



Smart Dry Pump™

16 cfm • 20 mTorr • 20,000 hours



Lowest Cost to Own and Install

- *No Cooling Water!*
- *No Purge Gas!*
- *No Oil Whatsoever!*

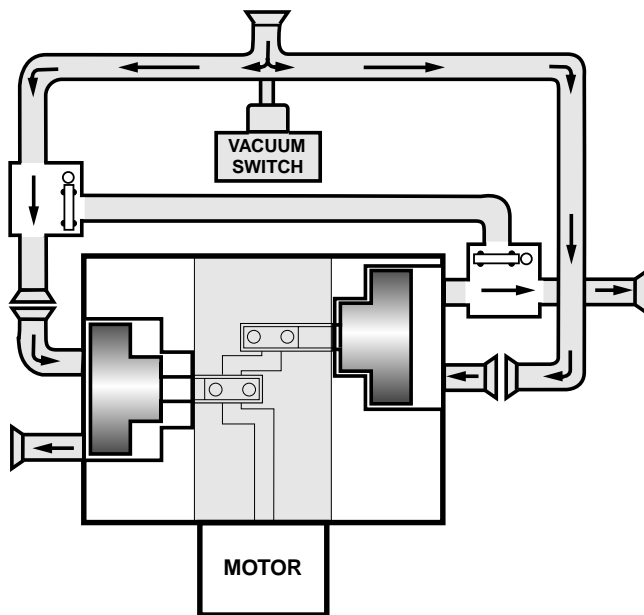
Smart Dry Pump™ Operation

The new VRC **Smart Dry Pumps™** provide the proven reliability of our piston style pumps at 30% lower cost per cubic foot of pumping speed and a 30% smaller footprint. Like all VRC Dry Pumps, the **Smart Dry Pump™** needs no cooling water or purge gas, and of course, there is absolutely no oil or pump fluid to monitor or dispose of. The high capacity and low ultimate pressure of the smart pump is accomplished by

operating the pistons in parallel from atmosphere to 1 Torr and then automatically switching them to series operation to give the 20 mTorr ultimate pressure. The crossover is controlled with a VRC Pirani gauge vacuum switch and even more savings can be accomplished with the VRC Soft Start Speed Control added to your **Smart Dry Pump™** (the Speed Control feature is described on the back page).

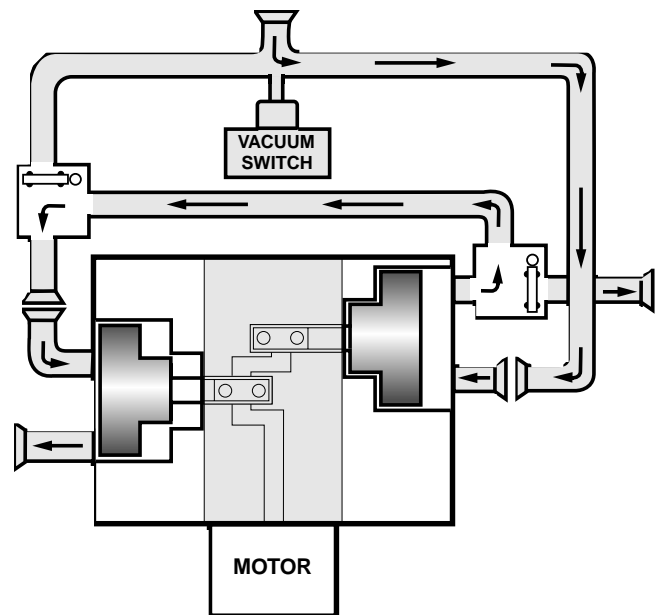
Smart Dry Pump™ in Roughing Mode

Pistons in parallel for maximum capacity from atmosphere to 1 Torr (133 Pa)



Smart Dry Pump™ in High Vacuum Mode

Pistons switched to be in series for ultimate pressure of 20 mTorr (2.6 Pa)



Lowest Cost of Ownership

When you add it all up, the VRC **Smart Dry Pump™** offers more for less. You don't have to invest in expensive synthetic oils, oil filters or oil mist eliminators because our oil-free pump is true to its name; no oil! And the VRC truly dry pumps are competitively priced. Less than 1/2 the price of many other dry pumps. Ownership costs are also reduced because there is no cooling water or purge gas, and of course, no hazardous waste to dispose of. The savings in water, sewage, and purge gas in one year will often pay the entire cost of the pump.

