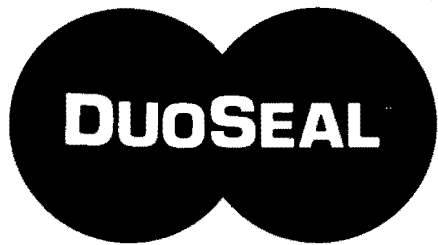


Chem Stockroom
1146 USB



vacuum pumps



owner's
manual



SARGENT-WELCH



OWNER'S MANUAL

For Use With

DuoSeal TWO-STAGE MODELS

1374, 1375, 1376, 1392, 1395, 1396, 1397, 1398, 1400, 1402, 1405

and

DuoSeal SINGLE-STAGE MODELS

1373, 1380, 1399, 1403, 1404, 1410



SARGENT-WELCH

**SCIENTIFIC COMPANY
VACUUM PRODUCTS DIVISION**

7300 NORTH LINDER AVENUE
SKOKIE, ILLINOIS 60076

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I. INSTALLATION

I-1. INTRODUCTION

This manual has been compiled not only for the care and maintenance of the DuoSeal pump now in your possession but as a helpful reference and guide for many problems which are usually associated with mechanical vacuum pumps. Take time to read these instructions carefully and preserve this manual for future reference; we think it will be useful to you.

I-2. UNPACKING

Carefully remove the pump from the shipping case and unfasten and remove the wooden skid. Preserve all paper work and inspection tags for future reference. If damage has occurred from shipment a claim must be filed with the carrier immediately; preserve the shipping container for inspection by the carrier. If you are required to communicate with your dealer or with the Sargent-Welch Scientific Company be sure to include your order number and the pump model and serial numbers for quick identification. Do not return the pump to the factory without first obtaining shipping instructions from us.

I-3. PUMP MOUNTING

I-3a. Mounted Pumps

Rubber bumpers are supplied with most of our mounted pumps, either loosely or attached. Bumpers are excellent for applications involving a semi-flexible surface such as a bench top; they help to isolate noise and eliminate creeping. For more rigid requirements the pump base may be bolted directly to a firm foundation with or without the bumpers. All DuoSeal pumps should be mounted in a horizontal plane.

I-3b. Unmounted Pumps

If you have purchased an unmounted pump, refer to Section V for information concerning the size of motor, motor pulley and belt necessary to drive your particular pump at the recommended speed.

I-4. PUMP LOCATION

The pump should be located preferably in a clean and well-ventilated area and adequate space should be provided wherever possible for routine maintenance such as changes of oil and belt adjustments and replacements. Above all, the pump should be located as closely as possible to its

system in order to utilize it most efficiently. Its location should include such determining factors as the length and size of connections, the number of bends and the type of exhaust connections.

I-5. EXHAUST PROVISIONS

Exhaust connections will be determined by the type of system to be exhausted and the desired cleanliness of the atmosphere surrounding the pump. Under normal conditions of mild evacuation nothing more than the dust cap will be necessary to cover the port. Where relatively high gas flows are involved or where the presence of oil vapor is objectionable an exhaust filter may be fastened to the exhaust port in place of the dust cap. The exhaust filters used on our pumps are capable of absorbing and restricting any vapor particle larger than 0.1 micron. Exhaust filters of this type are designed to pass no more than 21 parts per million of vapor particles larger than 0.1 micron. Where extreme exhaust conditions are encountered it is best to pipe the exhaust directly out of the building.

I-6. ELECTRICAL POWER

I-6a. Power Source Review

Review the power source and the motor rating to be sure they agree in voltage, phase and frequency. On three-phase applications the direction of rotation of the motor must be considered. Make a momentary check of rotation at the time of power installation and wiring. Momentary backward rotation of the pump is not harmful. Check the drawings in Section V for proper direction of rotation.

I-6b. Overload Protection

Motor thermal overload protection is made available by the motor manufacturer as an aid to minimizing motor failure. Overload protection is not a standard feature on all motors; its presence is determined by power requirements and availability. Motors of 1½ horsepower or larger supplied with Sargent-Welch pumps contain no overload protection. Installations of such equipment must comply with local electrical codes which dictate appropriate starter and protection devices. Motors of one horsepower or less generally will have some form of overload protection, depending upon availability. Some motors may be protected by manual reset while others will have automatic overload protection. It is strongly suggested that

you familiarize yourself with the protection supplied with your motor so that you may react accordingly in the event of an emergency. Automatic reset protection is designed to reset itself after a predetermined cooling period. If the fault to the drive remains unaltered, the motor will cycle on and off until the fault is corrected. Manual reset overload protectors prevent the motor from becoming energized until reset by hand. A red reset button protrudes from the motor shell or end shield. The motor data plate will indicate the presence of thermal protection.

I-7. VACUUM CONNECTIONS

I-7a. Choice of Connections

The choice of connections and fittings can have a very marked effect on the pumping speed at the vacuum chamber. Any connection placed between the pump and the chamber creates an impedance to the flow of gas. This is particularly true at low pressures in the millitorr range where the gas flow is substantially molecular in character. The gas flow is then dependent upon the kinetic activity of the molecules to bring it to the intake of the pump.

I-7b. The Effects of Conductance

It has been shown that the conductance of a tube is proportional to the cube of its diameter and inversely proportional to its length. Therefore it is imperative that the connecting lines be as large in diameter and as short in length as practical. For best results the diameter of the connecting tube should be at least as large as the diameter of the pump intake. Refer to Paragraph IV-3e for a description of the effects of conductance on pumping speed. To avoid a large reduction in pumping speed at the vacuum chamber, it is clear that the conductance of the line must be considerably greater than the speed of the pump.

I-7c. Metal Joints

If metal piping or tubing is used, it is preferable to solder or braze all the connections. Where threaded joints must be used, coat the threads with Glyptal or Leak Lock and screw together tightly. Flanged connections with elastomer gaskets make excellent demountable joints.

I-7d. Glass Joints

Where glass tubing is used between the system and the pump intake, joints can be made by butting the ends of the two sections together in a short section of rubber vacuum hose. This type of joint

can also be used with metal-to-metal and glass-to-metal tubing. Worm-screw band clamps are useful for securing the hose to the tubing. Whatever the joint you choose to use, cleanliness should be of utmost importance.

I-7e. Valves and Stopcocks

Metal valves or glass stopcocks may be used in the connecting line between the system and the pump to provide a means of isolating the pump from the system. To minimize the impedance of flow, the valve openings should be as large as possible. Lubricate the rotating plug of the stopcock with a film of vacuum grease sufficiently thick enough to prevent seizure.

I-8. INSTALLATION OF MODEL 1392 SERIES

I-8a. Diffusion Pump Connections

These combinations consist of a Model 1400B DuoSeal pump with motor and a modified, two-stage, metal diffusion pump mounted on a common base. Installation is the same as that for other DuoSeal pumps with the following additional requirements. Connect the diffusion pump intake to the vacuum system, preferably by brazing or silver soldering. Use a short connection with as large a diameter as possible. Connect the diffusion pump heater and electric motor to the appropriate power supply with the separate cords and switches provided.

I-8b. Coolant Supply

Connect the diffusion pump to an appropriate coolant supply. Model 1392 uses a water-cooled diffusion pump and requires 0.08 of a gallon per minute of water at normal temperature. Connect the water supply to the tubing at the intake stack. Model 1392A uses an air-cooled diffusion pump. For best results a small blower or fan with a capacity of 20 cubic feet per minute should be used to direct air across the cooling fins, impinging first on the intake stack.

I-8c. Oil Supply

Check the system for leaks before filling the diffusion pump with pump fluid. Fill the pump with 55 ml of No. 1391K Octoil Pump Fluid. This may be accomplished by removing the drain plug, starting the mechanical pump and sucking the pump fluid into the boiler through a clean length of rubber tubing. Use a new drain plug gasket and replace the drain plug while the mechanical pump is running. Complete instructions are furnished with each diffusion pump assembly.

I-9. VACUUM GAUGES

The type of vacuum gauge to be used is determined largely by the pressure range to be measured. Pressures in the ranges produced by DuoSeal pumps can be covered by McLeod, Thermistor, Pirani or Thermocouple gauges. The McLeod gauge is used where high accuracy of measurement is required. The Pirani, Thermistor and Thermocouple gauges are electrical and give continuous readings of the total pressure. They are preferred where rapid pressure changes occur. The McLeod gauge does not measure condensable vapors; therefore, if vapors are present it will generally read lower in pressure than electrical gauges. For higher vacuums in systems employing diffusion, turbo-molecular or ion pumps, the hot filament ionization of the Philips gauge is used.

I-10. TRAPS

I-10a. The Need for a Trap

Where corrosive vapors or large quantities of condensable vapors are evolved from vacuum processing, a cold trap may be used in the connecting line to the pump. It will help prevent damage to the pump mechanism and reduce oil contamination. The cold trap, immersed in a suitable Dewar flask, is installed so that the vapors may come in contact with the surfaces of the trap and condense. Commonly used refrigerants are liquid nitrogen or dry ice and acetone. The refrigerant to be used depends upon the freezing point of the contaminants. A variety of glass cold traps and Dewar flasks are available from Sargent-Welch.

I-10b. The Care of a Trap

When using a cold trap the refrigerant should be maintained at a high level in the flask to keep the trap at a uniformly low temperature. If the trap is rewarmed it may allow reevaporation of the condensate. The opening of the Dewar flask should not be obstructed as the refrigerant boil-off can produce dangerously high pressures. If the trap becomes saturated it should be disconnected from the system, drained and cleaned. An increase in pressure in the vacuum system will normally indicate that the trap has become saturated. To clean the trap, remove the refrigerant and allow the trap to warm up. Remove the trap from the system and rinse off the condensate with a suitable solvent. Thoroughly clean and dry the trap before reinstalling in the system.

I-11. TYPES OF LUBRICANTS

All Sargent-Welch mechanical vacuum pumps are normally tested with DuoSeal oil and shipped with a full charge to prevent unnecessary contamination. An additional supply of oil is furnished with each pump with instructions to drain and discard the oil contained in the pump and replace with the fresh oil. DuoSeal oil has been especially prepared and is ideally suited for use in mechanical vacuum pumps because of its desirable viscosity, low vapor pressure and chemical stability. The vacuum guarantee on all Sargent-Welch pumps applies only when DuoSeal oil is used. Other lubricants for special applications are available including various lubricants for oxygen compatibility, lubricants for use with diffusion pumps as well as other special requirements.

II. OPERATION

II-1. STARTING PROCEDURES

II-1a. Starting a DuoSeal Pump

Before attaching the pump to a system it is well to familiarize yourself with the function and action of the pump which you have now acquired. Remove the intake and exhaust port plugs and temporarily provide a stopper for the intake and a dust cap for the exhaust. Review the power requirements as described in Paragraph I-6.

II-1b. Oil Level Determination

The amount of oil suitable for efficient and satisfactory performance should be determined after the pump has reached its operating temperature. Initially, however, the pump should be filled with fresh oil while the pump is idle. Fill the pump until the oil level falls between the two oil level marks. If after a short period of operation the level should fall, it is likely the result of oil entering some of the interior pockets of the pump. If a gurgling sound occurs, additional oil must be added. In general, the oil level will be higher during high pressure operation. Mechanical pumps will gurgle in varying degrees under four conditions of performance: (a.) when operating at high pressure as in the beginning cycles of evacuation of a chamber; (b.) when the oil level in the pump reservoir is lower than required; (c.) when a large leak is present in the system; and (d.) when the vented-exhaust valve is open. Awareness of these possibilities will save time in setting up a system. Best performance of a mechanical pump is generally obtained after sufficient time has been allowed for the pump to come to operating temperature.

II-1c. Cleanliness

Take every precaution to prevent foreign particles from entering the pump. A fine mesh screen is provided for this purpose in the intake passage of all the DuoSeal pumps except the Model 1404.

II-1d. Starting Model 1392

To operate the Model 1392 series of pumps after making the necessary connections, switch on the mechanical pump to enable it to evacuate the system to 500 millitorr or less. Then activate the coolant for the diffusion pump and turn on the heater. The pressure in the system will increase temporarily as entrained gases within the oil are

evolved. Allow about 30 minutes for the diffusion pump to reach operating temperature and full pumping capacity. If the system pressure does not decrease after the operating temperature has been reached, the system should be checked for leaks. As a precaution against exposing the hot oil to abnormal pressures, it is best to turn off the heater when checking for leaks.

II-1e. Starting Model 1404

The Model 1404 pump is shipped without oil because it does not have an oil-tight exhaust cover. The proper oil level mark may be seen by removing the top plate which is fastened with two screws. Add oil to the indicated level and refasten the top plate.

II-2. LEAK DETECTION

II-2a. Large Leaks

The importance of eliminating all leaks in a vacuum system is obvious when it is realized that a leak into the system, at atmospheric pressure, expands in volume by a factor of 750,000 to 10,000,000 or more. The pump must remove this added volume to maintain the desired vacuum. Fortunately a number of effective techniques for leak detection have been developed. Large leaks can be located by pressurizing the system and painting the suspected area with a thick soap solution. Escaping air will produce soap bubbles.

II-2b. Small Leaks

Small leaks in glass systems may be located by probing with a high frequency coil of the Tesla type. This instrument is an ungrounded, high-potential spark coil with a pointed electrode. The discharge spark from the coil will seek and pass through any minute opening and produce a faint pink glow at the location of the hole. In using a Tesla coil, the electrode point should be held about $\frac{1}{2}$ inch from the glass and should be kept in constant motion. It is not recommended for use in very thin-walled systems or in locations adjacent to glass-to-metal seals. Small leaks may also be detected by spraying a suspected area with acetone or gases rich in hydrogen, and observing a sudden change in pressure on an electrical gauge. The difference in calibration of these gauges, for air and other gases, will produce a distinct change in

the pressure reading. To use this method of detection, the system must be under vacuum and the gauge sensing tube must be located between the pump and the area to be probed. Use extreme caution, as these materials are highly flammable!

II-2c. Fine Leaks

Locating very fine leaks requires a helium-sensitive, mass-spectrometer leak detector. This instrument will locate leaks which cannot be detected by any other method. Numerous fine leaks can have the total effect of a large leak.

II-3. SHUTDOWN PROCEDURES

II-3a. DuoSeal Shutdown

A few simple precautions are all that is necessary when a shutdown is in order. If a gauge is connected to the system, first isolate the gauge, then turn off the power and open the system to at-

mosphere. If the pump is removed from the system, cover the intake port with a rubber stopper or suitable cover to protect the pump against contamination and loose particles. If the pump has been contaminated in service and is going to be shelved for a prolonged period it is best to drain the oil and refill with a fresh charge.

II-3b. Diffusion Pump Shutdown

When a pump of the Model 1392 series is shut down the following precautions should be taken. Turn off the diffusion pump heater and continue to cool the pump until the pump boiler is cool to the touch. The coolant supply may then be removed and the mechanical pump stopped. Atmospheric pressure may then be admitted to the system. CAUTION. To avoid decomposition of the diffusion pump oil it should not be exposed to any pressure above one torr while it is hot. If the pressure in the boiler should rise above one torr, turn off the pump heater immediately and continue cooling the pump.

III. MAINTENANCE

III-1. VACUUM PROBLEMS

III-1a. Pressure Determinations

Leakage, contamination and unusual outgassing are the general causes of problems associated with poor vacuum. To operate at maximum efficiency a system must be thoroughly clean. If the system is completely clean and free from leaks, and unwarranted vacuum problems still exist, the pump should be checked. A simple criterion for the condition of a mechanical pump is a determination of its ultimate pressure capability. This can be accomplished by attaching a gauge directly to the pump. The gauge may be any suitable type provided consideration is given to the limitations of the gauge being used. Refer to Paragraph I-9 for further suggestions. If the pressure is unusually high, the pump may be badly contaminated, low on oil or malfunctioning. On the other hand, if the pressure is only slightly higher than the guaranteed pressure of the pump, an oil change may be all that is required.

III-1b. Oil Contamination

The most common cause of a loss in efficiency in a mechanical pump is contamination of oil. It is caused by condensation of vapors and by foreign particles. The undesirable condensate emulsifies with the oil which is recirculated and subjected to re-evaporation during the normal cycle of pump activity thus reducing the ultimate vacuum attainable. Some foreign particles and vapors may form sludges with the oil, impair sealing and lubrication and cause eventual seizure. A vented-exhaust valve is helpful in removing vapors, especially water, but it is not equally effective on all foreign substances; therefore, periodic oil changes are necessary to maintain efficient operation of the system. The required frequency of changes will vary with the particular system. Experience with the process will help you determine the normal period of operation before an oil change is required.

III-2. OIL CHANGES AND OIL LEVEL

III-2a. Draining the Pump

An oil change is most easily accomplished when the pump is warm and the oil is less viscous. Use a container large enough for the oil in the particular

pump. Stop the pump, and open the drain valve. A thorough job may be accomplished by tipping the pump slightly if this is possible. The small residue remaining in the pump may be forced out by hand-rotating the pump pulley with the exhaust port partially closed and the intake port open. Closing the exhaust port completely under these conditions will create excessive pressure at the drain valve which may cause the oil being drained to splatter.

III-2b. Flushing the Pump

After removing all the oil, close the drain and pour about four ounces of clean DuoSeal oil into the intake port. Open the exhaust port and operate the pump for about a minute with the intake port alternately opened and closed to agitate and circulate the fresh oil. Again stop the pump, drain the flushing oil and force out the residue as before. The amount of flushing oil and the number of flushes will be determined by the extent of contamination and the color of the oil. Under no circumstances should anything other than DuoSeal oil be used for flushing a mechanical pump. The higher vapor pressures of other types of oil will cause difficulty later in the attainment of a high vacuum.

III-2c. Refilling the Pump

After you are satisfied that the pump has been thoroughly flushed, refill the pump by pouring new DuoSeal oil into the exhaust port. Fill to the indicated level and start the pump with the intake closed. A gurgling noise is characteristic when high pressure air is drawn through the pump. It should disappear quickly as the pressure within the pump is reduced. If gurgling continues, add sufficient additional oil through the exhaust port until gurgling ceases.

III-3. SHAFT SEAL REPLACEMENT

To replace the shaft seal of a pump, drain the oil and remove the pump pulley and key. Remove the screws securing the old seal and pry it loose with a screwdriver or similar wedge, being careful not to mar the surface of the pump body against which the seal fits. Discard the seal and its gasket, inspect all surfaces and repair any damages with a fine abrasive stone. Wipe all sealing areas clean and place a film of DuoSeal oil on both the shaft and the inside bore of the new shaft seal. Using a new gasket, carefully slide the new seal into position and center it on the shaft. It is not necessary to

apply any sealant to the gasket. Tighten the mounting screws uniformly and refill the pump with DuoSeal oil.

III-4. REPAIRING OIL LEAKS

III-4a. Location, Cause and Effect

Oil leaks may develop wherever two mating faces are sealed with a gasket. Such seams may fail as the result of deterioration of the gasket material, loosening of the screws caused by temperature variations, or improper care as the result of previous reassembly. Typical gasketed seams in a mechanical pump are located at the oil level window, the shaft seal, the oil drain, and the mating faces of such mechanical surfaces as the intake chamber cover, the oil case and the exhaust chamber cover. The importance of a gasketed seam is determined principally by its function. If it is a vacuum seal, the ultimate performance of the pump is dependent upon it. If it is an oil seal, the pump may be operated satisfactorily for some time without loss of function. Eventually, of course, a great loss of oil may cause harmful damage.

III-4b. Repairing Technique

An oil seam may be sealed by any of several methods. When an O-ring is employed, the surfaces of the O-ring and its groove should be wiped clean. If the O-ring is not badly deformed or scratched it may be reused by sealing with a slight film of vacuum oil or vacuum grease. If a thick elastomer or composition gasket is used it may be cleaned and reused without any sealant if it is undamaged. Thin composition gaskets are generally used for large irregularly shaped areas. If they are used for an oil seal they may be cemented with shellac on either or both faces if desired. A replacement joint of this type should be thoroughly cleaned of all previous shellac and old gasket material and the mating surfaces cleaned of any nicks.

III-5. REPAIRING VACUUM LEAKS

III-5a. Surface Preparation

Good vacuum seals are an essential and important attribute of a good mechanical pump. A good seal is dependent upon the quality of the mating surfaces as well as the sealant and its preparation. The mating faces should be carefully inspected for any projections or foreign particles which might interfere with proper mating. Slight projections such as nicks and burrs are most easily removed by rubbing with a fine abrasive stone. The surfaces of the mating parts may be washed with a solvent such as triethane or acetone after which they must be

thoroughly dried. If a gasket is required, a very thin coat of varnish should be applied to both faces before assembly.

III-5b. Temporary Repair

Temporary vacuum repairs are often made by covering the known leak with an industrial sealant such as Glyptal, Leak Lock or Zinc White. Such a practice, however, is not recommended for seals of a permanent nature.

III-6. MAINTENANCE OF HELIUM TRANSFER PUMPS

A helium transfer pump is especially constructed to provide a vacuum-tight storage space for helium gas within the oil reservoir as well as the internal passages of the pump itself. Consequently, the importance of vacuum seals throughout the pump is increased, especially between the mating face of the oil case and the pump body. Instructions for preparation of a gasketed vacuum seal are given in Paragraph III-5a. Equal care must also be applied to other areas such as the connection of the exhaust fitting and the oil level window, each of which must be vacuum tight.

III-7. DRIVE PROBLEMS

If for any reason the pump will not operate, turn off the power and check the fuse and electrical connections. Then try the power to the motor only by removing the belt. If the motor operates properly try hand-rotating the pump in the proper direction with the pump intake port open. If both turn freely then replace the belt and check the belt tension. The tension should be just sufficient to drive the pump without visible slippage. Any greater tension will cause noise and possible damage to the bearings of both the motor and the pump. Make certain that both pulley grooves are clean and free from oil. The pulleys must be fastened securely on their respective shafts, and in parallel alignment.

III-8. MAINTENANCE OF THE MODEL 1392 SERIES

III-8a. Determination of an Oil Change

The Model 1400 pump of the diffusion-mechanical pump combination may be repaired and maintained as outlined in the preceding paragraphs. The pump fluid of the diffusion pump should be inspected periodically for color change and odor. If the fluid is slightly darkened and has no odor, a simple change of fluid is normally all that is needed. Follow the instructions described in

Paragraph I-8c. If the fluid has developed a noticeable odor, the pump should be cleaned.

III-8b. Cleaning Procedures

To clean the diffusion pump, remove it from the system. Thoroughly drain the oil through the drain outlet; if the oil is slightly warm it will help drainage. Rinse the pump with acetone and fill with a 50% solution of caustic soda; use care in handling the solution. Using the pump heater, boil the caustic soda solution in the pump for about 30 minutes. Drain and rinse with clean hot water. Rinse with acetone and dry with a stream of warm dry air. Replace the drain plug and reinstall the pump in the system. Always use a new drain plug gasket after the plug has been removed. Fill the pump with 55ml of fresh Octoil pump fluid. If the heater is burned out it can be removed by removing the holding nut at the bottom of the boiler and lowering the heater. Follow the instructions supplied with the pump.

III-9. REPAIR SERVICE

III-9a. Major Factory Repair

With proper care, Sargent-Welch DuoSeal vacuum pumps will give many years of reliable service. The basic working parts of DuoSeal pumps are machined to very close tolerances and require assembly on fixtures, with special tools, by mechanics who are highly skilled at this work. Should major repairs involving the pump mechanism become necessary, it is strongly recommended that the pump be returned to the factory for repair.

III-9b. Major Repair Requirements

The Sargent-Welch Scientific Company maintains complete repair departments strategically located throughout the United States and Canada. These facilities are well equipped and staffed with experts to insure prompt reconditioning of all returned pumps. Broken, worn, scored or corroded parts are replaced with new parts and the pump is thoroughly evaluated and tested to satisfy the performance requirements of the original guarantee.

III-10. REPAIR KITS AND GASKET KITS

Repairs of a minor nature may well be accomplished in the field. Such repairs often circumvent the necessity for costly breakdowns or delays. Repair kits and gasket kits have been made available for the purpose of providing the owner of a Sargent-Welch pump with those parts which may be easily replaced, are most easily subjected to breakage or wear and involve only minor repair. Parts constituting the internal mechanism of the pump which would require complete pump disassembly for replacement are not included in these kits. The location of each item on the pump may be found by use of the reference number on the exploded view included with each kit. Refer to Section V for the catalog numbers of the repair and gasket kits for your particular pump.

III-11. EXCHANGE SERVICE

III-11a. Standard Pump Exchange

A rapid pump exchange service is offered by Sargent-Welch through all of its offices to save customers the normal down-time required for factory repair. A pool of reconditioned pumps is maintained for this service. Under this plan, a customer's repairable pump will be replaced by a factory reconditioned pump of the same catalog number. Simply order a factory reconditioned replacement pump of the same catalog number as the pump you wish to replace; it will be shipped to you immediately. Your pump may then be returned to the factory in the same shipping container. You will be billed the price of a new pump for the replacement pump at time of shipment. On receipt of your pump at the factory, a credit memorandum will be issued to you covering the difference between the billed charge and the exchange allowance for your pump.

III-11b. Non-Standard Pump Exchange

If your pump is not a standard model, the cost of parts and labor necessary to convert it to a standard model will be added to the cost of the replacement pump. If your pump is not repairable you will be notified. You may then purchase a new pump if you wish and return the replacement to us when you receive the new unit. Return the pump only; do not send the motor or base.

IV. PRINCIPLES OF OPERATION

IV-1. THE FUNCTION OF A MECHANICAL VACUUM PUMP

IV-1a. The Evacuating Principle

The essential purpose of a vacuum pump, whether mechanical or otherwise, is its ability to reduce the pressure in a given vessel or enclosed system. The degree of reduction in pressure is dependent upon the requirements of the application, the type of vacuum pump employed, and the design of the pump. We are mostly concerned with those mechanical, rotary, oil-sealed pumps which are capable of attaining pressures in the low millitorr region. Reduction in pressure is accomplished by steadily and consistently removing a portion of the original volume of a gas contained in an enclosed vessel. Removal is performed by the action of the rotating elements of the pump which cause a given

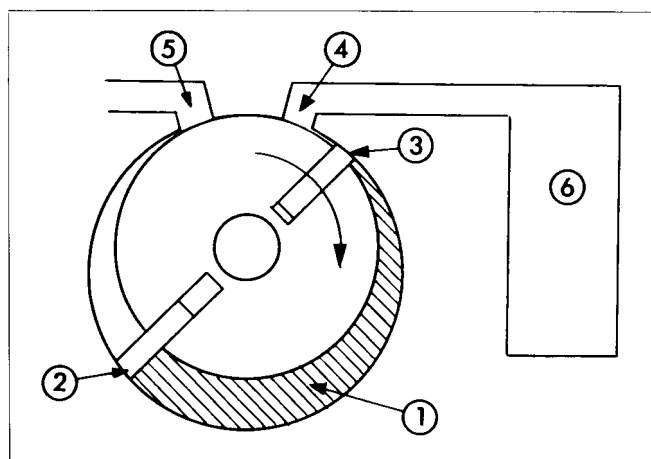


Fig. #1 Schematic Diagram of a Vacuum System

space to be successively enlarged and diminished. Fig. 1 illustrates a section through a typical pump stage. The action of the pump creates an increasingly enlarged, hollow, vacuum-tight space (1), into which gas is drawn by virtue of the difference in pressure between the space created and the inlet connection (4), to the space. The volume of gas is trapped by action of the vanes (2) and (3) and is ultimately compressed out of the stage into the exhaust port (5) by action of vane (3) as the space is gradually diminished. This expansion and contraction constitutes one complete cycle of operation. This cycle is repeated as vane (2) passes and closes the intake port. Thus, for each revolution of the pump two cycles of evacuation are performed.

IV-1b. Pressure Reduction

With the completion of each evacuation cycle, the quantity of gas contained in the vessel (6) is reduced. The quantity of gas remaining in the vessel must necessarily expand to fill the vessel and consequently with each cycle the pressure in the vessel is reduced. This action is a manifestation of Boyle's law which states that the volume of a body of gas is inversely proportional to its pressure, provided the temperature remains constant; i.e. if the volume is enlarged the pressure must be reduced. As the original amount of gas in the vessel is steadily diminished, its pressure is correspondingly reduced. The action of the pump must therefore compress a successively smaller quantity of gas with each cycle to something greater than atmospheric pressure in order to expel it from the pump. At the beginning of an evacuation sequence, the compression ratio is very small. In the first cycle of operation the pump draws in a volume of gas at atmospheric pressure and expels it at approximately atmospheric pressure. At blankoff pressure, on the other hand, the pump will draw in a volume of gas at, say, one millitorr and compress this volume to a pressure of 760,000 millitorr, or atmospheric pressure, in order that it may be expelled. Since the exhaust valve is generally spring-loaded to provide a good seal, a pressure somewhat greater than atmospheric pressure is required to open it. Therefore at a guaranteed blankoff pressure of 10^{-4} torr the compression ratio performed by the pump is in the order of 10,000,000 to one.

IV-1c. The Ultimate Pressure

With each cycle of the pump, as mentioned earlier, a quantity of gas is removed from the vessel being evacuated. With the completion of each cycle, the remaining gas in the vessel will expand to a newly reduced pressure. Since the pump can remove only a small portion of the remaining amount in the vessel at one time with each cycle, it is obvious that this method of evacuation can never completely remove all the gas in the vessel. In addition to this, the components of the system, including the vacuum pump, the vessel being evacuated and the necessary connections, each contain minute sources of leakage which are impossible to seal completely against atmospheric pressure. Virtual leaks as well as outgassing of materials within the system provide additional sources of gas evolution. Thus, after prolonged pumping, a state of equilibrium is reached in which the summation of

all the leakage sources is balanced by the ability of the pump to maintain a steady pressure within the system. This steady state of equilibrium is referred to as the blankoff pressure or ultimate pressure of the pump and the particular system. No matter how much additional time is provided for the pump to continue its evacuation of the system, no further reduction in pressure can be accomplished by mechanical action.

IV-1d. Displacement Determination

The gas passage through a conventional two-stage vacuum pump is of the series type in which the flow is directed successively through the two stages. The first stage, also known as the intake stage or finishing stage, is the one nearest the system to be evacuated. Of the two stages, the finishing stage operates at the lower pressure during normal evacuation. The second stage, also known as the exhaust stage, backing stage or roughing stage is the stage farthest from the system being evacuated. The roughing stage operates at the higher pressure during normal evacuation. Consequently, the gas flow in a series type, two-stage pump is successively through the intake and exhaust ports of the finishing stage and then through the intake and exhaust ports of the roughing stage. Since the entire volume of a system connected to a pump must pass through the stages successively, it must be realized that the displacement of the pump must be based upon the swept volume of the finishing stage only. The roughing stage is merely a backing stage for improving the quality of performance. Additional stages would further improve the quality but the degree of improvement would not justify the additional cost.

IV-1e. Measurement of Displacement

The capacity or displacement of a vacuum pump is almost universally expressed in terms of its ability to pump free air, i.e., with its intake connection continuously open to atmospheric pressure while in operation. This measurement alone remains relatively constant, for under these conditions both the intake and exhaust of the pump are continuously subjected to atmospheric pressure. It must be appreciated that once a vacuum pump is placed in operation on a closed system, its ability to pass a given volume of gas through its stages will vary both with the size of the system and the length of time permitted for evacuation. Its displacement at free air is determined by calculating the product of the stage volume, represented by the product of the shaded area (1) in Fig. 1 and the

length of the stage, the number of cycles per revolution and the number of revolutions the pump will operate in a given period of time. Pumps of the type manufactured by Sargent-Welch are generally rated in liters per minute or cubic feet per minute. The calculated displacement is a theoretical value which, for the purposes of design, assumes that all mating faces of the moving parts are perfectly sealed against loss of vacuum. Actual pump displacement is measured by operating the pump connected directly to a commercial gas meter. Although certain losses are sustained by whatever method is used, this method provides a positive means of measurement.

IV-1f. Pump Efficiency

The displacement of the pump at any pressure less than atmospheric pressure is commonly referred to as the pumping speed of the pump; it is this displacement which is of greatest value to the user. Pumping speed is expressed as volume per unit time for a given pressure, i.e., 140 liters per minute at one millitorr, and is independent of the vacuum system with which it is used. If the free-air displacement of the pump is considered as 100% efficient, the user is then concerned with the efficiency of the pump at all pressures less than atmospheric pressure. Once evacuation has begun, the volume of gas at atmospheric pressure swept through the stage with each cycle is gradually diminished. As the pressure in the system continues to fall the pumping speed is subsequently reduced until a state of equilibrium is reached at which no further reduction in pressure in the system is possible; at this point the pumping speed falls off rapidly to zero.

IV-1g. Performance Factors

Acceptable and desirable performance of a vacuum pump is dependent upon many factors each of which contributes to its ability to reach and maintain a high vacuum. These factors include such items as the amount of clearance provided between the moving elements of each stage, the quality of the sealing lubricant which is provided to seal these clearances, the quality and density of the materials used to fabricate the elements of each stage, the quality of the surfaces comprising each stage element, and the cleanliness of the stage elements as well as of the entire pump itself especially with regard to the evolution of gas and vapor from the materials comprising the pump. Each factor plays an important part in its contribution toward a reliable product.

IV-2. THE PRINCIPLE OF VENTED EXHAUST

IV-2a. The Effects of Unwanted Vapors

Systems which contain undesirable vapors cause difficulty both from the standpoint of attaining desirable ultimate pressures as well as contamination of the lubricating medium. A vapor is defined as the gaseous form of any substance which is usually a liquid or a solid. Water, oil and mercury vapors are three of the more common vapors encountered in typical vacuum systems. When such vapors exist in a system, the vapors or mixtures of gas and vapor are subject to condensation within the pump; the precipitated liquid may thus ultimately dissolve or become emulsified with the lubricating medium. This emulsion is recirculated to the chambers of the pump where it is again volatilized causing increased pressure within the system.

IV-2b. The Presence and Removal of Condensate

Condensation takes place particularly in the compression stroke of the backing or second stage of a two-stage pump. The compression stroke is that portion of the cycle during which the gas drawn from the intake port is compressed to the pressure necessary to expel it past the exhaust valve. Condensation takes place when the ratio between the initial pressure and the end pressure of the compression is high, that is, when the mixture of vapor and gas drawn from the intake port is compressed from a low pressure to a high pressure. By adding air through the vented exhaust valve to the mixture of vapor and gas being compressed, the pressure required for delivery past the exhaust valve is reached with a considerably smaller reduction of the volume of the mixture; thus, depending upon the amount of air added, condensation of the vapor is either entirely avoided or substantially reduced.

IV-2c. Pump Function Without Vented Exhaust

In a pump functioning on a contaminated system and operating without the vented exhaust feature, compression within the stage takes place in the normal manner until the saturation pressure of the contaminating vapor contained within the mixture of gas and vapor is reached. The saturation pressure of water vapor is that pressure and corresponding temperature at which the dew point of the vapor is reached and condensation occurs. The

saturation pressure of water vapor at an ambient temperature of 20°C is 17.5 torr, while at 60°C, the approximate operating temperature of a pump, the saturation pressure is 149 torr. The external side of the exhaust valve is subjected to atmospheric pressure. Consequently a compressive force somewhat greater than atmospheric pressure is required to open the valve and permit expulsion of the gas. Sometime during increased compression of the mixture of gas and vapors, the saturation pressure of 149 torr for the water vapor is reached and the vapor condenses. The condensate is then allowed to emulsify with the oil which is recirculated within the pump stages thus providing continued contamination of the system.

IV-2d. Pump Function With Vented Exhaust

On the other hand, when ballast air at atmospheric pressure is supplied to the compression stroke by means of the vented-exhaust valve, the partial pressure of the unwanted vapor becomes a very small part of the total pressure of the mixture of gas, vapor and newly supplied air. The vapor is thus prevented from reaching its saturation pressure corresponding to the temperature of the pump and is finally expelled from the pump as a vapor.

IV-2e. Controlled Ballast Flow

Some degree of variation in ballast flow may be obtained by the amount of opening applied to the vented-exhaust valve. Two or more turns of the valve are sufficient to open it wide. With the valve open, the sound of the exhaust is similar to that of a pump operating against a large leak. Because of the increased pressure introduced into the compression stroke, the pump must work a little harder to function, thus resulting in an increased operating temperature of approximately 8°C over a prolonged period of time. Tests have shown that continuous and prolonged operation for several weeks under these conditions is not injurious to the pump.

IV-2f. Other Forms of Contamination Control

The application of the vented-exhaust valve is a moderate and very successful method for the removal of condensable vapors. For very heavily laden systems, other means of removal such as oil separators may be required. For mild cases of contamination the simple expedient of a cold trap or a change of oil may serve the purpose.

IV-3. SPEED OF EVACUATION

IV-3a. Factors Affecting Pump Selection

The selection of a vacuum pump is almost always determined by the time required for it to evacuate a given volume to a particular pressure. Variable factors make it almost impossible to determine an accurate mathematical solution. However, by establishing certain basic assumptions and eliminating any attempts at refinement, a simple and direct approach is possible. Some examples will help to show a method for calculating comparative evacuation times for a mechanical pump, a mechanical-diffusion pump combination as well as the effect of an additional connection.

IV-3b. Speed Determination by Evacuation Factors

In the table of evacuation factors below we have made the assumption that atmospheric pressure is 10^3 torr (standard atmospheric pressure is 0.76×10^3 torr). On this assumption consider a chamber of volume V containing dry air which is to be evacuated by a pump having a pumping speed S . The chamber is mounted directly on the pump which is at operating temperature and the chamber is at atmospheric pressure.

EVACUATION FACTORS			
Chamber Pressure Torr	Factors of 10 from Atmospheric Pressure	Percent Air Retained	Percent Air Removed
10^3	0	100.0	0
10^2	1	10.0	90.0
10^1	2	1.0	99.0
10^0	3	0.1	99.9
10^{-1}	4	0.01	99.99
10^{-2}	5	0.001	99.999
10^{-3}	6	0.0001	99.9999
10^{-4}	7	0.00001	99.99999

IV-3c. Sample Calculations Using a Mechanical Pump

It can be shown that the time T required to reduce the pressure in a chamber at constant pumping speed by a factor of ten is

$$T = 2.3 \frac{V}{S_p} \times 1$$

By six factors of 10 the time required to reach a pressure of 10^{-3} torr would be

$$T = 2.3 \frac{V}{S_p} \times 6$$

But the pumping speed of a pump is not constant as the accompanying speed curve, Fig. 2, illustrates. In addition, there are always some connections of various lengths and diameters to contend with; consequently, modifications are required.

From the speed curve, for a chamber of one liter, and a pumping speed of 1.65 liters per second at 10^{-3} torr, the time of evacuation would be

$$T_e = \frac{2.3}{1.65} \times 1 \times 6 = 8.36 \text{ sec.}$$

If the pumping speed at atmospheric pressure were selected the time would be

$$T_o = \frac{2.3}{2.67} \times 1 \times 6 = 5.17 \text{ sec.}$$

Notice that the time at a pumping speed of 10^{-3} torr is $\frac{2.67}{1.65}$ longer than the time at 10^3 torr.

A better approximation is obtained by using the average pumping speed over the range in question or

$$S_a = \frac{S_e + S_o}{2} = \frac{1.65 + 2.67}{2} = 2.16 \text{ liters/sec.}$$

from which the time is

$$T_a = \frac{2.3}{2.16} \times 1 \times 6 = 6.4 \text{ sec.}$$

As a further example, determine the time required to evacuate a volume of 15 liters with a Model 1402 pump to a pressure of 10^{-3} torr.

$$S_a = \frac{S_e + S_o}{2} = \frac{1.65 + 2.67}{2} = 2.16 \text{ liters/sec.}$$

$$T_e = \frac{2.3}{2.16} \times 15 \times 6 = 96 \text{ sec.}$$

To 10^{-4} torr the time would be

$$S_a = \frac{S_7 + S_o}{2} = \frac{1.5 + 2.67}{2} = 2.08 \text{ liters/sec.}$$

$$T_7 = \frac{2.3}{2.08} \times 15 \times 7 = 116 \text{ sec.}$$

IV-3d. Further Calculations with the Addition of a Diffusion Pump

Now let us suppose that we wish to speed up the process by employing a diffusion pump in the system, one which has a pumping speed of 25 liters per second and a specified backing pressure of 10^{-1} torr. The average pumping speed of the mechanical pump down to 10^{-1} torr is

$$S_a = \frac{S_d + S_o}{2} = \frac{2.15 + 2.67}{2} = 2.41 \text{ liters/sec.}$$

and the time is then

$$T_a = 2.3 \frac{V}{S_a} \times 4 = \frac{2.3}{2.41} \times 15 \times 4 = 57 \text{ sec.}$$

The diffusion pump is activated at 10^{-1} torr and then reduces the pressure to 10^{-4} torr, a reduction in factor of 3. Since the pumping speed of a diffusion pump is relatively constant over its operating pressure range, there is no need to determine its average pumping speed. Therefore the time required for the diffusion pump to reduce the system to 10^{-4} torr is

$$T = \frac{2.3}{25} \times 15 \times 3 = 4.2 \text{ sec.}$$

The total time for the mechanical-diffusion pump combination to reduce the pressure in the 15-liter system from atmosphere to 10^{-4} torr then is the summation of the two separate calculations or

$$T = 57 + 4.2 = 61.2 \text{ sec.,}$$

which is almost twice as fast as the time required for the mechanical pump alone.

