PUMP CONSTRUCTION

Rotary vane deep vacuum pumps are readily available and are best suited for our work. Piston type pumps, because of the clearance necessary between piston and head, are incapable of producing a deep vacuum or at best are very inefficient. Many single stage compressors, similar to a hermetic compressor will not evacuate a system into a micron range, the last inch of pressure on the compound gauge, nor will it condense any moisture vapor in the system. Two stage pumps (2 pumps in series) have the best record in our business because they are capable of producing consistently lower pressures and are much more efficient when removing moisture vapor. The pump should be equipped with a blankoff valve which allows us to perform the isolation test (pressure rise) which is required in deep vacuum procedures. So far, we have defined our pump requirement as follows: 2-stage, rotary vane; Blankoff Valve; Gas Ballast Balve; 1,25 CFM - 35 l/' to 8,3 CFM - 240 l/'. A system is evacuated to between 300 and 400 microns so obviously these pumps should be able to produce vacuum in the low micron range with a safety factor of at least 25 microns total absolute. Thus, the pump should be able to achieve vacuum readings of at least 25 microns total absolute. We should also look for light weight and rugged construction because we all know the vacuum pump will be at our side as we climb those ladders to the roof top.

GAS BALLAST VALVE

At the beginning of evacuation, water vapor is quickly removed and if a system is laden with moisture, can very quickly contaminate the oil. Through the gas ballast, a fine metering valve connected to the second stage of the pump, a small amount of relatively dry ambient air is admitted to help prevent the moisture vapor from condensing in the oil.

CHOOSING THE RIGHT SIZE PUMP

Deep vacuum pumps are the first item to come to mind when we think of vacuum tools. Unfortunately the first mistake is usually made in the selection of these pumps with reasoning that goes like this “The larger the pump I get, the faster I can do the job.” Pump capacity has very little to do with evacuation time in refrigeration systems, as is easily seen when we examine the following. The refrigeration system itself is constructed of several feet of small diameter tubing with return bends and metering devices to offer restriction during evacuation. Compound this with the fact that service valves, when provided, have 1/4" Male SAE Flare ports which only have a 4,8 mm. (3/16") orifice. We also know that the only way to get more flow through a given orifice is by increasing the pressure across that orifice. But does a pump create pressure that increases the flow? No. We tend to forget two basic principles. A vacuum pump creates a void toward which the system pressure flows. The second point is that as pressure decreases in the system during evacuation, flow decreases. Therefore, it’s impossible for us to increase pressure or flow through our gauge ports with a larger pump. As a rule of thumb, the CFM rating squared equals the maximum system tonnage. A 4,2 CFM - 120 l/' pump is rated for 62 Kw Capacity; 2,5 CFM - 70 l/' pump is rated for 22 Kw Capacity. They are all that should be purchased for service and installation. In many cases, depending on the system line sizes of large tonnage systems, it is better to put two or more of the small, easily handled pumps at different locations. This will overcome some of the pressure drop problems and actually be faster than a single large pump. Pumps in the 1,25 CFM - 35 l/' to 8,3 CFM - 240 l/' class are adequate to handle 99% of the work.

MEASURING EVACUATION Microns Or Inches ?

A micron is a measurement of pressure starting from a perfect vacuum (no pressure) expressed in linear increments. One inch equals 25,400 microns. It should be noted at this point that when we discuss vacuum in terms of microns, we are referring to total absolute pressure as opposed to gauge pressure. Besides using a more accurate unit of measure (you can’t read fractions on a bourdon tube type gauge), we are also starting from the same measuring point (theoretical perfect vacuum). The bourdon tube type gauge, you will also remember, uses atmospheric pressure as its reference point, which is constantly changing during the day. The weather forecaster always includes this reading, barometric pressure, along with the temperature. When an area is covered by a HIGH, it translates into high barometric pressure and vice versa for a LOW. Pumps And How To Select Them.