Belt Drive & Direct Drive

VRC offers the **Smart Dry Pump™** with either direct or belt drive and the selection of the drive most suitable for you is usually based on the following considerations.

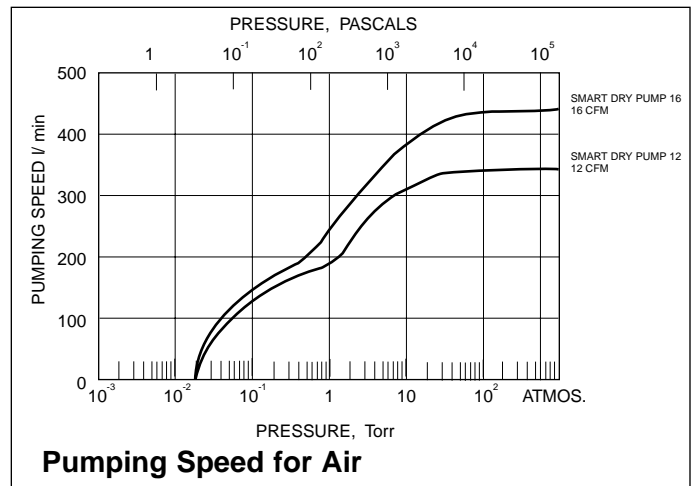
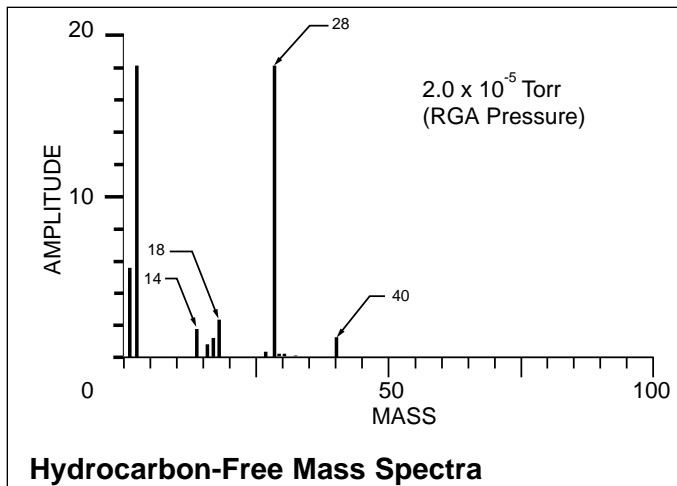
The belt drive pumps turn slower and thereby have 20,000 hour service life compared to the faster turning direct drive pumps which have a 10,000 hour life before servicing. Because they turn faster, our direct drive pumps have about 15% higher pumping speed than our belt drive pumps. In applications such as

roughing for ion or cryo pumps high speed is usually selected because the dry pump is turned off after roughing and the 10,000 hour life will provide years of service without down time. In applications where the dry pump will be used to back a turbo pump or to continuously pump a vacuum oven the slower pumping but longer life belt drive is usually selected.

The drive belt used by VRC is polyurethane with steel reinforcing which will provide many years of continuous operation.

