KINNEY®

AF

VACUUM PUMP SELECTOR GUIDE

TUTHILL
Vacuum & Blower Systems

REGISTERED
VACUUM & BLOWER SYSTEMS
ISO 9001
TUTHILL CORPORATION
INTERNATIONAL QUALITY STANDARD

KT

KT Single-Stage Rotary Piston Pumps

KT pumps are quiet running vacuum pumps with high pumping capacity at both high and low pressures. The triplex piston design is inherently dynamically balanced and is practically vibration-free. Even in dirty applications, the KT enjoys unequalled durability, as there is no metal-to-metal contact between the pump piston and the cylinder; clearances are filled with oil. All KT models include an integral, positive pressure lubrication system to insure reliable lubrication at all pressure levels. KT pumps are water-cooled; however, optional air-cooling systems are available on several sizes. Adjustable gas ballast valves are included as standard equipment for handling water and other vapor loads.

LP series KT pumps incorporate all the features of the standard KT pumps, in addition to an integral oil mist eliminator and a compact, low-profile design.

Typical Applications:
Vacuum Packaging
Vacuum Furnaces
Vacuum Coating

Model	CFM / m³/h	HP / kW
KT-170LP	100/170	5/3.7
KT-150C	144/245	7.5/5.5
KT-275LP	160/272	10/7.5
KT-300D	296/503	15/11
KT-505LP	296/503	15/11
KT-500D	484/822	30/22
KT-840VFP	484/822	30/22
KT-850D	778/1322	40/30
KT-1350VFP	778/1322	40/30

KC, KTC

KC and KTC Two-Stage Rotary Piston Pumps

KC and KTC rotary piston vacuum pumps achieve the lowest possible pressures from mechanical pumps and are recommended for applications where the operating pressure is below 0.1 Torr (0.13 mbar).

As there is no metal-to-metal contact from the clearances being filled with oil, these two-stage pumps are extremely rugged and reliable. KC and KTC pumps are air-cooled with the exception of the KTC-112, which is water-cooled (optional air-cooling systems are available). Adjustable gas ballast valves are included as standard equipment for handling water and other vapor loads.

The triplex piston design incorporated into the KTC pumps is inherently dynamically balanced and is practically vibration-free.

Typical Applications:
Evacuating Refrigeration Systems
Liquid Gas Storage
Brake Filling Systems
Low-Pressure Chemical Vapor Deposition (LPCVD)
Silicon Crystal Growing
Leak Detection

Model	CFM / m³/h	HP / kW
KC-5	5/8.5	0.33/0.25
KC-8	8/14	0.5/0.37
KC-15	15/25	1/0.75
KTC-21	21/35	1.5/1.1
KTC-60	60/102	3/2.2
KTC-112	107/182	7.5/5.5

KD, KDH

KD and KDH Single-Stage Duplex Rotary Piston Pumps

KD and KDH vacuum pumps are belt-driven, low-speed rotary piston pumps. These pumps enjoy unparalleled ruggedness and reliability; some have been in system operation for over 70 years. This reliability is due to no metal-to-metal contact from the clearances being filled with oil. Gas ballast and their large oil capacity enable the KD and KDH models to handle moderate water or other vapor loads.

KD models are air-cooled, KDH models are water-cooled.

Typical Applications:
Drying Chambers
Degasifiers
Filling Machinery
Evacuation of Process Chambers

Model	CFM / m³/h	HP / kW
KD-30	33/56.1	1.5/1.1
KD-50	52/88.4	2/1.5
KDH-130	134/227	5/3.7
KDH-150	150/255	7.5/5.5

KLRC

KLRC Liquid Ring Vacuum Pumps

KLRC liquid ring vacuum pumps are ideally suited for pumping wet mixtures and even slugs of liquid. They are available in standard, all iron construction (no yellow metals) and 316 stainless steel. Liquid ring pumps often require water-cooling, but air-cooling systems are available.

Complete engineered system solutions, including instrumentation, controls, piping and valves; self-contained liquid recovery and recirculation are also available.

KLRC liquid ring vacuum pumps can pull down as low as 4 Torr (5.3 mbar a). However, low-pressure performance is limited by the vapor pressure of the sealing liquid, which can be water, oil or process liquids.