IV-3e. Calculations Involving Tubular Conductance

Suppose, however, that the connection between the 15-liter vessel and the diffusion pump is a tube 90 cm. (35.5 in.) long and 2 cm. (.79 in.) diameter. From a chart of tubular conductance, this tube will have a conductance of 1.0 liter per second. The speed of evacuation of the vessel will now be con-

siderably less than the original value of 25 liters per second. This may be determined from the equation

$$\frac{1}{S_e} = \frac{1}{S_p} + \frac{1}{Z}$$

Where S_e = speed of evacuation

S_p = speed of diffusion pump

Z = conductance of the connection

Rearranging the terms in the above equation:

$$S_e = \frac{S_p Z}{Z + S_p} = \frac{25 \times 1}{1 + 25} = 0.96 \text{ liters/sec.}$$

The time now required for the diffusion pump to reduce the system to 10^{-4} torr is

$$T = \frac{2.3}{0.96} \times 15 \times 3 = 108 \text{ sec.}$$

This may be compared with the original value of 4.2 seconds. The total time for the pump combination to reduce the pressure from atmosphere to 10^{-4} torr is now

$$T = 57 + 108 = 165 \text{ sec.}$$

which is not nearly as good as the value of 116 seconds for the mechanical pump alone.

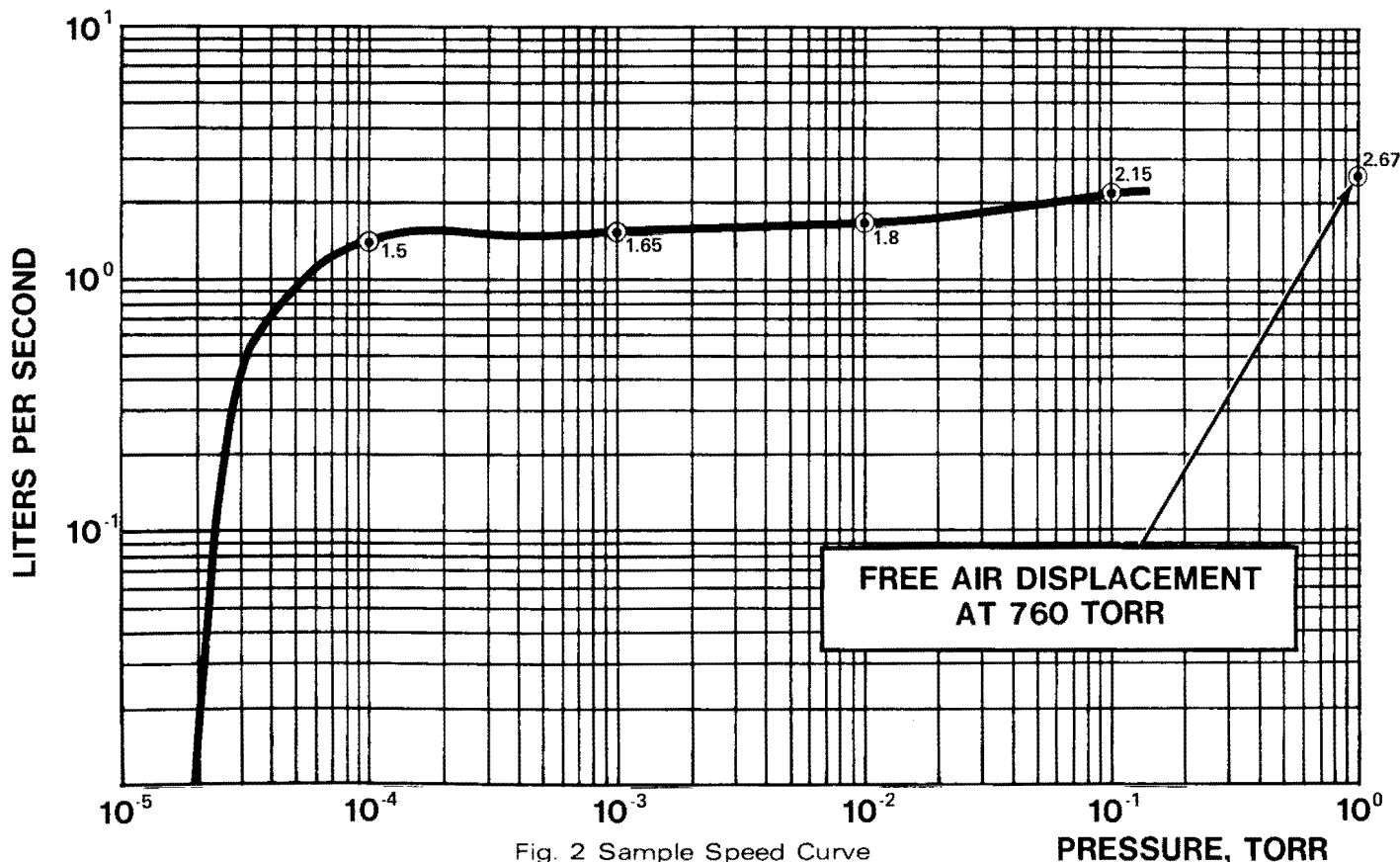
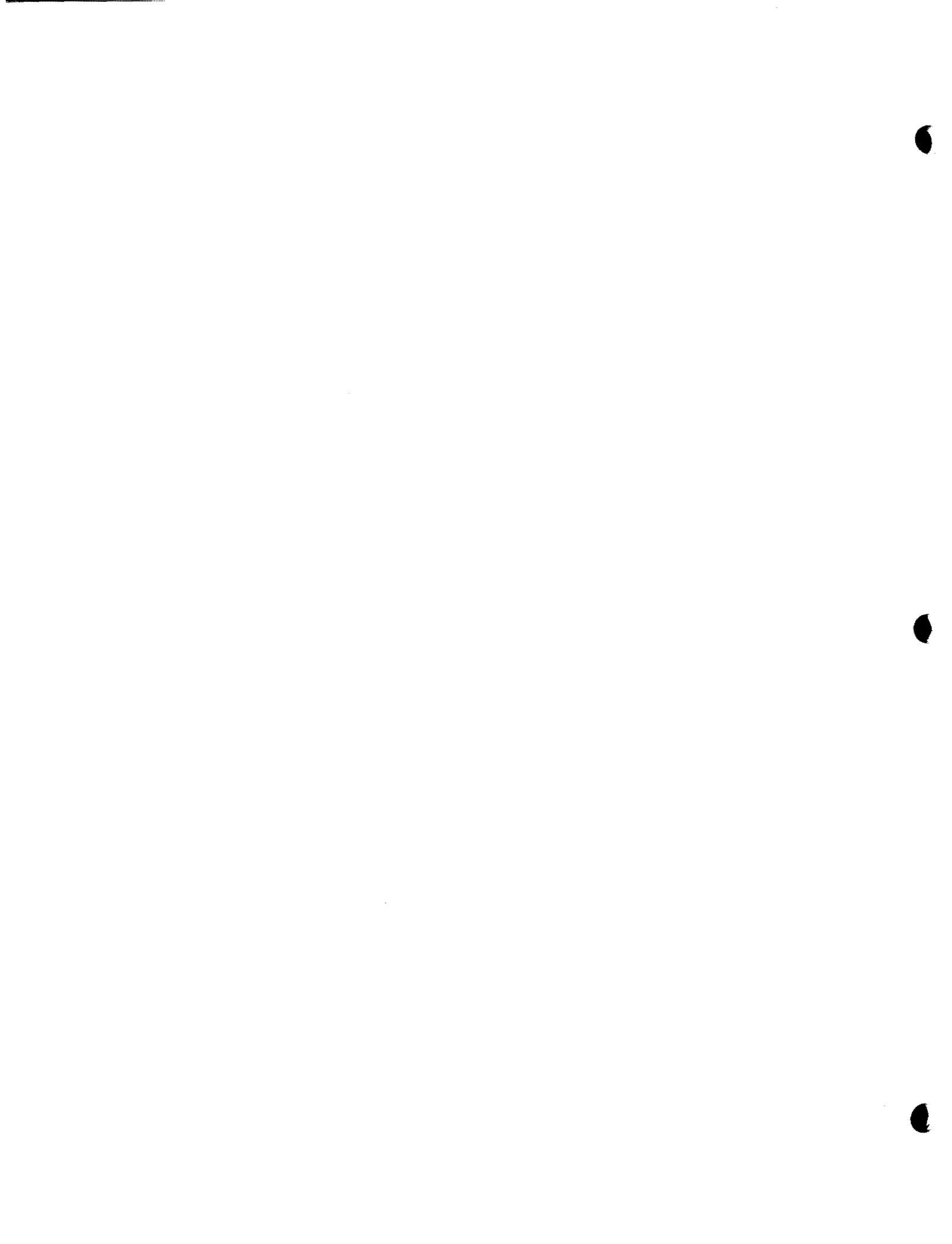


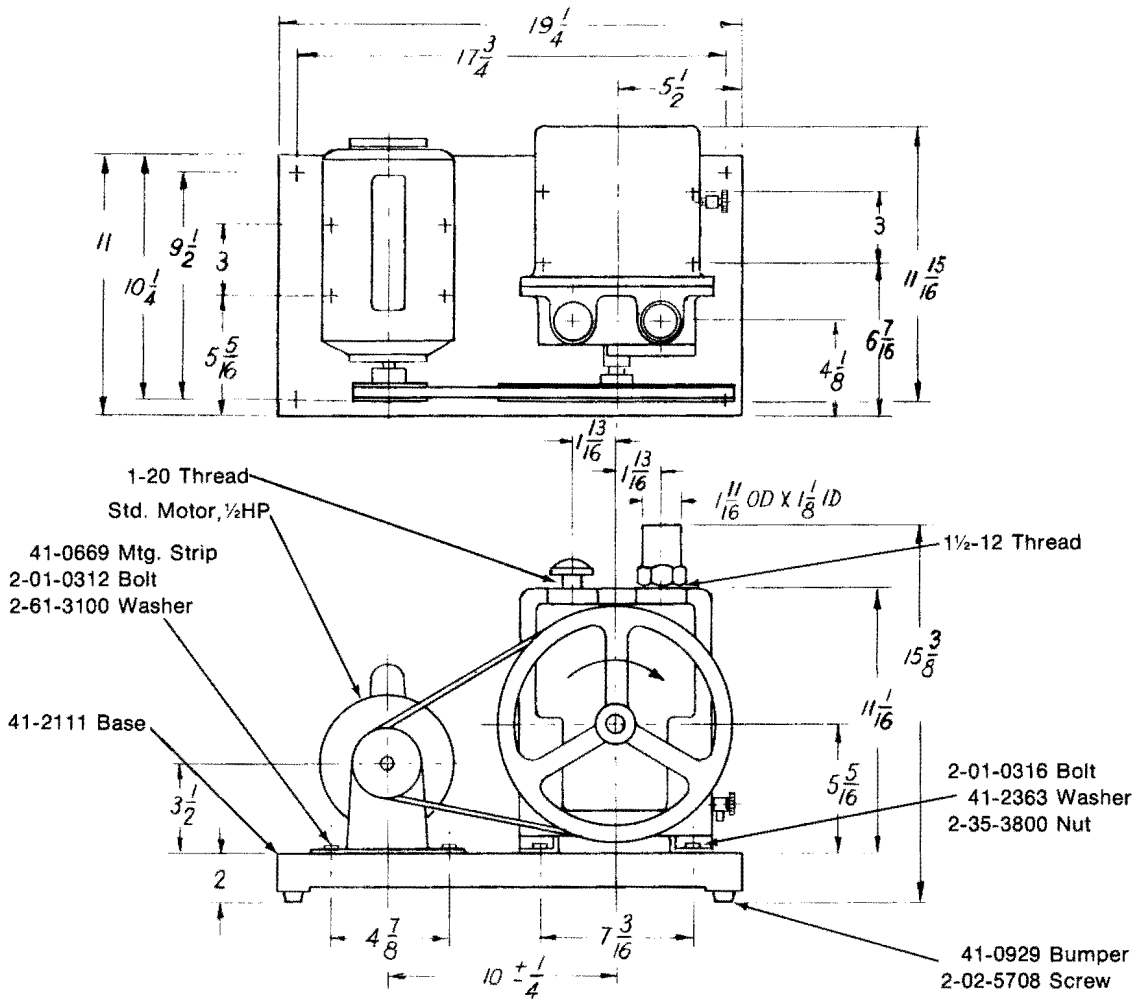
Fig. 2 Sample Speed Curve



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Model 1373



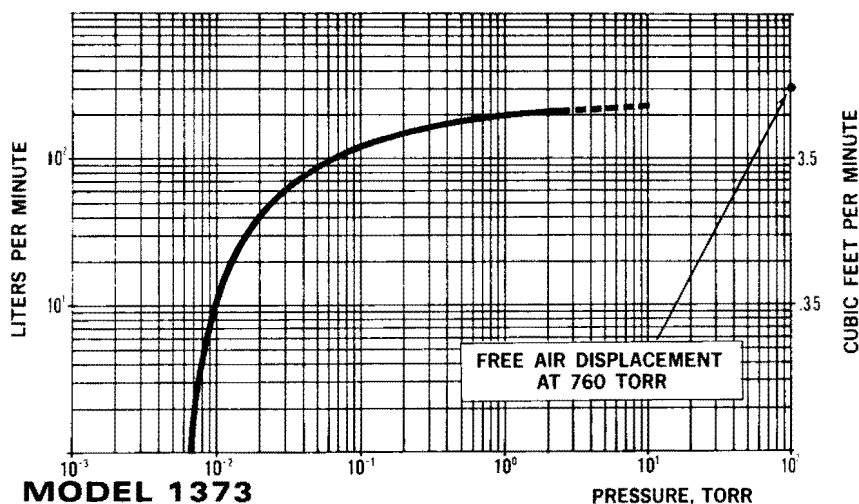
SPECIFICATIONS

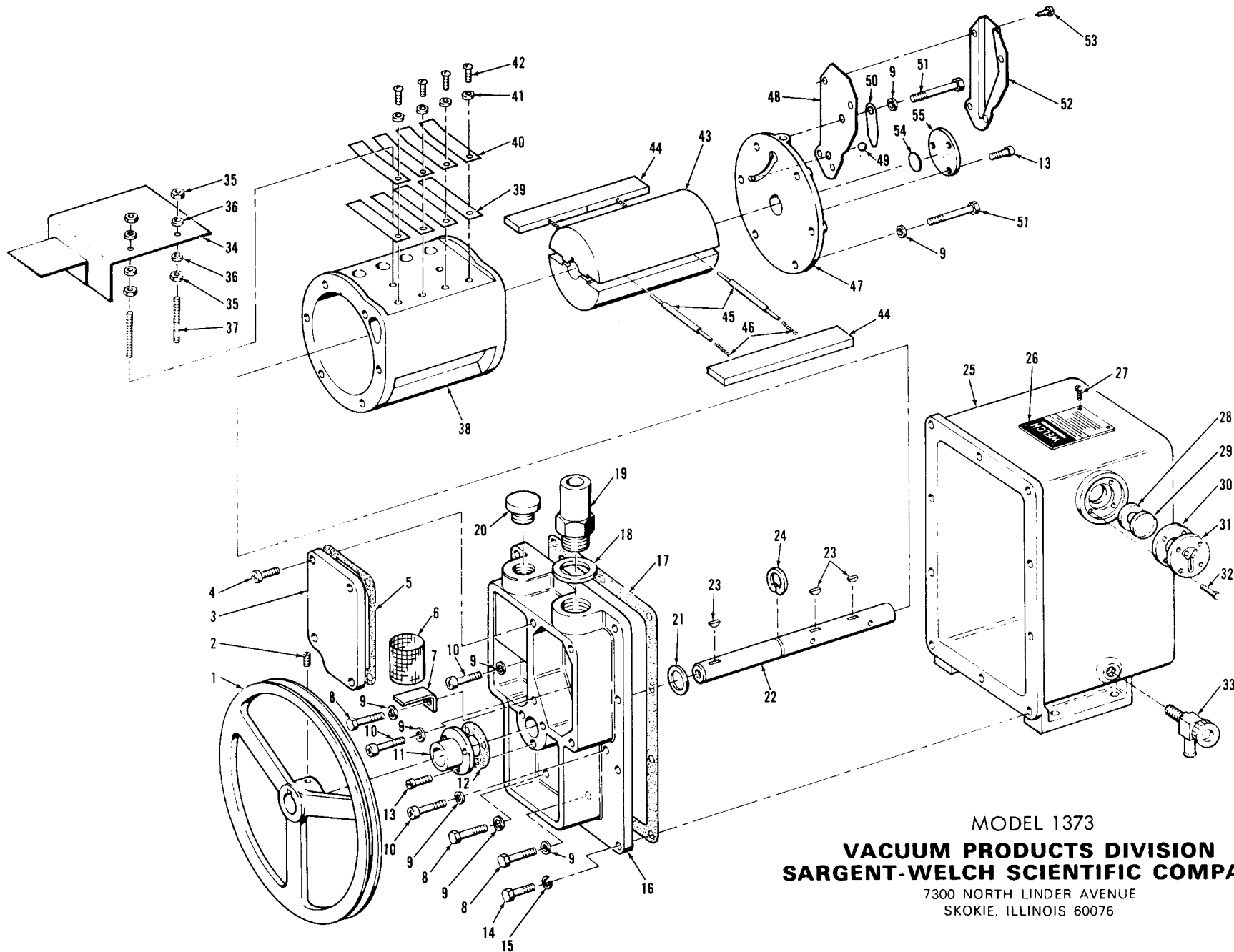
Free-Air Displacement, L/M	300
CFM	10.6
Guaranteed Partial Pressure	
Blankoff, millitorr	15
Pump Rotational Speed, RPM	525
Number of Stages	1
Oil Capacity, qts	2½
Standard Belt Guard (not shown)	No. 1371G
Net Weight, Pump Only, lbs.	68
Net Weight, Mounted Pump, lbs.	102
Shipping Weight, Mounted Pump, lbs.	115
Optional Exhaust Filter, Complete	No. 1417A
Exhaust Filter Element	No. 1417G
Size of Rubber Stopper for Intake	6½

Model 1373 Drive Requirements

Cat. No.	Belt Number and Size	MOTOR					Remarks	
		Pulley Number and Size	HP	V	HZ	PH		RPM
1373B	41-0710 4L415	41-0668 3 x .625	41-1907 ½	115/230	60	1	1725	For 115V
1373C	41-0710 4L415	41-0668 3 x .625	41-1907 ½	115/230	60	1	1725	For 230V
1373K-01	COMPLETE GASKET and SEAL KIT							
1373K-02	REPAIR KIT							
1373L	41-0713 4L420	41-0667 3.5 x .625	41-1905 ½	110/220	50	1	1425	
1373M	41-0710 4L415	41-0668 3 x .625	41-1904 ½	230/460	60	3	1725	
1373Q	41-0710 4L415	41-0668 3 x .625	41-1911 ½	115/230	60	1	1725	Totally Enclosed
1373S	41-0713 4L420	41-0667 3.5 x .625	41-2824 ½	110/220	50	1	1425	Totally Enclosed
1373U	41-0710 4L415	41-0668 3 x .625	41-1913 ½	230/460	60	3	1725	Totally Enclosed
1373W	41-0710 4L415	41-0668 3 x .625	41-1912 ½	115/230	60	1	1725	Explosion Proof
1373X	41-0713 4L420	41-0667 3.5 x .625	41-2825 ½	110/220	50	1	1425	Explosion Proof
1373Y	41-0710 4L415	41-0668 3 x .625	41-2823 ½	230/460	60	3	1725	Explosion Proof

Note: 1. Pump pulley, No. 41-2074, 10" O.D. x .750" Bore, is common to all pumps.
 2. 4L415 Belts, "A" size, ½"W x 5/16"D. are stamped 1405A.





MODEL 1373
VACUUM PRODUCTS DIVISION
SARGENT-WELCH SCIENTIFIC COMPANY
 7300 NORTH LINDER AVENUE
 SKOKIE, ILLINOIS 60076

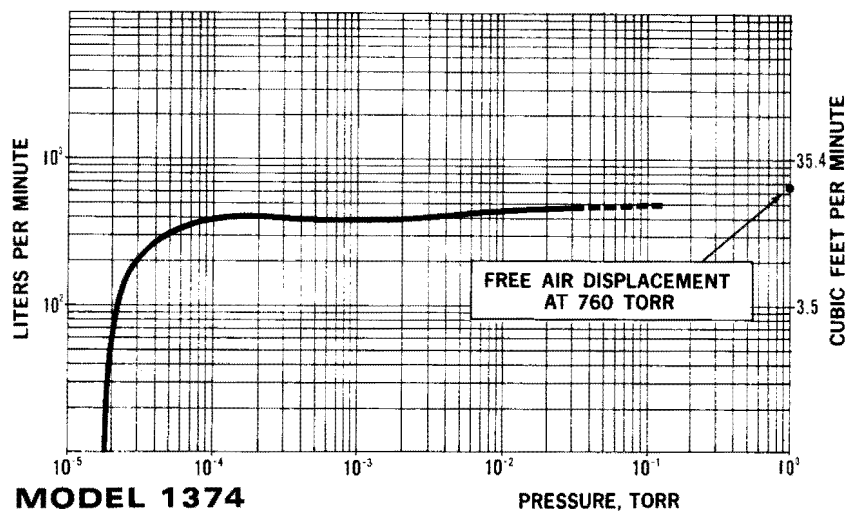
PARTS LIST
MODEL 1373 VACUUM PUMP

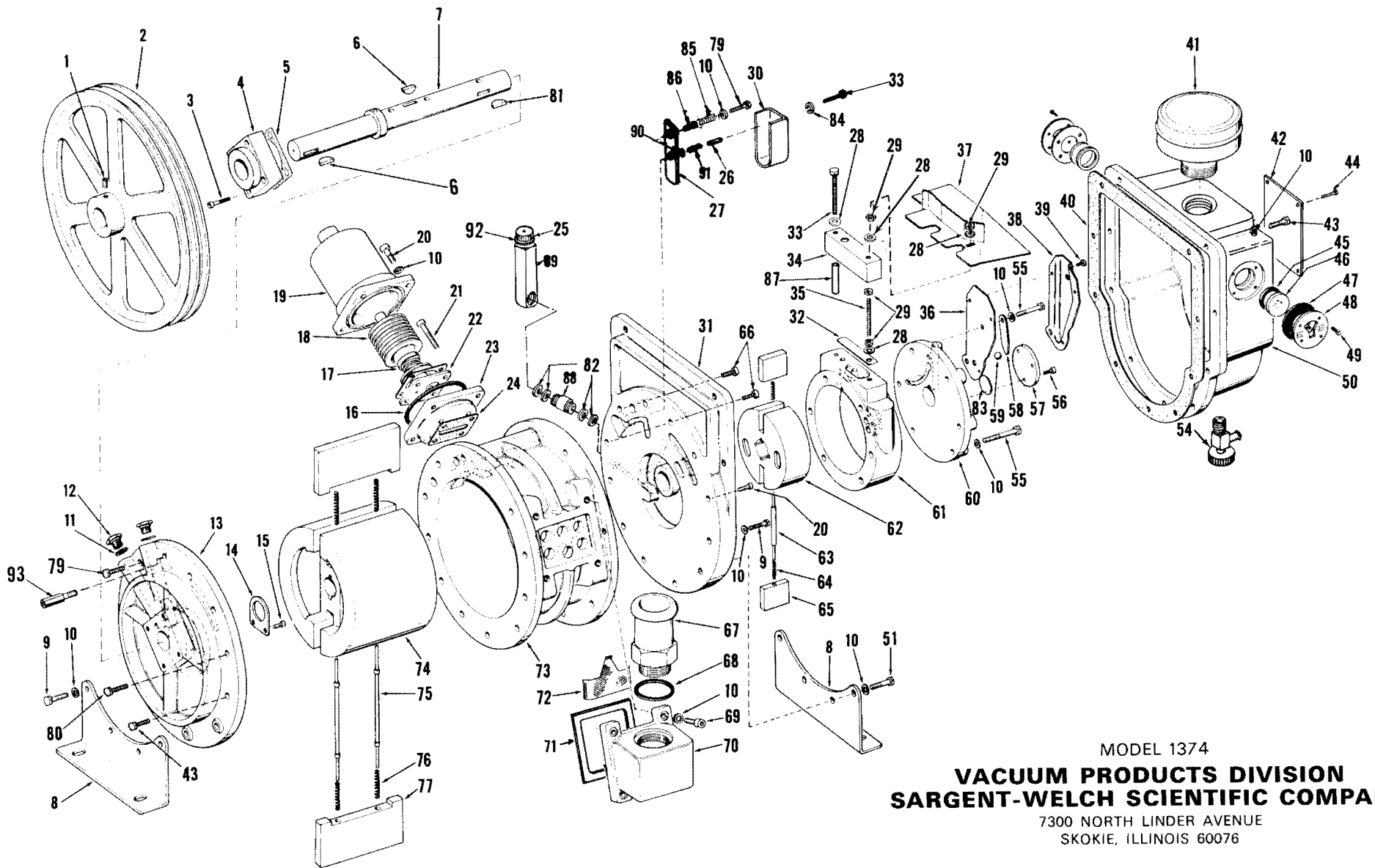
ITEM	QUANTITY	PC. NO.	DESCRIPTION	ITEM	QUANTITY	PC. NO.	DESCRIPTION
1	1	41-2074	PULLEY, INCLUDING SETSCREW, ITEM 2	29	2	41-1268	GLASS DISK
2	1	2-01-9306	SOCKET HD. STEEL SETSCREW 5/16-18x3/8	30	2	41-1267	RUBBER WASHER
3	1	41-0775	INTAKE CHAMBER COVER	31	2	41-1061	OIL WINDOW COVER
4	4	2-01-6112	SOCKET HD. STEEL SCREW 1/4-20x3/4	32	8	2-00-0608	HEX. HD. STEEL SCREW 8-32x1/2
5	1	41-0234	INTAKE CHAMBER COVER GASKET	33	1	41-1734	DRAIN VALVE
6	1	41-1692	AIR FILTER	34	1	41-1769	BAFFLE PLATE
7	1	41-0663	AIR FILTER BRACKET	35	4	2-31-0112	HEX. STEEL NUT 1/4-20
8	3	2-01-0316	HEX. HD. STEEL CAP SCREW 5/16-18x1	36	4	2-61-3100	STEEL WASHER 1/4
9	12	41-2363	WASHER	37	2	41-2175	HEADLESS STEEL SETSCREW
10	3	2-01-6316	SOCKET HD. STEEL CAP SCREW 5/16-18x1	38	1	41-1760	RING
11	1	1401D	SHAFT SEAL INCLUDING GASKET, ITEM 12 AND 3 SCREWS, ITEM 13	39	4	41-1768	LOWER EXHAUST VALVE
12	1	41-0643	SEAL GASKET	40	4	41-1767	UPPER EXHAUST VALVE
13	6	2-00-2706	FIL. HD. STEEL SCREW 10-32x3/8	41	4	2-61-0000	STEEL WASHER
14	10	2-01-0112	HEX. HD. STEEL CAP SCREW 1/4-20x3/4	42	4	2-01-5106	RD. HD. STEEL SCREW 1/4-20x3/8
15	10	2-63-0193	SPLIT LOCKWASHER 1/4	43	1	41-1761	ROTOR
16	1	41-1765	LARGE END PLATE	44	2	41-1763	VANE
17	1	41-0403	OIL CASE GASKET	45	2	41-0696	SPRING HOLDER
18	1	41-1691	ALUMINUM WASHER	46	4	41-1304	VANE SPRING
19	1	41-1690	INTAKE NIPPLE	47	1	41-2045	SMALL END PLATE
20	1	41-0612	DUST CAP	48	1	41-1005	PRESSURE RELEASE TUBE NO. 2
21	1	41-0508	THRUST WASHER	49	1	4-40-1200	STEEL BALL 3/8 DIA.
22	1	41-1762	SHAFT	50	1	41-0992	PRESSURE RELEASE VALVE
23	3	41-0624	WOODRUFF KEY	51	6	2-01-0320	HEX. HD. STEEL CAP SCREW 5/16-18x1-1/4
24	1	4-06-0754	RETAINING RING	52	1	41-0986	PRESSURE RELEASE TUBE NO. 1
25	1	41-1764	OIL CASE	53	3	2-03-3104	BIND HD. SHEET METAL SCREW NO. 6x1/4
26	1	41-2618	NAME PLATE	54	1	41-1766	THRUST DISK
27	4	2-09-1204	SELF-TAPPING SCREWSTICK 3-48x1/8	55	1	41-0672	END CAP
28	2	41-1266	TENSION WASHER				

Model 1374 Drive Requirements

Cat. No.	Belt Number and Size	MOTOR						
		Pulley Number and Size	HP	V	HZ	PH	RPM	Remarks
1374B	41-0716 4L500	41-1010 3.5 x .625 x 2G	41-1925 1½	115/230	60	1	1725	For 115V
1374C	41-0716 4L500	41-1010 3.5 x .625 x 2G	41-1925 1½	115/230	60	1	1725	For 230V
1374F	41-0716 4L500	41-1010 3.5 x .625 x 2G	41-1990 1½	200	60	3	1725	
1374J	41-0717 4L510	41-1011 4.25 x .875 x 2G	41-1991 1½	220/380	50	3	1425	
1374K	41-0716 4L500	41-1010 3.5 x .625 x 2G	41-1925 1½	115/230	60	1	1725	For 115V
1374K-01	COMPLETE GASKET and SEAL KIT							
1374K-02	REPAIR KIT							
1374L	41-0717 4L510	41-1014 4.25 x 1.125 x 2G	41-1992 1½	110/220	50	1	1425	
1374M	41-0716 4L500	41-1010 3.5 x .625 x 2G	41-1993 1½	230/460	60	3	1725	
1374Q	41-0716 4L500	41-1012 3.5 x .875 x 2G	41-1994 1½	115/230	60	1	1725	Totally Enclosed
1374S	41-0717 4L510	41-1014 4.25 x 1.125 x 2G	41-1995 1½	110/220	50	1	1425	Totally Enclosed
1374U	41-0716 4L500	41-1012 3.5 x .875 x 2G	41-1996 1½	230/460	60	3	1725	Totally Enclosed
1374W	41-0716 4L500	41-1013 3.5 x 1.125 x 2G	41-1997 1½	115/230	60	1	1725	Explosion Proof
1374X	41-0717 4L510	41-1014 4.25 x 1.125 x 2G	41-1999 1½	110/220	50	1	1425	Explosion Proof
1374Y	41-0716 4L500	41-1013 3.5 x 1.125 x 2G	41-1998 1½	230/460	60	3	1725	Explosion Proof

- Note:** 1. Pump pulley, No. 41-1492, 12" O.D. x 1" Bore x 2 Groove, is common to all pumps.
 2. 4L500 Belts, "A" size, ½"W x 5/16"D, are stamped 1374A.



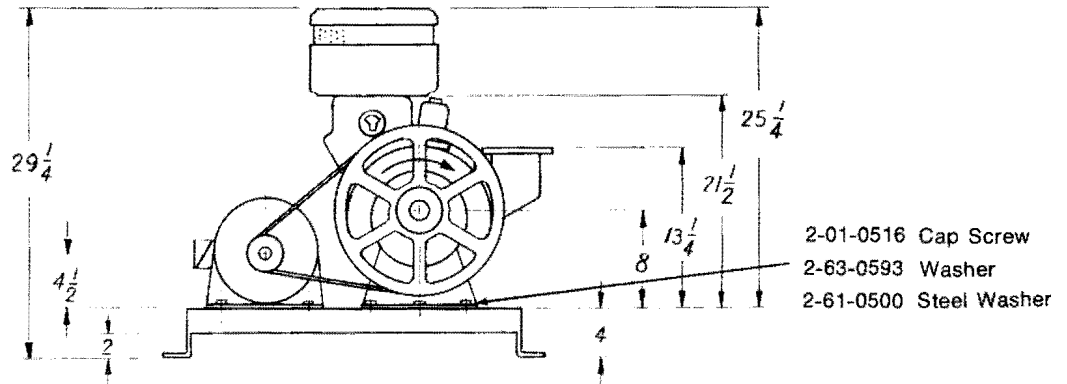
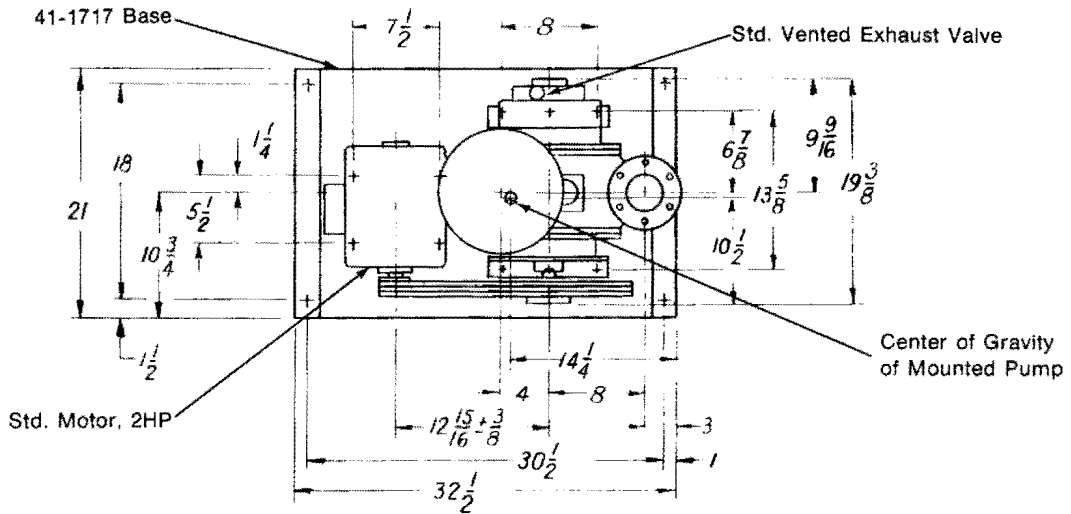


MODEL 1374
VACUUM PRODUCTS DIVISION
SARGENT-WELCH SCIENTIFIC COMPANY
 7300 NORTH LINDER AVENUE
 SKOKIE, ILLINOIS 60076

PARTS LIST
MODEL 1374 VACUUM PUMP

ITEM	QUANTITY	PC. NO.	DESCRIPTION	ITEM	QUANTITY	PC. NO.	DESCRIPTION
1	1	2-01-9306	HDLESS STL. SETSCREW 5/16-18x3/8, HEX. SOC.	46	2	41-1268	GLASS DISK
2	1	41-1492	PULLEY INCLUDING SETSCREW, ITEM 1	47	2	41-1267	RUBBER WASHER
3	4	2-01-6120	SOCKET HD. STEEL CAP SCREW 1/4-20x1-1/4	48	2	41-1061	OIL WINDOW COVER
4	1	1401F	SHAFT SEAL INCLUDING GASKET, ITEM 5	49	8	2-00-0608	HEX. HD. STEEL SCREW 8-32x1/2
5	1	41-1494	SEAL GASKET	50	1	41-1482	OIL CASE
6	2	41-1490	WOODRUFF KEY	51	4	2-01-0328	HEX. HD. STEEL CAPSCREW 5/16-18x1-3/4
7	1	41-1484	SHAFT & COLLAR				
8	2	41-1486	LEG				
9	9	2-01-0324	HEX. HD. STL. CAP SCREW 5/16-18x1-1/2	54	1	41-1734	DRAIN VALVE
10	44	41-2363	STEEL WASHER	55	6	2-01-0344	HEX. HD. STEEL CAPSCREW 5/16-18x2-3/4
11	2	41-1137	PLUG WASHER	56	3	2-00-2706	FIL. HD. STEEL SCREW 10-32x3/8
12	2	41-1136	PLUG	57	1	41-0672	SHAFT END CAP
13	1	41-1466	LARGE END PLATE	58	1	41-0992	PRESSURE RELEASE VALVE
14	1 to 4	41-0055	SPACER	59	1	4-40-1200	STEEL BALL 3/8 DIA.
15	2	2-00-2704	FIL. HD. STL. SCREW 10-32x1/4	60	1	41-1500	SMALL END PLATE
16	1	41-1507	"O" RING	61	1	41-1497	EXHAUST RING
17	1	41-1504	VALVE SPRING UNIT	62	1	41-1499	EXHAUST ROTOR
18	1	41-1505	VALVE BELLOW UNIT	63	1	41-0696	SMALL SPRING HOLDER
19	1	41-2492	COVER FOR CONVERSION VALVE	64	2	41-1304	SMALL VANE SPRING
20	5	2-01-6312	SOCKET HD. STL. CAPSCREW 5/16-18x3/4	65	2	41-2035	SMALL VANE
21	4	2-01-6320	SOCKET HD. STL. CAPSCREW 5/16-18x1-1/4	66	2	2-01-6316	SOCKET HD. STEEL CAPSCREW 5/16-18x1
22	1	41-1506	VALVE INNER PLATE	67	1	41-1493	INTAKE NIPPLE
23	1	41-1503	VALVE PLATE	68	1	41-0961	ALUMINUM WASHER
24	1	41-1508	VALVE GASKET	69	4	2-01-6314	SOCKET HD. STEEL CAPSCREW 5/16-18x7/8
25	1	41-1736	VENTED EXHAUST VALVE	70	1	41-1479	INTAKE CHAMBER
26	1	41-2258	HARDENED SLEEVE 1/4 SIZE	71	1	41-1495	INTAKE CHAMBER GASKET
27	1	41-2260	DISCHARGE VALVE	72	1	41-0937	SCREEN FILTER
28	4	2-61-0000	STEEL WASHER, 3/16 BOLT SIZE	73	1	41-1476	LARGE RING
29	4	2-31-0112	HEX. STEEL NUT 1/4-20x7/16	74	1	41-1478	LARGE ROTOR
30	1	41-2253	DISCHARGE VALVE COVER	75	2	41-1489	LARGE SPRING HOLDER
31	1	41-1465	CENTER PLATE	76	4	41-1488	LARGE VANE SPRING
32	1	41-2161	EXHAUST VALVE	77	2	41-1462	LARGE VANE
33	2	2-01-0120	HEX. HD. STEEL CAPSCREW 1/4-20x1-1/4	79	2	2-01-0320	HEX. HD. STEEL CAPSCREW 5/16-18x1-1/4
34	1	41-2164	COVER	80	1	2-01-0314	HEX. HD. STEEL CAPSCREW 5/16-18x7/8
35	1	2-01-8132	HEADLESS STEEL SETSCREW 1/4-20x2	81	1	41-1516	KEY FOR SMALL ROTOR
36	1	41-1005	PRESSURE RELEASE TUBE, PART 2	82	4	41-1056	ALUMINUM WASHER
37	1	41-1461	DEFLECTOR	83	1	41-1469	SPACER DISK
38	1	41-0986	PRESSURE RELEASE TUBE, PART 1	84	1	2-63-0193	SPLIT LOCK WASHER 1/4
39	3	2-03-3104	BIND. HD. SHEET METAL SCREW #6x1/4	85	1	41-2256	COIL SPRING
40	1	41-1496	OIL CASE GASKET	86	1	41-2257	HARDENED SLEEVE 5/16 SIZE
41	1	41-1501	DUST CAP	87	1	41-2553	SPACER
42	1	41-2610	NAME PLATE	88	1	41-2350	CONNECTING NIPPLE
43	15	2-01-0316	HEX. HD. STEEL CAP SCREW 5/16-18x1	89	1	41-1745	ADAPTER
44	4	2-09-1204	SELF-TAPPING SCREW STICK 3-48x1/8	90	1	2-69-7007	STAINLESS STEEL WASHER 11/32 x 11/16 x 1/6
45	2	41-1266	TENSION WASHER	91	1	41-2259	COIL SPRING

MODEL 1375



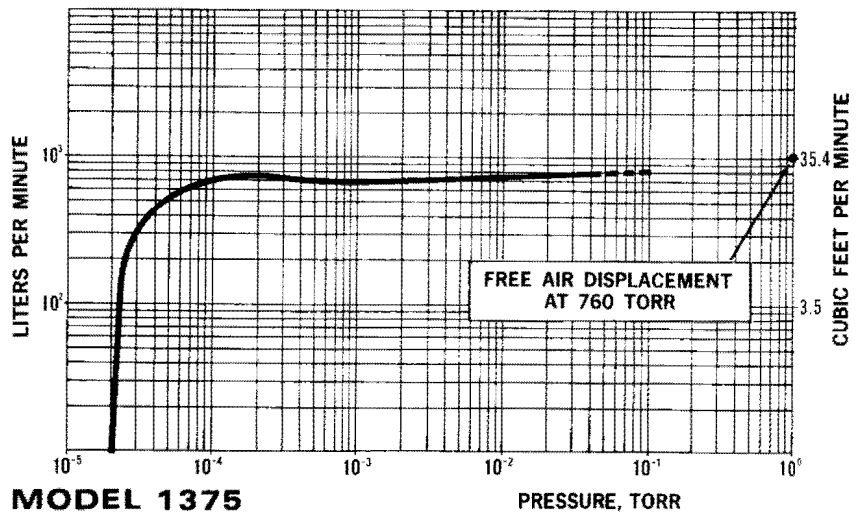
SPECIFICATIONS

Free-Air Displacement, L/M	1000
CFM	35.4
Guaranteed Partial Pressure	
Blankoff, millitorr	0.1
Pump Rotational Speed, RPM	335
Number of Stages	2
Oil Capacity, qts	1
Standard Belt Guard (not shown)	No. 41-1718
Net Weight, Pump Only, lbs.	280
Net Weight, Mounted Pump, lbs.	416
Shipping Weight, Mounted Pump, lbs.	460
Intake Flange	6-1/8 O.D. x 3 1/4 I.D.
Bolt Circle	5 1/4 Dia.
6 Holes, 60° Apart	7/16 Dia.
O-Ring Groove	4-7/64 O.D. x 3-5/8 I.D. x 5/32 Deep

Model 1375 Drive Requirements

Cat. No.	Belt Number and Size	MOTOR					
		Pulley Number and Size	HP	V	HZ	PH	RPM
1375B	41-1716 3V560	41-1755 2.65 x 1.125 x 3G	41-1952 2	115/230	60	1	1740
1375F	41-1716 3V560	41-1715 2.65 x .875 x 3G	41-1969 2	200	60	3	1725
1375J	41-1716 3V560	41-1695 3.35 x .875 x 3G	41-1965 2	220/380	50	3	1425
1375K-01	COMPLETE GASKET and SEAL KIT						
1375K-02	REPAIR KIT						
1375M	41-1716 3V560	41-1715 2.65 x .875 x 3G	41-1951 2	230/460	60	3	1725

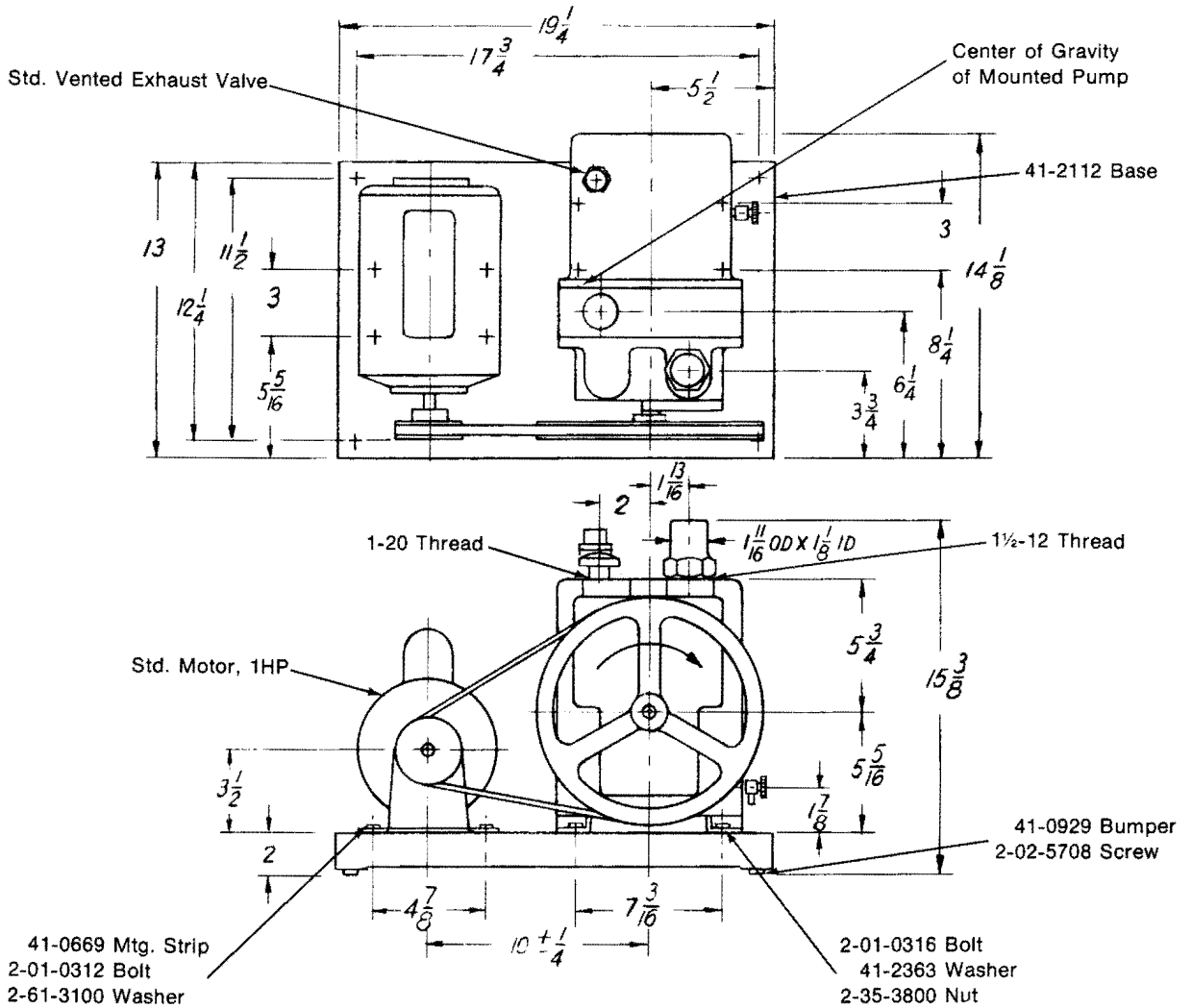
- Note:** 1. Pump pulley, No. 41-1714, 14" O.D. x 1.5" Bore x 3 Groove, is common to all pumps.
 2. 3V Belts, 3/8"W x 5/16"D, are notched underside.