VACUUM GAUGE SELECTION AND ACCURACY

The most important feature of all is range. If the micron gauge only indicates from 50 to 1000 microns, you will not be able to determine whether you are pumping against a leak or against moisture. Look for an instrument that reads from 50 microns to at least 9,000 microns. Portable micron gauges typically operate from battery power. It’s best to buy a micron gauge with AC adaptor capability so you won’t run out of power on the job. When batteries are run below the low battery warning, the batteries can cause corrosion and may cause permanent damage to the vacuum gauge. Another feature to look for is a sturdy case to protect the instrument. Finally, when you buy instruments of this type, remember that you are really only buying answers, and the instrument should give you these answers quickly and accurately. You get paid for adjusting refrigeration systems, not your tools. As already noted, we are talking about accuracy when we talk about micron type gauges. Gauge accuracy is affected by two factors. Extreme temperatures especially with exposure to the summer sun on a hot roof top or pavement and sensor contamination. The vacuum sensor is factory calibrated on air. If refrigerant gas or oil is drawn into the vacuum sensor of a remote reading unit or unit connected to the pump during the system evacuation, the gas will cause an erroneous reading. Any oil getting into the vacuum sensor via hose will also affect gauge accuracy. Improper shut down of pump after evacuation and loss of power will suck back oil and contaminate the hose and micron gauge. A hose used for charging or testing will contain droplets of system oil spurted into the hose when the schrader valve is opened. If this same hose is used on the hookup to the gauge, oil will collect in the gauge sensor. This can be prevented by using a dedicated hose for evacuation.

1 micron = 1 mTorr

1 micron = 0,00133 mBar = $1x10^{-3}$ mBar

VACUUM PUMPS - SELECTION				
1,25 CFM - 35 l./' - 2,1 m^3/h	**2,5 CFM - 70 l/1' - 4,2 m^3/h**	**4,2 CFM - 120 l/' - 7,1 m^3/h**	**5,8 CFM - 170 l/' - 10,0 m^3/h**	**8,3 CFM - 240 l/' - 14,2 m^3/h**
<4.700 Frig/h - 5,5 Kw Automotive Freezer - Refrigerator RAC Room Air Conditioner Split-System A/C	**<18.900 Frig/h - 22 Kw** Trasport Refrigeration Cold Room Packaged Roof-Top Commercial Split-System	**<53.300 Frig/h - 62 Kw** Trasport Refrigeration Autobus Packaged Roof-Top Commercial Split-System	**<100.000 Frig/h - 118 Kw** Chiller Large Cold Room Packaged Roof-Top Industrial Refrigeration	**<208.300 Frig/h - 242 Kw** Supermarket - Chiller Large Cold Room Packaged Roof-Top Industrial Refrigeration

2 STAGE - DIRECT DRIVE DEEP VACUUM PUMPS

The DV Series was created with the serious Air Conditioning and Refrigeration Technician in mind. The DV Series is manufactured with rigid quality standards with outstanding features and an unprecedented 12 month Over-The-Counter warranty. Models are availabe in 1.25, 2.5, 4.2, 5.8 & 8.3 CFM (35, 72, 119, 167 e 237 l/' - 2,1, 4,2, 7,1, 9,9 e 14,1 m^3/h) to meet any application on systems with refrigerant CFC, HCFC, HFC (R-22, R-134a, R-404a, R-407c, R-410a, AZ-20, Puron®, R-507...).

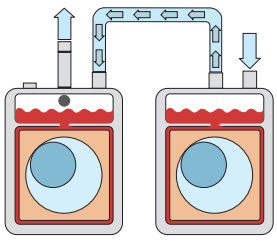
As a rule of thumb, the CFM rating squared equals the maximum system capacity. A 4,2 CFM (119 l/' - 7,1 m^3/h) pump is rated for 62 Kw (53.300 Frig/h - 17,6 Tons); 8,3 CFM (237 l/' - 14,1 m^3/h) pump is rated for 242 Kw (208.300 Frig/h - 69 Tons). In many cases, depending on the system line sizes of large tonnage systems, it is better to put two or more of the small, easily handled pumps at different locations. This will overcome some of the pressure drop problems and actually be faster than a single large pump. Pumps in the 1.25 to 8.3 CFM (35 to 237 l/' - 2,1 to 14,1 m^3/h) class are adequate to handle 99% of the work.