Typical Applications:
Chemical and Pharmaceutical Processing
Vapor Recovery
Deaeration
Extruders
Crystallizers
Central Vacuum Systems

Model	CFM / m³/h	HP / kW
KLRC-40	35/60	5/3.7
KLRC-75	70/120	5/3.7
KLRC-100	100/170	7.5/5.5
KLRC-125	130/220	10/7.5
KLRC-200	205/350	15/11
KLRC-300	300/510	25/18.5
KLRC-525	560/950	50/37
KLRC-775	830/1410	75/56
KLRC-950	990/1680	100/75

AF

A Series Liquid Ring Vacuum Pumps

AF single-stage "A" series and vacuum pumps are simplistic in design, rugged in construction and built to run in the most severe of industrial conditions. With no metal-to-metal contact, it is not unusual for these pumps to run in 24/7 operation for years without maintenance.

These "abuser-friendly" pumps are vibration-free and environmentally friendly, with no oil used for lubrication, and no oil discharged to atmosphere. Complete, self-contained systems, including liquid recovery and recirculation, are also available.

"A" series single-stage pumps pull down to 29" Hg (25 Torr [33 mbar a]).

Typical Applications:
Filtration
Solvent Distillation/Vapor Recovery
Sterilization
Autoclaves
Degasifiers
Extruders
Deaeration
Evaporators

Model	CFM / m³/h	HP / kW
A5	10/17	1 / 0.75
A10	16/27	1.5/1.1
A15	22/37	2/1.5
A20	35/59	3/2.2
A75	80/136	5/3.7
A100	115/195	7.5/5.5
A130	150/255	10/7.5
A200	220/374	15/11
A300	300/510	20/15
A600	625/1062	40/30

SDV

Dry Screw Vacuum Pumps

The SDV dry screw vacuum pump operates without oil or water in the pumping chamber, and with its straight-through design, the SDV can handle both condensable vapors and some solids without leaving residue. There is no metal-to-metal contact inside the pumping chamber, so wear is greatly reduced. The Kinney SDV dry screw pump is water-cooled, but self-contained air-cooled coolant recirculation systems are available.

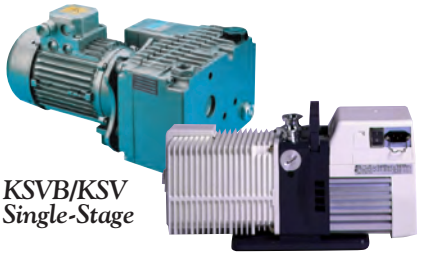
Typical Applications:
Chemical and Pharmaceutical Processing
Solvent Recovery
Forming
Crystallization
Dry Etching
Sputtering
Vapor Recovery

SDV pumps are variable-pitch, to increase efficiency, and lower temperatures. SDV pumps are also capable of full pumping speed from atmospheric pressure to 1 Torr (1.3 mbar a); however, the SDV can achieve ultimate vacuum as low as 0.01 Torr (0.013 mbar a).

Model	CFM / m³/h	HP / kW
SDV-120	71/120	5/3.7
SDV-200	106/180	5/3.7
SDV-320	188/320	10/7.5
SDV-430	253/430	15/11
SDV-800	441/750	20/15
SDV-1500	882/1500	50/37
SDV- 2700	1588/2700	75/55

Complete engineered system solutions, including instrumentation, controls, piping and valves, and self-contained coolant recirculation, are also available.

KSVB/KSV, KVAC



KSVB/KSV
Single-Stage

KVAC
Two-Stage

Rotary Vane Vacuum Pumps

KSVB/KSV rotary vacuum pumps are ideally suited for clean or moderately contaminated applications when suction filters are fitted to the pump. KSVB/KSV pumps incorporate direct driven motors and integral oil mist eliminators. Gas ballast valves are standard for vapor handling.