PARTS LIST
MODEL 1375 VACUUM PUMP

ITEM	QUANTITY	PC. NO.	DESCRIPTION	ITEM	QUANTITY	PC. NO.	DESCRIPTION
1	1	41-1714	PUMP PULLEY INCLUDING SETSCREWS, ITEM 2	50	1	41-2517	GASKET
2	2	2-01-9306	SOC. HD. STEEL SETSCREW 5/16-18x3/8	51	2	2-01-0332	HEX.HD. STEEL CAPSCREW 5/16-18x 2
3	1	41-2491	SHAFT SEAL	53	1	41-2580	NAME PLATE
4	6	2-01-0110	HEX.HD. STEEL CAPSCREW 1/4-20x5/8	54	4	2-09-1204	SELF-TAPPING SCREWSTICK 3-48x1/8
5	6	2-61-0000	STEEL WASHER 3/16 BOLT SIZE	55	1	41-1720	EXHAUST FILTER, INCL. ELEMENT, ITEM 93
6	1	41-2515	"O" RING 3-5/8 OD x3-3/8 ID x1/8 W	56	4	2-61-3100	STEEL WASHER 1/4 BOLT SIZE
7	1	41-2519	ELBOW COVER	57	9	2-01-0352	HEX.HD. STEEL CAPSCREW 5/16-18x3-1/4
8	32	2-01-0520	HEX.HD. STEEL CAPSCREW 3/8-16x1-1/4	58	2	41-1710	LEG
9	1	2-01-0532	HEX.HD. STEEL CAPSCREW 3/8-16x2	59	2	41-1729	LARGE VANE
10	6	2-61-0300	STEEL WASHER 5/16 BOLT SIZE	60	6	41-2505	LARGE VANE SPRING
11	28	2-61-0571	STEEL WASHER 3/8x5/8x.071	61	2	41-1709	LARGE SPRING HOLDER
12	1	41-2481	"O" RING 4 OD x3-5/8 ID x3/16 W	62	1	41-1725	LARGE ROTOR
13	1	41-2394	INTAKE ELBOW ASSEMBLY	63	2	41-2514	WOODRUFF KEY
14	14	2-01-0316	HEX.HD. STEEL CAPSCREW 5/16-18x1	64	1	41-2403	SHAFT
15	26	41-2363	WASHER	65	1	41-2473	LARGE KEY
16	1	41-2523	FINE FILTER SCREEN	66	1	41-1701	CENTER PLATE
17	1	41-2401	INTAKE OIL BAFFLE	67	1	41-2522	PLUG 1/4 NPT
18	4	2-64-0400	SHAKEPROOF LOCKWASHER NO. 6 EXT. T.	68	1	2-01-0580	HEX.HD. STEEL CAPSCREW 3/8-16x5
19	4	2-00-2406	FIL. HD. STEEL SCREW 6-32x3/8	69	1	41-1704	SMALL RING
20	1	41-2482	"O" RING 4-7/8 OD x4-1/2 ID x3/16 W	70	1	4-40-2000	STEEL BALL 5/8 DIA.
21	1	41-1702	LARGE END PLATE	71	1	41-1719	CONE SPRING
22	2	41-1136	PLUG	72	1	41-0491	ALUMINUM WASHER
23	2	41-1137	WASHER	73	1	41-1708	EXHAUST VALVE CAP
24	2	41-2397	THRUST SPACER	74	2	41-2380	SMALL VANE
25	4	2-00-2704	FIL. HD. STEEL SCREW 10-32x1/4	76	1	41-2471	SMALL SPRING HOLDER
26	1	41-1700	LARGE RING	77	2	4-21-3901	DOWEL PIN .4375 DIA. x3
27	1	41-2508	INNER PLATE FOR CONVERSION VALVE	78	1	41-2405	SMALL ROTOR
28	1	41-1504	VALVE SPRING UNIT	79	1	41-2393	SMALL END PLATE
29	4	2-01-6308	SOC. HD. STEEL CAPSCREW 5/16-18x1/2	80	2	41-0374	PIPE PLUG 1/8 NPT
30	1	41-1505	BELLOWS VALVE UNIT	81	1	2-01-0364	HEX.HD. STEEL CAPSCREW 5/16-18x4
31	1	41-1507	"O" RING	82	1	41-2521	BALL CHECK PLUG
32	1	41-2492	CONVERSION VALVE COVER	83	1	4-40-0800	STEEL BALL 1/4 DIA.
33	4	2-01-6312	SOC. HD. STEEL CAPSCREW 5/16-18x3/4	84	1	41-1713	CONNECTING TUBE
34	1	41-2398	EXHAUST VALVE	85	1	41-2480	LOCKNUT
35	4	41-2507	EXHAUST VALVE SPRING	86	1	41-1712	REGULATING ROD
36	1	41-1707	VALVE COVER	87	1	41-2498	REGULATOR KNOB
37	4	41-2485	SPRING RETAINER	88	1	41-2470	SHAFT END CAP
38	4	41-2509	LONG EXTENSION ROD	89	6	2-01-6112	SOC. HD. STEEL CAPSCREW 1/4-20x3/4
39	1	41-1727	CHIMNEY	90	6	2-31-2521	HEX. STEEL NUT 3/8-16
41	1	41-2493	BAFFLE PLATE	91	2	41-2402	RETAINING RING
43	1	41-1711	OIL CASE GASKET	92	1	41-1722	DRAINCOCK
44	1	41-1728	OIL CASE ASSEMBLY	93	1	41-1721	REPLACEMENT FILTER ELEMENT FOR AIR-MAZE FILTER
45	2	41-1266	TENSION WASHER				
46	2	41-1268	GLASS DISK	93	1	41-1726	REPLACEMENT FILTER ELEMENT FOR TECHNOLAB FILTER
47	2	41-1267	RUBBER WASHER				
48	2	41-1061	OIL LEVEL WINDOW COVER	94	4	2-01-0352	HEX. HD. STEEL CAPSCREW 5/16-18x3 1/4 FOR AIR-MAZE FILTER
49	8	2-00-0608	HEX. HD. STEEL SCREW 8x32x1/2	94	4	2-01-0312	HEX. HD. STEEL CAPSCREW 5/16-18x3/4 FOR TECHNOLAB FILTER

MODEL 1376



SPECIFICATIONS

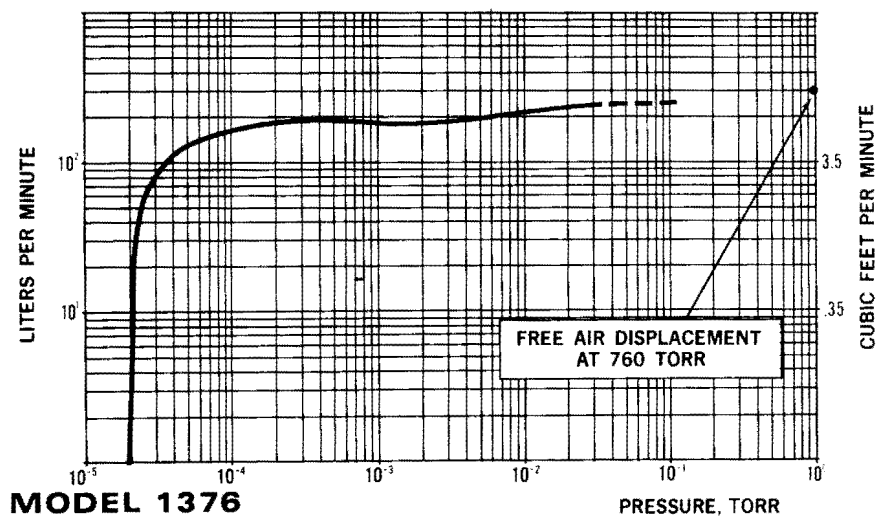
Free-Air Displacement, L/M	300
CFM	10.6
Guaranteed Partial Pressure	
Blankoff, millitorr	0.1
Pump Rotational Speed, RPM	525
Number of Stages	2
Oil Capacity, qts.	2 1/2
Standard Belt Guard (not shown)	No. 1371G
Net Weight, Pump Only, lbs.	107
Net Weight, Mounted Pump, lbs.	156
Shipping Weight, Mounted Pump, lbs.	172
Optional Exhaust Filter, Complete	No. 1417A
Exhaust Filter Element	No. 1417G
Size of Rubber Stopper for Intake	6 1/2

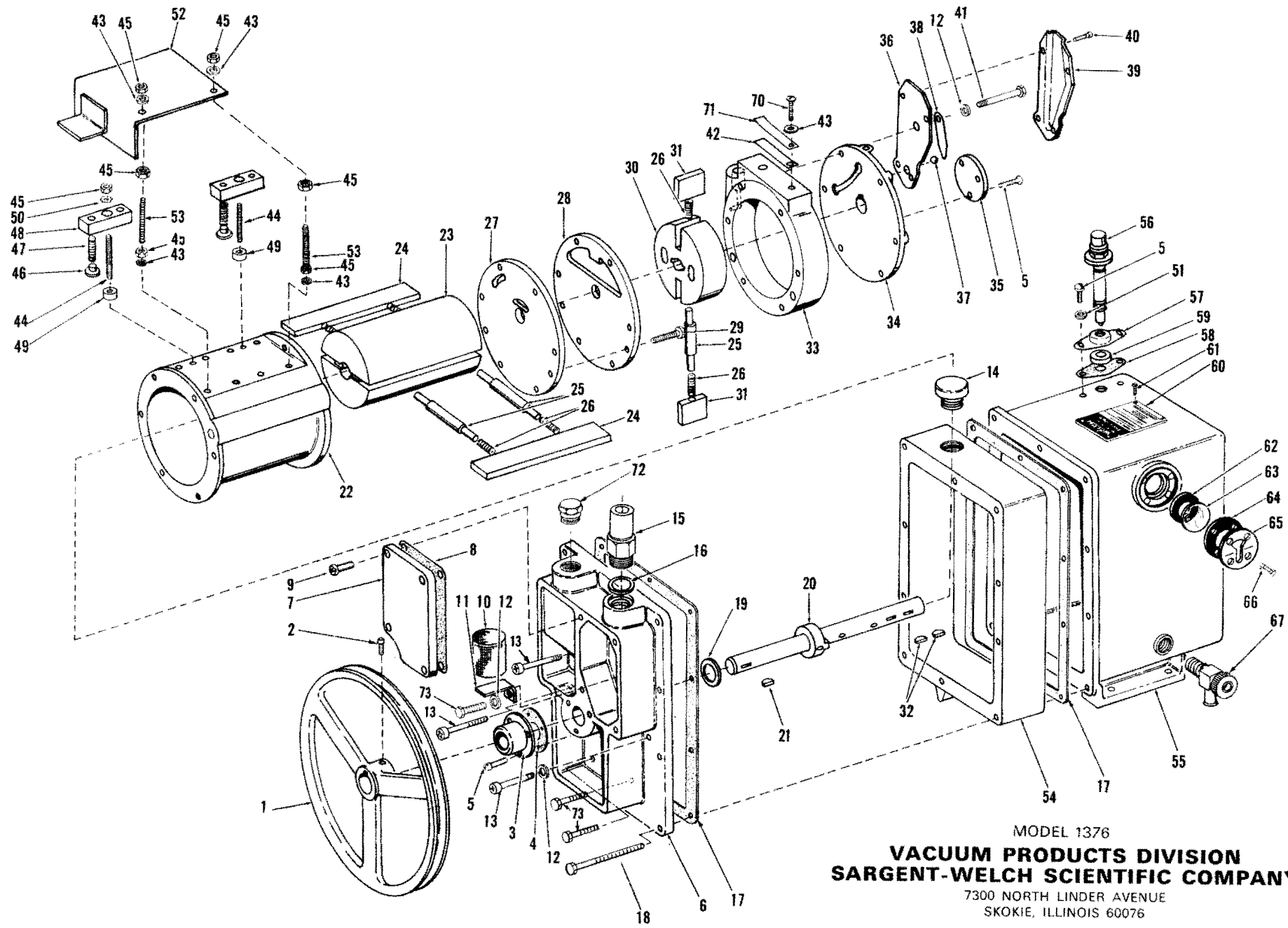
Model 1376 Drive Requirements

Cat. No.	Belt Number and Size	MOTOR					Remarks	
		Pulley Number and Size	HP	V	HZ	PH		RPM
1376B	41-0710 4L415	41-0668 3 x .625	41-1940 1	115/230	60	1	1725	Cord and Switch for 115V
1376C	41-0710 4L415	41-0668 3 x .625	41-1941 1	115/230	60	1	1725	Cord and Switch for 230V
1376F	41-0710 4L415	41-0668 3 x .625	41-1968 1	200	60	3	1725	
1376J	41-0710 4L415	41-0667 3.5 x .625	41-1964 1	220/380	50	3	1425	
1376K	41-0710 4L415	41-0668 3 x .625	41-1940 1	115/230	60	1	1725	Cord and Switch for 115V
1376K-01	COMPLETE GASKET and SEAL KIT							
1376K-02	REPAIR KIT							
1376L	41-0710 4L415	41-0667 3.5 x .625	41-1942 1	110/220	50	1	1425	
1376M	41-0710 4L415	41-0668 3 x .625	41-1917 1	230/460	60	3	1725	
1376Q	41-0710 4L415	41-0668 3 x .625	41-1943 1	115/230	60	1	1725	Totally Enclosed
1376S	41-0710 4L415	41-0667 3.5 x .625	41-1944 1	110/220	50	1	1425	Totally Enclosed
1376U	41-0710 4L415	41-0668 3 x .625	41-1945 1	230/460	60	3	1725	Totally Enclosed
1376W	41-0710 4L415	41-1694 3 x .875	41-1949 1	115/230	60	1	1725	Explosion Proof
1376X	41-0710 4L415	41-0667 3.5 x .625	41-2826 1	110/220	50	1	1425	Explosion Proof
1376Y	41-0710 4L415	41-0668 3 x .625	41-1947 1	230/460	60	3	1725	Explosion Proof

Note:

1. 4L415 Belts, "A" size, 1/2"W x 5/16"D, are stamped 1405A.
2. Pump pulley, No. 41-2074, 10" O.D. x .750" Bore, is common to all pumps.
3. Motor switch is available as No. 41-0943.
4. Cord and Plug for 230V, 1 PH, is available as No. 41-2551, 14 ga. wire, or No. 51-0375, 18 ga. wire.
5. Cord and Plug for 115V, 1 PH, is available as No. 41-2500.



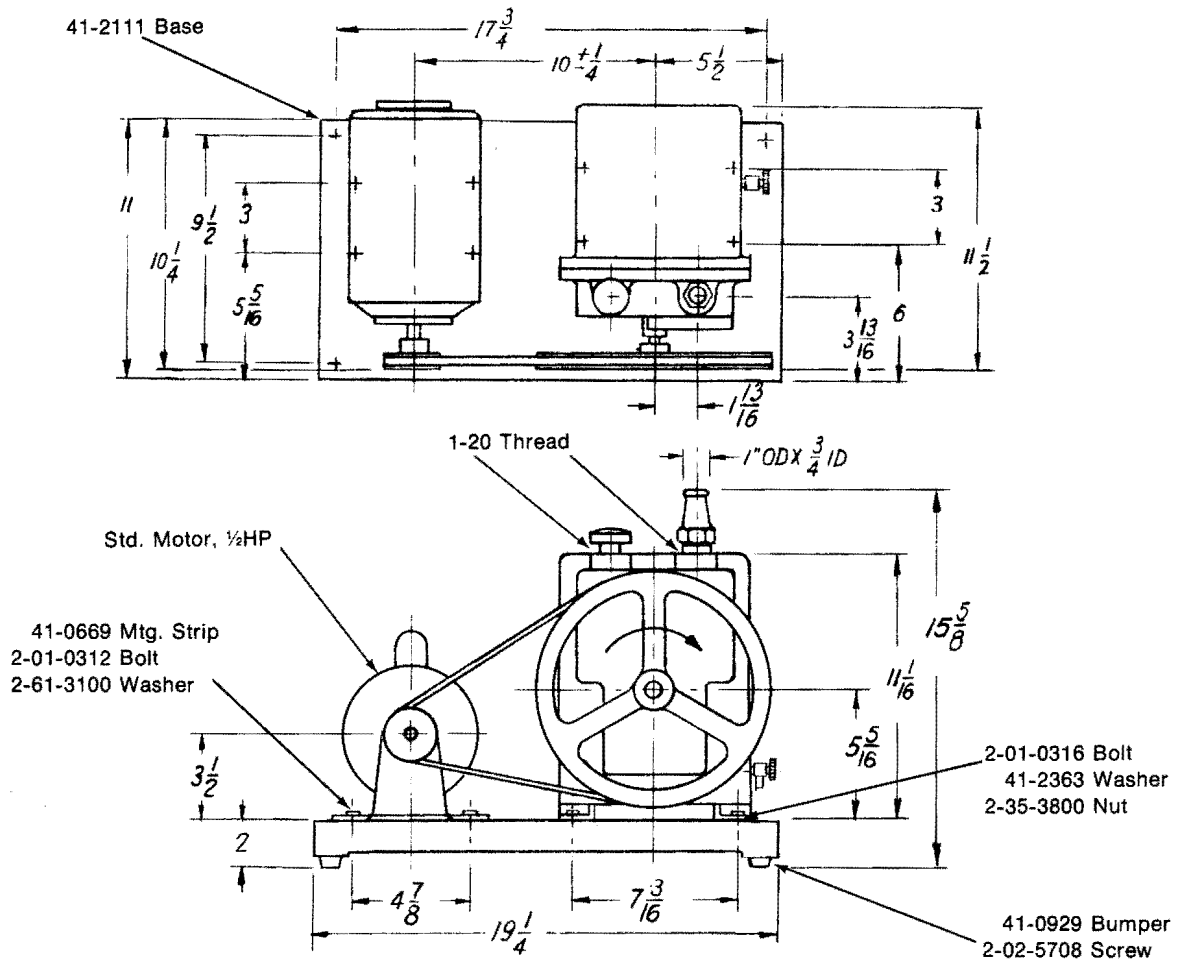


MODEL 1376
VACUUM PRODUCTS DIVISION
SARGENT-WELCH SCIENTIFIC COMPANY
 7300 NORTH LINDER AVENUE
 SKOKIE, ILLINOIS 60076

PARTS LIST
MODEL 1376 VACUUM PUMP

ITEM	QUANTITY	PC. NO.	DESCRIPTION	ITEM	QUANTITY	PC. NO.	DESCRIPTION
1	1	41-2074	PULLEY INCLUDING SETSCREW, ITEM 2	41	6	2-01-0356	HEX. HD. STEEL CAP SCREW 5/16-18x3-1/2
2	1	2-01-9306	SOCKET HD. STEEL SETSCREW 5/16-18x3/8	42	1	41-2154	LOWER EXHAUST VALVE
3	1	1401D	SHAFT SEAL INCLUDING GASKET, ITEM 4 AND 3 SCREWS, ITEM 5	43	5	2-61-0000	STEEL WASHER 3/16 BOLT SIZE
4	1	41-0643	SEAL GASKET	44	2	2-01-8128	HEADLESS STEEL SETSCREW 1/4-20x1-3/4
5	8	2-00-2706	FIL. HD. STEEL SCREW 10-32x3/8	45	8	2-31-0112	HEX. STEEL NUT 1/4-20x3/16x7/16
6	1	41-1689	LARGE END PLATE	46	4	41-2157	BLOCK VALVE
7	1	41-0775	INTAKE CHAMBER COVER	47	4	41-2158	VALVE SPRING
8	1	41-0234	INTAKE CHAMBER COVER GASKET	48	2	41-2156	VALVE BLOCK
9	4	2-01-6112	SOCKET HD. STEEL CAP SCREW 1/4-20x3/4	49	2	41-2159	VALVE BLOCK SPACER
10	1	41-1692	AIR FILTER	50	2	2-65-0125	SHAKEPROOF LOCKWASHER 1/4 EXT. T.
11	1	41-0663	AIR FILTER BRACKET	51	2	2-71-0040	BRASS WASHER #10 SIZE
12	12	41-2363	WASHER	52	1	41-1686	BAFFLE PLATE
13	3	2-01-6316	SOC. HD. STEEL CAP SCREW 5/16-18x1	53	2	41-2175	HEADLESS STEEL SETSCREW
14	1	41-0612	DUST CAP	54	1	41-1680	OIL CASE SPACER
15	1	41-1690	INTAKE NIPPLE	55	1	41-2038	OIL CASE
16	1	41-1691	ALUMINUM WASHER	56	1	41-2348	VENTED EXHAUST VALVE
17	2	41-0403	OIL CASE GASKET	57	1	41-2290	SEAL COVER
18	10	2-01-0152	HEX. HD. STEEL CAP SCREW 1/4-20 x 3-1/4	58	1	41-2291	SEAL COVER GASKET
19	1	41-0508	THRUST WASHER	59	1	41-0578	SEAL
20	1	41-1683	SHAFT	60	1	41-2581	NAME PLATE
21	1	41-0624	PULLEY KEY	61	4	2-09-1204	SELF-TAPPING SCREWSTICK 3-48x1/8
22	1	41-1688	LARGE RING	62	2	41-1266	TENSION WASHER
23	1	41-1682	LARGE ROTOR	63	2	41-1268	GLASS DISK
24	2	41-1748	LARGE VANE	64	2	41-1267	RUBBER WASHER
25	3	41-0696	SPRING HOLDER	65	2	41-1061	OIL WINDOW COVER
26	6	41-1304	VANE SPRING	66	8	2-00-0608	HEX. HD. STEEL SCREW 8-32x1/2
27	1	41-2041	CENTER PLATE PART 2	67	1	41-1734	DRAIN VALVE
28	1	41-2040	CENTER PLATE PART 1				
29	2	2-01-6320	SOCKET HD. CAP SCREW 5/16-18x1-1/4	70	1	2-01-5106	RD. HD. STEEL SCREW 1/4-20x3/8
30	1	41-1518	EXHAUST ROTOR	71	1	41-2153	UPPER EXHAUST VALVE
31	2	41-2035	SMALL VANE	72	1	41-1708	PLUG
32	2	41-0613	WOODRUFF KEY	73	3	2-01-0316	HEX. HD. STEEL CAP SCREW 5/16-18 x 1
33	1	41-2039	EXHAUST RING				
34	1	41-2045	SMALL END PLATE				
35	1	41-0672	END CAP				
36	1	41-1005	PRESSURE RELEASE TUBE PART 2				
37	1	4-40-1200	STEEL BALL 3/8 DIA.				
38	1	41-0992	PRESSURE RELEASE VALVE				
39	1	41-0986	PRESSURE RELEASE TUBE PART 1				
40	3	2-03-3104	BIND. HD. SHEET METAL SCREW #6x1/4				

MODEL 1380



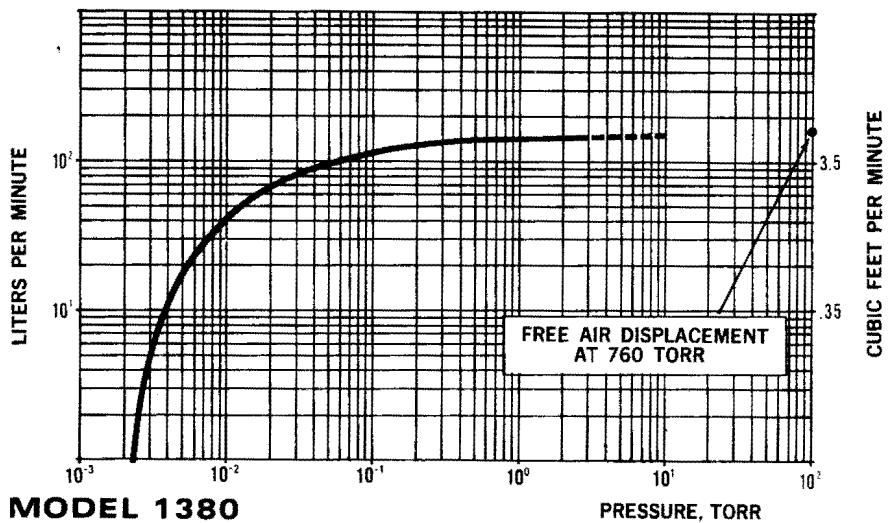
SPECIFICATIONS

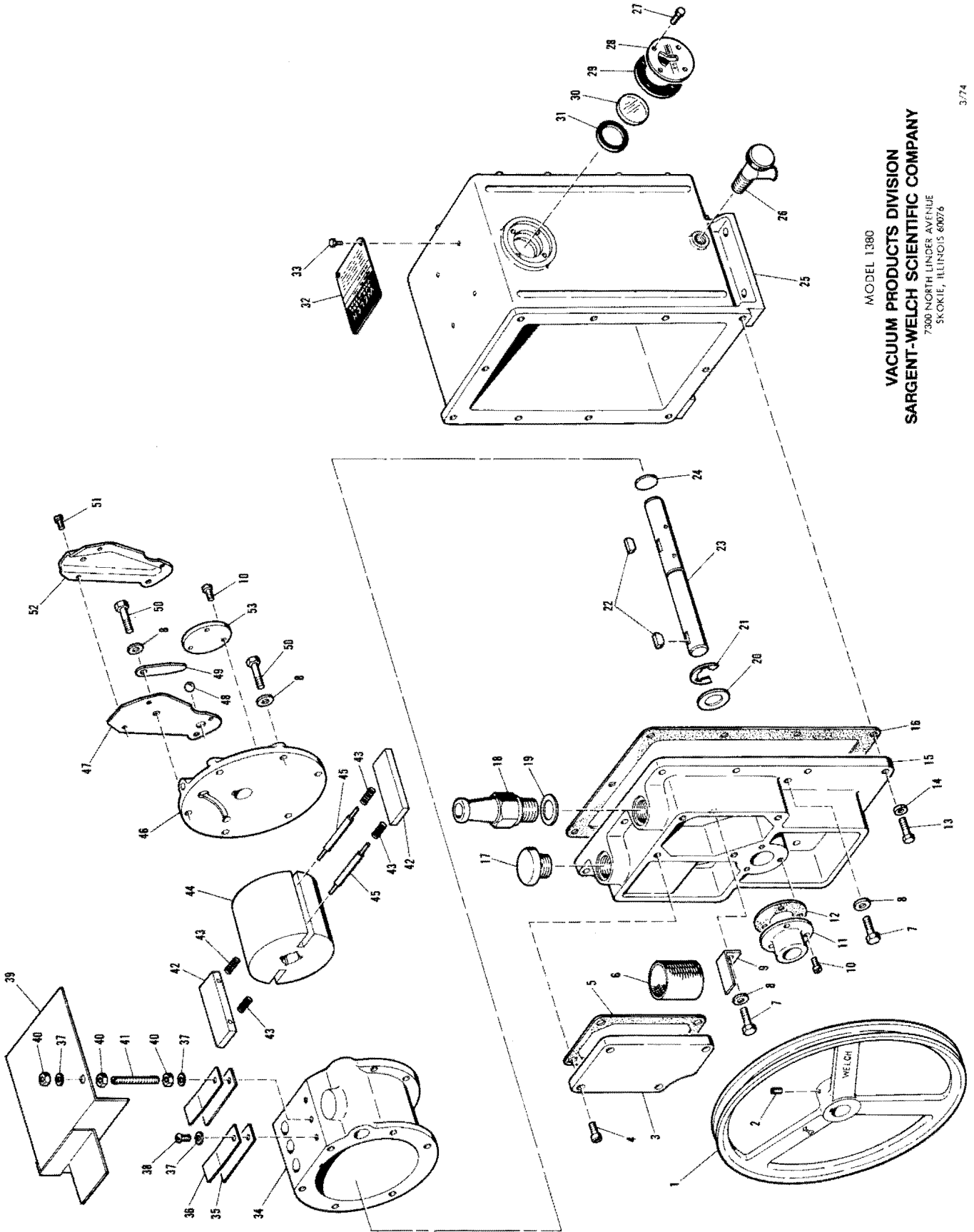
Free-Air Displacement, L/M	160
CFM	5.6
Guaranteed Partial Pressure	
Blankoff, millitorr	15.0
Pump Rotational Speed, RPM	525
Number of Stages	1
Oil Capacity, qts.	3.7
Standard Belt Guard (not shown)	No. 1371G
Net Weight, Pump Only, lbs.	57
Net Weight, Mounted Pump, lbs.	91
Shipping Weight, Mounted Pump, lbs.	104
Optional Exhaust Filter, Complete	No. 1417A
Exhaust Filter Element	No. 1417G
Size of Rubber Stopper for Intake	3

Model 1380 Drive Requirements

Cat. No.	Belt Number and Size	MOTOR					Remarks	
		Pulley Number and Size	HP	V	HZ	PH		RPM
1380B	41-0710 4L415	41-0668 3 x .625	41-1907 ½	115/230	60	1	1725	For 115V
1380C	41-0710 4L415	41-0668 3 x .625	41-1907 ½	115/230	60	1	1725	For 230V
1380K-01	COMPLETE GASKET and SEAL KIT							
1380K-02	REPAIR KIT							
1380L	41-0713 4L420	41-0667 3.5 x .625	41-1905 ½	110/220	50	1	1425	
1380M	41-0710 4L415	41-0668 3 x .625	41-1904 ½	230/460	60	3	1725	
1380Q	41-0710 4L415	41-0668 3 x .625	41-1911 ½	115/230	60	1	1725	Totally Enclosed
1380S	41-0713 4L420	41-0667 3.5 x .625	41-2824 ½	110/220	50	1	1425	Totally Enclosed
1380U	41-0710 4L415	41-0668 3 x .625	41-1913 ½	230/460	60	3	1725	Totally Enclosed
1380W	41-0710 4L415	41-0668 3 x .625	41-1912 ½	115/230	60	1	1725	Explosion Proof
1380X	41-0713 4L420	41-0667 3.5 x .625	41-2825 ½	110/220	50	1	1425	Explosion Proof
1380Y	41-0710 4L415	41-0668 3 x .625	41-2823 ½	230/460	60	3	1725	Explosion Proof

Note: 1. Pump pulley, No. 41-2074, 10" O.D. x .750" Bore, is common to all pumps.
 2. 4L415 Belts, "A" size, ½"W x 5/16"D, are stamped 1405A.



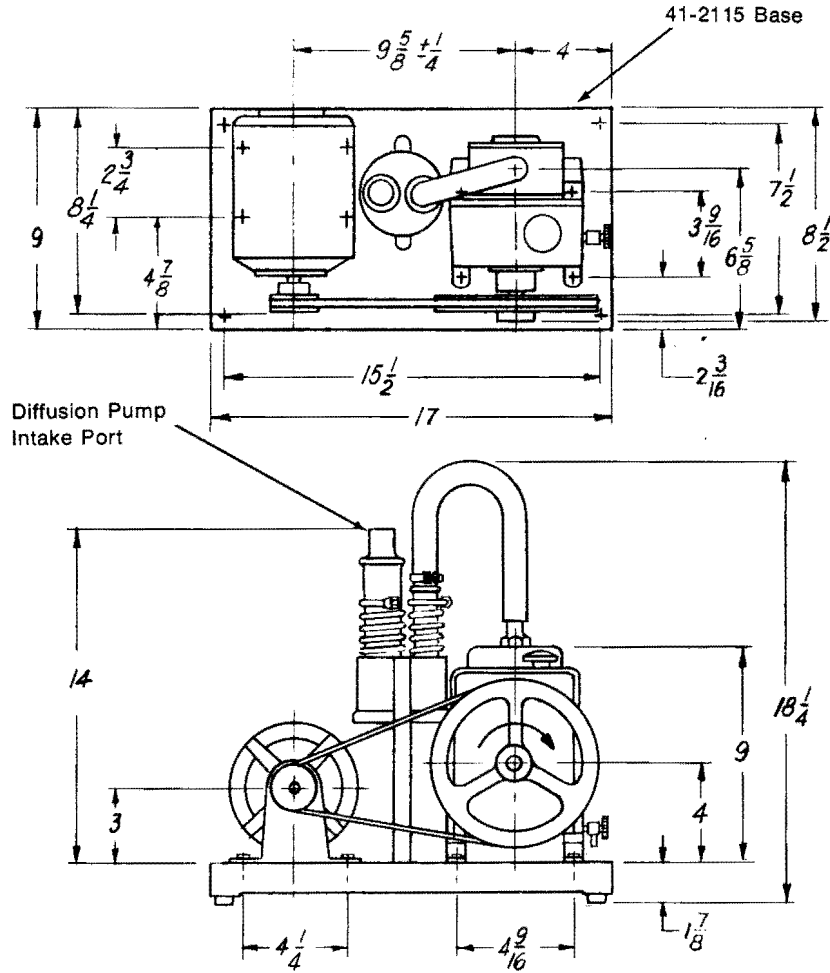


MODEL 1380
VACUUM PRODUCTS DIVISION
SARGENT-WELCH SCIENTIFIC COMPANY
 7300 NORTH LINDER AVENUE
 SKOKIE, ILLINOIS 60076

PARTS LIST
MODEL 1380 VACUUM PUMP

<u>ITEM</u>	<u>QUANTITY</u>	<u>PC. NO.</u>	<u>DESCRIPTION</u>
1	1	41-2074	PULLEY, INCL. SETSCREW, ITEM 2
2	1	2-01-9306	SOC. HD. STEEL SETSCREW 5/16 - 18 x 3/8
3	1	41-0775	INTAKE CHAMBER COVER
4	4	2-01-6112	SOC. HD. STEEL CAPSCREW 1/4 - 20 x 3/4
5	1	41-0234	INTAKE CHAMBER COVER GASKET
6	1	41-0660	AIR FILTER
7	6	2-01-0316	HEX. HD. STEEL CAPSCREW 5/16 - 18 x 1
8	12	41-2363	STEEL WASHER
9	1	41-0663	AIR FILTER BRACKET
10	6	2-00-2706	FIL. HD. STEEL SCREW 10 - 32 x 3/8
11	1	1401D	SHAFT SEAL, INCL. GASKET, ITEM 12, AND 3 SCREWS, ITEM 10
12	1	41-0643	SEAL GASKET
13	10	2-01-0112	HEX. HEAD STEEL CAPSCREW 1/4 - 20 x 3/4
14	10	2-63-0193	SPLIT LOCKWASHER 1/4
15	1	41-1770	LARGE ENDPLATE
16	1	41-0403	OIL CASE GASKET
17	1	41-0612	DUST CAP
18	1	41-0993	INTAKE NIPPLE
19	1	41-0491	ALUMINUM WASHER
20	1	41-0508	STEEL WASHER
21	1	4-06-0754	RETAINING RING
22	2	41-0624	WOODRUFF KEY
23	1	41-1773	SHAFT
24	1	41-1766	THRUST DISK
25	1	41-1764	OIL CASE
26	1	41-1734	DRAIN VALVE
27	8	2-00-0608	HEX. HD. STEEL SCREW 8 - 32 x 1/2
28	2	41-1061	OIL WINDOW COVER
29	2	41-1267	RUBBER WASHER
30	2	41-1268	GLASS DISK
31	2	41-1266	TENSION WASHER
32	1	41-2619	NAMEPLATE
33	4	2-09-1204	SELF TAPPING SCREWSTICK 3 - 48 x 1/8
34	1	41-1772	RING
35	3	41-1775	LOWER EXHAUST VALVE
36	3	41-1774	UPPER EXHAUST VALVE
37	4	2-61-0000	STEEL WASHER 3/16
38	2	2-01-5106	RD. HD. STEEL SCREW 1/4 - 20 x 3/8
39	1	41-1776	BAFFLE
40	3	2-31-0112	HEX. STEEL NUT 1/4 - 20
41	1	41-2175	SLOTTED STEEL SETSCREW 1/4 - 20 x 2-1/4
42	2	41-2036	VANE
43	4	41-1304	VANE SPRING
44	1	41-1771	ROTOR
45	2	41-0696	VANE SPRING HOLDER
46	1	41-2045	SMALL ENDPLATE
47	1	41-1005	PRESSURE RELEASE TUBE NO. 2
48	1	4-40-1200	STEEL BALL 3/8 DIA.
49	1	41-0992	PRESSURE RELEASE VALVE
50	6	2-01-0318	HEX. HD. STEEL CAPSCREW 5/16 - 18 x 1-1/8
51	3	2-03-3104	BIND. HD. SHEET METAL SCREW NO. 6 x 1/4
52	1	41-0986	PRESSURE RELEASE TUBE NO. 1
53	1	41-0672	END CAP