<i>SPECIFICATIONS</i>	<i>20,000 Hours Before Maintenance Belt Drive Pumps</i>	<i>10,000 Hours Before Maintenance Direct Drive Pumps</i>
PUMP MODEL	SMART DRY PUMP™ 12 - \$8200 For Soft Start Speed Control Add \$1200	SMART DRY PUMP™ 16 - \$8200 For Soft Start Speed Control Add \$1200
DISPLACEMENT	16 CFM, 500 l/min, 30 m³/hr @ 60 or 50hz	20 CFM, 566 l/min, 34 m³/hr @ 60 or 50hz
PUMPING SPEED*	12 CFM, 340 l/min, 20 m³/hr @ 60 or 50hz	16 CFM, 450 l/min, 27 m³/hr @ 60 or 50hz
ULTIMATE PRESSURE	less than 20 mTorr, 0.026 mbar, 2.6 Pa	less than 20 mTorr, 0.026 mbar, 2.6 Pa
INLET PRESSURE RANGE	for evacuation: atm. to 0.026 mbar (20 mT) for continuous pumping: below 133 mbar (100 Torr)	for evacuation: atm. to 0.026 mbar (20 mT) for continuous pumping: below 133 mbar (100 Torr)
MAXIMUM OUTLET PRESSURE	1,333 mbar (1,000Torr)	1,333 mbar (1,000Torr)
INLET PORT	ISO-type KF-40 flange	ISO-type KF-40 flange
OUTLET PORT	ISO-type KF-25 flange	ISO-type KF-25 flange
STANDARD MOTOR	1 hp, 3ø, 208-230/460V, 60 Hz; 3ø, 190-380 V, 50 Hz	1 1/2 hp, 3ø, 208-230/460V, 60 Hz; 3ø, 190-380 V, 50 Hz
MOTOR ON PUMP WITH SOFT START SPEED CONTROL	1 1/2 hp, 3ø, 208-230/460V, 60 Hz; 3ø, 190-380 V, 50 Hz	2 hp, 3ø, 208-230/460V, 60 Hz; 3ø, 190-380 V, 50 Hz
OPTIONAL MOTORS	1 1/2 hp. 1ø, 115/230V, 60 Hz	1 1/2 hp. 1ø, 115/230V, 60 Hz
OTHER OPTIONS	Explosion proof, CE Mark motors for virtually any voltages are available	
MAINTENANCE	none required for 20,000 hours (reconditioning recommended after 20,000 hours)	none required for 10,000 hours (reconditioning recommended after 10,000 hours)
NOISE LEVEL (at low pressures)	52 db (A) at 1 meter	56 db (A) at 1 meter
WATER VAPOR FLOW RATE	6 grams of water/minute with gas ballast; 1 gram/minute without gas ballast	
AMBIENT TEMPERATURE	10°C to 40°C (50°F to 104°F)	
MATERIALS OF CONSTRUCTION	aluminum, stainless steel, PTFE composite polymer piston liners and dynamic seals, Viton O-Rings, stainless steel springs.	
TOLERANCE TO FOREIGN MATERIALS	inlet filters recommended in the presence of substantial amounts of abrasive particles and vapors which may condense to form adhesive films, or if there is a possibility of ingesting liquids.	
MOUNTING AND ORIENTATION	4 tapped holes, 3/8-16; 4 through holes 14 mm (9/16") diameter. Orient the pump in any plane; on side, end, or bottom. Bolt to wall or floor.	
DIMENSIONS	20 inches x 16 inches x 20 inches high (51 x 41 x 51 cm high)	20 inches x 24.5 inches x 16.75 inches high (51 x 62 x 43 cm high)
WEIGHT	net: 123 pounds (56 kg); 163 pounds (74 kg)	