- Finned aluminum housings for lower operating temperature;
- Break-resistant steel handle with cushioned cool-grip;
- Check Valve prevents oil backflow during power failure;
- Gas ballast valve increases pump down time speed and keeps oil cleaner;
- Large easy to see sight glass;
- Housing protected oil drain valve;
- Blank-Off isolation valve. Quarter turn on-off. Non-restrictive flow pattern with ball valve design. Isolates pump from system for detecting leaks;
- Intake Port :
  1/4" + 5/16" + 3/8" Male SAE Flare (DV- 42N);
  1/4" + 3/8" Male SAE Flare (DV- 85N);
  3/8" + 1/4" + 3/8" Male SAE Flare (DV-142, -200, -285);
- O-Ring sealed easy open drain valve prevents unwanted leaks;
- 1/2 HP dual cycle motor 1425/1725 RPM (can be switched from 230 to 115 Volts - 1 phase - 50/60 Hz) with start capacitor, and thermal overload protection;
- Low profile rocker on-off switch;
- Three point base is heavy duty to prevent overturning.

Tested to 25 µ micron.

Operating temperature : 60° ± 10° C. (150° ± 18° F.);
Oil Capacity : 865 cc. (30 oz.) for DV- 42N;
785 cc. (27 oz.) for DV- 85N;
660 cc. (23 oz.) for DV-142N, and -200N;
705 cc. (24 oz.) for DV-285N;
Dimension : 365 x 134 x 295 (h) mm. (DV- 42 ÷ 200N);
390 x 134 x 295 (h) mm. (DV-285N);
Weight : 12,4 Kg. for DV- 42N, 13,7 Kg. for DV- 85N, 14,9 Kg. for DV-142N, 13,7 Kg. for DV-200N, and 17,5 Kg. for DV-285N.

IMPORTANT : Use oil ISO 460 specifically refined for deep vacuum pumps. Using oil not refined for deep vacuum pumps and/or operating with contaminated oil will void warranty.



TWO-STAGE

DV- 42N DV- 85N

DV-142N DV-200N

DV-285N

Model	Description
DV- 42N	Dual stage direct drive deep vacuum pump. Capacity 1.5/**1.25 CFM** (42/**35 lt/1'** - 2,5/**2,1 m^3/h**). 25 µ micron. Motor 1/2 HP 115/**220V-1f**-60/**50Hz**.
DV- 85N	As above. Capacity 3.0/**2.5 CFM** (85/**72 lt/1'** - 5,1/**4,2 m^3/h**). 25 µ micron. Motor 1/2 HP 115/**220V-1f**-60/**50Hz**.
DV-142N	As above. Capacity 5.0/**4.2 CFM** (142/**119 lt/1'** - 8,5/**7,1 m^3/h**). 25 µ micron. Motor 1/2 HP 115/**220V-1f**-60/**50Hz**.
DV-200N	As above. Capacity 7.0/**5.8 CFM** (200/**167 lt/1'** - 11,9 / **9,9 m^3/h**). 25 µ micron. Motor 1/2 HP 115/**220V-1f**-60/**50Hz**.
DV-285N	As above. Capacity 10.0/**8.3 CFM** (285/**237 lt/1'** - 17,0 / **14,1 m^3/h**). 25 µ micron. Motor 1/2 HP 115/**220V-1f**-60/**50Hz**.

Coale®vaC 2 STAGE - DIRECT DRIVE VACUUM PUMPS

The new ***Coale®vaC*** Series high performance vacuum pumps was engineered specifically for Air Conditioning and Refrigeration Service (systems up to 6 Tons - 22 Kw) with refrigerant CFC, HCFC, HFC (R-22, R-134a, R-404a, R-407c, R-410a, AZ-20, Puron®, R-507...)