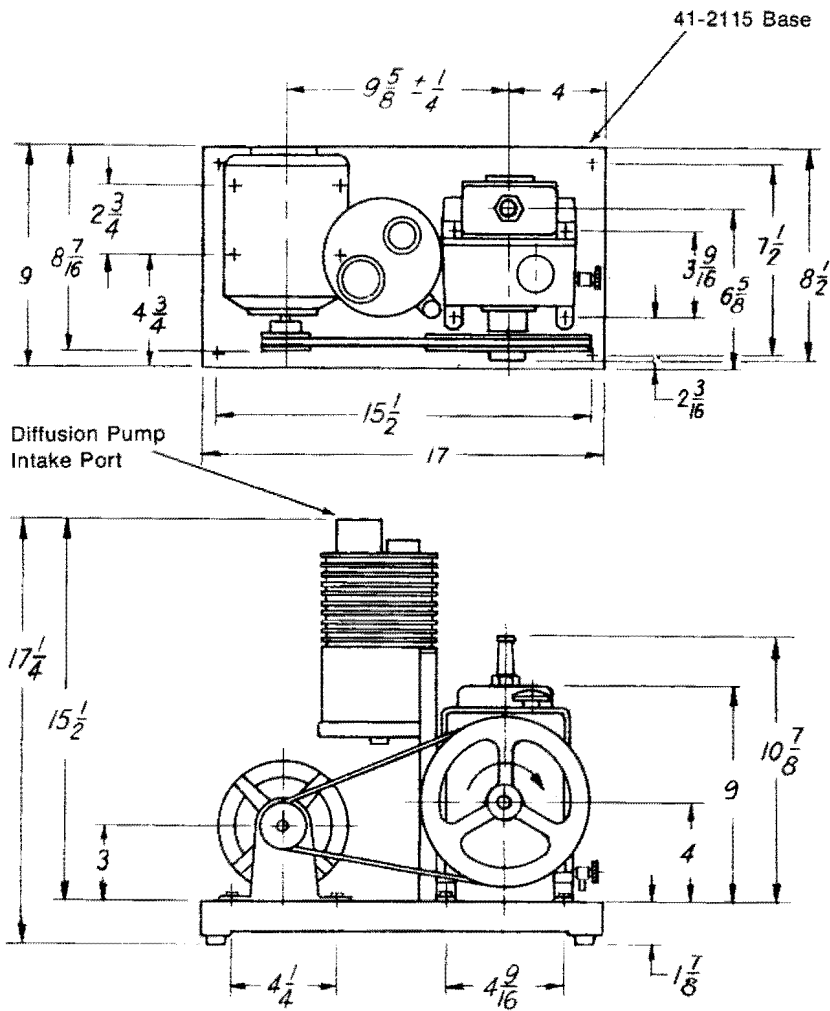
MODEL 1392



SPECIFICATIONS

Ultimate Pressure Attainable, Torr	.....	1×10^{-6}
Model 1392 Diffusion Pump Speed @ 1×10^{-4} Torr, L/M	.....	600
Model 1392B Diffusion Pump Speed @ 1×10^{-4} Torr, L/M	.....	1200
Free-Air Displacement, L/M	.....	25
CFM	.....	0.9
Cooling Rate, Water Cooled—Model 1392	.....	0.04 gal/min @ 65°F
Air Cooled—Models 1392A and 1392B	.....	15 cu ft/min @ 78°F
Limit of Forepressure, millitorr	.....	100
Pump Fluid Required, ml	.....	55
Octoil Pump Fluid, 150 ml	.....	No. 1391K
500 ml	.....	No. 1391L
Heater Input, Watts	.....	135
Heater—135 Watt, 115V	.....	No. 1391H
Standard Belt Guard (not shown)	.....	No. 1371H
Net Weight, Mounted Pump, lbs.	.....	63
Shipping Weight, Mounted Pump, lbs.	.....	71

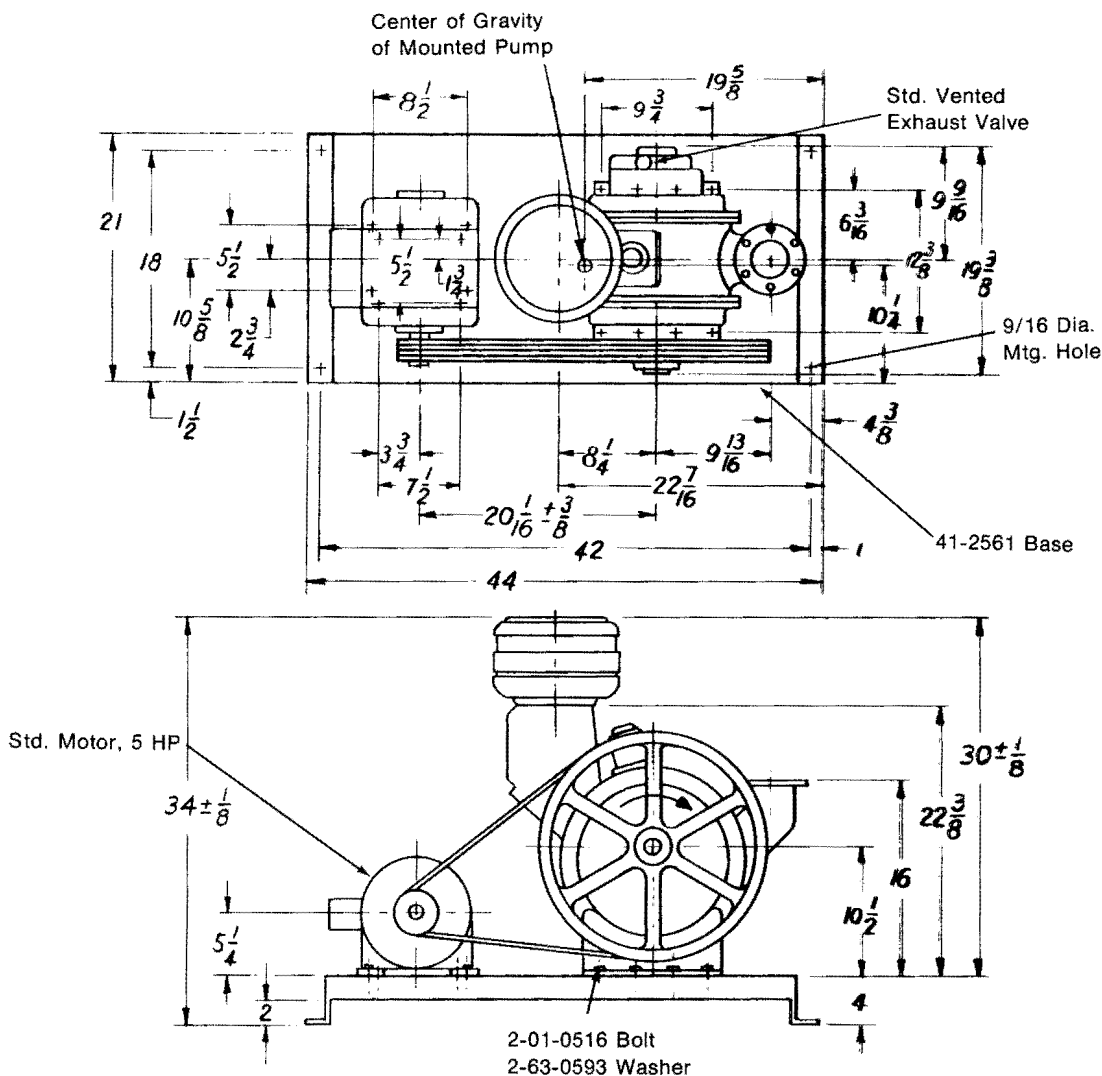
MODEL 1392B



Model 1392 Drive Requirements

Cat. No.	Belt Number and Size	MOTOR					
		Pulley Number and Size	HP	V	HZ	PH	RPM
1392	41-0708 4L340	41-0551 2.4 x .5	41-1901 1/3	115	60	1	1725
1392A	41-0708 4L340	41-0551 2.4 x .5	41-1901 1/3	115	60	1	1725
1392B	41-0708 4L340	41-0551 2.4 x .5	41-1901 1/3	115	60	1	1725
1400K-01	COMPLETE GASKET and SEAL KIT for use with Model 1400 Mechanical Pump component.						
1400K-02	REPAIR KIT for use with Model 1400 Mechanical Pump component.						

MODEL 1395



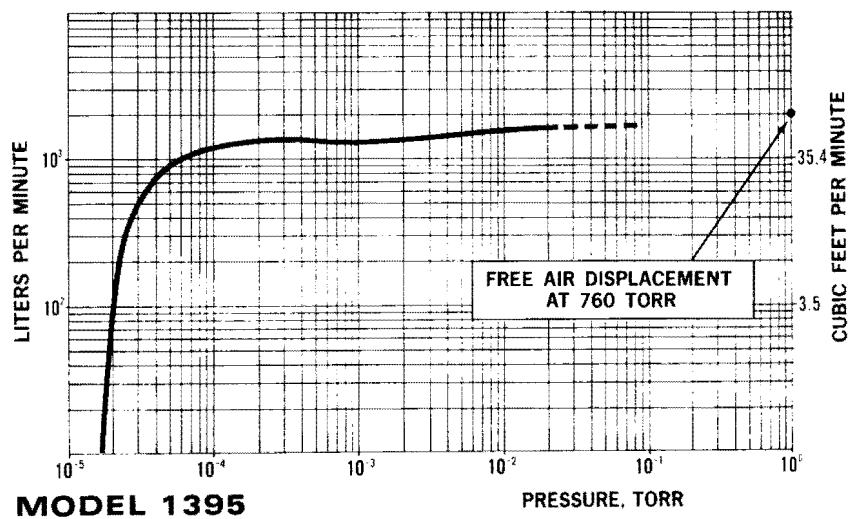
SPECIFICATIONS

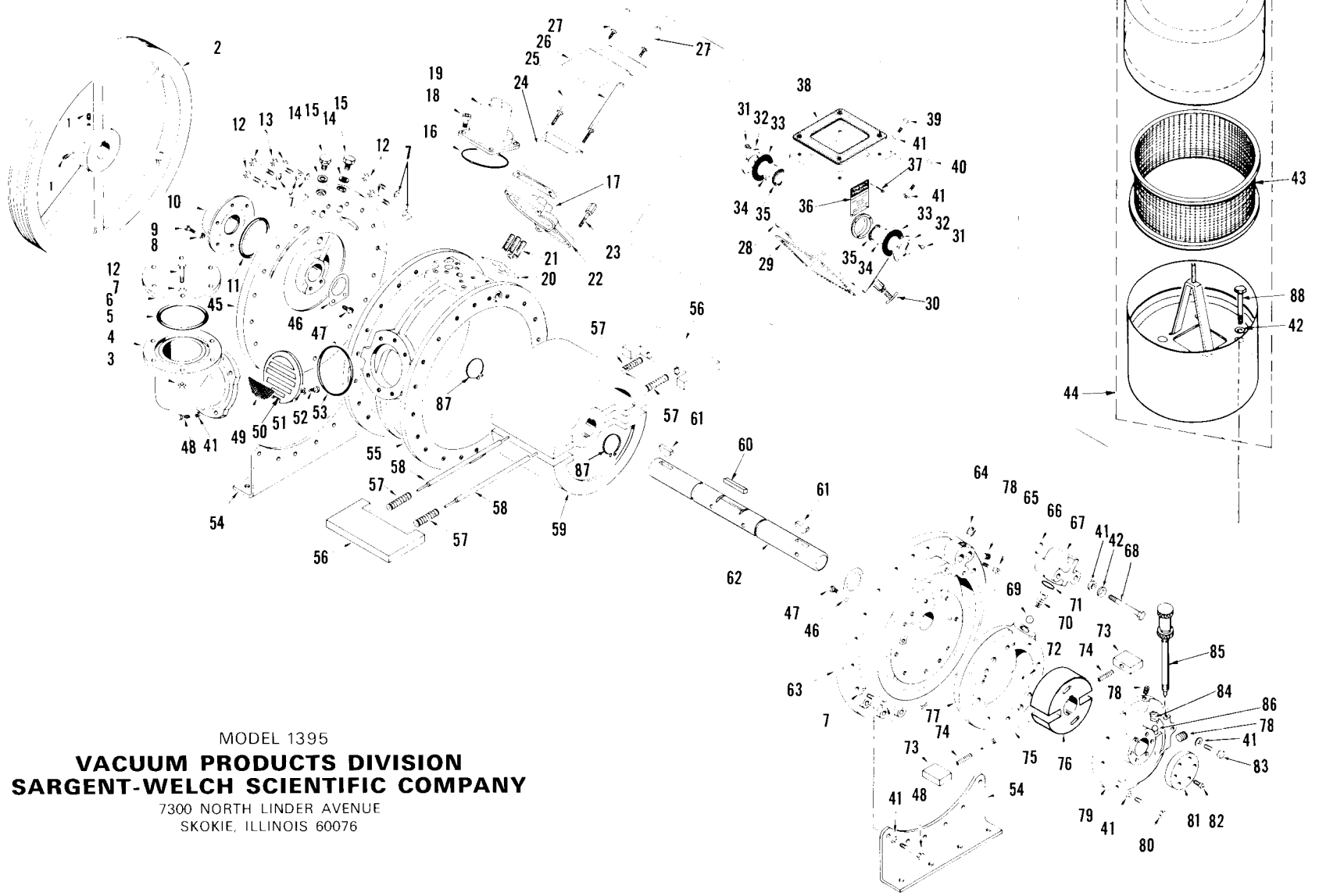
Free-Air Displacement, L/M	2000
CFM	71
Guaranteed Partial Pressure	
Blankoff, millitorr	0.1
Pump Rotational Speed, RPM	340
Number of Stages	2
Oil Capacity, qts.	2½
Standard Belt Guard (not shown)	No. 41-2930
Net Weight, Pump Only, lbs.	385
Net Weight, Mounted Pump, lbs.	601
Shipping Weight, Mounted Pump, lbs.	670
Intake Flange	6-1/8 O.D. x 3¼ I.D.
Bolt Circle	5¼ Dia.
6 Holes, 60° Apart	7/16 Dia.
O-Ring Groove	4-7/64 O.D. x 5/32 Deep x ¼ Wide

Model 1395 Drive Requirements

Cat. No.	Belt Number and Size	MOTOR				
		Pulley Number and Size	HP V	HZ	PH	RPM
1395F	41-2512 3V800	41-2548 3.65 x 1.125 x 4G	41-1954 5 200	60	3	1745
1395J	41-2512 3V800	41-1696 4.25 x 1.125 x 4G	41-1967 5 220/380	50	3	1425
1398K-01	COMPLETE GASKET and SEAL KIT for use with Model 1395					
1398K-02	REPAIR KIT for use with Model 1395					
1395M	41-2512 3V800	41-2548 3.65 x 1.125 x 4G	41-1953 5 230/460	60	3	1745

Note: 1. Pump pulley, No. 41-2510, 19" O.D. x 1.5" Bore x 4 Groove, is common to all pumps.
 2. 3V Belts, 3/8"W x 5/16"D, are notched underside.



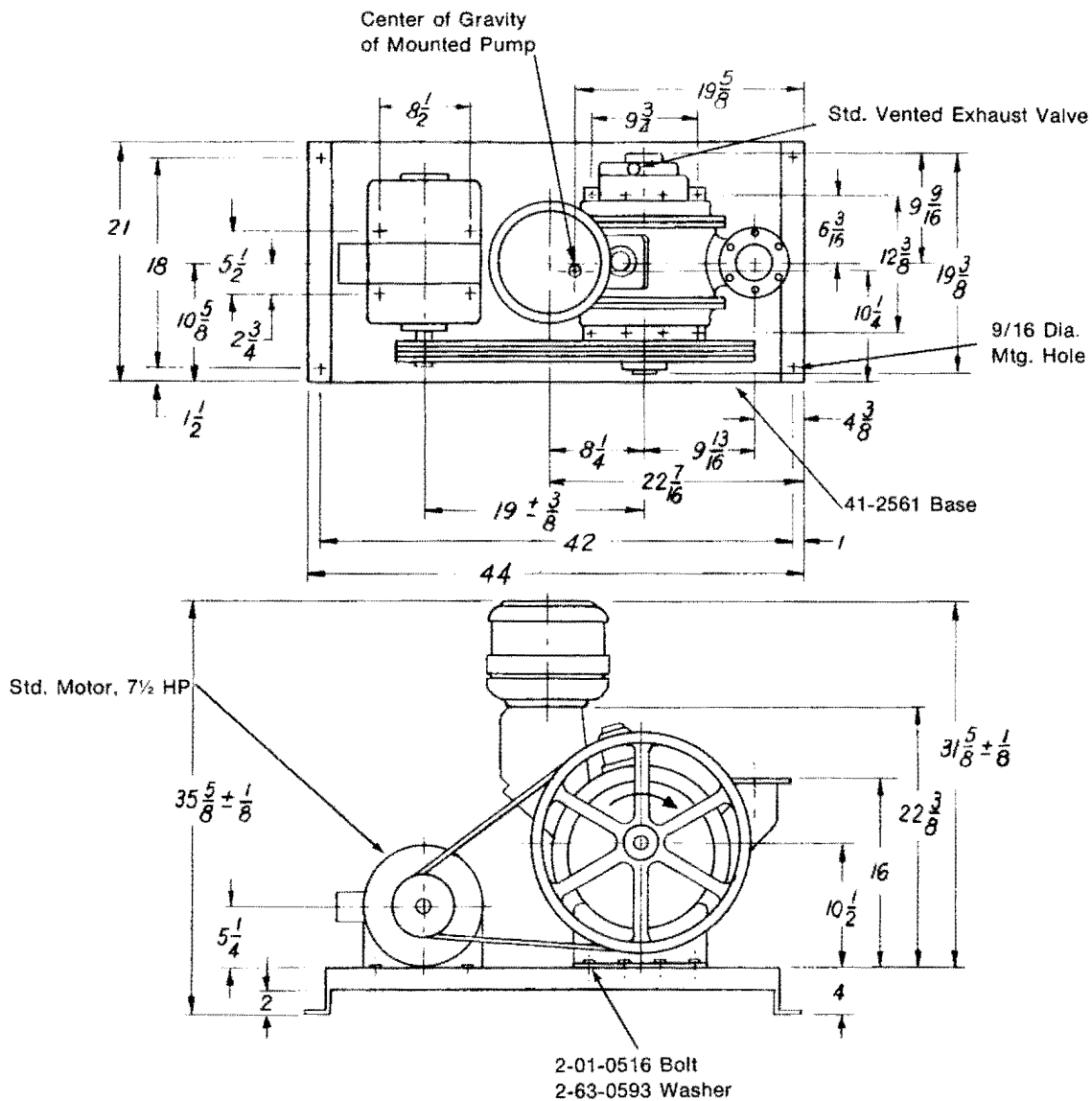


MODEL 1395
VACUUM PRODUCTS DIVISION
SARGENT-WELCH SCIENTIFIC COMPANY
7300 NORTH LINDER AVENUE
SKOKIE, ILLINOIS 60076

PARTS LIST
MODEL 1395 VACUUM PUMP

ITEM	QUANTITY	PC. NO.	DESCRIPTION	ITEM	QUANTITY	PC. NO.	DESCRIPTION
1	2	2-01-9306	SETSCREW FOR PULLEY, 5/16-18x3/8, HEX.SOC.	46	2	41-2397	SPACER
2	1	41-2510	PULLEY INCLUDING SETSCREWS, ITEM 1	47	4	2-00-2704	FIL. HEAD STEEL SCREW 10-32x1/4
3	6	2-31-2521	HEX. STEEL NUT 3/8-16	48	18	2-01-0316	HEX. HEAD STEEL CAPSCREW 5/16-18x1
4	1	41-2394	ELBOW	49	1	41-2523	FINE FILTER SCREEN
5	1	41-2481	O RING 4 O. D. x3-5/8 I. D.	50	1	41-2401	INTAKE OIL BAFFLE
6	1	41-2519	COVER FOR ELBOW	51	4	2-64-0400	SHAKEPROOF LOCKWASHER #6 EXT. T.
7	43	2-61-0571	STEEL WASHER .071 THK. 3/8 I. D. x5/8 O. D.	52	4	2-00-2406	FIL. HEAD STEEL MACHINE SCREW 6-32x3/8
8	6	2-61-0000	STEEL WASHER 3/16 BOLT SIZE	53	1	41-2482	O RING FOR ELBOW 4-7/8 O. D. x4-1/2 I. D.
9	6	2-01-0110	HEX. HEAD CAPSCREW 1/4-20x5/8	54	2	41-2494	LEG
10	1	41-2491	SEAL	55	1	41-2386	LARGE RING
11	1	41-2515	O RING	56	2	41-2383	LARGE VANE
12	42	2-01-0520	HEX. HEAD STEEL CAPSCREW 3/8-16x1-1/4	57	4	41-2505	SPRING FOR LARGE VANE
13	3	2-01-0532	HEX. HEAD STEEL CAPSCREW 3/8-16x2	58	2	41-2472	SPRING HOLDER FOR LARGE VANE
14	4	41-1137	WASHER	59	1	41-2404	LARGE ROTOR
15	2	41-1136	PLUG	60	1	41-2473	KEY
16	1	41-1507	O RING 3-3/8 O. D. x3-1/8 I. D.	61	2	41-2514	WOODRUFF KEY
17	4	41-2485	SPRING RETAINER	62	1	41-2403	SHAFT
18	4	2-01-6312	SOCKET HEAD STEEL CAPSCREW 5/16-18x3/4	63	1	41-2410	CENTER PLATE
19	1	41-2492	CONVERSION VALVE COVER	64	1	41-2522	PIPE PLUG 1/4 PIPE SIZE
20	1	41-2398	VALVE	65	1	2-01-6532	SOCKET HEAD STEEL CAP SCREW 3/8-16x2
21	4	41-2507	SPRING FOR EXHAUST VALVE	66	1	41-2487	O RING 1 O. D. x3/4 I. D.
22	1	41-2399	VALVE COVER	67	1	41-2396	EXHAUST BY-PASS
23	2	41-2509	LONG EXTENSION ROD	68	2	2-01-0344	HEX. HEAD STEEL CAPSCREW 5/16-18x2-3/4
24	1	41-2486	DEFLECTOR	69	1	41-2382	BALL VALVE 3/4 DIAMETER
25	2	41-2483	CONNECTOR ROD	70	1	41-2506	CONE SPRING
26	1	41-2493	BAFFLE PLATE	71	1	41-2488	O RING 1-3/8 O. D. x1-1/8 I. D.
27	2	41-2484	EXTENSION ROD	72	2	4-21-3901	DOWEL PIN .4375 DIA. x3
28	1	41-2395	OIL CASE	73	2	41-2380	SMALL VANE
29	1	41-2518	GASKET	74	2	41-1488	SMALL SPRING
30	1	41-1722	DRAINCOCK	75	1	41-2471	SPRING HOLDER FOR SMALL VANES
31	8	2-00-0608	HEX. HEAD STEEL SCREW 8-32x1/2	76	1	41-2405	SMALL ROTOR
32	2	41-1061	OIL WINDOW COVER	77	1	41-2390	SMALL RING
33	2	41-1267	RUBBER WASHER	78	3	41-0374	PIPE PLUG
34	2	41-1268	GLASS DISK	79	1	41-2409	SMALL END PLATE
35	2	41-1266	TENSION WASHER	80	7	2-01-0352	HEX. HEAD STEEL CAPSCREW 5/16-18x3-1/4
36	1	41-2606	NAME PLATE	81	1	41-2470	SHAFT END CAP
37	4	2-09-1204	SCREWSTICK 3-48x1/8	82	6	2-01-6112	SOCKET HEAD STEEL CAPSCREW 1/4-20x3/4
38	1	41-2517	GASKET	83	1	2-01-0364	HEX. HEAD STEEL CAPSCREW 5/16-18x4
39	2	2-01-0320	HEX. HEAD STEEL CAPSCREW 5/16-18x1-1/4	84	1	41-2521	BALL CHECK PLUG
40	2	2-01-0356	HEX. HEAD STEEL CAPSCREW 5/16-18x3-1/2	85	1	41-2497	VENTED EXHAUST VALVE
41	32	41-2363	WASHER	86	1	4-40-0800	STEEL BALL 1/4 DIAMETER
42	6	2-61-3100	STEEL WASHER 1/4 BOLT SIZE	87	2	41-2402	RETAINING RING
43	1	41-1721	REPLACEMENT FILTER ELEMENT FOR AIR-MAZE FILTER	88	4	2-01-0352	HEX. HD. STEEL CAPSCREW 5/16-18x3 1/4 FOR AIR-MAZE FILTER
43	1	41-1726	REPLACEMENT FILTER ELEMENT FOR TECHNOLAB FILTER	88	4	2-01-0312	HEX. HD. STEEL CAPSCREW 5/16-18x3/4 FOR TECHNOLAB FILTER
44	1	41-1720	EXHAUST FILTER INCL. ELEMENT, ITEM 43				
45	1	41-2411	LARGE END PLATE				

MODEL 1396



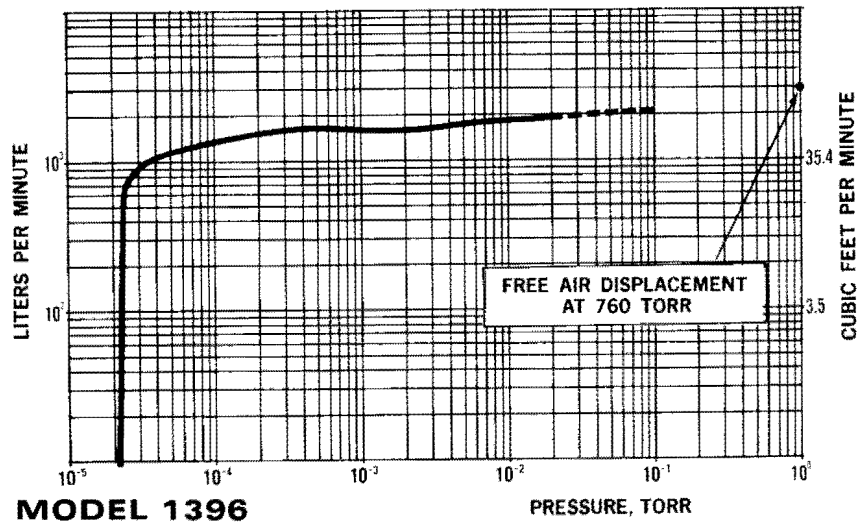
SPECIFICATIONS

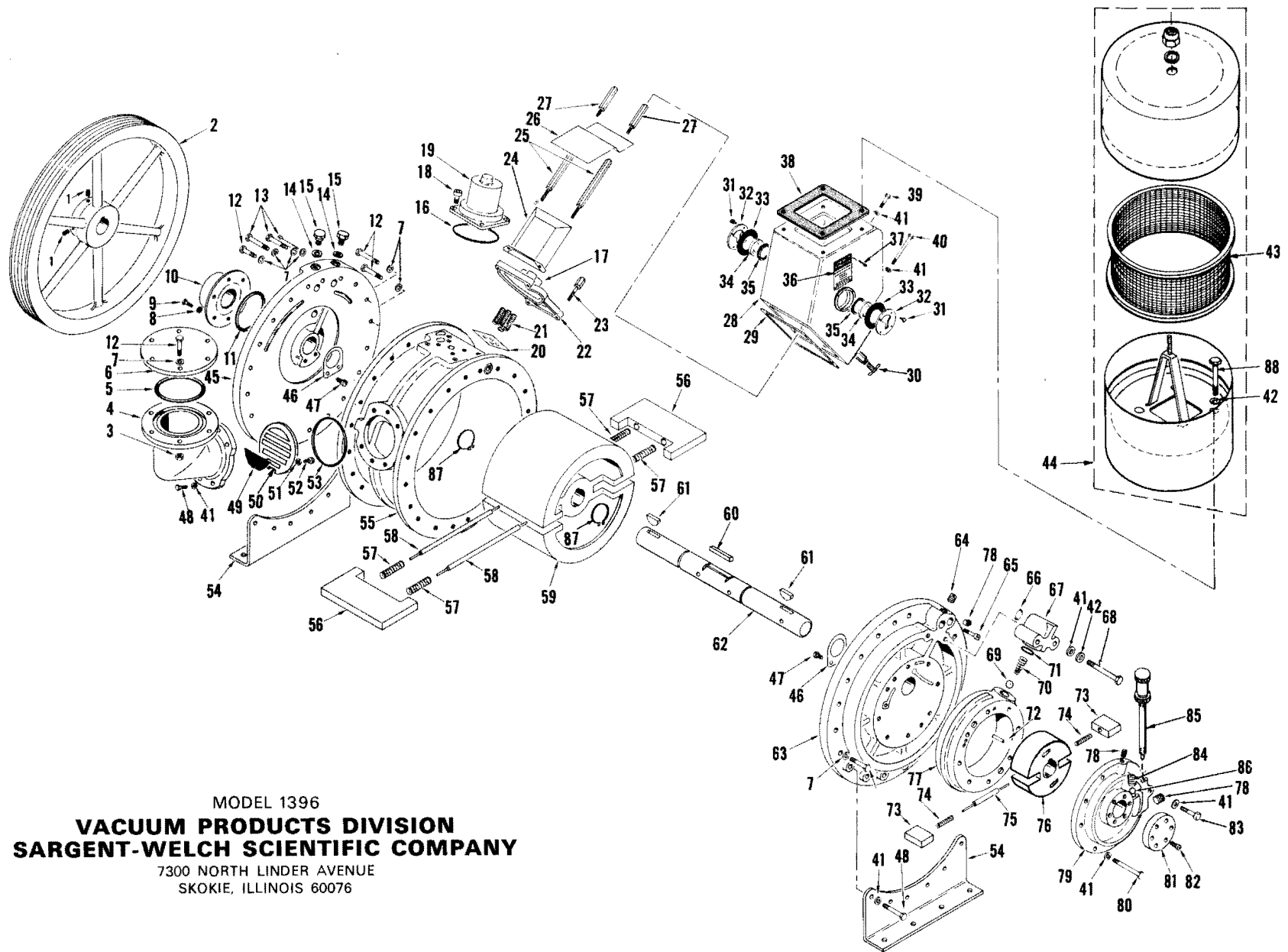
Free-Air Displacement, L/M	2800
CFM	100
Guaranteed Partial Pressure	
Blankoff, millitorr	0.1
Pump Rotational Speed, RPM	470
Number of Stages	2
Oil Capacity, qts.	2½
Standard Belt Guard (not shown)	No. 41-2930
Net Weight, Pump Only, lbs.	374
Net Weight, Mounted Pump, lbs.	622
Shipping Weight, Mounted Pump, lbs.	712
Intake Flange	6-1/8 O.D. x 3¼ I.D.
Bolt Circle	5¼ Dia.
6 Holes, 60° Apart	7/16 Dia.
O-Ring Groove	4-7/64 O.D. x 5/32 Deep x ¼ Wide

Model 1396 Drive Requirements

Cat. No.	Belt Number and Size	MOTOR					
		Pulley Number and Size	HP	V	HZ	PH	RPM
1396F	41-2512 3V800	41-2549 5 x 1.375 x 4G	41-1958 7½	200	60	3	1745
1396J	41-2512 3V800	41-2550 5.8 x 1.375 x 4G	41-1959 7½	220/380	50	3	1425
1398K-01	COMPLETE GASKET and SEAL KIT for use with Model 1396						
1398K-02	REPAIR KIT for use with Model 1396						
1396M	41-2512 3V800	41-2549 5 x 1.375 x 4G	41-1960 7½	230/460	60	3	1745

Note: 1. Pump pulley, No. 41-2510, 19" O.D. x 1.5" Bore x 4 Groove, is common to all pumps.
 2. 3V Belts, 3/8"W x 5/16"D, are notched underside.



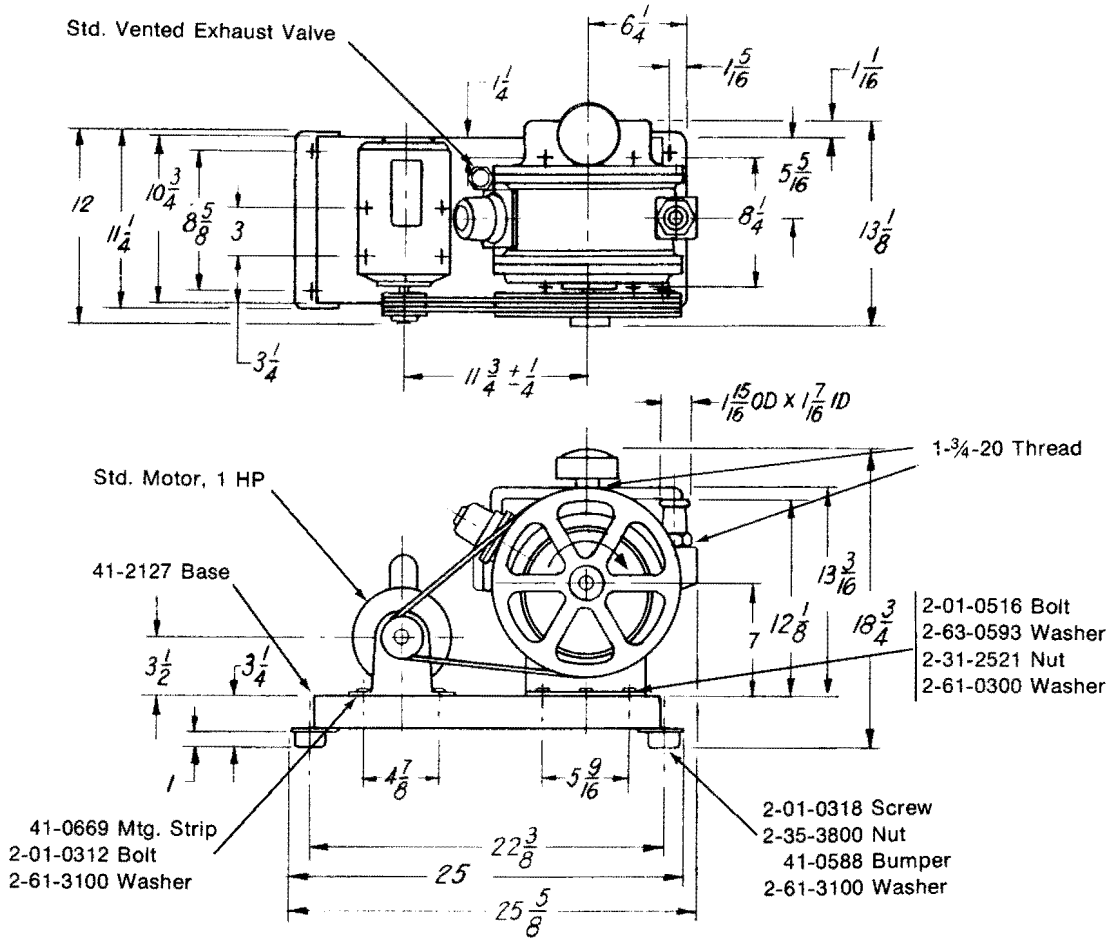


MODEL 1396
VACUUM PRODUCTS DIVISION
SARGENT-WELCH SCIENTIFIC COMPANY
 7300 NORTH LINDER AVENUE
 SKOKIE, ILLINOIS 60076

PARTS LIST
MODEL 1396 VACUUM PUMP

ITEM	QUANTITY	PC. NO.	DESCRIPTION	ITEM	QUANTITY	PC. NO.	DESCRIPTION
1	2	2-01-9306	SETSCREW FOR PULLEY, 5/16-18x3/8, HEX.SOC.	46	2	41-2397	SPACER
2	1	41-2510	PULLEY INCLUDING SETSCREWS, ITEM 1	47	4	2-00-2704	FIL. HEAD STEEL SCREW 10-32x1/4
3	6	2-31-2521	HEX. STEEL NUT 3/8-16	48	18	2-01-0316	HEX. HEAD STEEL CAPSCREW 5/16-18x1
4	1	41-2394	ELBOW	49	1	41-2523	FINE FILTER SCREEN
5	1	41-2481	O RING 4 O. D. x3-5/8 I. D.	50	1	41-2401	INTAKE OIL BAFFLE
6	1	41-2519	COVER FOR ELBOW	51	4	2-64-0400	SHAKEPROOF LOCKWASHER #6 EXT. T.
7	43	2-61-0571	STEEL WASHER .071 THK. 3/8 I. D. x5/8 O. D.	52	4	2-00-2406	FIL. HEAD STEEL MACHINE SCREW 6-32x3/8
8	6	2-61-0000	STEEL WASHER 3/16 BOLT SIZE	53	1	41-2482	O RING FOR ELBOW 4-7/8 O. D. x4-1/2 I. D.
9	6	2-01-0110	HEX. HEAD CAPSCREW 1/4-20x5/8	54	2	41-2494	LEG
10	1	41-2491	SEAL	55	1	41-2386	LARGE RING
11	1	41-2515	O RING	56	2	41-2383	LARGE VANE
12	42	2-01-0520	HEX. HEAD STEEL CAPSCREW 3/8-16x1-1/4	57	4	41-2505	SPRING FOR LARGE VANE
13	3	2-01-0532	HEX. HEAD STEEL CAPSCREW 3/8-16x2	58	2	41-2472	SPRING HOLDER FOR LARGE VANE
14	4	41-1137	WASHER	59	1	41-2404	LARGE ROTOR
15	2	41-1136	PLUG	60	1	41-2473	KEY
16	1	41-1507	O RING 3-3/8 O. D. x3-1/8 I. D.	61	2	41-2514	WOODRUFF KEY
17	4	41-2485	SPRING RETAINER	62	1	41-2403	SHAFT
18	4	2-01-6312	SOCKET HEAD STEEL CAPSCREW 5/16-18x3/4	63	1	41-2410	CENTER PLATE
19	1	41-2492	CONVERSION VALVE COVER	64	1	41-2522	PIPE PLUG 1/4 PIPE SIZE
20	1	41-2398	VALVE	65	1	2-01-6532	SOCKET HEAD STEEL CAP SCREW 3/8-16x2
21	4	41-2507	SPRING FOR EXHAUST VALVE	66	1	41-2487	O RING 1 O. D. x3/4 I. D.
22	1	41-2399	VALVE COVER	67	1	41-2396	EXHAUST BY-PASS
23	2	41-2509	LONG EXTENSION ROD	68	2	2-01-0344	HEX. HEAD STEEL CAPSCREW 5/16-18x2-3/4
24	1	41-2486	DEFLECTOR	69	1	41-2382	BALL VALVE 3/4 DIAMETER
25	2	41-2483	CONNECTOR ROD	70	1	41-2506	CONE SPRING
26	1	41-2493	BAFFLE PLATE	71	1	41-2488	O RING 1-3/8 O. D. x1-1/8 I. D.
27	2	41-2484	EXTENSION ROD	72	2	4-21-3901	DOWEL PIN .4375 DIA.x3
28	1	41-2395	OIL CASE	73	2	41-2380	SMALL VANE
29	1	41-2518	GASKET	74	2	41-1488	SMALL SPRING
30	1	41-1722	DRAINCOCK	75	1	41-2471	SPRING HOLDER FOR SMALL VANES
31	8	2-00-0608	HEX. HEAD STEEL SCREW 8-32x1/2	76	1	41-2405	SMALL ROTOR
32	2	41-1061	OIL WINDOW COVER	77	1	41-2390	SMALL RING
33	2	41-1267	RUBBER WASHER	78	3	41-0374	PIPE PLUG
34	2	41-1268	GLASS DISK	79	1	41-2409	SMALL END PLATE
35	2	41-1266	TENSION WASHER	80	7	2-01-0352	HEX. HEAD STEEL CAPSCREW 5/16-18x3-1/4
36	1	41-2606	NAME PLATE	81	1	41-2470	SHAFT END CAP
37	4	2-09-1204	SCREWSTICK 3-48x1/8	82	6	2-01-6112	SOCKET HEAD STEEL CAPSCREW 1/4-20x3/4
38	1	41-2517	GASKET	83	1	2-01-0364	HEX. HEAD STEEL CAPSCREW 5/16-18x4
39	2	2-01-0320	HEX. HEAD STEEL CAPSCREW 5/16-18x1-1/4	84	1	41-2521	BALL CHECK PLUG
40	2	2-01-0356	HEX. HEAD STEEL CAPSCREW 5/16-18x3-1/2	85	1	41-2497	VENTED EXHAUST VALVE
41	32	41-2363	WASHER	86	1	4-40-0800	STEEL BALL 1/4 DIAMETER
42	6	2-61-3100	STEEL WASHER 1/4 BOLT SIZE	87	2	41-2402	RETAINING RING
43	1	41-1747	REPLACEMENT FILTER ELEMENT	88	4	2-01-0312	HEX. HD. STEEL CAPSCREW 5/16-18x3/4
44	1	41-1746	EXHAUST FILTER INCL. ELEMENT, ITEM 43				
45	1	41-2411	LARGE END PLATE				

MODEL 1397



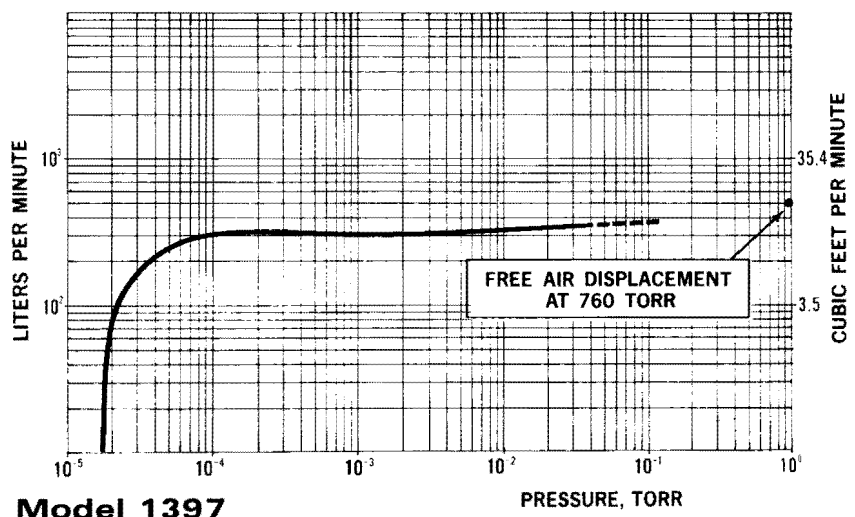
SPECIFICATIONS

Free-Air Displacement, L/M	500
CFM	17.7
Guaranteed Partial Pressure	
Blankoff, millitorr	0.1
Pump Rotational Speed, RPM	400
Number of Stages	2
Oil Capacity, qts.	1 1/4
Standard Belt Guard (not shown)	No. 1371J
Net Weight, Pump Only, lbs.	138
Net Weight, Mounted Pump, lbs.	206
Shipping Weight, Mounted Pump, lbs.	224
Optional Exhaust Filter, Complete	No. 1417B
Exhaust Filter Element	No. 1417H
Size of Rubber Stopper for Intake	9