Typical Applications:
Vacuum Packaging
Meat Packing
Vacuum Chucking & Holding
Central Vacuum Systems
Medical/Dental Vacuum
Electronic Assembly
Plastic Thermoforming
Food Processing

Model	CFM / m³/h	HP / kW
KSVB-25	15 / 25	1.5 / 1.1
KSVB-40	25 / 47	2 / 1.5
KSVB-65	38 / 64	2.5 / 1.8
KSVB-100	62 / 105	4 / 3
KSV-200	130 / 220	7.5 / 5.5
KSV-300	200 / 340	10 / 7.5
KSV-500	336 / 570	15 / 11
KSV-630	495 / 840	25 / 18.5
KSV-1200	677 / 1150	30 / 22

KVAC rotary vane vacuum pumps are utilized in laboratories and industry.

All models include gas ballast valves and KF flanges. A range of matching KF fittings is available from stock.

Model	CFM / m³/h	HP / kW
KVAC-2	1.4/2.4	0.25/0.18
KVAC-5	3.8/6.5	0.75/0.56
KVAC-10	6.8/11.6	0.75/0.56
KVAC-15	11/19	0.75/0.56
KVAC-21	15/25	0.75/0.56
KVAC-33	23/39	1.5/1.1
KVAC-63	42/71	3/2.2

Typical Applications:
Freeze Drying
Filtering
Tube Evacuation
Vacuum Coating and Deposition
Backing Diffusion or Turbomolecular Pumps

Engineered Solutions

Booster/Rotary Piston Vacuum Pumping Systems

Kinney Booster/Rotary Piston vacuum pumping systems pump high volumes at very low pressures. A high-capacity dry rotary lobe vacuum booster is matched to a smaller rotary piston vacuum pump. For continuous operation below 1 Torr (1.3 mbar a), the vacuum booster can increase the pumping speed of the vacuum pump by a factor of 10 or more, resulting in a higher capacity system with economy of scale. For operation at higher pressure and for faster evacuations, the booster may be approximately twice the capacity of the piston pump. Conventional systems with either direct driven or V-belt driven boosters and low-profile systems with close-coupled boosters are available. Performance ranges from 200-2700 CFM (340-4590 m³/h) with ultimate vacuum levels as low as 0.2 microns.

Custom engineered system solutions to 10,000 CFM (17000 m³/h) are also available. Our application engineers can help you make the best selection for your specific needs.

Typical Applications:
Transformer Oil Drying
Vacuum Furnaces
Vapor Coating
Vacuum Packaging

Booster/Liquid Ring Vacuum Pumping Systems

Kinney Booster/Liquid Ring systems are ideal for pumping wet gas mixtures at low pressures. Sealing liquids can range from water to oil to process liquids. Oil filled systems avoid problems with corrosive contaminants and sealant liquid vapor pressures at higher temperatures. Process liquid filled systems prevent contamination of process gases with either water or oil.

A wide variety of two- and three-stage systems are available, complete with instrumentation, condensers, partial or complete sealant liquid recovery and recirculation, piping, and valves.

Typical Applications:
Vapor Recovery
Chemical Processing
Dryers and Evaporators

Booster/Dry Screw Vacuum Pumping Systems

These systems combine high pumping speed with deep vacuum levels and operate free of oil, water or other sealing liquids. Flows range to 10,000 CFM (17000 m³/h) with vacuum levels to 10 microns and below.

Complete engineered solutions are available and may include any combination of Kinney KDP or SDV vacuum pumps, vacuum boosters, electric motors, direct or V-belt drive, coolant recirculation systems, instrumentation, controls, skid piping and valves.

Typical Applications:
Chemical and Pharmaceutical Processing
Semiconductor Processing
Solvent Recovery
Forming
Crystallization
Dry Etching
Sputtering
Vapor Recovery

Our application engineers are ready to help you select the best system and combinations of components for your specific needs.

