	Gelatin	E	Phosphoric Acid dil	E	Tanning Liquor	E
Borax	E	Glucose	E	Pine Oil	E	Tar	E
Boric Acid	E	Glycerin	E	Pine Resin	E	Tartaric Acid	E
Butter	E	Hydraulic Oils	SE	Potassium Chloride	E	TolUene (Toluol)	MS
Calcium Bisulfate	NR	Hydrochloric Acid, dil	E	Potassium Hydroxide	E	Trichloroethylene	MS
Calcium Chloride	E	Hydrogen Peroxide	NR	Potassium Nitrate	E	Tricresyl Phosphate	E
Calcium Hydroxide	E	Kerosene	E	Potassium Sulfate	E	Trisodium Phosphate	E
Calcium Hypochlorite	E	Lacquers	SE	Salt Water	E	Tung Oil	E
Calcium Nitrate	E	Lacquer Solvents	SS	Sewage	E	Turpentine	E
Calcium Sulfide	E	Lactic Acid	E	Shellac	E	Urea	E
Caliche/Sodium Nitrate	E	Lard	E	Silicone Fluid	E	Urine	E
Cane Sugar	E	Lincolic Acid	E	Silicone Oil	E	Vegetable Oils	E
Carbon Bisulfide	NR	Linseed Oil	E	Soap Solutions	E	Vinegar	E
Carbon Tetrachloride	MS	Lubricating Oils	E	Soda Ash	E	Water	E
Castor Oil	E	Magnesium Chloride	E	Sodium Bicarbonate	E	Whiskey and Wine	E
Chinawood Oil	E	Magnesium Hydroxide	E	Sodium Borate	E	*Xylene	MS
Chlorinated Solvents	MS	Magnesium Sulfate	E	Sodium Bisulfate	E	Zinc Chloride	E
Chromic Acid	E	Meat and Bone Meal	E	Sodium Carbonate	E	Zinc Sulphate	E
Citric Acid	E	Methyl Alcohol	E	Solium Chloride	E		

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