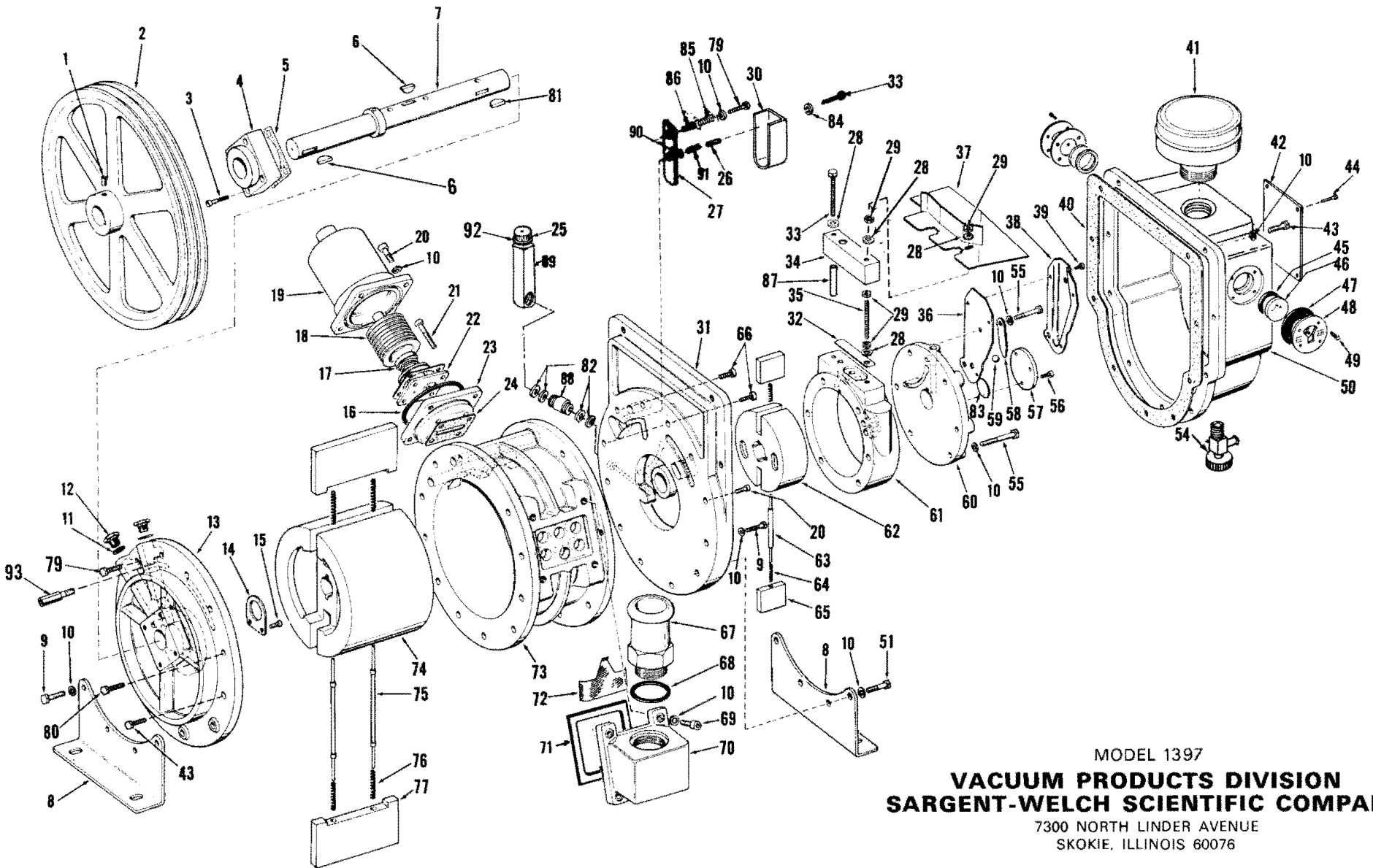
MODEL 1397 Drive Requirements

Cat. No.	Belt Number and Size	MOTOR					
		Pulley Number and Size	HP V	HZ	PH	RPM	Remarks
1397B	41-0715 4L490	41-0995 2.75 x .625 x 2G	41-1940 1 115/230	60	1	1725	For 115V
1397C	41-0715 4L490	41-0995 2.75 x .625 x 2G	41-1941 1 115/230	60	1	1725	For 230V
1397F	41-0715 4L490	41-0995 2.75 x .625 x 2G	41-1968 1 200	60	3	1725	
1397J	41-0716 4L500	41-0996 3.25 x .625 x 2G	41-1964 1 220/380	50	3	1425	
1397K	41-0715 4L490	41-0995 2.75 x .625 x 2G	41-1940 1 115/230	60	1	1725	For 115V
1397K-01	COMPLETE GASKET and SEAL KIT						
1397K-02	REPAIR KIT						
1397L	41-0716 4L500	41-0996 3.25 x .625 x 2G	41-1942 1 110/220	50	1	1425	
1397M	41-0715 4L490	41-0995 2.75 x .625 x 2G	41-1917 1 230/460	60	3	1725	
1397Q	41-0715 4L490	41-0995 2.75 x .625 x 2G	41-1943 1 115/230	60	1	1725	Totally Enclosed
1397S	41-0716 4L500	41-0996 3.25 x .625 x 2G	41-1944 1 110/220	50	1	1425	Totally Enclosed
1397U	41-0715 4L490	41-0995 2.75 x .625 x 2G	41-1945 1 230/460	60	3	1725	Totally Enclosed
1397W	41-0715 4L490	41-0997 2.5 x .875 x 2G	41-1949 1 115/230	60	1	1725	Explosion Proof
1397X	41-0716 4L500	41-2501 3.25 x .875 x 2G	41-2826 1 110/220	50	1	1425	Explosion Proof
1397Y	41-0715 4L490	41-0995 2.75 x .625 x 2G	41-1947 1 230/460	60	3	1725	Explosion Proof

- Note:** 1. 4L490 Belts, "A" size, are stamped 1397A.
 2. Pump pulley, No. 41-1492, 12" O.D. x 1" Bore x 2 Groove, is common to all pumps.



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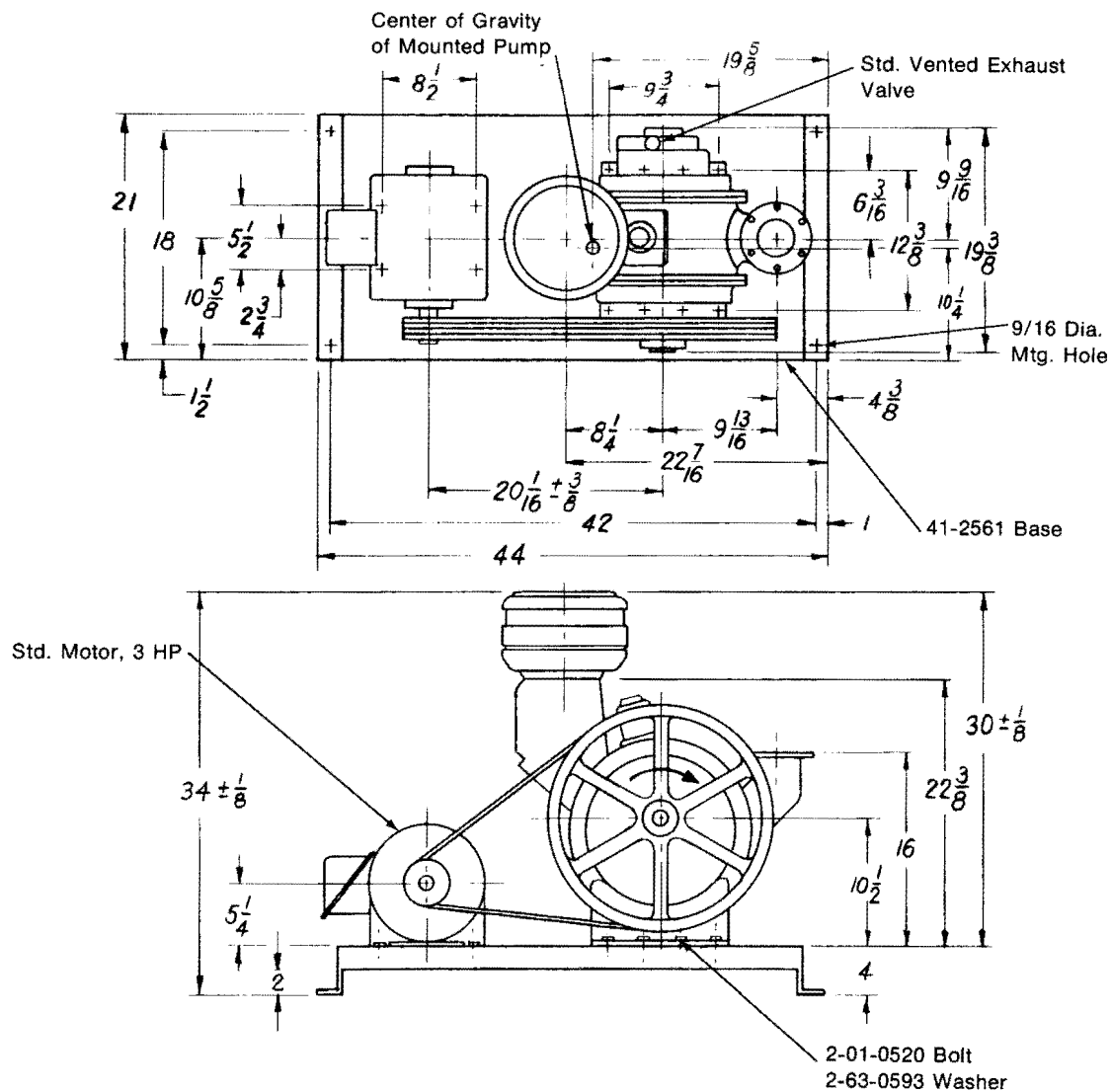


MODEL 1397
VACUUM PRODUCTS DIVISION
SARGENT-WELCH SCIENTIFIC COMPANY
7300 NORTH LINDER AVENUE
SKOKIE, ILLINOIS 60076

PARTS LIST
MODEL 1397 VACUUM PUMP

ITEM	QUANTITY	PC. NO.	DESCRIPTION	ITEM	QUANTITY	PC. NO.	DESCRIPTION
1	1	2-01-9306	HDLESS STL. SETSCREW 5/16-18x3/8, HEX. SOC.	46	2	41-1268	GLASS DISK
2	1	41-1492	PULLEY INCLUDING SETSCREW, ITEM 1	47	2	41-1267	RUBBER WASHER
3	4	2-01-6120	SOCKET HD. STEEL CAPSCREW 1/4-20x1-1/4	48	2	41-1061	OIL WINDOW COVER
4	1	1401F	SHAFT SEAL INCLUDING GASKET, ITEM 5	49	8	2-00-0608	HEX. HD. STEEL SCREW 8-32x1/2
5	1	41-1494	SEAL GASKET	50	1	41-1482	OIL CASE
6	2	41-1490	WOODRUFF KEY	51	4	2-01-0328	HEX. HD. STEEL CAPSCREW 5/16-18x1-3/4
7	1	41-1484	SHAFT & COLLAR				
8	2	41-1486	LEG				
9	9	2-01-0324	HEX. HD. STL. CAP SCREW 5/16-18x1-1/2	54	1	41-1734	DRAIN VALVE
10	44	41-2363	STEEL WASHER	55	6	2-01-0344	HEX. HD. STEEL CAPSCREW 5/16-18x2-3/4
11	2	41-1137	PLUG WASHER	56	3	2-00-2706	FIL. HD. STEEL SCREW 10-32x3/8
12	2	41-1136	PLUG	57	1	41-0672	SHAFT END CAP
13	1	41-1481	LARGE END PLATE	58	1	41-0992	PRESSURE RELEASE VALVE
14	1 to 4	41-0055	SPACER	59	1	4-40-1200	STEEL BALL 3/8 DIA.
15	2	2-00-2704	FIL. HD. STL. SCREW 10-32x1/4	60	1	41-1500	SMALL END PLATE
16	1	41-1507	"O" RING	61	1	41-1497	EXHAUST RING
17	1	41-1504	VALVE SPRING UNIT	62	1	41-1499	EXHAUST ROTOR
18	1	41-1505	VALVE BELLOW UNIT	63	1	41-0696	SMALL SPRING HOLDER
19	1	41-2492	COVER FOR CONVERSION VALVE	64	2	41-1304	SMALL VANE SPRING
20	5	2-01-6312	SOCKET HD. STL. CAPSCREW 5/16-18x3/4	65	2	41-2035	SMALL VANE
21	4	2-01-6320	SOCKET HD. STL. CAPSCREW 5/16-18x1-1/4	66	2	2-01-6316	SOCKET HD. STEEL CAPSCREW 5/16-18x1
22	1	41-1506	VALVE INNER PLATE	67	1	41-1493	INTAKE NIPPLE
23	1	41-1503	VALVE PLATE	68	1	41-0961	ALUMINUM WASHER
24	1	41-1508	VALVE GASKET	69	4	2-01-6314	SOCKET HD. STEEL CAPSCREW 5/16-18x7/8
25	1	41-1736	VENTED EXHAUST VALVE	70	1	41-1479	INTAKE CHAMBER
26	1	41-2258	HARDENED SLEEVE 1/4 SIZE	71	1	41-1495	INTAKE CHAMBER GASKET
27	1	41-2260	DISCHARGE VALVE	72	1	41-0937	SCREEN FILTER
28	4	2-61-0000	STEEL WASHER, 3/16 BOLT SIZE	73	1	41-1476	LARGE RING
29	4	2-31-0112	HEX. STEEL NUT 1/4-20x7/16	74	1	41-1478	LARGE ROTOR
30	1	41-2253	DISCHARGE VALVE COVER	75	2	41-1489	LARGE SPRING HOLDER
31	1	41-1483	CENTER PLATE	76	4	41-1488	LARGE VANE SPRING
32	1	41-2161	EXHAUST VALVE	77	2	41-1462	LARGE VANE
33	2	2-01-0120	HEX. HD. STEEL CAPSCREW 1/4-20x1-1/4	79	2	2-01-0320	HEX. HD. STEEL CAPSCREW 5/16-18x1-1/4
34	1	41-2164	COVER	80	1	2-01-0314	HEX. HD. STEEL CAPSCREW 5/16-18x7/8
35	1	2-01-8132	HEADLESS STEEL SETSCREW 1/4-20x2	81	1	41-1516	KEY FOR SMALL ROTOR
36	1	41-1005	PRESSURE RELEASE TUBE, PART 2	82	4	41-1056	ALUMINUM WASHER
37	1	41-1461	DEFLECTOR	83	1	41-1469	SPACER DISK
38	1	41-0986	PRESSURE RELEASE TUBE, PART 1	84	1	2-63-0193	SPLIT LOCK WASHER 1/4
39	3	2-03-3104	BIND. HD. SHEET METAL SCREW #6x1/4	85	1	41-2256	COIL SPRING
40	1	41-1496	OIL CASE GASKET	86	1	41-2257	HARDENED SLEEVE 5/16 SIZE
41	1	41-1501	DUST CAP	87	1	41-2553	SPACER
42	1	41-2582	NAME PLATE	88	1	41-2350	CONNECTING NIPPLE
43	14	2-01-0316	HEX. HD. STEEL CAP SCREW 5/16-18x1	89	1	41-1745	ADAPTER
44	4	2-09-1204	SELF-TAPPING SCREW STICK 3-48x1/8	90	1	2-69-7007	STAINLESS STEEL WASHER, 11/32 x 11/16 x 1/6
45	2	41-1266	TENSION WASHER				
				91	1	41-2259	COIL SPRING
				92	1	41-2757	LOCKNUT
				93	1	41-2165	GUARD STUD

MODEL 1398



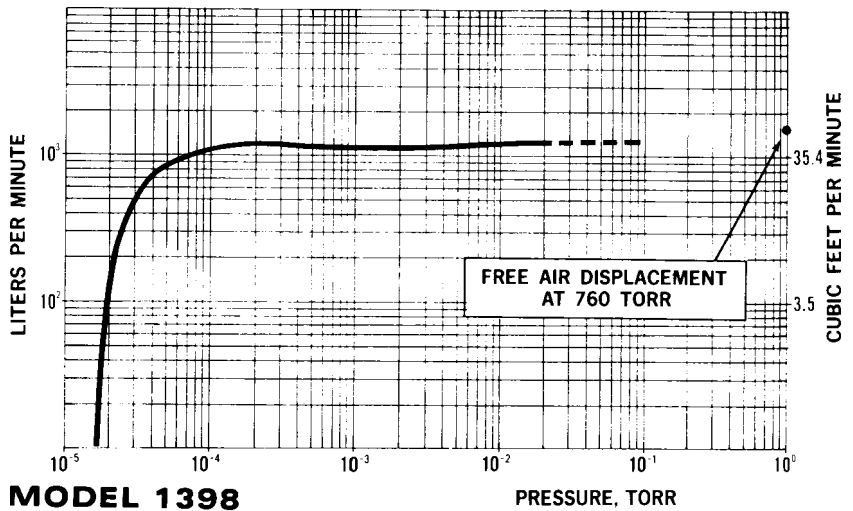
SPECIFICATIONS

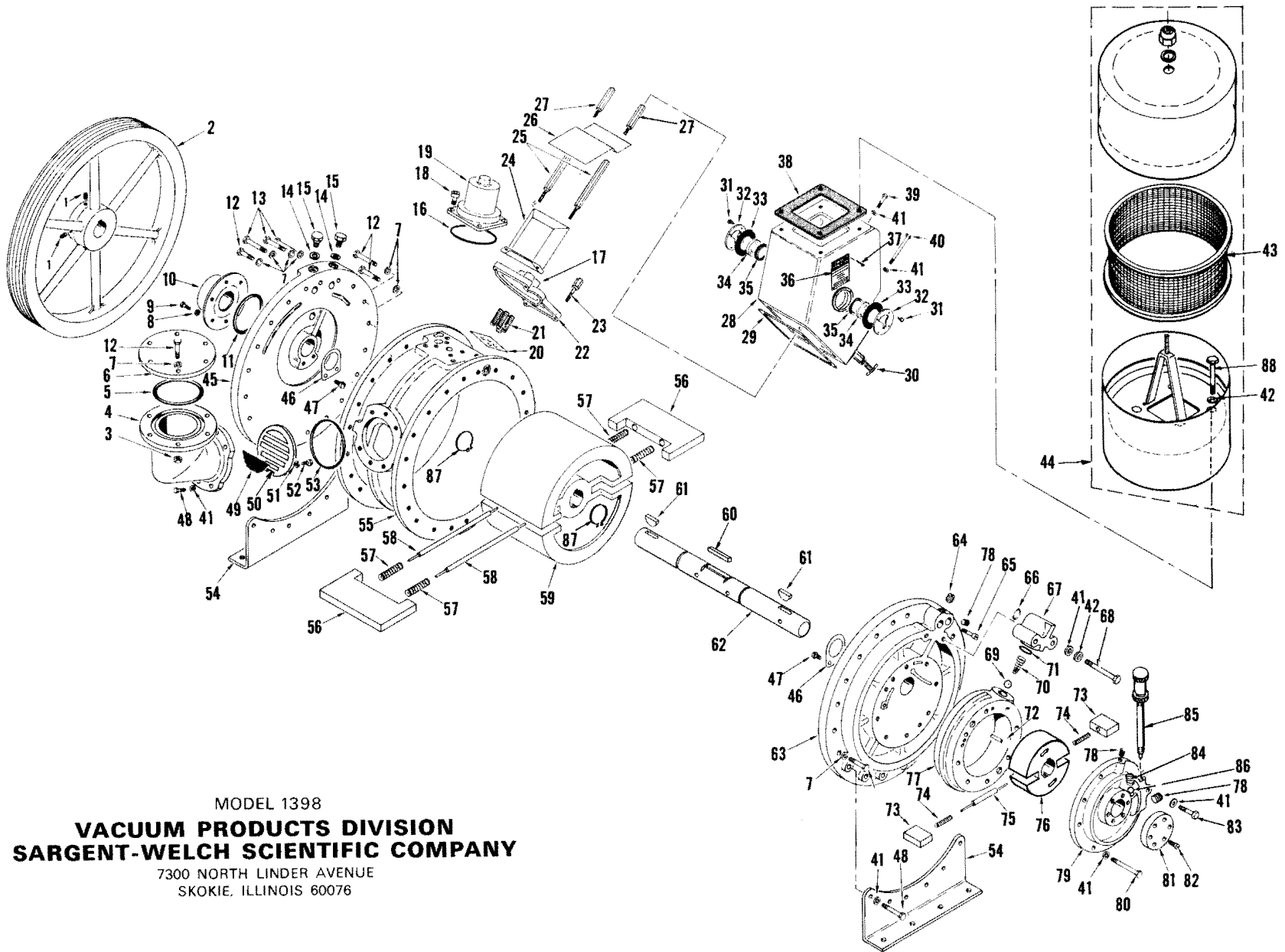
Free-Air Displacement, L/M	1500
CFM	53
Guaranteed Partial Pressure	
Blankoff, millitorr	0.1
Pump Rotational Speed, RPM	245
Number of Stages	2
Oil Capacity, qts.	2 1/2
Standard Belt Guard (not shown)	No. 41-2930
Net Weight, Pump Only, lbs.	386
Net Weight, Mounted Pump, lbs.	601
Shipping Weight, Mounted Pump, lbs.	670
Intake Flange	6-1/8 O.D. x 3 1/4 I.D.
Bolt Circle	5 1/4 Dia.
6 Holes, 60° Apart	7/16 Dia.
O-Ring Groove	4-7/64 O.D. x 5/32 Deep x 1/4 Wide

Model 1398 Drive Requirements

Cat. No.	Belt Number and Size	MOTOR				
		Pulley Number and Size	HP V	HZ	PH	RPM
1398F	41-2512 3V800	41-2547 4 x 1.375 x 4G	41-1970 3 200	60	3	1200
1398J	41-2512 3V800	41-1697 4.75 x 1.375 x 4G	41-1966 3 220/380	50	3	1000
1398K-01	COMPLETE GASKET and SEAL KIT					
1398K-02	REPAIR KIT					
1398M	41-2512 3V800	41-2547 4 x 1.375 x 4G	41-1921 3 230/460	60	3	1140

- Note:**
1. Pump pulley, No. 41-2510, 19" O.D. x 1.5" Bore x 4 Groove, is common to all pumps.
 2. 3V Belts, 3/8"W x 5/16"D, are notched underside.





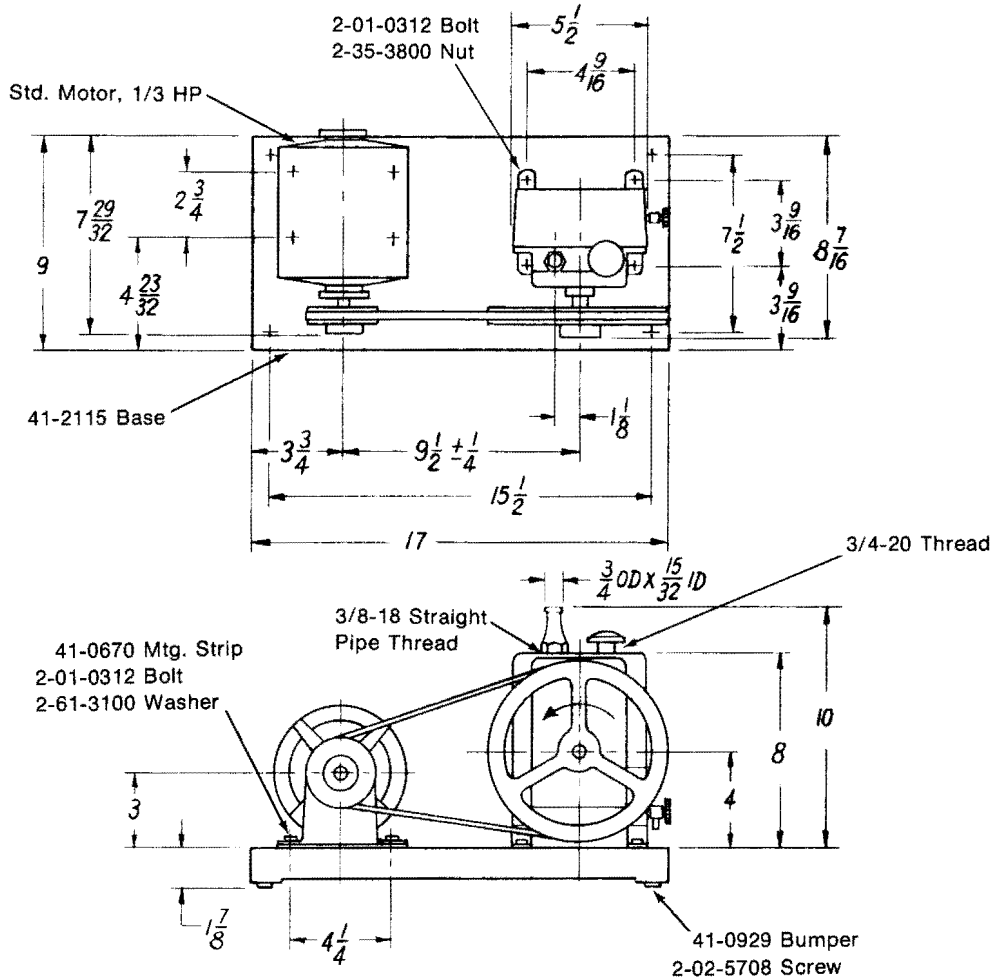
MODEL 1398
VACUUM PRODUCTS DIVISION
SARGENT-WELCH SCIENTIFIC COMPANY
 7300 NORTH LINDER AVENUE
 SKOKIE, ILLINOIS 60076

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PARTS LIST
MODEL 1398 VACUUM PUMP

ITEM	QUANTITY	PC. NO.	DESCRIPTION	ITEM	QUANTITY	PC. NO.	DESCRIPTION
1	2	2-01-9306	SETSCREW FOR PULLEY, 5/16-18x3/8, HEX.SOC.	46	2	41-2397	SPACER
2	1	41-2510	PULLEY INCLUDING SETSCREWS, ITEM 1	47	4	2-00-2704	FIL. HEAD STEEL SCREW 10-32x1/4
3	6	2-31-2521	HEX. STEEL NUT 3/8-16	48	18	2-01-0316	HEX. HEAD STEEL CAPSCREW 5/16-18x1
4	1	41-2394	ELBOW	49	1	41-2523	FINE FILTER SCREEN
5	1	41-2481	O RING 4 O. D. x3-5/8 I. D.	50	1	41-2401	INTAKE OIL BAFFLE
6	1	41-2519	COVER FOR ELBOW	51	4	2-64-0400	SHAKEPROOF LOCKWASHER #6 EXT. T.
7	43	2-61-0571	STEEL WASHER .071 THK. 3/8 I. D. x5/8 O. D.	52	4	2-00-2406	FIL. HEAD STEEL MACHINE SCREW 6-32x3/8
8	6	2-61-0000	STEEL WASHER 3/16 BOLT SIZE	53	1	41-2482	O RING FOR ELBOW 4-7/8 O. D. x4-1/2 I. D.
9	6	2-01-0110	HEX. HEAD CAPSCREW 1/4-20x5/8	54	2	41-2494	LEG
10	1	41-2491	SEAL	55	1	41-2386	LARGE RING
11	1	41-2515	O RING	56	2	41-2383	LARGE VANE
12	42	2-01-0520	HEX. HEAD STEEL CAPSCREW 3/8-16x1-1/4	57	4	41-2505	SPRING FOR LARGE VANE
13	3	2-01-0532	HEX. HEAD STEEL CAPSCREW 3/8-16x2	58	2	41-2472	SPRING HOLDER FOR LARGE VANE
14	4	41-1137	WASHER	59	1	41-2404	LARGE ROTOR
15	2	41-1136	PLUG	60	1	41-2473	KEY
16	1	41-1507	O RING 3-3/8 O. D. x3-1/8 I. D.	61	2	41-2514	WOODRUFF KEY
17	4	41-2485	SPRING RETAINER	62	1	41-2403	SHAFT
18	4	2-01-6312	SOCKET HEAD STEEL CAPSCREW 5/16-18x3/4	63	1	41-2385	CENTER PLATE
19	1	41-2492	CONVERSION VALVE COVER	64	1	41-2522	PIPE PLUG 1/4 PIPE SIZE
20	1	41-2398	VALVE	65	1	2-01-6532	SOCKET HEAD STEEL CAP SCREW 3/8-16x2
21	4	41-2507	SPRING FOR EXHAUST VALVE	66	1	41-2487	O RING 1 O. D. x3/4 I. D.
22	1	41-2399	VALVE COVER	67	1	41-2396	EXHAUST BY-PASS
23	2	41-2509	LONG EXTENSION ROD	68	2	2-01-0344	HEX. HEAD STEEL CAPSCREW 5/16-18x2-3/4
24	1	41-2486	DEFLECTOR	69	1	41-2382	BALL VALVE 3/4 DIAMETER
25	2	41-2483	CONNECTOR ROD	70	1	41-2506	CONE SPRING
26	1	41-2493	BAFFLE PLATE	71	1	41-2488	O RING 1-3/8 O. D. x1-1/8 I. D.
27	2	41-2484	EXTENSION ROD	72	2	4-21-3901	DOWEL PIN .4375 DIA. x3
28	1	41-2395	OIL CASE	73	2	41-2380	SMALL VANE
29	1	41-2518	GASKET	74	2	41-1488	SMALL SPRING
30	1	41-1722	DRAINCOCK	75	1	41-2471	SPRING HOLDER FOR SMALL VANES
31	8	2-00-0608	HEX. HEAD STEEL SCREW 8-32x1/2	76	1	41-2405	SMALL ROTOR
32	2	41-1061	OIL WINDOW COVER	77	1	41-2390	SMALL RING
33	2	41-1267	RUBBER WASHER	78	3	41-0374	PIPE PLUG
34	2	41-1268	GLASS DISK	79	1	41-2393	SMALL END PLATE
35	2	41-1266	TENSION WASHER	80	7	2-01-0352	HEX. HEAD STEEL CAPSCREW 5/16-18x3-1/4
36	1	41-2583	NAME PLATE	81	1	41-2470	SHAFT END CAP
37	4	2-09-1204	SCREWSTICK 3-48x1/8	82	6	2-01-6112	SOCKET HEAD STEEL CAPSCREW 1/4-20x3/4
38	1	41-2517	GASKET	83	1	2-01-0364	HEX. HEAD STEEL CAPSCREW 5/16-18x4
39	2	2-01-0320	HEX. HEAD STEEL CAPSCREW 5/16-18x1-1/4	84	1	41-2521	BALL CHECK PLUG
40	2	2-01-0356	HEX. HEAD STEEL CAPSCREW 5/16-18x3-1/2	85	1	41-2497	VENTED EXHAUST VALVE
41	32	41-2363	WASHER	86	1	4-40-0800	STEEL BALL 1/4 DIAMETER
42	6	2-61-3100	STEEL WASHER 1/4 BOLT SIZE	87	2	41-2402	RETAINING RING
43	1	41-1721	REPLACEMENT FILTER ELEMENT FOR AIR-MAZE FILTER	88	4	2-01-0352	HEX. HD. STEEL CAPSCREW 5/16-18x3 1/4 FOR AIR-MAZE FILTER
43	1	41-1726	REPLACEMENT FILTER ELEMENT FOR TECHNOLAB FILTER	88	4	2-01-0312	HEX. HD. STEEL CAPSCREW 5/16-18x3/4 FOR TECHNOLAB FILTER
44	1	41-1720	EXHAUST FILTER INCL. ELEMENT, ITEM 43				
45	1	41-2389	LARGE END PLATE				

MODEL 1399



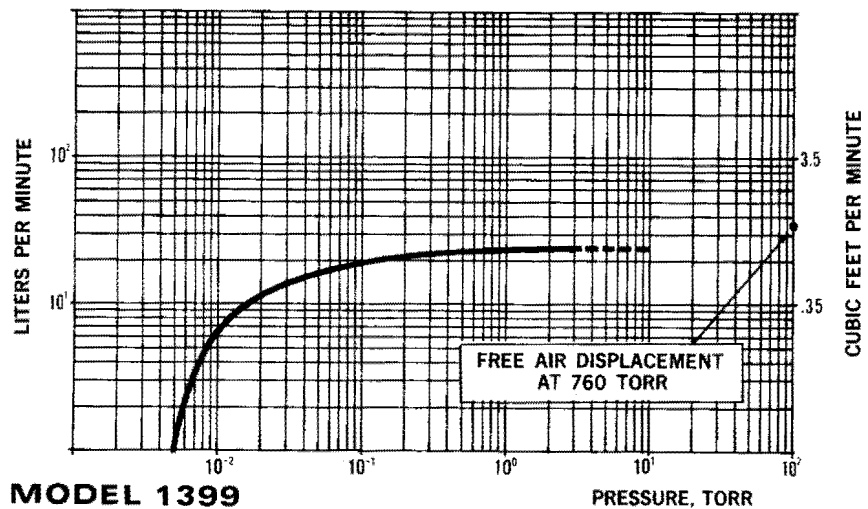
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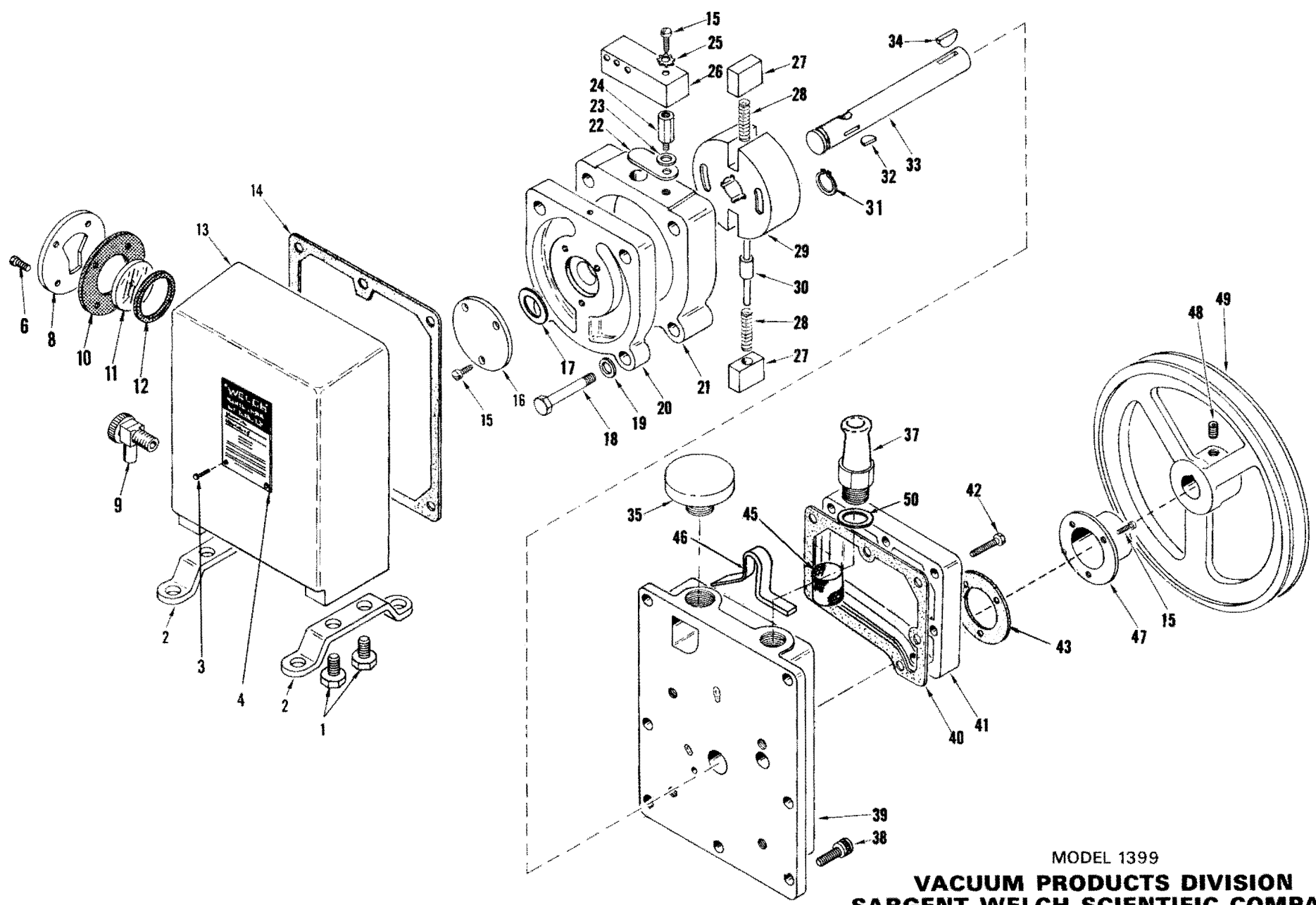
Free-Air Displacement, L/M	35
CFM	1.2
Guaranteed Partial Pressure	
Blankoff, Millitor	15
Pump Rotational Speed, RPM	750
Number of Stages	1
Oil Capacity, qts.	1/2
Standard Belt Guard (not shown)	No. 1371H
Net Weight, Pump Only, lbs.	28
Net Weight, Mounted Pump, lbs.	49
Shipping Weight, Mounted Pump, lbs.	57
Optional Exhaust Filter, Complete	No. 1417
Filter Element, Air Maze	No. 1417F
Filter Element, Technolab	No. 1417L
Size of Rubber Stopper for Intake	00
Line Cord, with Switch for 115V	No. 41-1058
Line Cord, with Switch for 230V	No. 41-1057

Model 1399 Drive Requirements

Cat. No.	Belt Number and Size	MOTOR						Remarks
		Pulley Number and Size	HP	V	HZ	PH	RPM	
1399B	41-0711 4L350	41-2377 3 x .5	41-1901 1/3	115	60	1	1725	
1399C	41-0711 4L350	41-2377 3 x .5	41-1914 1/3	230	60	1	1725	
1399K-01	COMPLETE GASKET and SEAL KIT							
1399K-02	REPAIR KIT							
1399L	41-0711 4L350	41-2377 3 x .5	41-1915 1/3	110	50	1	1425	
1399M	41-0711 4L350	41-0668 3 x .625	41-1909 1/3	230/460	60	3	1725	
1399Q	41-0708 4L340	41-0668 3 x .625	41-1910 1/3	115	60	1	1725	Totally Enclosed
1399S	41-0711 4L350	41-0668 3 x .625	41-1924 1/3	110/220	50	1	1425	Totally Enclosed
1399U	41-0711 4L350	41-0668 3 x .625	41-1923 1/3	230/460	60	3	1725	Totally Enclosed
1399W	41-0711 4L350	41-2377 3 x .5	41-1906 1/3	115	60	1	1725	Explosion Proof
1399X	41-0708 4L340	41-0668 3 x .625	41-2827 1/3	110/220	50	1	1425	Explosion Proof
1399Y	41-0711 4L350	41-0668 3 x .625	41-2828 1/3	230/460	60	3	1725	Explosion Proof

- Note:**
1. Pump pulley, No. 41-2192, 7" O.D. x .625" Bore, is common to all pumps.
 2. 4L350 Belts, "A" size, are stamped 1399A.
 3. 4L340 Belts, "A" size, are stamped 1400A.
 4. Cord and Plug for 230V, 1 PH operation, is No. 41-1057.
 5. Cord and Plug for 115V, 1 PH operation, is No. 41-1058.