- A Model DVE- 35N is rated for 1,56 Tons - 5,5 Kw;
- A Model DVE- 70N is rated for 6,25 Tons - 22,0 Kw;

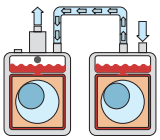
Two stage, offset rotary vane design provides powerful, quiet high vacuum capability and assures moisture removal, while the high pumping capacity reduces evacuation time. ***Coale®vaC*** uses less oil, reflecting lower maintenance costs. Gasket sealed drain plug prevents unwanted leaks.

- Die-cast aluminum housing, molded board. Precision one-piece, molded handle makes it easy to carry the pump to and from job sites, and the handle stays cool to the touch during operation;
- External check valve prevents oil suckback during power failure;
- Large easy to see sight glass;
- Blank-Off isolation valve. Quarter turn on-off. Non-restrictive flow pattern with ball valve design. Isolates pump from system for detecting leaks;
- Intake Ports :
  1/4" (7/16" 20UNF) + **5/16"** (1/2" 20UNF) for **R-410a** (AZ-20, Puron®..) + **3/8"** (5/8" 18UNF) **Male SAE Flare** with brass caps and chain;
- Intake filter prevents foreign matter from entering the pumping chamber, and an internal exhaust filter separates oil vapor from the exhaust flow
- 1/4 HP - 184W and 1/3 HP - 245W motors (1425 RPM 230 Volts - 1 phase - 50 Hz) with start capacitor, and thermal overload protection. (4) Rubber foots;
- Line cord 1,9 m. with Schuko plug.

Specifications :

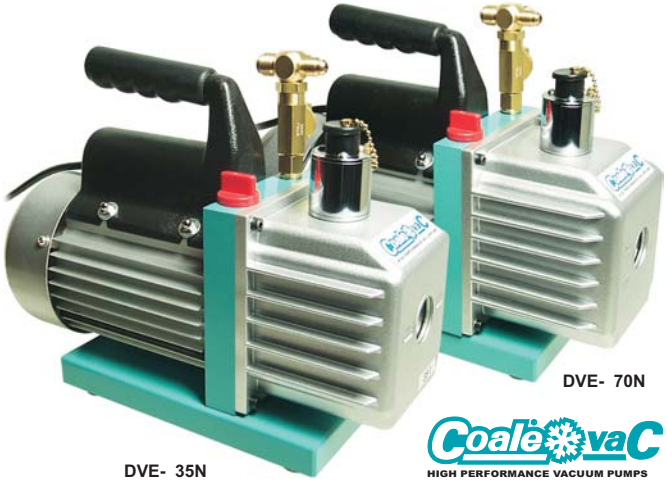
Operating Temperature : 60° ± 10° C. (150° F. ± 18° F.);
Oil Capacity : 220 cc. - 8 oz. (250 cc. oil included);
Dimensions : 315 x 120 x 240 (h) mm. (DVE- 35N);
336 x 123 x 255 (h) mm. (DVE- 70N);
Weight : 10,7 Kg. (DVE- 35N), 12,7 Kg. (DVE- 70N).

Intake Port w/Ball Valve



2 - STAGE

Check Valve



DVE- 70N

DVE- 35N

Model	Description
DVE- 35N	*Coale®vaC* 2 Stage Vacuum Pump **1,25 CFM - 35 lt/1' - 2,1 m³/h**. 50 μ micron ultimate Vacuum. 1/4", 5/16", 3/8" Male SAE Flare Intake Ports with Ball Valve. Oil Check Valve. **220V-1phase-50Hz**.
DVE- 70N	*Coale®vaC* 2 Stage Vacuum Pump **2,50 CFM - 70 lt/1' - 4,2 m³/h**. 50 μ micron ultimate Vacuum. 1/4", 5/16", 3/8" Male SAE Flare Intake Ports with Ball Valve. Oil Check Valve. **220V-1phase-50Hz**.