How to Use This Selector Guide

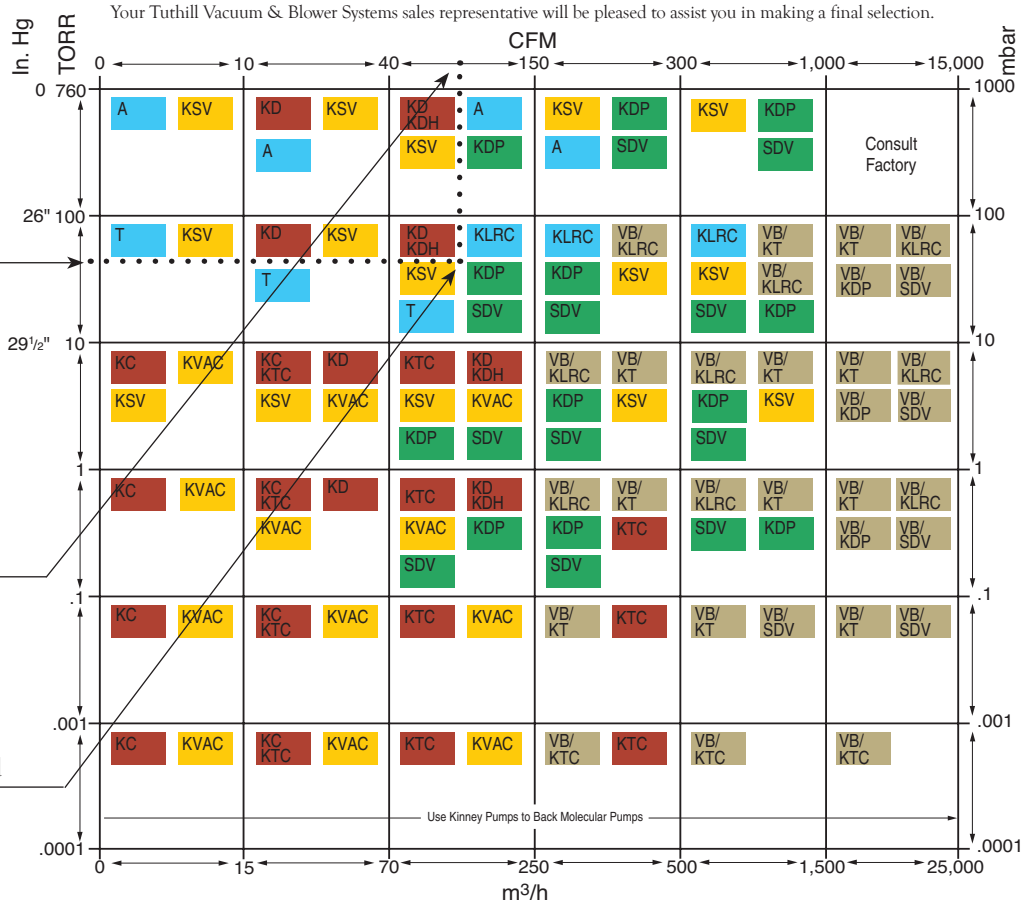
This guide is designed to help you select from the wide range of Kinney Vacuum pumps that best meet your needs. Your Tuthill Vacuum & Blower Systems sales representative will be pleased to assist you in making a final selection.

1. Determine the desired vacuum level in inches of mercury, Torr or mbar*, and locate it on the vertical scale.

2. Calculate the required capacity in cubic feet per minute or cubic meters per hour based on system volume, pump down time, gas load, and leakage (see back cover) and locate it on the horizontal scale.

3. The box where lines projected from the points on the vertical and horizontal scales intersect shows the possible pumps for the selected pressure and capacity.

4. See "Other Factors" listed on the back page to further narrow your selection.



*Note: 1 Torr= 1mm mercury absolute pressure.
To convert inches of mercury vacuum to Torr:
Torr = (30 – inches of vacuum) x 25.4 at sea level
e.g., 20 inches Hg = (30 - 20) x 25.4 = 254 Torr

EXAMPLE:

For 50 CFM and 80 Torr, the selector guide indicates that KD, KDH, KSV, KLRC, KDP, SDV, and T pumps should be considered. The color coding in the guide is coordinated with the colors of the headings of the columns on the inside pages which describe these pumps.

A review of the data in the appropriate columns will further narrow your selection to the following specific pump models: KSV-200, KLRC-100. Final selection should be based on a consideration of "OTHER FACTORS" as listed on the back cover of the folder.