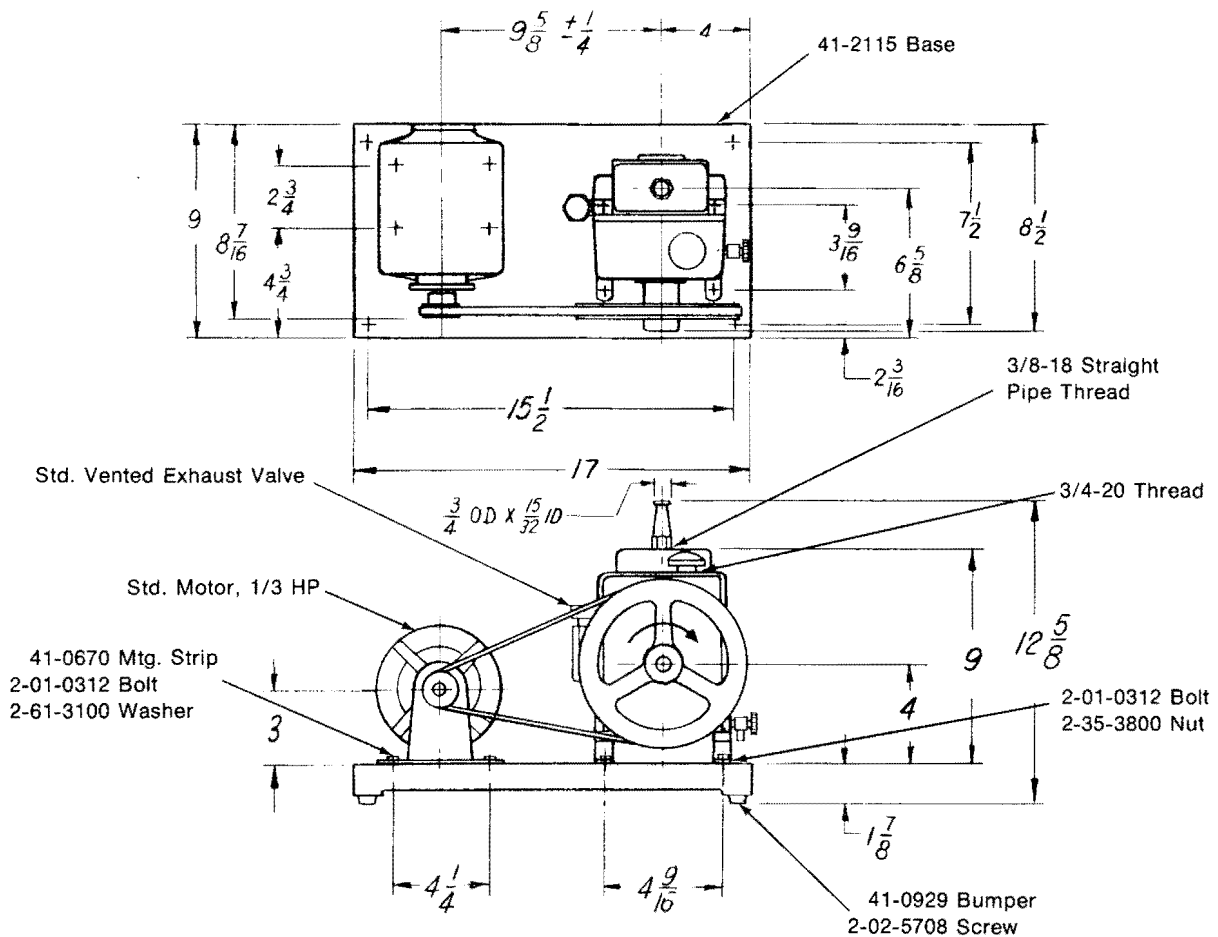


MODEL 1399
VACUUM PRODUCTS DIVISION
SARGENT-WELCH SCIENTIFIC COMPANY
7300 NORTH LINDER AVENUE
SKOKIE, ILLINOIS 60076
REVISED 11/74

PARTS LIST
 MODEL 1399 VACUUM PUMP

<u>ITEM</u>	<u>QUANTITY</u>	<u>PC. NO.</u>	<u>DESCRIPTION</u>
1	4	2-01-0308	HEX. HEAD STEEL SCREW 5/16-18x1/2
2	2	41-1049	LEG
3	4	2-09-1204	SELF-TAPPING SCREWSTICK 3-48x1/8
4	1	41-2584	NAME PLATE
6	4	2-00-0608	HEX. HEAD STEEL SCREW 8-32x1/2
8	1	41-1061	OIL WINDOW COVER
9	1	41-1734	DRAIN VALVE
10	1	41-1267	RUBBER WASHER
11	1	41-1268	GLASS DISK
12	1	41-1266	TENSION WASHER
13	1	41-2372	OIL CASE
14	1	41-1052	CASE GASKET
15	7	2-00-2706	FIL. HEAD STEEL SCREW 10-32x3/8
16	1	41-0672	SHAFT END CAP
17	1	41-1285	STEEL WASHER
18	4	2-01-0332	HEX. HEAD STEEL CAP SCREW 5/16-18x2
19	4	41-2363	WASHER
20	1	41-2373	END PLATE
21	1	41-1042	RING
22	1	41-1239	CLOCK SPRING VALVE
23	1	2-71-0040	WASHER #10
24	1	41-2370	VALVE COVER STUD
25	1	2-65-0000	SHAKEPROOF LOCKWASHER #10 EXT. T.
26	1	41-2368	VALVE COVER
27	2	41-1070	VANE
28	2	41-1304	SPRING
29	1	41-1040	ROTOR
30	1	41-1063	SPRING HOLDER
31	1	41-0974	RETAINING RING
32	1	41-0613	KEY
33	1	41-2374	SHAFT
34	1	41-0624	PULLEY KEY
35	1	41-1345	DUST CAP
37	1	41-0920	INTAKE NIPPLE
38	7	2-01-6112	SOCKET HEAD STEEL SCREW 1/4-20x3/4
39	1	41-2367	INTAKE CHAMBER
40	1	41-2375	COVER GASKET
41	1	41-2369	INTAKE CHAMBER COVER
42	6	2-00-0716	HEX. HEAD STEEL SCREW 10-32 x 1
43	1	41-0643	SEAL GASKET
45	1	41-0306	AIR FILTER
46	1	41-2371	AIR FILTER BRACKET
47	1	1401E	SHAFT SEAL INCLUDING GASKET, ITEM 43 AND 3 SCREWS, ITEM 15
48	1	2-01-9306	HEADLESS STEEL SETSCREW 5/16-18x3/8, HEX SOC
49	1	41-2192	PULLEY INCLUDING SETSCREW, ITEM 48
50	1	41-1137	ALUMINUM WASHER

MODEL 1400



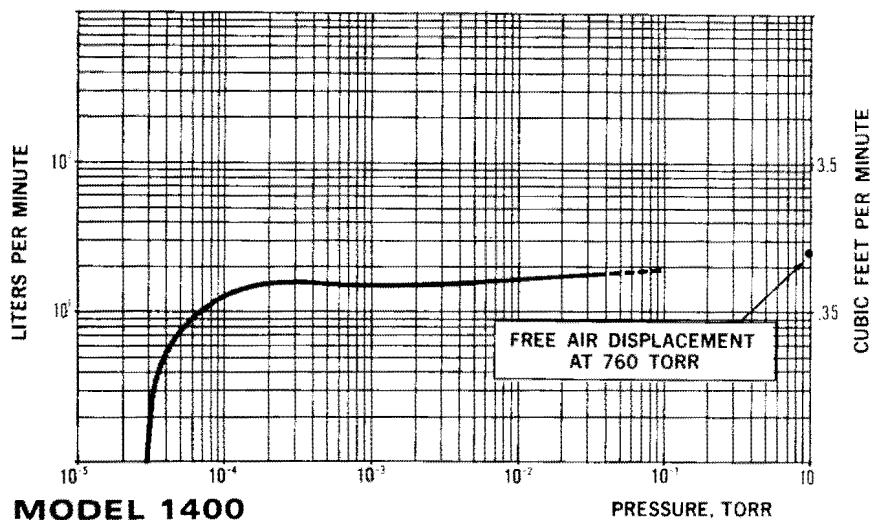
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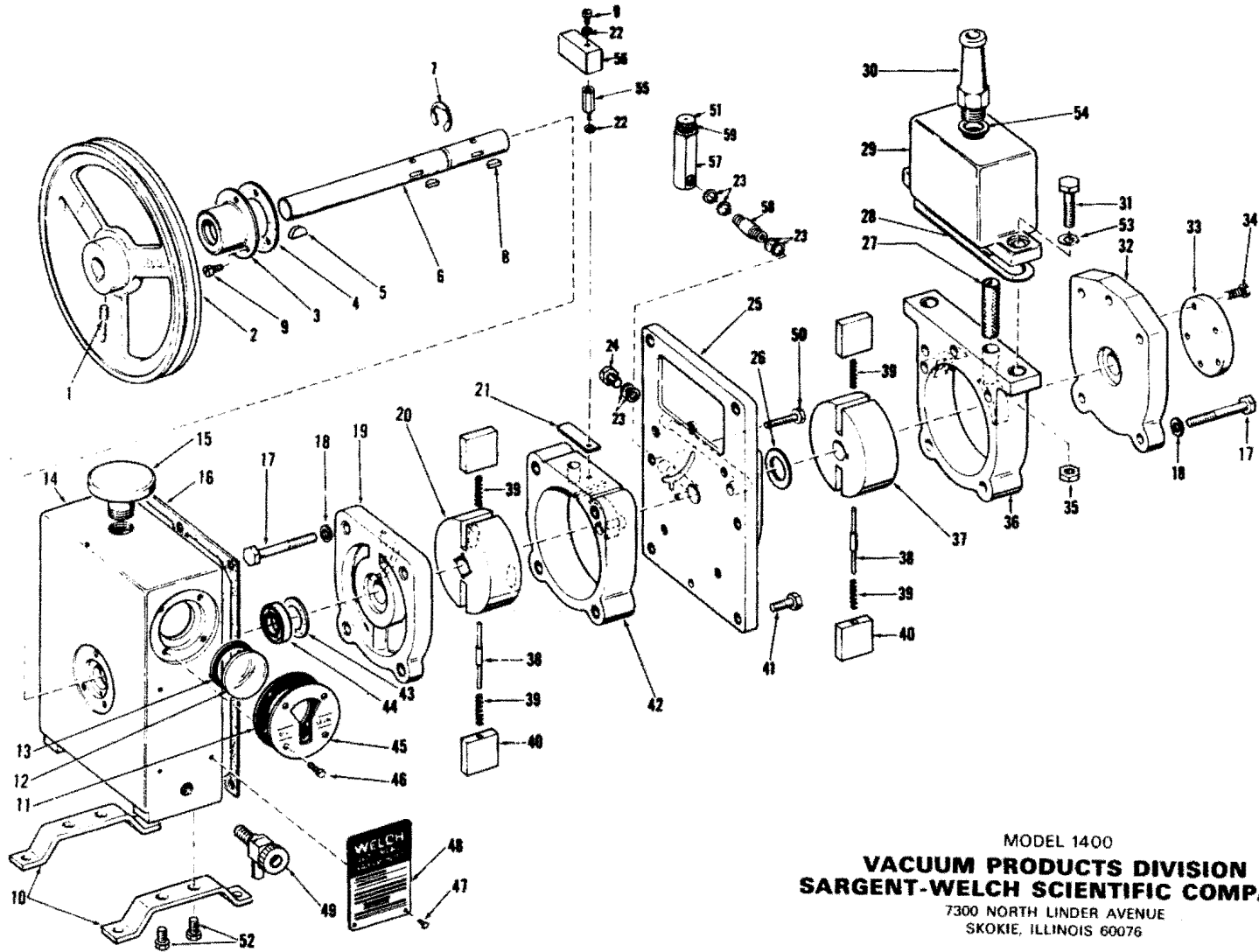
Free-Air Displacement, L/M	25
CFM	0.9
Guaranteed Partial Pressure	
Blankoff, millitorr	0.1
Pump Rotational Speed, RPM	580
Number of Stages	2
Oil Capacity, qts.	$\frac{5}{8}$
Standard Belt Guard (not shown)	No. 1371H
Net Weight, Pump Only, lbs.	33
Net Weight, Mounted Pump, lbs.	58
Shipping Weight, Mounted Pump, lbs.	66
Optional Exhaust Filter, Complete	No. 1417
Filter Element, Air Maze	No. 1417F
Filter Element, Technolab	No. 1417L
Size of Rubber Stopper for Intake	00
Line Cord, with Switch for 115V	No. 41-1058
Line Cord, with Switch for 230V	No. 41-1057

Model 1400 Drive Requirements

Cat. No.	Belt Number and Size	MOTOR						
		Pulley Number and Size	HP	V	HZ	PH	RPM	Remarks
1400B	41-0708 4L340	41-0551 2.4 x .5	41-1901 1/3	115	60	1	1725	
1400C	41-0708 4L340	41-0551 2.4 x .5	41-1914 1/3	230	60	1	1725	
1400K-01	COMPLETE GASKET and SEAL KIT							
1400K-02	REPAIR KIT							
1400L	41-0711 4L350	41-2377 3 x .5	41-1915 1/3	110	50	1	1425	
1400M	41-0712 4L330	41-0552 2.4 x .625	41-1909 1/3	230/460	60	3	1725	
1400Q	41-0712 4L330	41-0552 2.4 x .625	41-1910 1/3	115	60	1	1725	Totally Enclosed
1400S	41-0711 4L350	41-0668 3 x .625	41-1924 1/3	110/220	50	1	1425	Totally Enclosed
1400U	41-0708 4L340	41-0552 2.4 x .625	41-1923 1/3	230/460	60	3	1725	Totally Enclosed
1400W	41-0708 4L340	41-0551 2.4 x .5	41-1906 1/3	115	60	1	1725	Explosion Proof
1400X	41-0711 4L350	41-0668 3 x .625	41-2827 1/3	110/220	50	1	1425	Explosion Proof
1400Y	41-0708 4L340	41-0552 2.4 x .625	41-2828 1/3	230/460	60	3	1725	Explosion Proof

- Note:**
1. Pump pulley, No. 41-2191, 7" O.D. x .625" Bore, is common to all pumps.
 2. 4L340 Belts, "A" size, 1/2"W x 5/16"D, are stamped 1400A.
 3. 4L350 Belts, "A" size, are stamped 1399A.



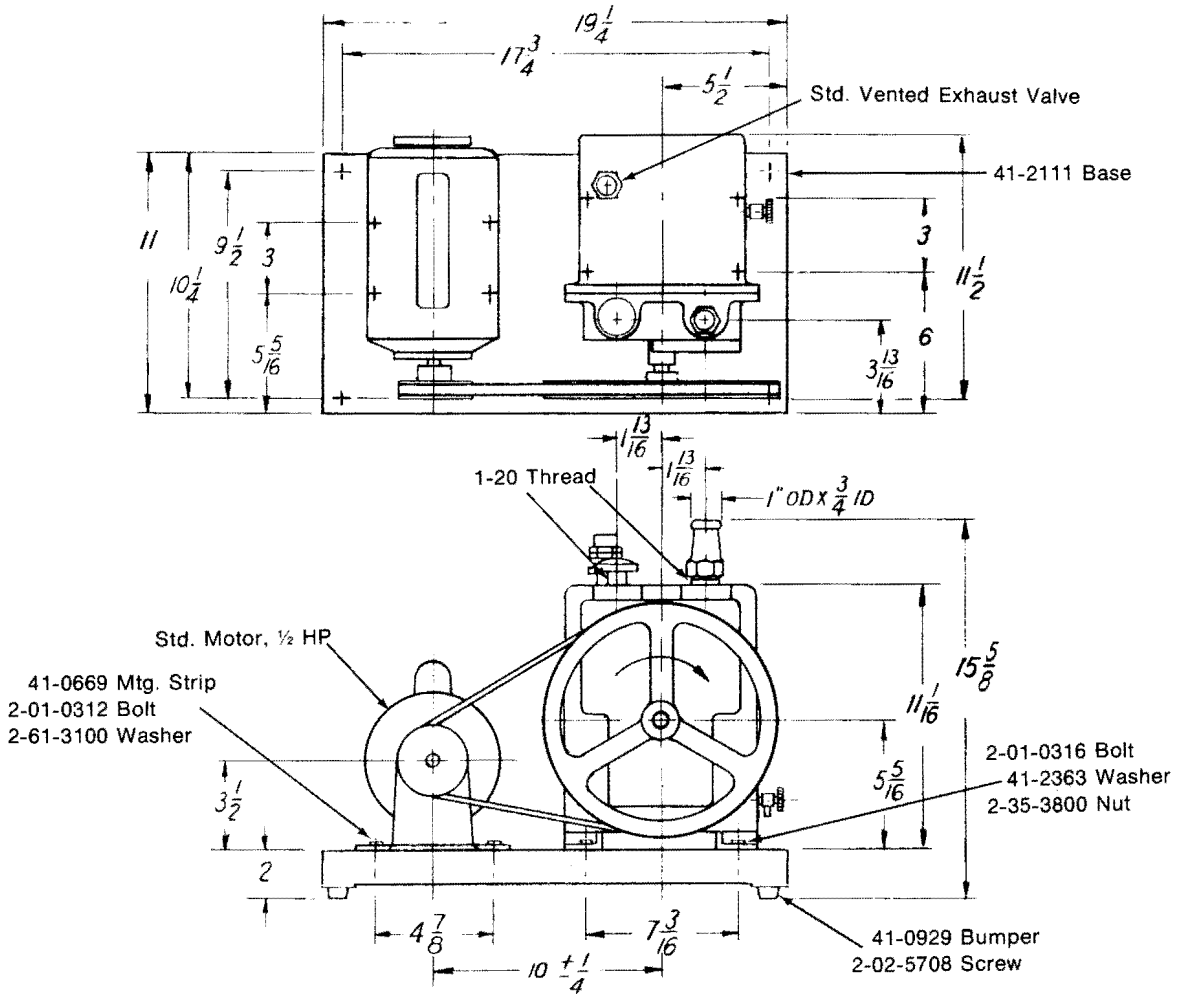


MODEL 1400
VACUUM PRODUCTS DIVISION
SARGENT-WELCH SCIENTIFIC COMPANY
7300 NORTH LINDER AVENUE
SKOKIE, ILLINOIS 60076

PARTS LIST
MODEL 1400 VACUUM PUMP

ITEM	QUANTITY	PC. NO.	DESCRIPTION
1	1	2-01-9306	SOCKET HD. SETSCREW 5/16-18x3/8
2	1	41-2191	PULLEY INCLUDING SETSCREW, ITEM 1
3	1	1401E	SHAFT SEAL INCLUDING GASKET, ITEM 4 AND SCREWS, ITEM 9
4	1	41-0643	SHAFT SEAL GASKET
5	1	41-0624	PULLEY KEY
6	1	41-1060	SHAFT
7	1	41-1150	RETAINING RING
8	2	41-0613	WOODRUFF KEY
9	4	2-00-2705	FIL. HD. STEEL SCREW 10-32x5/16
10	2	41-1049	LEG
11	1	41-1267	RUBBER WASHER
12	1	41-1268	GLASS DISK
13	1	41-1266	TENSION WASHER
14	1	41-1047	OIL CASE
15	1	41-1345	DUST CAP
16	1	41-1052	CASE GASKET
17	9	2-01-0332	HEX. STEEL CAP SCREW 5/16-18x2
18	9	41-2363	WASHER
19	1	41-1045	FRONT PLATE
20	1	41-1040	EXHAUST ROTOR
21	1	41-1239	CLOCK SPRING VALVE
22	2	2-71-0040	BRASS WASHER #10
23	6	41-1056	ALUMINUM WASHER
24	1	41-1039	VENTED EXHAUST PLUG
25	1	41-1044	CENTER PLATE
26	1	41-1285	STEEL WASHER
27	1	41-0890	AIR FILTER
28	1	41-0383	GASKET
29	1	41-1048	INTAKE CHAMBER
30	1	41-0920	NIPPLE
31	2	2-01-0524	HEX. STEEL CAP SCREW 3 8-16x1 1 2
32	1	41-1055	BACK PLATE
33	1	41-1255	SHAFT END CAP
34	5	2-00-0708	HEX. HD. STEEL SCREW 10-32x1/2
35	2	2-31-2521	HEX. STEEL NUT 3/8x16
36	1	41-2563	INTAKE RING
37	1	41-1041	INTAKE ROTOR
38	2	41-1063	SPRING HOLDER
39	4	41-1304	VANE SPRING
40	4	41-1070	VANE
41	6	2-01-0112	HEX. HD. STEEL CAPSCREW 1/4-20x3/4
42	1	41-1042	EXHAUST RING
43	1	41-0056	GASKET
44	1	41-0578	SEAL
45	1	41-1061	OIL WINDOW COVER
46	4	2-00-0608	HEX. HD. STEEL SCREW 8-32x1/2
47	4	2-09-1204	SELF-TAPPING SCREWSTICK 3-48x1/8
48	1	41-2585	NAME PLATE
49	1	41-1734	DRAIN VALVE
50	1	2-01-0120	HEX. HD. STEEL CAPSCREW 1/4-20x1 1/4
51	1	41-1736	VENTED EXHAUST VALVE
52	4	2-01-0308	HEX. HD. STEEL SCREW 5/16-18x1/2
53	2	2-61-0571	STEEL WASHER .071 THICK x 3/8 I. D.
54	1	41-1137	ALUMINUM WASHER
55	1	41-1069	BAFFLE STUD
56	1	41-1068	EXHAUST BAFFLE
57	1	41-1745	ADAPTER
58	1	41-2350	CONNECTING NIPPLE
59	1	41-2757	LOCKNUT

MODEL 1402



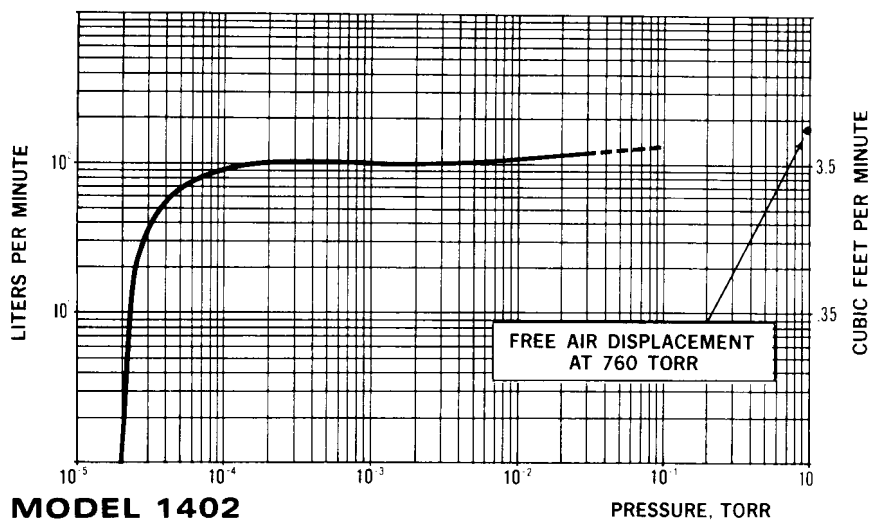
SPECIFICATIONS

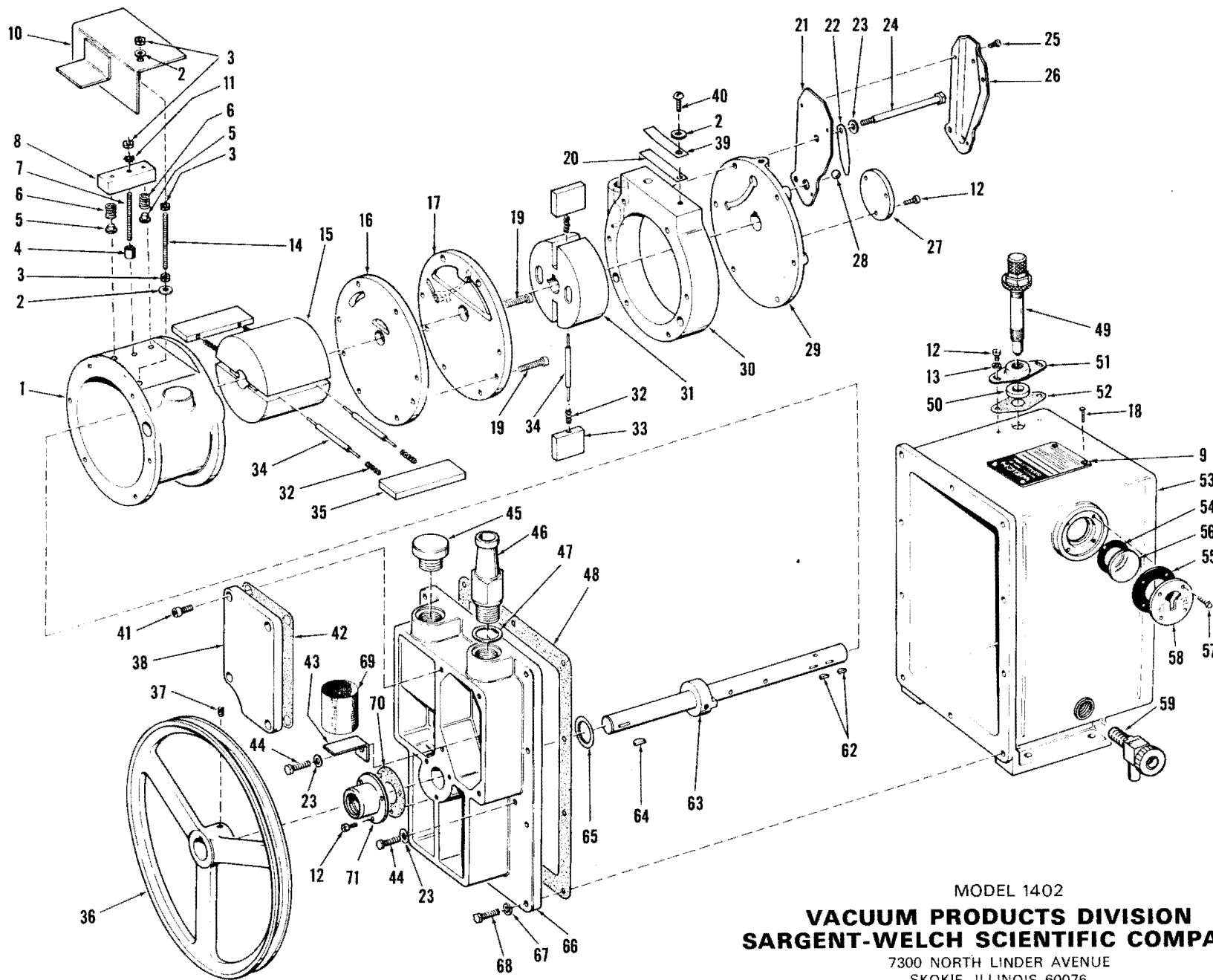
Free-Air Displacement, L/M	160
CFM	5.6
Guaranteed Partial Pressure	
Blankoff, millitorr	0.1
Pump Rotational Speed, RPM	525
Number of Stages	2
Oil Capacity, qts	2 1/4
Standard Belt Guard (not shown)	No. 1371G
Net Weight, Pump Only, lbs.	82
Net Weight, Mounted Pump, lbs.	112
Shipping Weight, Mounted Pump, lbs.	125
Optional Exhaust Filter, Complete	No. 1417A
Exhaust Filter Element	No. 1417G
Size of Rubber Stopper for Intake	3

Model 1402 Drive Requirements

Cat. No.	Belt Number and Size	MOTOR					
		Pulley Number and Size	HP V	HZ	PH	RPM	Remarks
1402B	41-0710 4L415	41-0668 3 x .625	41-1907 ½ 115/230	60	1	1725	For 115V
1402C	41-0710 4L415	41-0668 3 x .625	41-1907 ½ 115/230	60	1	1725	For 230V
1402K	41-0710 4L415	41-0668 3 x .625	41-1907 ½ 115/230	60	1	1725	
1402K-03	COMPLETE GASKET and SEAL KIT						
1402K-04	REPAIR KIT						
1402L	41-0713 4L420	41-0667 3.5 x .625	41-1905 ½ 110/220	50	1	1425	
1402M	41-0710 4L415	41-0668 3 x .625	41-1904 ½ 230/460	60	3	1725	
1402Q	41-0710 4L415	41-0668 3 x .625	41-1911 ½ 115/230	60	1	1725	Totally Enclosed
1402S	41-0713 4L420	41-0667 3.5 x .625	41-2824 ½ 110/220	50	1	1425	Totally Enclosed
1402U	41-0710 4L415	41-0668 3 x .625	41-1913 ½ 230/460	60	3	1725	Totally Enclosed
1402W	41-0710 4L415	41-0668 3 x .625	41-1912 ½ 115/230	60	1	1725	Explosion Proof
1402X	41-0710 4L415	41-0667 3.5 x .625	41-2825 ½ 110/220	50	1	1425	Explosion Proof
1402Y	41-0710 4L415	41-0668 3 x .625	41-2823 ½ 230/460	60	3	1725	Explosion Proof

Note: 1. Pump pulley, No. 41-2074, 10" O.D. x .750" Bore, is common to all pumps.
 2. 4L415 Belts, "A" size, ½"W x 5/16"D, are stamped 1405A.



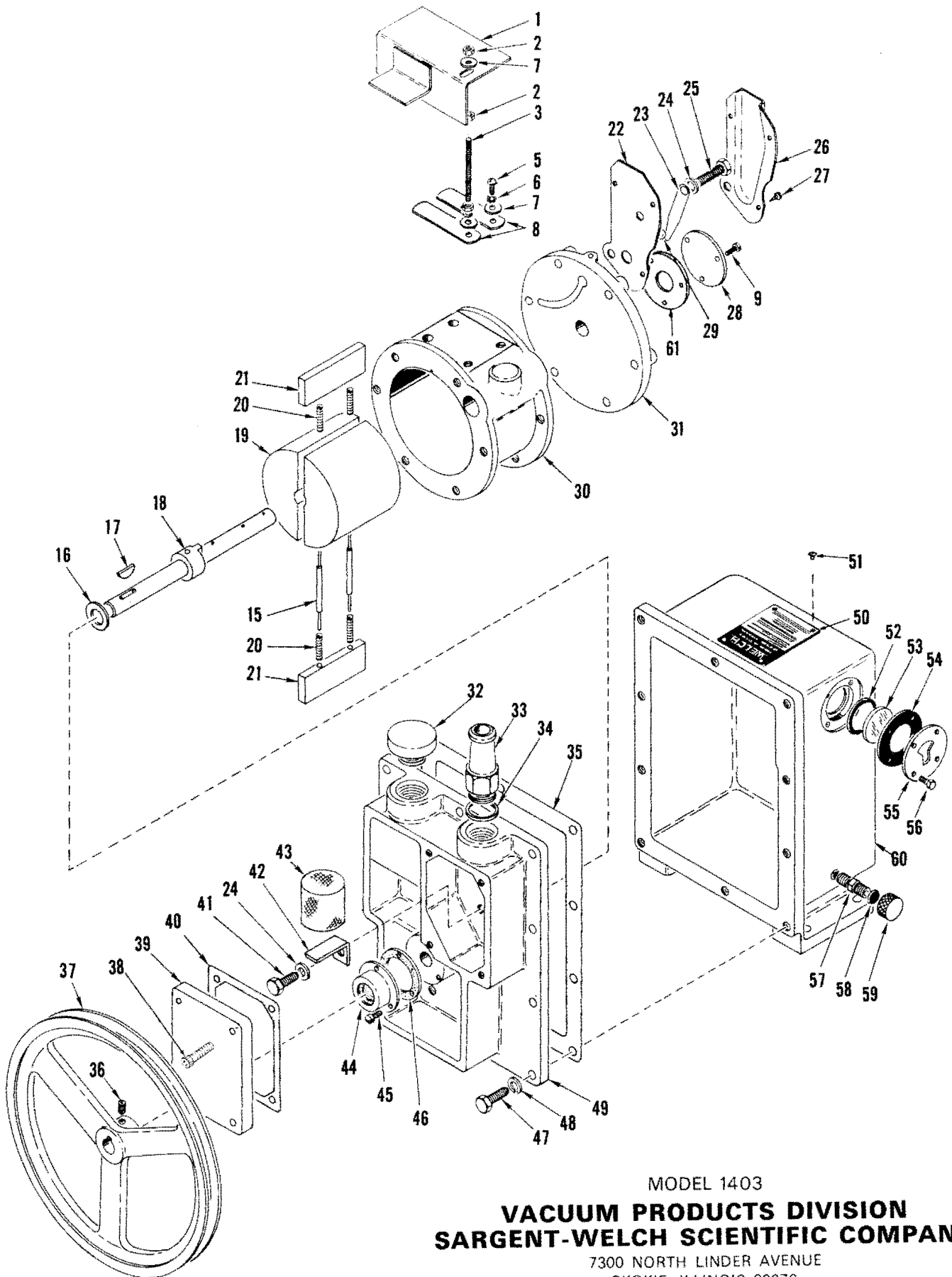


MODEL 1402
VACUUM PRODUCTS DIVISION
SARGENT-WELCH SCIENTIFIC COMPANY

7300 NORTH LINDER AVENUE
 SKOKIE, ILLINOIS 60076

PARTS LIST
MODEL 1402 VACUUM PUMP

ITEM	QUANTITY	PC. NO.	DESCRIPTION	ITEM	QUANTITY	PC. NO.	DESCRIPTION
1	1	41-2562	INTAKE RING	44	6	2-01-0316	HEX. HEAD STEEL CAP SCREW 5/16-18x1
2	3	2-61-0000	STEEL WASHER 3/16 BOLT SIZE	45	1	41-0612	DUST CAP
3	4	2-31-0112	HEX. STEEL NUT 1/4-20x3/16x7/16	46	1	41-0993	INTAKE NIPPLE
4	1	41-2159	VALVE BLOCK SPACER	47	1	41-0491	WASHER
5	2	41-2157	BLOCK VALVE	48	1	41-0403	OIL CASE GASKET
6	2	41-2158	VALVE SPRING	49	1	41-2348	VENTED EXHAUST VALVE
7	1	2-01-8128	HEADLESS STEEL SETSCREW 1/4-20x1-3/4	50	1	41-0578	SEAL
8	1	41-2156	VALVE BLOCK	51	1	41-2290	SEAL COVER
9	1	41-2586	NAME PLATE	52	1	41-2291	SEAL COVER GASKET
10	1	41-2160	BAFFLE PLATE	53	1	41-2038	OIL CASE
11	1	2-65-0125	SHAKEPROOF LOCKWASHER 1/4 EX.T.	54	2	41-1266	TENSION WASHER
12	8	2-00-2706	FIL. HD. STEEL SCREW 10-32x3/8	55	2	41-1267	RUBBER WASHER
13	2	2-71-0040	BRASS WASHER #10	56	2	41-1268	GLASS DISK
14	1	41-2175	HEADLESS STEEL SETSCREW 1/4-20x2-3/4	57	8	2-00-0608	HEX. HEAD STEEL SCREW 8-32x1/2
15	1	41-2042	INTAKE ROTOR	58	2	41-1061	OIL WINDOW COVER
16	1	41-2041	CENTER PLATE PART 2	59	1	41-1734	OIL DRAIN VALVE
17	1	41-2040	CENTER PLATE PART 1				
18	4	2-09-1204	SELF-TAPPING SCREWSTICK 3-48x1/8				
19	2	2-01-6320	SOCKET HEAD CAP SCREW 5/16-18x1-1/4	62	2	41-0613	WOODRUFF KEY
20	1	41-2154	LOWER EXHAUST VALVE	63	1	41-2046	SHAFT & COLLAR
21	1	41-1005	PRESSURE RELEASE TUBE, PART 2	64	1	41-0624	PULLEY KEY
22	1	41-0992	PRESSURE RELEASE VALVE	65	1	41-0508	THRUST WASHER
23	12	41-2363	STEEL WASHER	66	1	41-2044	LARGE END PLATE
24	6	2-01-0356	HEX. HEAD STEEL CAP SCREW 5/16-18x3-1/2	67	10	2-63-0193	SPLIT LOCKWASHER 1/4 SIZE
25	3	2-03-3104	BINDING HEAD SHEET METAL SCREW 6x1/4	68	10	2-01-0112	HEX. HEAD STEEL CAP SCREW 1/4-20x3/4
26	1	41-0986	PRESSURE RELEASE TUBE PART 1	69	1	41-0660	AIR FILTER
27	1	41-0672	END CAP	70	1	41-0643	SEAL GASKET
28	1	4-40-1200	STEEL BALL 3/8 DIAMETER	71	1	1401D	SHAFT SEAL INCLUDING GASKET, ITEM 70 AND 3 SCREWS, ITEM 12
29	1	41-2045	SMALL END PLATE				
30	1	41-2039	EXHAUST RING				
31	1	41-1518	EXHAUST ROTOR				
32	6	41-1304	VANE SPRING				
33	2	41-2035	SMALL VANE				
34	3	41-0696	VANE SPRING HOLDER				
35	2	41-2036	LARGE VANE				
36	1	41-2074	PULLEY INCLUDING SETSCREW, ITEM 37				
37	1	2-01-9306	SOCKET HEAD SET SCREW 5/16-18x3/8				
38	1	41-0775	INTAKE CHAMBER COVER				
39	1	41-2153	UPPER EXHAUST VALVE				
40	1	2-01-5106	RD. HD. STEEL SCREW 1/4-20x3/8				
41	4	2-01-6112	SOCKET HEAD STEEL CAP SCREW 1/4-20x3/4				
42	1	41-0234	INTAKE CHAMBER COVER GASKET				
43	1	41-0663	AIR FILTER BRACKET				



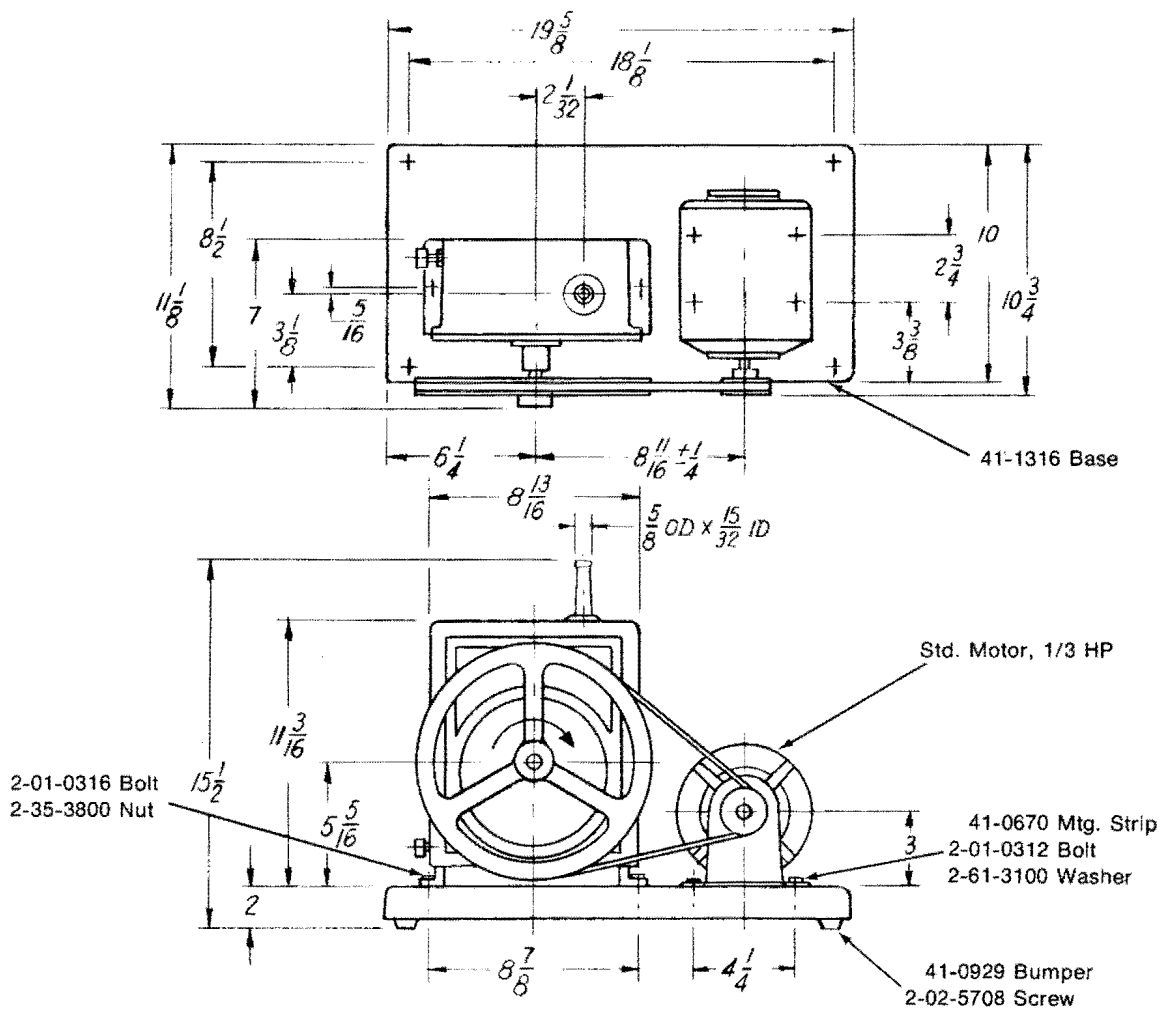
MODEL 1403
VACUUM PRODUCTS DIVISION
SARGENT-WELCH SCIENTIFIC COMPANY
 7300 NORTH LINDER AVENUE
 SKOKIE, ILLINOIS 60076