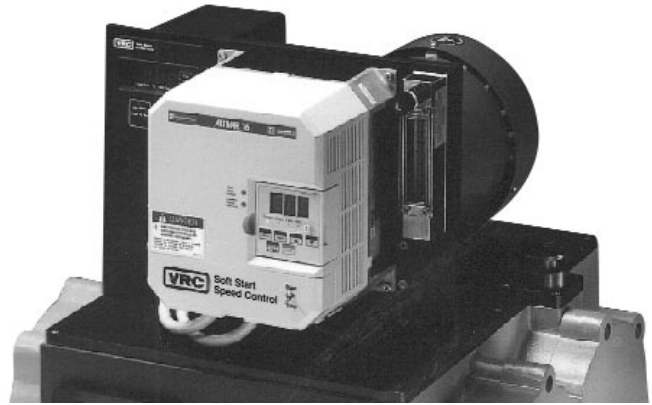
* Measured using AVS-recommended procedure AVS 5.3-1967, Journal of Vacuum Science Technology, 5.3, 1968 and AVS 5.1, Journal of Vacuum Science Technology, A7 (3) May/June 1989, p. 2403



Soft Start and Speed Control

The optional **Soft Start Speed Control** will extend the life of your **Smart Dry Pump™** by many years. This feature will automatically slow the pump speed when the gas load and pressure are low and will immediately increase the pump capacity should the pressure increase.

The speed control system includes a VRC Pirani gauge switch with set point adjustable from 5 to 5000 mTorr (0.6 to 660 Pa) and a 5 VDC analog output. Motor speed is controlled by a variable frequency drive which can be programmed by you for soft start ramps from 1 second to 600 seconds and for capacity between 20% and 100%.



Soft start speed control shown mounted on Absolute 501Dry Pump.

Turbo and Molecular Drag Pumps

Your VRC Dry Pump will run at maximum speed for fast roughing until you reach a pressure suitable for the turbo pumps. Once the turbo starts the gas load is small and the dry pump will slow to whatever speed you select, usually 25% to 50% of maximum speed. This not only dramatically increases the pump life but reduces power consumption and noise as well.

Cryo and Ion Pumps

Because the VRC pumps are true positive displacement pumps their speed for all gases, even argon, hydrogen and helium is about the same as the speed for air. This means no enrichment of concentration for these troublesome gases. Because the VRC pumps have no oil to warm up or degas, they reach their ultimate pressure and full capacity almost immediately from a cold start. The speed control can therefore turn the dry pump off when roughing is complete or reduce the speed to perhaps 25% of maximum and this results in substantial savings of power and pump life.

Serial Communication with PLCs and Computers

The **Soft Start Speed Control** has a serial communication option that allows Programmable Logic Controllers (PLCs) and computers to monitor parameters such as pump motor speed, amps, and volts. For installations with only a few pumps and communication distances of less than 50 feet (17 m) RS-232 is usually the best choice. For distances up to 4000 feet (1200 m) or if more than 2 or 3 pumps are involved then RS-485 may be better suited for serial communication. Please contact VRC for additional details about this feature.

Specifications

PUMP SPEED SWITCHING POINT	Controller includes a Pirani sensor vacuum switch with an adjustable set point range of 5 to 5000 mT (0.6 to 600 Pa). Up to 7 additional inputs and 7 speeds can be programmed.
ANALOG OUTPUT	The Pirani vacuum switch provides 0 to 2 VDC for computer or PLC interface for pressure from 5 to 5000 mTorr.
PUMP MOTORS	Standard motors are TEFC but explosion proof and CE Mark motors are also available on most pump models.
SOFT START RAMP	Programmable from 1 to 600 seconds. Optimum length of ramp for your system will depend on chamber size, pump size and the conductance of your vacuum line.
INPUT VOLTAGE	208V (-10%) to 240 V (+10%), 50 or 60 Hz, single or three phase. 380 to 460 VAC available.
MOUNTING	Standard mounting is on the end of the pump as shown in the photograph. However, you may relocate the controller in the field up to 320 feet (100 m) from the pump.
SERIAL COMMUNICATION	With this option, motor parameters such as frequency and current can be sent to a serial port on your computer or PLC. The serial output is compatible with all popular networks.



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VRC Pumps are made in the USA