How to Calculate Pump Capacity
Cubic Feet per Minute (CFM) or Cubic Meters per Hour (m^3/h)

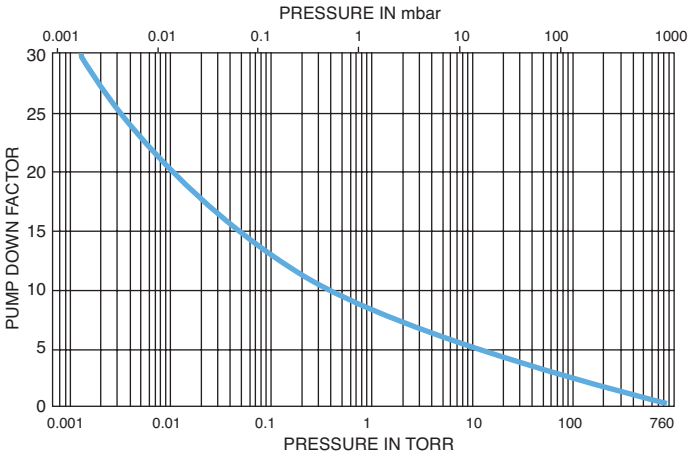
Pump capacity in CFM must be sufficient to achieve both pump down speed and to handle gas load and/or leakage. The following steps will allow you to estimate the required CFM for both. Pump selection should be based on the higher of the two numbers.

PUMP DOWN

1. Determine the volume of the system or process in ft^3 (or m^3).
2. Determine the pump down factor from the graph.
3. Divide the volume of the system ft^3 (or m^3) by the desired pump down time in minutes (or hours) and multiply by the pump down factor.

FORMULA

$$\frac{\text{System Volume } ft^3 \text{ (or } m^3\text{)}}{\text{Desired Pump Down Time min (or hr)}} \times \text{Pump Down Factor (from chart)} = \text{Pump Capacity in CFM (or } m^3/h\text{)}$$



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GAS LOAD

If you know the volume of gas at standard conditions (760 Torr, 70°F) (1013 mbar, 0°C), use this formula.

FORMULA

For English units:

$$\text{Volume} \times \frac{760}{\text{Pressure in Torr}} \times \frac{\text{Temp (°F)} + 460}{530} = \text{Pump Capacity in CFM}$$

For metric units:

$$\text{Volume in } m^3/h \times \frac{1013}{\text{Pressure in mbar}} \times \frac{\text{Temp (°C)} + 273}{273} = \text{Pump Capacity in } m^3/h$$

If you know the mass flow of gas in lbs/hr (or kg/hr), use this formula.

FORMULA

For English units:

$$\frac{\text{Gas Flow in lbs/hr X Material Factor*}}{\text{Pressure in Torr}} = \text{Pump Capacity in CFM}$$

For metric units:

$$\frac{\text{Gas Flow in kg/h X Material Factor*}}{\text{Pressure in mbar}} = \text{Pump Capacity in } m^3/h$$

		English Units	Metric Units
*Material Factor:	Air	169	842
	Water Vapor	272	1354

OTHER FACTORS

The design of the vacuum piping connecting the pump to the process may affect the selection of the vacuum pump. Piping which is too long or too small in diameter will reduce pumping speed at the process. For rapid pump down on small volumes, include the volume of the piping as part of the volume to be evacuated.

In considering the alternative pump selections for an application, take into account these factors:

- *Is the gas to be pumped dry or are there heavy vapor loads?*
- *Is the gas clean? Is it contaminated by dust or chemicals?*
- *Compare the power consumption of alternatives.*
- *Is cooling water available if required? Is air cooling an option?*

Before making final pump selection, contact your TVBS sales representative who will be pleased to assist you in selecting the right pump for your application. Call or go online to locate the sales office nearest you.

LOCATIONS WORLDWIDE

Tuthill Vacuum Systems/Europe – Heywood Lancs, England – Tel: (44) 01706 362 444

Shanghai Kinney Vacuum Equipment Co. Ltd. – Shanghai, China – Tel: 86-21-5974 5418

Tuthill Lubex – Wavre, Belgium – Tel: 32 10 22 83 34

Tuthill Latin America – Coral Gables, Florida – Tel: 305-740-3381

Tuthill Asia Pacific – Kilsyth, Victoria, Australia – Tel: 61 3 9720 6533