REVISED 10/73

PARTS LIST
MODEL 1403 VACUUM PUMP

ITEM	QUANTITY	PC. NO.	DESCRIPTION
1	1	41-2160	BAFFLE PLATE
2	3	2-31-0112	HEX. STEEL NUT 1/4-20x7/16
3	1	41-2175	HEADLESS SET SCREW 1/4-20 x 2 1/4
5	1	2-01-5106	RD. HEAD STEEL CAP SCREW 1/4-20 x 3/8
6	2	2-65-0125	SHAKEPROOF LOCKWASHER 1/4 EXT. T.
7	3	2-61-0000	STEEL WASHER 9/16 O. D. X 1/4 I. D.
8	2	41-0695	VALVE
9	3	2-00-2706	FIL. HEAD STEEL SCREW 10-32x3/8
15	2	41-0696	SPRING HOLDER
16	1	41-1285	WASHER
17	1	41-0624	KEY
18	1	41-0960	SHAFT AND COLLAR
19	1	41-0772	ROTOR
20	4	41-1304	SPRING
21	2	41-2036	VANE
22	1	41-1005	PRESSURE RELIEF TUBE NO. 2
23	1	41-0992	PRESSURE RELEASE VALVE
24	12	41-2363	WASHER
25	6	2-01-0318	HEX. HEAD CAP SCREW 5/16-18x1-1/8
26	1	41-0986	PRESSURE RELIEF TUBE NO. 1
27	3	2-03-3104	SHEET METAL SCREW, NO. 6x1/4
28	1	41-0672	SHAFT END CAP
29	1	4-40-1200	STEEL BALL 3/8 DIAMETER
30	1	41-0776	RING
31	1	41-0777	SMALL END PLATE
32	1	41-0612	DUST CAP
33	1	41-0993	INTAKE NIPPLE
34	1	41-0491	INTAKE NIPPLE WASHER
35	1	41-0403	GASKET
36	1	2-01-9306	HEADLESS SETSCREW, 5/16-18x3/8 HEX.SOC.
37	1	41-2194	PULLEY INCLUDING SETSCREW, ITEM 36
38	4	2-01-6112	SOCKET HEAD CAP SCREW 1/4-20x3/4
39	1	41-0775	INTAKE CHAMBER COVER
40	1	41-0234	INTAKE CHAMBER GASKET
41	6	2-01-0314	HEX. HEAD CAPSCREW 5/16-18x7/8
42	1	41-0663	AIR FILTER BRACKET
43	1	41-0660	AIR FILTER
44	1	1401E	SEAL INCLUDING GASKET, ITEM 46 AND SCREWS, ITEM 45
45	3	2-00-2705	FIL. HEAD STEEL SCREW 10-32x5/16
46	1	41-0643	SEAL GASKET
47	10	2-01-0112	HEX. HEAD CAP SCREW 1/4-20x3/4
48	10	2-63-0193	SPLIT LOCKWASHER 1/4
49	1	41-0773	LARGE END PLATE
50	1	41-2587	NAME PLATE
51	4	2-09-1204	SCREWSTICK, 3-48x1/8
52	1	41-1266	TENSION WASHER
53	1	41-1268	GLASS DISK
54	1	41-1267	RUBBER WASHER
55	1	41-1061	OIL WINDOW COVER
56	4	2-00-0608	HEX. HEAD STEEL SCREW 8-32x1/2
57	1	41-1168	DRAIN FITTING
58	1	41-1192	DISK
59	1	41-1166	CAP
60	1	41-0774	OIL CASE
61	1	41-0224	GASKET

MODEL 1404



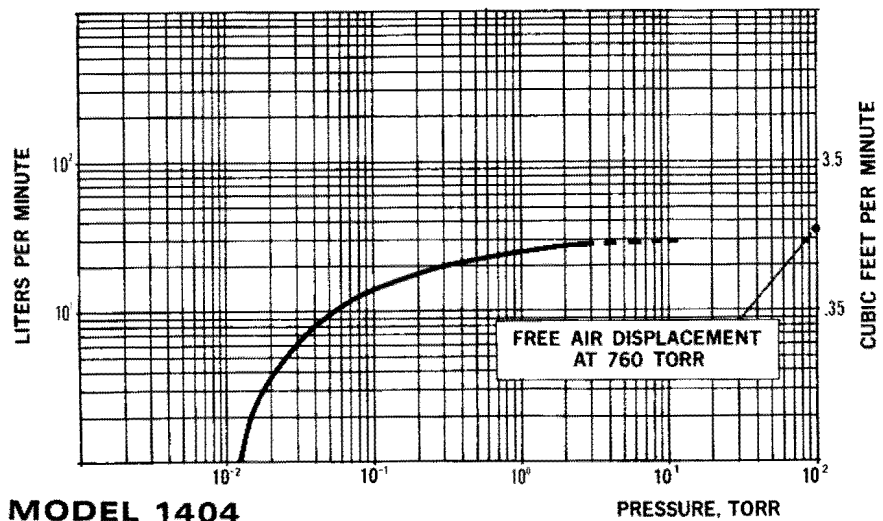
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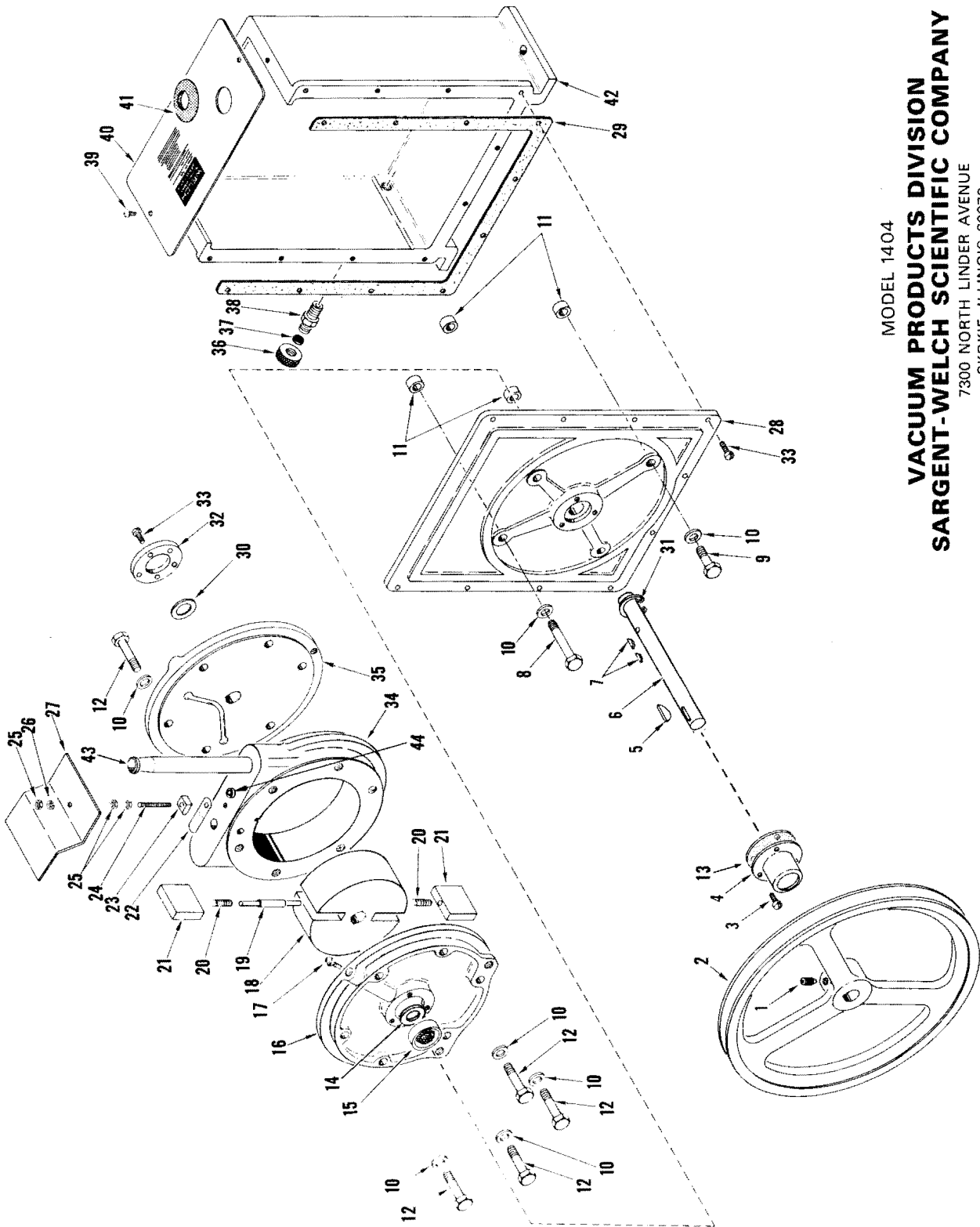
Free-Air Displacement, L/M	35
CFM	1.2
Guaranteed Partial Pressure	
Blankoff, millitorr	20
Pump Rotational Speed, RPM	300
Number of Stages	1
Oil Capacity, qts.	2½
Standard Belt Guard (not shown)	No. 1404G
Net Weight, Pump Only, lbs.	45
Net Weight, Mounted Pump, lbs.	83
Shipping Weight, Mounted Pump, lbs.	95
Size of Rubber Stopper for Intake	00
Line Cord, with Switch for 115V	No. 41-1058
Line Cord, with Switch for 230V	No. 41-1057

Model 1404 Drive Requirements

Cat. No.	Belt Number and Size	MOTOR						Remarks
		Pulley Number and Size	HP	V	HZ	PH	RPM	
1404H	41-0709 4L390	41-0549 2 x .5	41-1900 1/3 115		60	1	1725	
1404I	41-0709 4L390	41-0549 2 x .5	41-1914 1/3 230		60	1	1725	
1404K-01	COMPLETE GASKET and SEAL KIT							
1404K-02	REPAIR KIT							
1404L	41-0709 4L390	41-0551 2.4 x .5	41-1915 1/3 110		50	1	1425	
1404M	41-0709 4L390	41-0550 2 x .625	41-1909 1/3 230/460		60	3	1725	
1404Q	41-0709 4L390	41-0550 2 x .625	41-1910 1/3 115		60	1	1725	
1404S	41-0709 4L390	41-0552 2.4 x .625	41-1924 1/3 110/220		50	1	1425	
1404U	41-0709 4L390	41-0550 2 x .625	41-1923 1/3 230/460		60	3	1725	
1404W	41-0709 4L390	41-0549 2 x .5	41-1906 1/3 115		60	1	1725	Explosion Proof
1404X	41-0709 4L390	41-0552 2.4 x .625	41-2827 1/3 110/220		50	1	1425	Explosion Proof
1404Y	41-0709 4L390	41-0550 2 x .625	41-2828 1/3 230/460		60	3	1725	Explosion Proof

- Note:**
1. Pump pulley, No. 41-2194, 10" O.D. x .625" Bore, is common to all pumps.
 2. 4L390 Belts, "A" size, 1/2"W x 5/16"D, are stamped 1406A.
 3. 4L415 Belts, "A" size, 1/2"W x 5/16"D, are stamped 1405A.



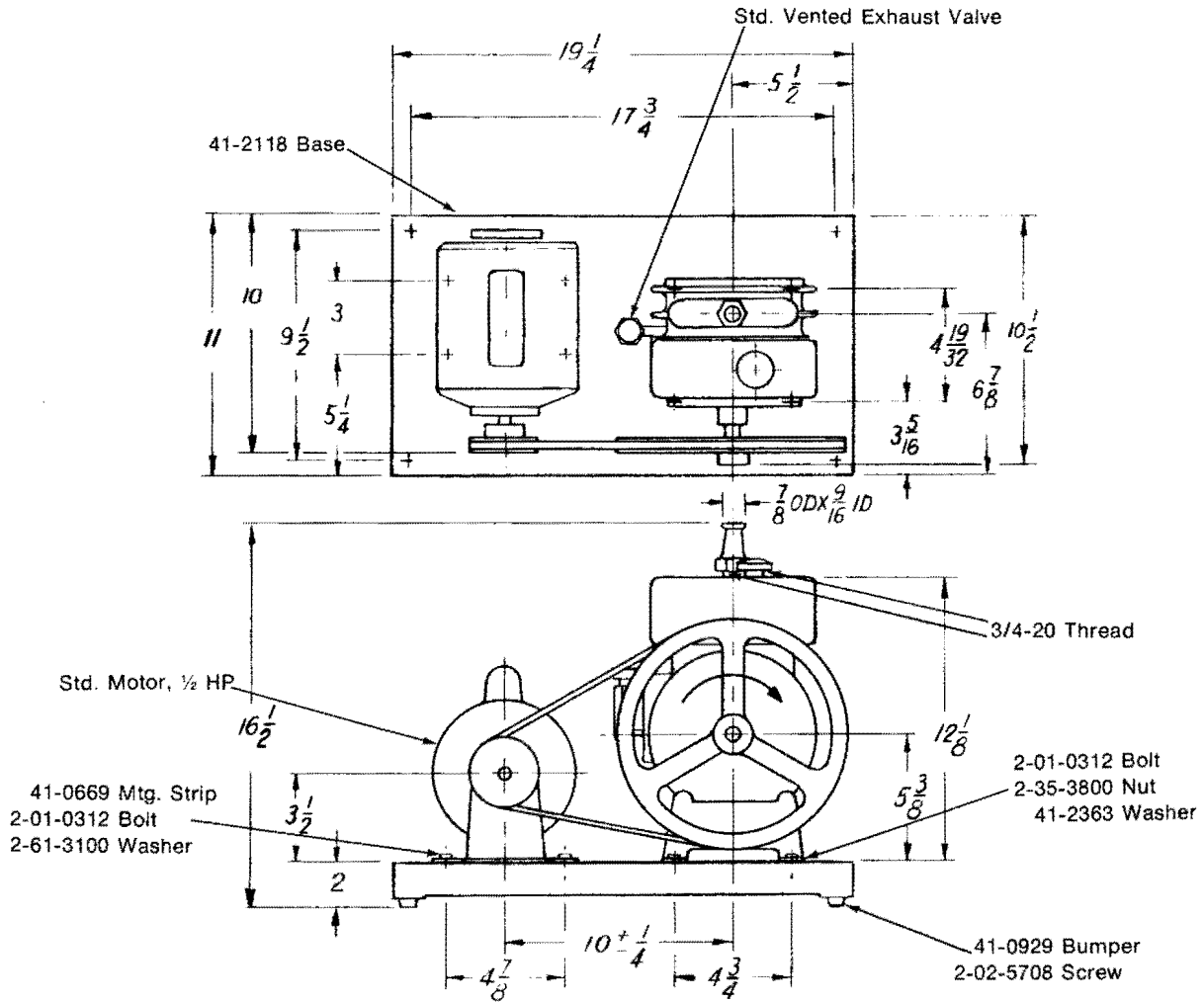


MODEL 1404
VACUUM PRODUCTS DIVISION
SARGENT-WELCH SCIENTIFIC COMPANY
 7300 NORTH LINDER AVENUE
 SKOKIE, ILLINOIS 60076

PARTS LIST
MODEL 1404 VACUUM PUMP

<u>ITEM</u>	<u>QUANTITY</u>	<u>PC. NO.</u>	<u>DESCRIPTION</u>
1	1	2-01-9306	HEADLESS STEEL SETSCREW 5/16-18x3/8, HEX. SOC.
2	1	41-2194	PULLEY INCLUDING SETSCREW , ITEM 1
3	3	2-00-2705	FIL. HEAD STEEL SCREW 10-32x5/16
4	1	1401E	SEAL COMPLETE WITH SCREWS, ITEM 3 AND GASKET, ITEM 13
5	1	41-0624	PULLEY KEY
6	1	41-0923	SHAFT INCLUDING RING, ITEM 31
7	2	41-0613	WOODRUFF KEY
8	2	2-01-0332	HEX. HEAD CAP SCREW 5/16-18x2
9	2	2-01-0320	HEX. HEAD CAP SCREW 5/16-18x1-1/4
10	14	41-2363	WASHER
11	4	41-0934	SPACING COLLAR
12	10	2-01-0324	HEX. HEAD CAP SCREW 5/16-18x1-1/2
13	1	41-0643	GASKET
14	1	41-0056	GASKET
15	1	41-0578	SEAL
16	1	41-1287	FRONT END PLATE
17	1	2-01-2106	FIL. HEAD STEEL SCREW 1/4-20x3/8
18	1	41-1253	ROTOR
19	1	41-1303	SPRING HOLDER
20	2	41-1304	VANE SPRING
21	2	41-1301	VANE
22	1	41-1239	CLOCK SPRING VALVE
23	1	41-1283	BRASS POST
24	1	11-1276	LEVELING SCREW
25	3	2-30-5708	HEX. STEEL NUT 10-32x3/8
26	1	2-62-0793	LOCKWASHER #10
27	1	41-0507	BAFFLE PLATE
28	1	41-0922	PUMP COVER
29	1	41-0493	GASKET
30	1	41-1285	STEEL WASHER
31	1	41-0974	RETAINING RING
32	1	41-1292	SHAFT END CAP
33	15	2-00-2708	FIL. HEAD STEEL SCREW 10-32x1/2
34	1	41-1269	RING
35	1	41-1296	BACK PLATE
36	1	41-1166	DRAIN CAP
37	1	41-1192	DRAIN DISK
38	1	41-1168	DRAIN FITTING
39	2	2-00-5704	RD. HEAD STEEL SCREW 10-32x1/4
40	1	41-0567	NAME PLATE
41	1	41-0570	BEVELED WASHER
42	1	41-0921	PUMP CASE
43	1	41-0924	NIPPLE
44	1	41-1169	COLLAR

MODEL 1405



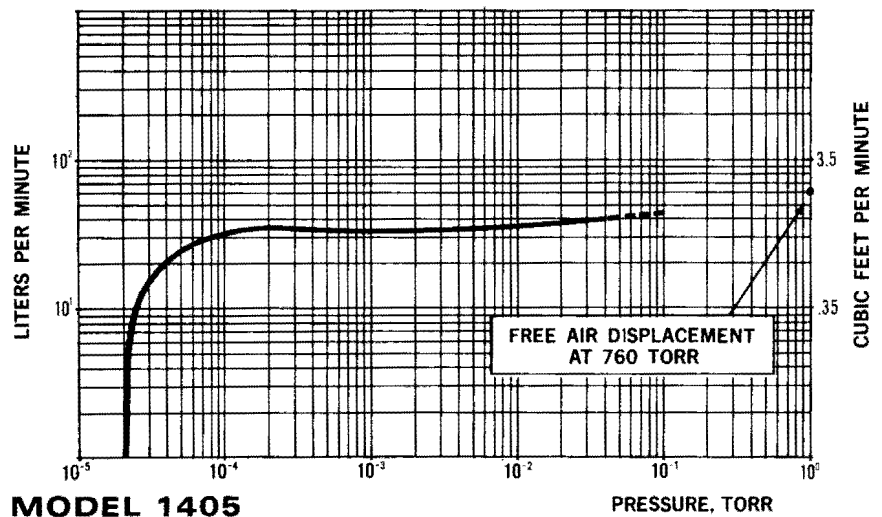
SPECIFICATIONS

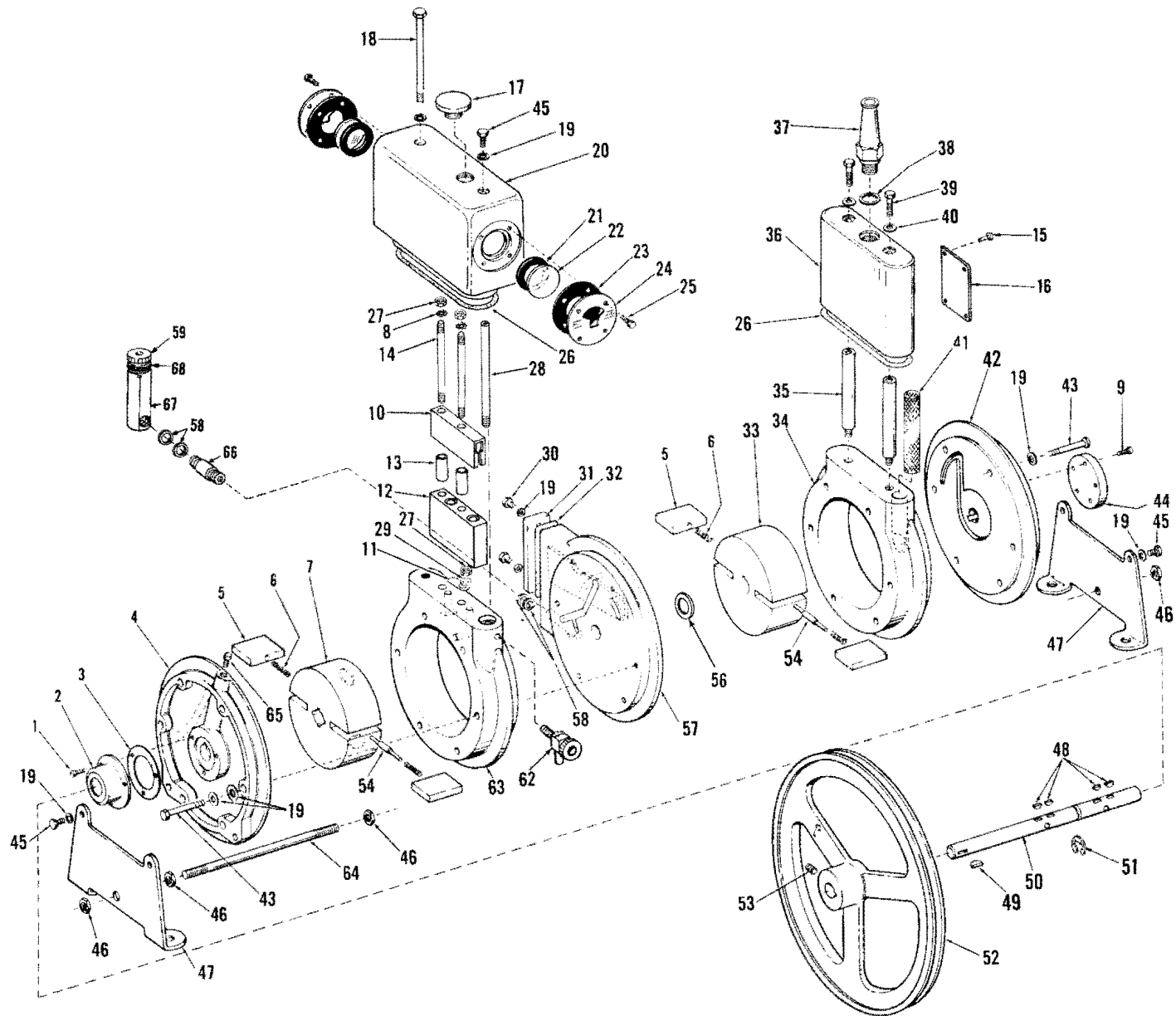
Free-Air Displacement, L/M	60
CFM	2.1
Guaranteed Partial Pressure	
Blankoff, millitorr	0.1
Pump Rotational Speed, RPM	525
Number of Stages	2
Oil Capacity, qts.	1/4
Standard Belt Guard (not shown)	No. 1371G
Net Weight, Pump Only, lbs.	58
Net Weight, Mounted Pump, lbs.	93
Shipping Weight, Mounted Pump, lbs.	106
Optional Exhaust Filter, Complete	No. 1417
Filter Element, Air Maze	No. 1417F
Filter Element, Technolab	No. 1417L
Size of Rubber Stopper for Intake	0
Line Cord, with Switch for 115V	No. 41-1058
Line Cord, with Switch for 230V	No. 41-1057

Model 1405 Drive Requirements

Cat. No.	Belt Number and Size	MOTOR					Remarks
		Pulley Number and Size	HP V	HZ	PH	RPM	
1405B	41-0710 4L415	41-0668 3 x .625	41-1907 ½ 115/230	60	1	1725	For 115V
1405C	41-0710 4L415	41-0668 3 x .625	41-1907 ½ 115/230	60	1	1725	For 230V
1405K-01	COMPLETE GASKET and SEAL KIT						
1405K-02	REPAIR KIT						
1405L-20	41-0713 4L420	41-0667 3.5 x .625	41-1905 ½ 110/220	50	1	1425	
1405M-25	41-0710 4L415	41-0668 3 x .625	41-1904 ½ 230/460	60	3	1725	
1405Q-34	41-0710 4L415	41-0668 3 x .625	41-1911 ½ 115/230	60	1	1725	Totally Enclosed
1405S-35	41-0713 4L420	41-0667 3.5 x .625	41-2824 ½ 110/220	50	1	1425	Totally Enclosed
1405U-39	41-0710 4L415	41-0668 3 x .625	41-1913 ½ 230/460	60	3	1725	Totally Enclosed
1405W-50	41-0710 4L415	41-0668 3 x .625	41-1912 ½ 115/230	60	1	1725	Explosion Proof
1405X-55	41-0710 4L415	41-0667 3.5 x .625	41-2825 ½ 110/220	50	1	1425	Explosion Proof
1405Y-60	41-0710 4L415	41-0668 3 x .625	41-2823 ½ 230/460	60	3	1725	Explosion Proof

Note: 1. Pump pulley, No. 41-2194, 10" O.D. x .625" Bore, is common to all pumps.
 2. 4L415 Belts, "A" size, ½"W x 5/16"D, are stamped 1405A.





MODEL 1405
VACUUM PRODUCTS DIVISION
SARGENT-WELCH SCIENTIFIC COMPANY

7300 NORTH LINDER AVENUE
 SKOKIE, ILLINOIS 60076

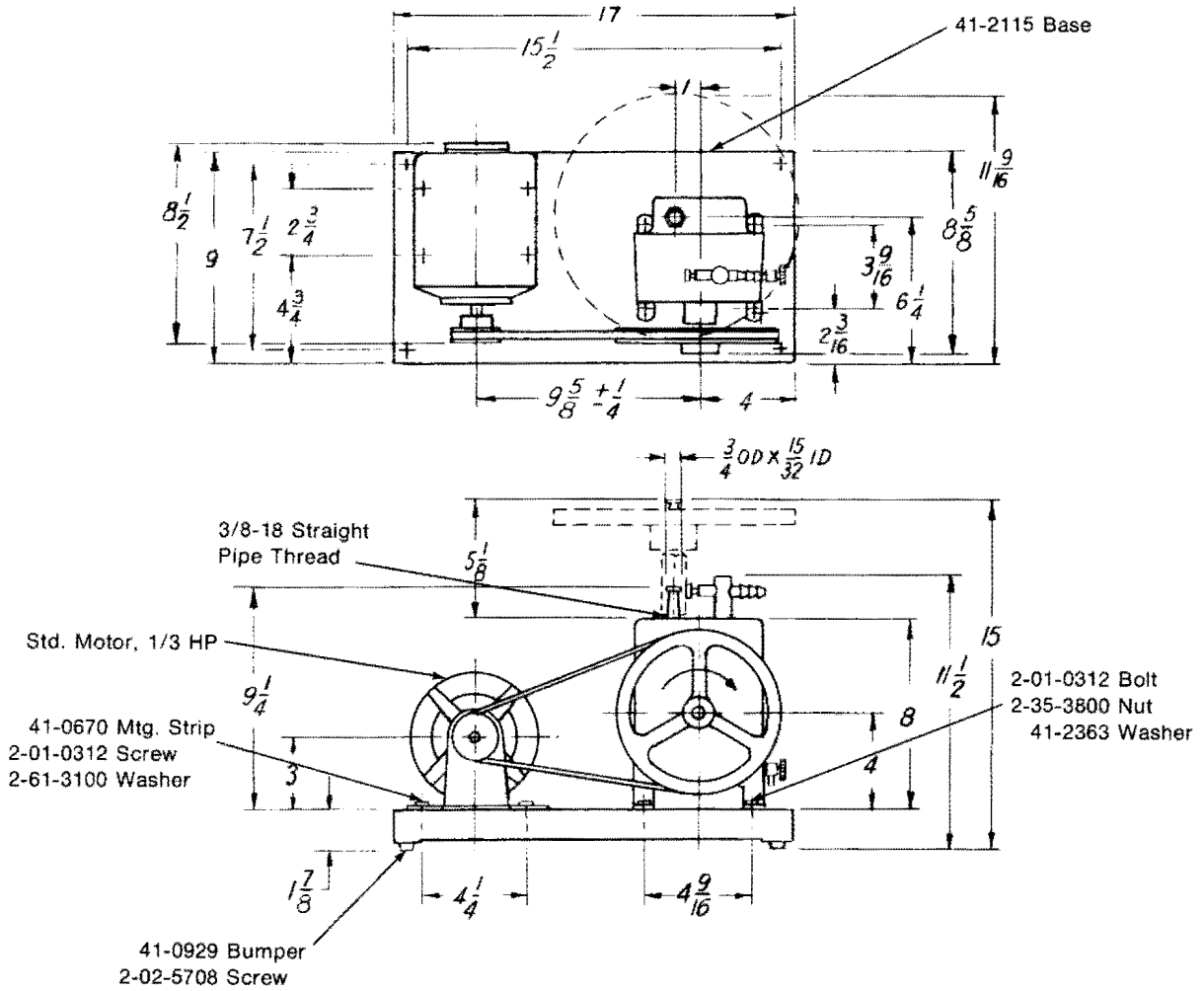
REVISED 11/74

PARTS LIST
MODEL 1405 VACUUM PUMP

ITEM	QUANTITY	PC. NO.	DESCRIPTION	ITEM	QUANTITY	PC. NO.	DESCRIPTION
1	3	2-00-2705	FIL. HD. STEEL SCREW 10-32x5/16	44	1	41-1255	SHAFT END CAP
2	1	1401E	SHAFT SEAL INCLUDING GASKET, ITEM 3 AND SCREWS, ITEM 1	45	5	2-01-0312	HEX. STEEL CAP SCREW 5/16-18x3/4
3	1	41-0643	GASKET	46	4	41-0199	HEX. NUT
4	1	41-1287	EXHAUST END PLATE	47	2	41-1286	LEG
5	4	41-1301	VANE	48	4	41-0613	WOODRUFF KEY
6	4	41-1304	SPRING	49	1	41-0624	PULLEY KEY
7	1	41-1253	EXHAUST ROTOR	50	1	41-1293	SHAFT
8	2	2-65-0000	STEEL SHAKEPROOF LOCKWASHER #10 EXT. T.	51	1	41-1150	RETAINING RING
9	5	2-00-2708	FIL. HD. STEEL SCREW 10-32x1/2	52	1	41-2194	PULLEY INCLUDING SETSCREW, ITEM 53
10	1	41-3761	VALVE BLOCK COVER	53	1	2-01-9306	SOCKET HD. SETSCREW 5/16-18-3/8
11	1	41-1239	CLOCK SPRING VALVE	54	2	41-1303	SPRING HOLDER
12	1	41-3762	EXHAUST VALVE BLOCK	56	1	41-1285	CLOCK SPRING WASHER
13	2	41-3767	SLEEVE	57	1	41-1291	CENTER PLATE
14	2	41-3766	COVER SUPPORT	58	4	41-1056	ALUMINUM WASHER
15	4	2-09-1204	SELF-TAPPING SCREWSTICK 3-48x1/8	59	1	41-1736	VENTED EXHAUST VALVE
16	1	41-2588	NAME PLATE				
17	1	41-1345	DUST CAP				
18	1	2-01-0372	HEX. STEEL CAPSCREW 5/16-18x4 1/2	62	1	41-1734	DRAIN VALVE
19	32	41-2363	WASHER	63	1	41-1298	EXHAUST RING
20	1	41-3768	EXHAUST CHAMBER	64	1	41-1280	SUPPORT ROD
21	2	41-1266	TENSION WASHER	65	1	2-01-2106	FIL. HD. STEEL SCREW 1/4-20x3/8
22	2	41-1268	GLASS DISK	66	1	41-2350	CONNECTING NIPPLE
23	2	41-1267	RUBBER WASHER	67	1	41-1745	ADAPTER
24	2	41-1061	OIL WINDOW FRAME	68	1	41-2757	LOCKNUT
25	8	2-00-0608	HEX. HD. STEEL SCREW 8-32x1/2				
26	2	41-1308	GASKET				
27	3	2-30-5708	HEX. STEEL NUT 10-32x3/8				
28	1	41-3763	ADAPTER ROD				
29	1	2-70-6736	WASHER #10S				
30	2	2-01-0310	HEX. STEEL CAPSCREW 5/16-18x5/8				
31	1	41-1275	CENTER PLATE COVER				
32	1	41-1178	GASKET				
33	1	41-1290	INTAKE ROTOR				
34	1	41-2529	INTAKE RING				
35	2	41-1306	EXTENSION ROD				
36	1	41-1273	INTAKE CHAMBER				
37	1	41-1274	NIPPLE				
38	1	41-0409	WASHER				
39	2	41-1305	SPECIAL CAPSCREW				
40	2	41-1165	ALUMINUM WASHER				
41	1	41-0891	AIR FILTER				
42	1	41-1288	INTAKE END PLATE				
43	12	2-01-0344	CAP SCREW 5/16-18x2-3/4				

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MODEL 1410



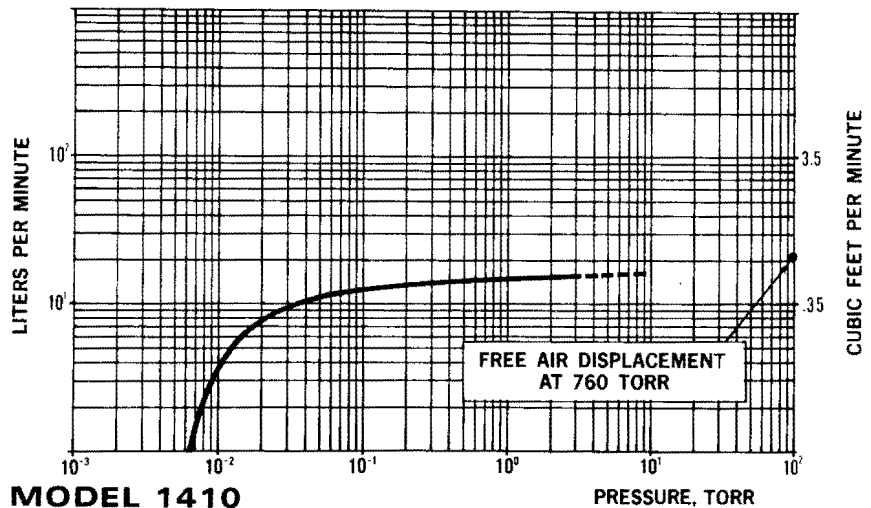
SPECIFICATIONS

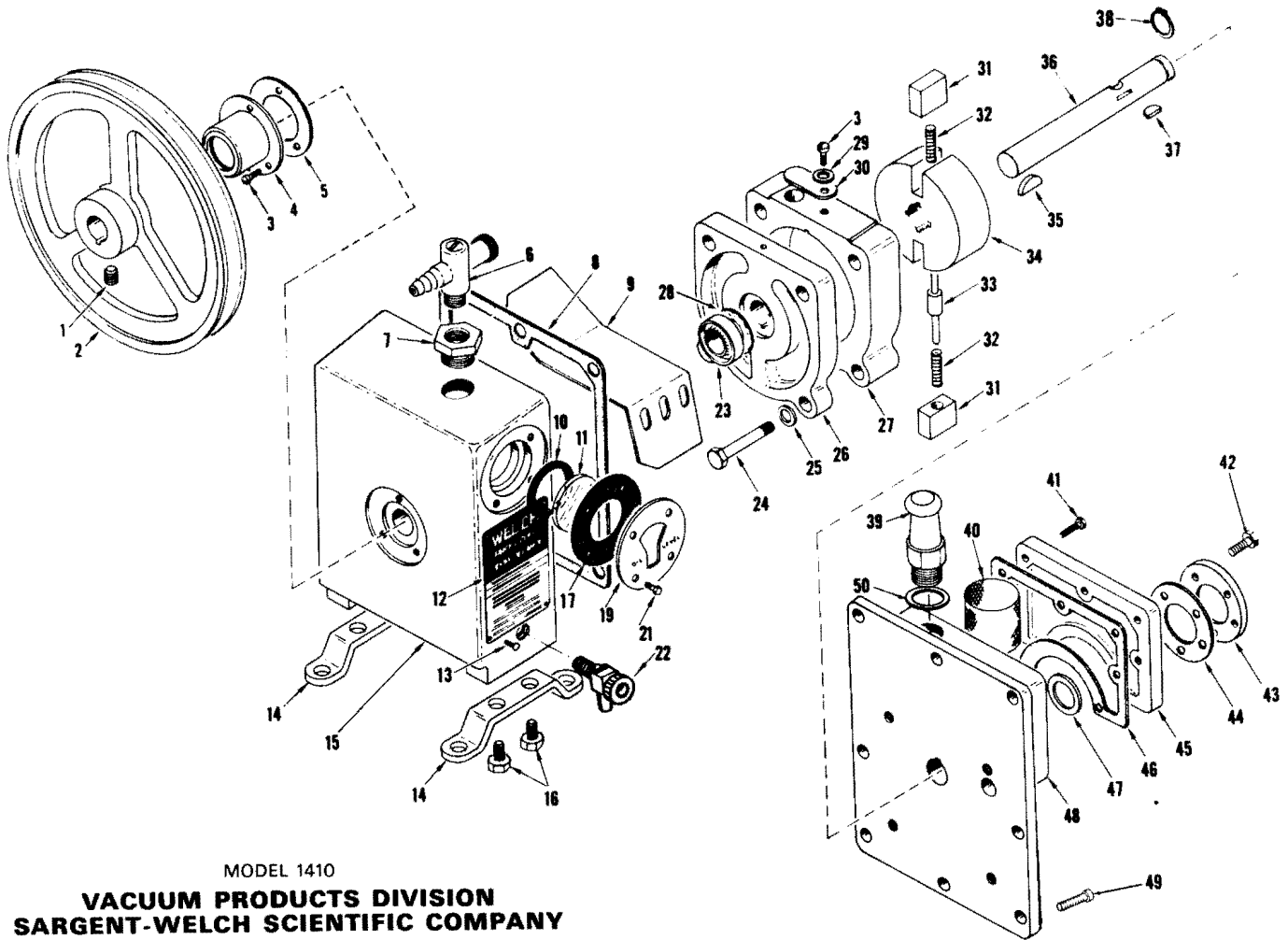
Free-Air Displacement, L/M	21
CFM	0.7
Guaranteed Partial Pressure	
Blankoff, millitorr	20
Pump Rotational Speed, RPM	480
Number of Stages	1
Oil Capacity, qts.	$\frac{1}{2}$
Standard Belt Guard (not shown)	No. 1371H
Net Weight, Pump Only, lbs.	26
Net Weight, Mounted Pump, lbs.	50
Shipping Weight, Mounted Pump, lbs.	58
Size of Rubber Stopper for Intake	00
Line Cord, with Switch for 115V	No. 41-1058
Line Cord, with Switch for 230V	No. 41-1057
Pressure as a Compressor, PSIG	15

Model 1410 Drive Requirements

Cat. No.	Belt Number and Size	MOTOR					Remarks	
		Pulley Number and Size	HP	V	HZ	PH		RPM
1410B	41-0708 4L340	41-0549 2 x .5	41-1918 1/3	115	60	1	1725	
1410C	41-0708 4L340	41-0549 2 x .5	41-1914 1/3	230	60	1	1725	
1410K-01	COMPLETE GASKET and SEAL KIT							
1410K-02	REPAIR KIT							
1410L	41-0708 4L340	41-0551 2.4 x .5	41-1915 1/3	110	50	1	1425	
1410M	41-0712 4L330	41-0550 2 x .625	41-1909 1/3	230/460	60	3	1725	
1410N	41-0708 4L340	41-0549 2 x .5	41-1918 1/3	115	60	1	1725	
1410Q	41-0712 4L330	41-0550 2 x .625	41-1910 1/3	115	60	1	1725	Totally Enclosed
1410S	41-0708 4L340	41-0552 2.4 x .625	41-1924 1/3	110/220	50	1	1425	Totally Enclosed
1410U	41-0708 4L340	41-0550 2 x .625	41-1923 1/3	230/460	60	3	1725	Totally Enclosed
1410W	41-0708 4L340	41-0549 2 x .5	41-1906 1/3	115	60	1	1725	Explosion Proof
1410X	41-0708 4L340	41-0552 2.4 x .625	41-2827 1/3	110/220	50	1	1425	Explosion Proof
1410Y	41-0708 4L340	41-0550 2 x .625	41-2828 1/3	230/460	60	3	1725	Explosion Proof

Note: 1. Pump pulley, No. 41-2191, 7" O.D. x .625" Bore, is common to all pumps.
 2. 4L340 Belts, "A" size, 1/2"W x 5/16"D, are stamped 1400A.





MODEL 1410
VACUUM PRODUCTS DIVISION
SARGENT-WELCH SCIENTIFIC COMPANY
 7300 NORTH LINDER AVENUE
 SKOKIE, ILLINOIS 60076

REVISED 11/74

PARTS LIST
MODEL 1410 VACUUM PUMP

<u>ITEM</u>	<u>QUANTITY</u>	<u>PC. NO.</u>	<u>DESCRIPTION</u>
1	1	2-01-9306	HEADLESS STEEL SETSCREW 5/16-18x3/8, HEX.SOC.
2	1	41-2191	PULLEY INCLUDING SETSCREW, ITEM 1
3	4	2-00-2705	FIL. HEAD STEEL SCREW 10-32x5/16
4	1	1401E	SEAL COMPLETE WITH SCREWS, ITEM 3 AND GASKET, ITEM 5
5	1	41-0643	SEAL GASKET
6	1	41-1186	PRESSURE CROSS (AVAIL. ONLY AS COMPLETE UNIT)
7	1	41-1184	ADAPTER
8	1	41-1052	CASE GASKET
9	1	41-0437	BAFFLE PLATE
10	1	41-1266	TENSION WASHER
11	1	41-1268	GLASS DISK
12	1	41-2589	NAME PLATE
13	4	2-09-1204	SELF-TAPPING SCREWSTICK 3-48x1/8
14	2	41-1049	LEG
15	1	41-1047	OIL CASE
16	4	2-01-0308	HEX. HEAD STEEL SCREW 5/16-18x1/2
17	1	41-1267	RUBBER WASHER
19	1	41-1061	COVER
21	4	2-00-0608	HEX. HEAD STEEL SCREW 8-32x1/2
22	1	41-1734	DRAIN VALVE
23	1	41-0578	SEAL
24	4	2-01-0332	HEX. STEEL CAP SCREW 5/16-18x2
25	4	41-2363	WASHER
26	1	41-1045	FRONT PLATE
27	1	41-1042	RING
28	1	41-0056	SEAL GASKET
29	1	2-71-0040	BRASS WASHER #10
30	1	41-1239	CLOCK SPRING VALVE
31	2	41-1070	VANE
32	2	41-1304	VANE SPRING
33	1	41-1063	SPRING HOLDER
34	1	41-1040	ROTOR
35	1	41-0624	PULLEY KEY
36	1	41-1009	SHAFT INCLUDING RING, ITEM 38
37	1	41-0613	WOODRUFF KEY
38	1	41-0974	RETAINING RING
39	1	41-0920	INTAKE NIPPLE
40	1	41-0306	AIR FILTER
41	7	2-00-2710	FIL. HEAD STEEL SCREW 10-32x5/8
42	5	2-00-2708	FIL. HEAD STEEL SCREW 10-32x1/2
43	1	41-1292	SHAFT END CAP
44	1	41-0231	GASKET
45	1	41-0936	INTAKE CHAMBER COVER
46	1	41-0258	GASKET
47	1	41-1285	STEEL WASHER
48	1	41-0935	INTAKE CHAMBER
49	8	2-01-6112	SOCKET HEAD STEEL SCREW 1/4-20x3/4
50	1	41-1137	ALUMINUM WASHER



VI. REFERENCE DATA

General Conversions*

atmosphere (atm) = 760mm Hg (0°C)
 atm 14.696 lb/in²
 atm 29.921 in Hg (32°F)
 atm 33.899 ft H₂O (39.2°F)
 atm 1033.2 g/cm²
 atm 1.0581 ton/ft²

centimeter (cm) = 0.3937 in
 cm² 0.1550 in²
 cm³ 3.5314 x 10⁻⁵ ft³
 cm³ 6.1024 x 10⁻² in³
 cm³ 0.99997 ml
 cm³/sec 2.1189 x 10⁻³ ft³/min

foot (ft) = 0.3048 m
 ft H₂O 0.0295 atm (4°C)
 ft H₂O 0.8826 in Hg (32°F)
 ft H₂O 0.4335 lb/in² (4°C)
 ft³ 28.316 liter
 ft³ 7.480 gal [US Liq]
 ft³ 0.02832 m³
 ft³ 2.832 x 10⁴ cm³
 ft³ H₂O 62.426 lb (39.2°F)
 ft³/min 472.0 cm³/sec
 ft³/min 0.472 liters/sec
 ft³/min 1.6990 m³
 ft³/min 0.1247 gal/sec
 ft³/min 28.316 liters/min

gram (g) = 15.432 grain
 g 0.03527 oz avdp
 gal [US Liq] 3.7853 liter
 gal [US Liq] 231.00 in³
 gal [US Liq] 0.13368 ft³
 gal [US Liq] 128 US fl oz
 gal H₂O 8.337 lb avdp (60°F)
 gal/min 2.228 x 10⁻³ ft³/sec
 gal/min 6.309 x 10⁻² liters/sec

inch (in) = 25.4 mm
 in Hg 13.55 in H₂O
 in H₂O .074 in Hg
 in² 6.4516 cm²
 in³ 16.387 cm³

kilogram (kg) = 2.2046 lb avdp
 kilometer (km) 1093.6 yd
 km 0.62137 mile

liter = 61.025 in³
 liter 0.03532 ft³
 liter 0.26418 gal [US Liq]
 liter 1.0567 qt [US Liq]
 liters/sec 2.1189 ft³/min
 liters/sec 3.600 m³/hr
 lb avdp 7000 grain
 lb avdp 453.59 g
 lb H₂O 0.01602 ft³ (39.2°F)
 lb H₂O 0.11983 gal [US Liq]

meter (m) = 39.37 in
 m 3.2808 ft
 m 1.0936 yd
 m³ 35.315 ft³
 m³/hr 0.5886 ft³/min
 m³/hr 16.666 liters/min
 mile 1.6093 km
 mm 0.03937 in
 mm Hg 1 torr
 mm Hg 1000μ
 mm Hg 0.00132 atm
 mm Hg 0.01934 lb/in²

micron (μ or mu) = 0.001 mm
 μ 0.001 torr
 μliters/sec 1.27 x 10² μft³/hr

oz avdp = 28.349 g

pint [US Liq] (pt) = 28.875 in³

quart [US Liq] (qt) = 32 fl oz
 qt 0.94633 liter
 qt 946.353 cm³
 qt 0.03342 ft³

torr = 1 mm Hg

* From HANDBOOK OF CHEMISTRY AND PHYSICS

Pressure Conversions

ABSOLUTE PRESSURE ⁽¹⁾									GAGE PRESSURE ⁽²⁾	
cm of Hg	Torr or mm of Hg	Micron	Atmosphere	lb/in ²	ton/ft ²	gram/cm ²	ft of H ₂ O	In of Hg	lb/in ²	In of Hg
76	760	760000	1.0	14.70	1.06	1033	33.9	29.9	0	0
70	700	700000	.921	13.53	.975	952	31.2	27.6	1.16	2.36
60	600	600000	.790	11.60	.835	816	26.8	23.6	3.10	6.30
50	500	500000	.659	9.67	.696	680	22.3	19.7	5.03	10.2
40	400	400000	.526	7.74	.557	545	17.8	15.7	6.97	14.2
30	300	300000	.395	5.80	.417	408	13.4	11.8	8.90	18.1
20	200	200000	.263	3.87	.278	272	8.92	7.87	10.8	22.0
10	100	100000	.132	1.94	.139	136	4.46	3.94	12.8	26.0
5	50	50000	.066	.967	.070	68.0	2.23	1.97	13.7	27.9
1	10	10000	.013	.194	.014	13.6	.446	.394	14.5	29.5
0.1	1	1000	.001	.019	.001	1.36	.045	.039	14.68	29.88
0	0	0	0	0	0	0	0	0	14.70	29.92

⁽¹⁾ Positive pressure measured from absolute zero.

⁽²⁾ Negative pressure (or vacuum) measured from atmospheric pressure.

Micron Equivalents

Millitorr or Micron	Torr or mm of Hg	
1000	= 1.0	= 10 ⁰
100	= 0.1	= 10 ⁻¹
10	= 0.01	= 10 ⁻²
1.0	= 0.001	= 10 ⁻³
0.5	= 0.0005	= 5 x 10 ⁻⁴
0.1	= 0.0001	= 1 x 10 ⁻⁴ or 10 ⁻⁴
0.01	= 0.00001	= 10 ⁻⁵
0.001	= 0.000001	= 10 ⁻⁶

PRESSURE and TEMPERATURE VALUES for VARIOUS ALTITUDES

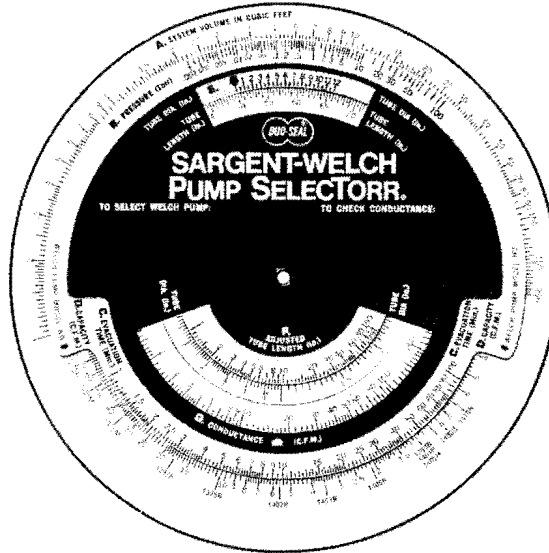
Based on U.S. Standard Atmosphere						From N.A.C.A. Report No. 538					
ALTITUDE (Feet)	PRESSURE			TEMPERATURE		ALTITUDE (Feet)	PRESSURE			TEMPERATURE	
	in Hg	mm Hg	P.S.I.	°C	°F		in Hg	mm Hg	P.S.I.	°C	°F
-1,000	31.02	787.9	15.25	17.0	62.6	32,500	7.91	201.0	3.89	-49.4	-56.9
- 500	30.47	773.8	14.94	16.0	60.8	33,000	7.73	196.4	3.80	-50.4	-58.7
0	29.921	760.0	14.70	15.0	59.0	33,500	7.55	191.8	3.71	-51.4	-60.5
500	29.38	746.4	14.43	14.0	57.2	34,000	7.38	187.4	3.63	-52.4	-62.3
1,000	28.86	732.9	14.18	13.0	55.4	34,500	7.20	183.0	3.54	-53.4	-64.1
1,500	28.33	719.7	13.90	12.0	53.6	35,000	7.04	178.7	3.46	-54.3	-65.8
2,000	27.82	706.6	13.67	11.0	51.8	35,332	6.93	175.9	3.40	-55.0	-66.0
2,500	27.31	693.8	13.41	10.0	50.0	35,500	6.87	174.5	3.375	-55.0	-66.0
3,000	26.81	681.1	13.19	9.1	48.4	36,000	6.71	170.4	3.296	-55.0	-66.0
3,500	26.32	668.6	12.92	8.1	46.6	36,500	6.55	166.4	3.22	-55.0	-66.0
4,000	25.84	656.3	12.70	7.1	44.8	37,000	6.39	162.4	3.14	-55.0	-66.0
4,500	25.36	644.2	12.45	6.1	43.0	37,500	6.24	158.6	3.067	-55.0	-66.0
5,000	24.89	632.3	12.23	5.1	41.2	38,000	6.10	154.9	2.994	-55.0	-66.0
5,500	24.43	620.6	12.00	4.1	39.4	38,500	5.95	151.2	2.925	-55.0	-66.0
6,000	23.98	609.0	11.77	3.1	37.6	39,000	5.81	147.6	2.852	-55.0	-66.0
6,500	23.53	597.6	11.56	2.1	35.8	39,500	5.68	144.1	2.798	-55.0	-66.0
7,000	23.09	586.4	11.34	1.1	34.0	40,000	5.54	140.7	2.72	-55.0	-66.0
7,500	22.65	575.3	11.12	0.1	32.2	40,500	5.41	137.4	2.66	-55.0	-66.0
8,000	22.22	564.4	10.90	- 0.8	30.67	41,000	5.28	134.2	2.595	-55.0	-66.0
8,500	21.80	553.7	10.70	- 1.8	28.8	41,500	5.16	131.0	2.535	-55.0	-66.0
9,000	21.38	543.2	10.50	- 2.8	27.0	42,000	5.04	127.9	2.47	-55.0	-66.0
9,500	20.98	532.8	10.30	- 3.8	25.2	42,500	4.92	124.9	2.415	-55.0	-66.0
10,000	20.58	522.6	10.10	- 4.8	23.4	43,000	4.80	122.0	2.36	-55.0	-66.0
10,500	20.18	512.5	9.91	- 5.8	21.6	43,500	4.69	119.1	2.304	-55.0	-66.0
11,000	19.79	502.6	9.73	- 6.8	19.8	44,000	4.58	116.3	2.25	-55.0	-66.0
11,500	19.40	492.8	9.53	- 7.8	18.0	44,500	4.47	113.5	2.195	-55.0	-66.0
12,000	19.03	483.3	9.35	- 8.8	16.2	45,000	4.36	110.8	2.14	-55.0	-66.0
12,500	18.65	473.8	9.15	- 9.8	14.4	45,500	4.26	108.2	2.094	-55.0	-66.0
13,000	18.29	464.5	8.97	-10.8	12.6	46,000	4.16	105.7	2.042	-55.0	-66.0
13,500	17.93	455.4	8.81	-11.7	10.9	46,500	4.06	103.2	1.997	-55.0	-66.0
14,000	17.57	446.4	8.63	-12.7	9.1	47,000	3.97	100.7	1.948	-55.0	-66.0
14,500	17.22	437.5	8.46	-13.7	7.3	47,500	3.873	98.38	1.90	-55.0	-66.0
15,000	16.88	428.8	8.28	-14.7	5.5	48,000	3.781	96.05	1.858	-55.0	-66.0
15,500	16.54	420.2	8.13	-15.7	3.7	48,500	3.693	93.79	1.813	-55.0	-66.0
16,000	16.21	411.8	7.96	-16.7	1.9	49,000	3.605	91.57	1.772	-55.0	-66.0
16,500	15.89	403.5	7.81	-17.7	0.1	49,500	3.52	89.41	1.729	-55.0	-66.0
17,000	15.56	395.3	7.64	-18.7	- 1.7	50,000	3.436	87.30	1.689	-55.0	-66.0
17,500	15.25	387.3	7.49	-19.7	- 3.5	51,000	3.276	83.22	1.610	-55.0	-66.0
18,000	14.94	379.4	7.34	-20.7	- 5.3	52,000	3.124	79.34	1.533	-55.0	-66.0
18,500	14.63	371.7	7.19	-21.7	- 7.1	53,000	2.978	75.64	1.463	-55.0	-66.0
19,000	14.33	364.0	7.04	-22.6	- 8.7	54,000	2.839	72.12	1.395	-55.0	-66.0
19,500	14.04	356.5	6.90	-23.6	-10.5	55,000	2.707	68.76	1.33	-55.0	-66.0
20,000	13.75	349.1	6.75	-24.6	-12.3	56,000	2.581	65.55	1.269	-55.0	-66.0
20,500	13.46	341.9	6.61	-25.6	-14.1	57,000	2.460	62.49	1.208	-55.0	-66.0
21,000	13.18	334.7	6.48	-26.6	-15.9	58,000	2.346	59.58	1.152	-55.0	-66.0
21,500	12.90	327.7	6.34	-27.6	-17.7	59,000	2.236	56.80	1.098	-55.0	-66.0
22,000	12.63	320.8	6.21	-28.6	-19.5	60,000	2.132	54.15	1.048	-55.0	-66.0
22,500	12.36	314.1	6.08	-29.6	-21.3	61,000	2.033	51.63	1.000	-55.0	-66.0
23,000	12.10	307.4	5.94	-30.6	-23.1	62,000	1.938	49.22	0.952	-55.0	-66.0
23,500	11.84	300.9	5.82	-31.6	-24.9	63,000	1.847	46.92	0.906	-55.0	-66.0
24,000	11.59	294.4	5.70	-32.5	-26.5	64,000	1.761	44.73	0.865	-55.0	-66.0
24,500	11.34	288.1	5.58	-33.5	-28.3	65,000	1.679	42.65	0.825	-55.0	-66.0
25,000	11.10	281.9	5.45	-34.5	-30.1	66,000	1.601	40.66	0.786	-55.0	-66.0
25,500	10.86	275.8	5.33	-35.5	-31.9	67,000	1.526	38.76	0.748	-55.0	-66.0
26,000	10.62	269.8	5.22	-36.5	-33.7	68,000	1.455	36.95	0.714	-55.0	-66.0
26,500	10.39	263.9	5.11	-37.5	-35.5	69,000	1.387	35.23	0.681	-55.0	-66.0
27,000	10.16	258.1	4.99	-38.5	-37.3	70,000	1.322	33.59	0.649	-55.0	-66.0
27,500	9.94	252.5	4.88	-39.5	-39.1	71,000	1.261	32.02	0.619	-55.0	-66.0
28,000	9.72	246.9	4.78	-40.5	-40.9	72,000	1.202	30.53	0.590	-55.0	-66.0
28,500	9.50	241.4	4.67	-41.5	-42.7	73,000	1.146	29.10	0.562	-55.0	-66.0
29,000	9.29	236.0	4.56	-42.5	-44.5	74,000	1.093	27.75	0.536	-55.0	-66.0
29,500	9.08	230.7	4.46	-43.4	-46.1	75,000	1.041	26.45	0.512	-55.0	-66.0
30,000	8.88	225.6	4.36	-44.4	-47.9	76,000	0.993	25.22	0.488	-55.0	-66.0
30,500	8.68	220.5	4.27	-45.4	-49.7	77,000	0.946	24.04	0.465	-55.0	-66.0
31,000	8.48	215.5	4.17	-46.4	-51.5	78,000	0.902	22.92	0.443	-55.0	-66.0
31,500	8.29	210.6	4.07	-47.4	-53.3	79,000	0.860	21.85	0.423	-55.0	-66.0
32,000	8.10	205.8	3.98	-48.4	-55.1	80,000	0.820	20.83	0.403	-55.0	-66.0

Pump Selectorr®

A convenient method for selecting the correct DuoSeal Vacuum pump to ideally fit your system is the use of this circular calculator. With scales indicating system volume, pressure, evacuation time and capacity, the proper pump for your system can be quickly selected.

Conductance of your system can be checked to make sure that the conductance of the system is greater than the capacity of the pump selected.

SelectTorr's are available from your Sargent-Welch representative, nearest branch office and the Vacuum Products division headquarters.



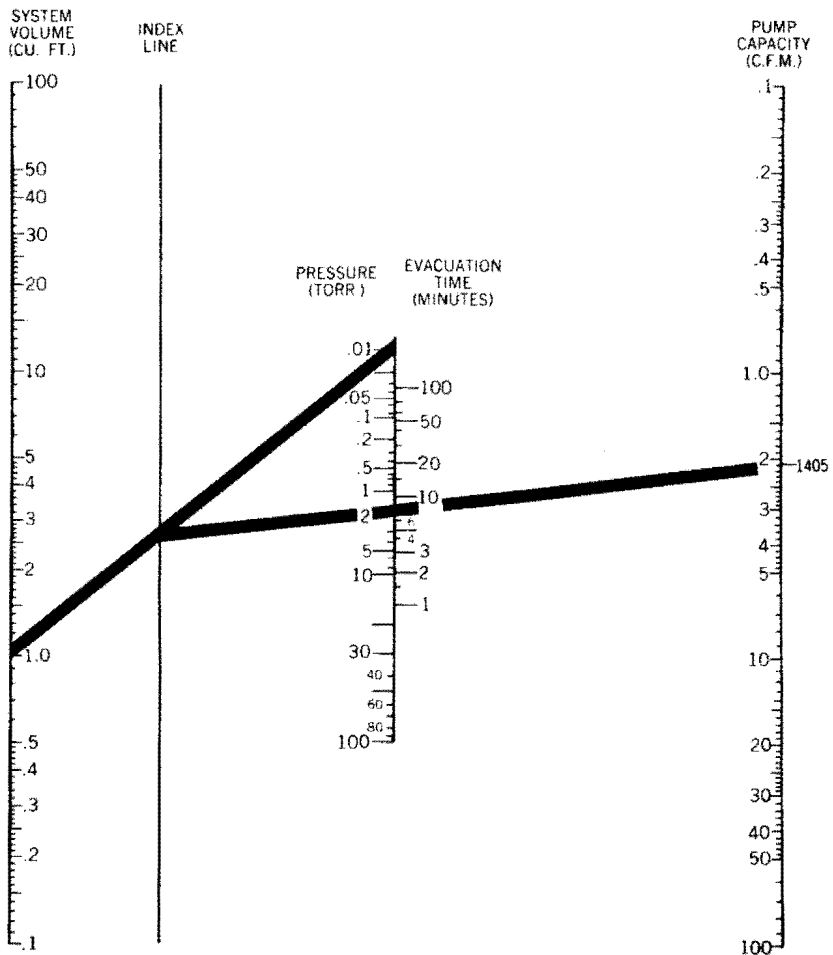
Nomogram for Pump Selection

Instead of using methods previously presented or the Sargent-Welch DuoSeal Pump Selectorr, it is sometimes possible to use a nomogram to determine the desired pumping information. This method can be used for systems which are reasonably clean.

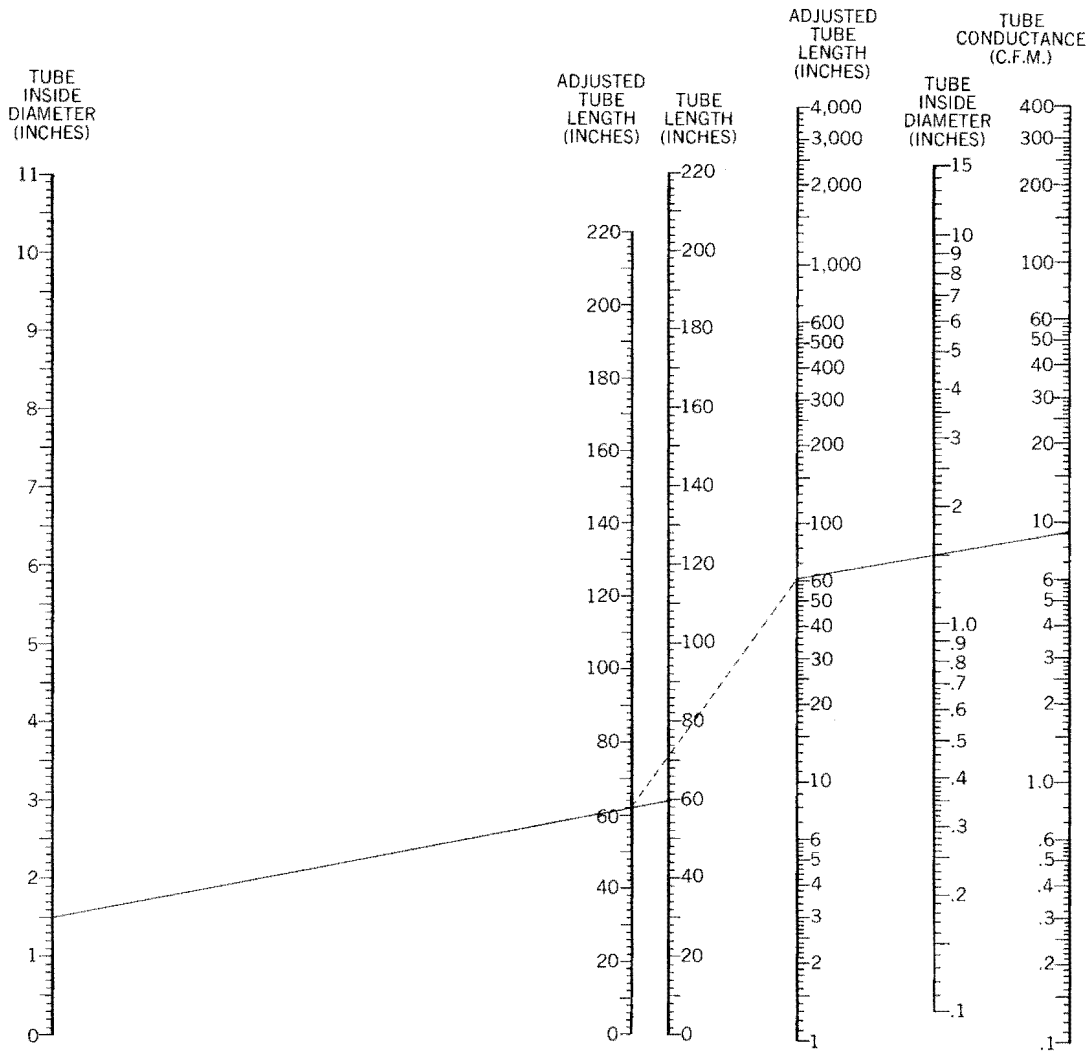
Example: Consider a system volume of 1 cubic foot, an operating pressure of 0.01 Torr, and a desired evacuation time of 8 minutes. The pump speed and selection of the appropriate Sargent-Welch pump is required.

The solution is:

1. Draw a line from the system volume to .01 on the pressure line.
2. Draw a line from the intercept of this line with the index line through the 8 point on the time line and extend it to the pump capacity line.
3. The required pump speed is 2.1 CFM and the Sargent-Welch Model 1405 is the appropriate pump to select.



Tube Conductance Nomogram



This nomogram can be used to determine the conductance of connecting tubing to insure that the system is not conductance limited.

Example: Consider a system where the connecting tubing is 60 inches long and has an inside diameter of 1.5 inches. The tube conductance in C.F.M. is required.

The solution is:

1. Draw a line from 1.5 on the tube I.D. line to 60 on the tube length line. The point where this line intercepts the intervening line is the adjusted tube length or 62 inches.
2. On the adjusted tube length line (to the right of the tube length line) draw a line from 62 through 1.5 on the tube I.D. line and extend it to the tube conductance line.
3. The tube conductance is 9 C.F.M.



VII. ACCESSORIES

DuoSeal Pump Oil

DuoSeal Oil is fractionated especially for use in Sargent-Welch Vacuum Pumps. A considerable percentage of the final fraction is rejected because it will not meet our rigid standards for physical and chemical stability. Our vacuum guarantee applies only when DuoSeal Oil is used. Use of other oils in DuoSeal pumps will almost certainly cause inferior performance both in pumping speed and ultimate vacuum attained. Most oils contain additives which (1) have high vapor pressures, (2) may cause foaming, (3) may break down chemically, or (4) may combine with vapors passing through the pump to form a varnish, or sludge, causing the vanes to stick or otherwise impair operation. Although none of these effects may

be evident at first, they may, in time, cause permanent damage to the mechanism. DuoSeal oil is checked frequently and carefully to insure that it meets rigid requirements for proper vapor pressure, chemical stability, viscosity, and other essential characteristics. It is available in the sizes and quantities listed below and may be ordered by specifying Cat. No. 1407K and the quantity needed.

12 Quart Case 5 Gallon Drum
4 Gallon Case 55 Gallon Drum



1 Quart 1 Gallon 5 Gallons



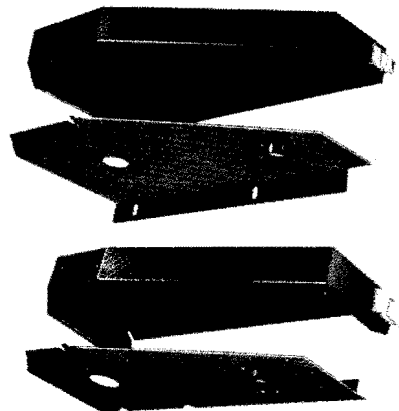
55 Gallons

Belt Guards

Effective January 1, 1975 all mounted DuoSeal pumps are supplied with a factory installed belt guard meeting OSHA requirements. These guards are also available separately for easy installation by the user on older models. Purchase of a separate belt guard for all models will include the appropriate base necessary to utilize the guard. The entire belt and both pulleys are covered on all sides by the guard and it

meets all OSHA safety standards. It is securely attached to the pump base but is readily opened or removed for access to the belt or pulleys. When ordering separately, specify the Model number of your pump for which the guard is intended.

Cat. No.	For Pump Series
1371A	1373, 1380, 1402
1371B	1376
1371C	1403
1371D	1405
1371E	1392, 1399, 1400, 1410
1371F	1374, 1397



Repair Kits and Gasket Kits

For DuoSeal Vacuum Pumps

Pump repairs, of a minor nature, can often be accomplished immediately by the user, provided parts involved in these repairs are accessible. Such repairs often circumvent costly breakdowns or delays.

Both Repair Kits and Gasket Kits are available for the purpose of providing the Sargent-Welch Pump owner with those parts

which can be easily replaced, are most easily subjected to breakage or wear, and involve only minor repair. Parts constituting the internal mechanism of the pump which would require complete pump disassembly for replacement are not included.

There is both a Repair Kit and a Gasket Kit available for each DuoSeal Pump Model. The location of each item on the pump may be found by use of the reference number on the exploded view drawing included in every kit. Specify the Sargent-Welch Model Number of your Vacuum Pump when ordering, and the type of kit desired.

Belt Replacements

These are V-belts of the same high quality as originally supplied on DuoSeal Pumps.

Cat. No.	For Pump Series
1400A	1392, 1400, 1410
1405A	1373, 1376, 1380, 1402, 1403, 1405
1406A	1404
1399A	1399
1397A	1397
1374A	1374
41-1716	1375
41-2512	1395, 1396, 1398

Exhaust Filters

For DuoSeal Vacuum Pumps

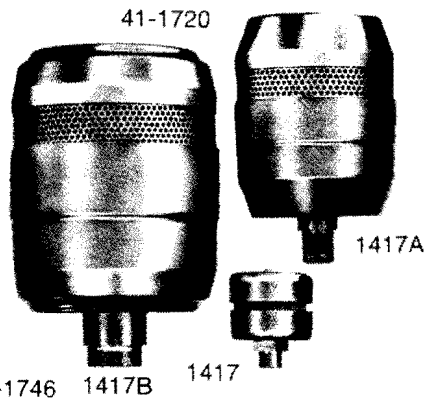
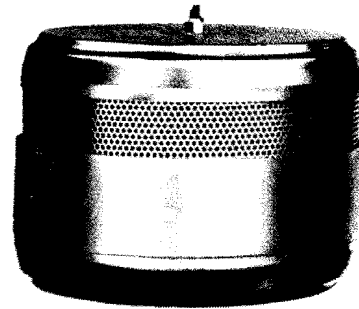
Sargent-Welch Exhaust Filters are specially designed to eliminate oil mist from around the exhaust and to maintain a clean vacuum pump area. The Exhaust Filter screws into the exhaust port in place of the dust cap and effectively removes oil vapors.

Oil droplets entrained in the discharged air are removed by the combined action of a two-stage filter element. One stage consists of multiple layers of fine wire screen and the other of a special non-organic fiber. Oil collected by these two components is drained from the element back through the discharge connection into the oil reservoir of the pump.

Cat. No.	For Pump Series	Specifications (inches)
1417	1392, 1399, 1400, 1405, 1410	2½ dia. x 2¾ high. ¾ -20 male thread.
1417A	1373, 1376, 1380, 1402, 1403	5 dia. x 6¼ high. 1 -20 male thread.
1417B	1374, 1397	6½ dia. x 8¾ high. 1¾ -20 male thread.
41-1720	1375, 1395, 1398	10⅝ dia. x 7¾ high.
41-1746	1396	10⅝ dia. x 9¼ high.

Replacement Elements

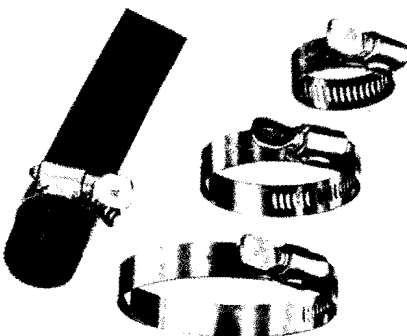
Cat. No.	For Exhaust Filter No.
1417F	1417 (Air Maze)
1417L	1417 (Technolab)
1417G	1417A
1417H	1417B
41-1721	41-1720 (Air Maze)
41-1726	41-1720 (Technolab)
41-1747	41-1746



Tubing Clamps

This clamp exerts a uniformly distributed holding force completely around the circumference of the tubing. A wrench or screw driver is not needed for adjustment or tightening. The worm-type, self-locking screw gives uniform, instant adjustment. Six of one size in a package.

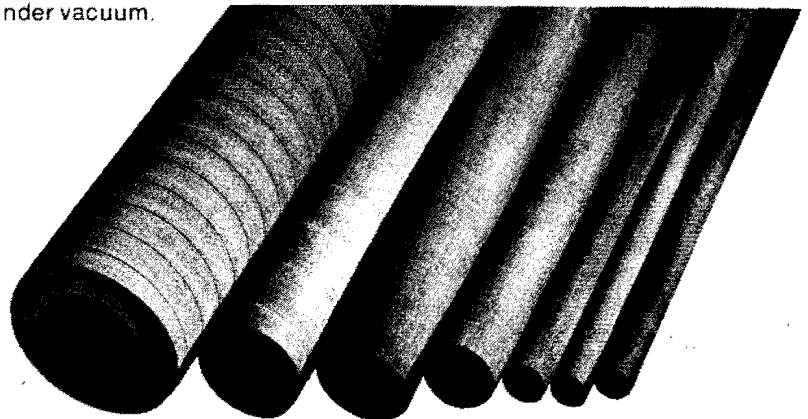
Cat. No.	For O.D. Size Tubing (inches)
4912	⅝ to ¾
4912A	1⅛ to 1½
4912B	1⅝ to 1⅞
4912C	1½ to 2¼
4912D	2½ to 3¼



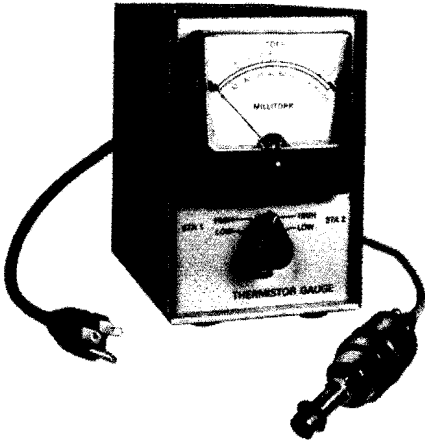
Vacuum Rubber Tubing

The tubing to be used in a vacuum system should be chosen with great care, even though the lengths ordinarily used may be short. This tubing is of high-grade, pure gum, red rubber, especially selected for its very low vapor pressure, uniformity of wall thickness, and excellent sealing properties. It is flexible, yet the extra-heavy wall is rigid enough to avoid collapsing under vacuum.

Cat. No.	I. D. (inches)	Wall (inches)
S-75390C	⅜	⅜
S-75390D	¼	⅜
S-75390G	⅜	⅜
S-75390H	⅝	⅜
S-75390J	1⅜	⅜
S-75390L	1⅝	½



High-Vacuum Thermistor Gauge



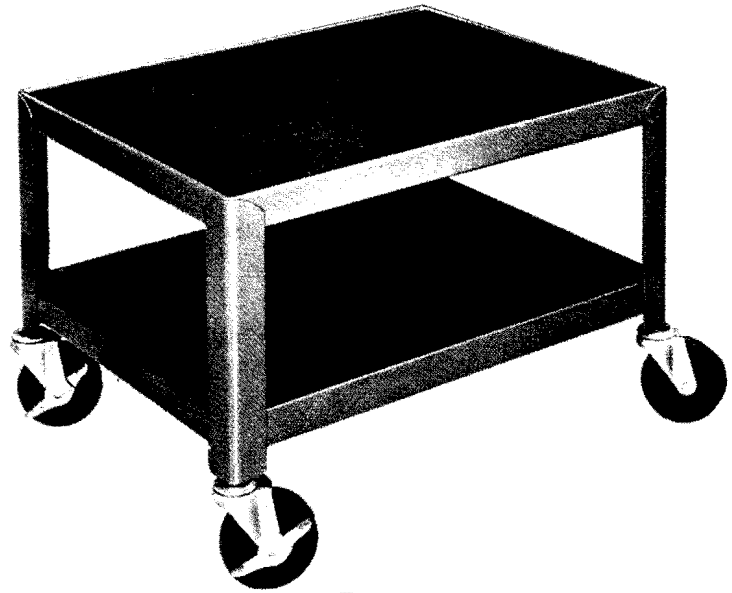
This high-quality, high-vacuum Thermistor Gauge incorporates the following features: (1) covers the 1 millitorr to atmosphere pressure range; (2) has interchangeable, pre-calibrated tubes; (3) high reliability is provided by solid-state circuitry; (4) the very low drift assures accurate pressure readings; (5) an external circuit control feature is available; and (6) the gauges are available with two sensing stations.

To order, specify:
 Cat. No. 1455T Thermistor Gauge
 Cat. No. 1455U Thermistor Tube

Quick Disconnect Coupling Assemblies

For DuoSeal Vacuum Pumps

Quick Disconnect Coupling Assemblies are available for easy connection of any glass or metal tubing of the proper diameter. They permit attachment to intake pipe lines without the need of rubber tubing. It is no longer necessary to dismantle the intake piping or tubing when removing or adjusting the pump in a system with these couplings.



Sargent-Welch Vacuum Pump Cart

The Sargent-Welch Vacuum Pump Cart is designed and constructed for heavy-duty transportation of Sargent-Welch vacuum pumps and other materials. It can accommodate loads in excess of 500 pounds.

The cart is supplied with a thick-ribbed rubber mat, engineered to absorb sound and vibration and to prevent slipping and sliding. Both shelves and legs are double-welded to insure squareness and durability. The cart's four sturdy free-rolling 4-inch rubber casters (2 with locks) are equipped with permanent shimmy dampeners. Dimensions are 18" x 24" x 16" high, and there is a 7½" clearance between the two shelves. When ordering, specify Cat. No. 1415A.

1393C 1393B 1393A

1393E 1393D

CONNECTING UNION (NUT)

INTAKE TUBE

SQUEEZE WASHER

RUBBER O-RING

INTAKE COUPLING WITH ALUMINUM GASKET ATTACHES TO PUMP

Cat. No.	For Pump Series	Specifications (inches)
1393A	1392, 1399, 1400, 1410	½ O.D. intake tube. 1½ dia. x 3⅜ high. ⅜ -18 straight thread.
1393B	1405	⅝ O.D. intake tube. 1½ dia. x 3⅜ high. ¼ -20 male thread.
1393C	1380, 1402, 1403	⅞ O.D. intake tube. 1½ dia. x 3⅜ high. 1 -20 male thread.
1393D	1374, 1397	1¼ O.D. intake tube. 3 dia. x 5 high. 1¼ -20 male thread.
1393E	1373, 1376	1¼ O.D. intake tube. 3 dia. x 5 high. 1½ -12 male thread.

VIII. GLOSSARY OF TERMS USED IN VACUUM TECHNOLOGY

Definitions for the following terms have been taken generally from the glossary issued by the American Vacuum Society. Only those terms directly associated with mechanical vacuum pumps have been selected.

Absolute Pressure, a term used in engineering literature to indicate pressure above the absolute zero value corresponding to empty space or the absolute zero of temperature as distinguished from gage pressure. In vacuum technology pressure always corresponds to absolute pressure and not to gage pressure; therefore the term absolute pressure is not required.

Atmospheric Pressure, the pressure of the atmosphere at a specified place and time.

- a. The standard atmosphere, or normal atmosphere, is defined (independently of barometric height) as a pressure of 1,013,250 dyne/cm².
- b. The normal atmosphere has also been defined as the pressure exerted by a mercury column 760 mm in height at 0°C under standard acceleration of gravity of 980.665 cm/sec². Assuming a density of mercury at 0°C of 13.59509 g/cm³ this is equal to 1,013,249 dyne/cm².

Compound Mechanical Pump, a mechanical pump having two or more stages in series.

Degassing, the deliberate removal of gas from a material, usually by application of heat under high vacuum.

Fore Pump, the pump which produces the necessary fore vacuum for a pump which is incapable of discharging gases at atmospheric pressure. Sometimes called the backing pump.

Free Air Displacement, the volume of air passed per unit time through a mechanical pump when the pressure on the intake and exhaust sides is equal to atmospheric pressure. Also called free air capacity.

Gage Pressure, a term used in engineering literature to indicate the difference between the absolute pressure and atmospheric pressure as read from a differential manometer having atmospheric pressure on the reference side. This term is seldom used in vacuum technology.

Gas, gas is defined as the state of matter in which the molecules are practically unrestricted by intermolecular forces so that the molecules are free to occupy any space within an enclosure. In vacuum technology the word gas has been loosely applied to the non-condensable gas and vapor within a vacuum system.

Gas Ballast, the venting of the compression chamber of a mechanical pump to the atmosphere to prevent condensation of condensable vapor within the pump. Also called vented exhaust.

High Vacuum, the term high vacuum has frequently been defined as a pressure less than some upper limit, such as one torr or one millitorr. High vacuum, and similar vacuum terms, should not be defined as a pressure but rather as the condition or state in a gas-filled space at pressures less than some upper limit or within specified limits.

- a. High vacuum is defined as the condition in a gas-filled space at pressures less than 10⁻³ torr.
- b. The following classification of degrees of high vacuum has been proposed:

Condition	Pressure Range
High Vacuum	— 10 ⁻³ to 10 ⁻⁶ torr (microtorr range)
Very High Vacuum	— 10 ⁻⁶ to 10 ⁻⁹ torr (manotorr range)
Ultra-High Vacuum	— 10 ⁻⁹ torr and below

Leak Rate, in leak detection practice leak rate is defined as the rate of flow (in pressure-volume units per unit time) through a leak with gas at a specified high pressure (usually atmospheric pressure) on the inlet side and gas at a pressure on the exit side which is low enough to have negligible effect on the rate of flow.

Low Vacuum, the term low vacuum applies to the condition in a gas-filled space at pressures less than 760 torr and greater than some lower limit. It is recommended that this lower limit be chosen as 25 torr corresponding approximately to the vapor pressure of water at 25°C and to one inch of mercury.

Two self-consistent classification schemes which have been proposed for the pressure range from 760 to 10⁻³ torr are as follows:

Condition	Pressure Range
Low Vacuum	— 760 to 25 torr
Medium Vacuum	— 25 to 10 ⁻³ torr
Rough Vacuum	— 760 to 1 torr (torr range)
Fine Vacuum	— 1 to 10 ⁻³ torr (millitorr range)

Manometer, an instrument for measuring pressure of gases and vapors whether above or below atmospheric pressure.

McLeod Gauge, a liquid level vacuum gauge in which a known volume of the gas, at the pressure to be measured, is compressed by the movement of a liquid column to a much smaller known volume, at which the resulting higher pressure is measured. Particular designs are named after the inventors or by various trade names.





SARGENT-WELCH
SCIENTIFIC COMPANY
VACUUM PRODUCTS DIVISION

Sargent-Welch Scientific Company
7300 North Linder Avenue
Skokie, Illinois 60076
(312) 677-0600

Dallas, Texas
5915 Peeler Street
Dallas, Texas 75235
(214) 357-9381

International Division
7300 North Linder Avenue
Skokie, Illinois 60076

Denver, Colorado
4040 Dahlia Street
P.O. Box 7196
Denver, Colorado 80207
(303) 399-8220

Anaheim, California
1617 East Ball Road
Anaheim, California 92803
(714) 772-3550

Detroit, Michigan
8560 West Chicago Avenue
Detroit, Michigan 48204
(313) 931-0337

Birmingham, Alabama
3125 Seventh Avenue North
P.O. Box 10404
Birmingham, Alabama 35202
(205) 251-5125

Springfield, New Jersey
35 Stern Avenue
Springfield, New Jersey 07081
(201) 376-7050

Cincinnati, Ohio
10400 Taconic Terrace
Cincinnati, Ohio 45215
(513) 771-3850

Toronto, Canada
285 Garyray Drive
Weston, Ontario M9L 1P3
(416) 741-5210

Cleveland, Ohio
9520 Midwest Avenue
Garfield Heights
Cleveland, Ohio 44125
(216) 587-3300

Montreal, Canada
3300 Cavendish Boulevard
Montreal, P.Q. H4B 2M8
(514) 481-0119

Port Allen, Louisiana
1550 Commercial Dr.
P.O. Box 798
Port Allen, Louisiana 70767
(504) 344-1335

