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SPECIFICATIONS

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Vyper™

Variable Speed Drive

305/254 HP
437/362 HP
700/572 HP
912/783 HP

FEATURES AND BENEFITS

The Frick® Vyper™ Variable Speed Drive offers the refrigeration industry superb system performance, enhanced energy savings, and reduced maintenance costs. The Vyper™ VSD provides fast, precise, and wide-ranging response to rapidly changing loads. The liquid-cooled, NEMA 4 rated cabinet provides protection from engine room contaminants such as ammonia vapors while the Quantum™LX control panel provides a user-friendly interface for ease of operation. The Vyper™ drive product line provides variable speed control on motors ranging from 200HP thru 912HP, and can be mounted either directly on the compressor package or remotely. An IEEE 519 Harmonic filter is available for supply power sine wave conditioning. No other variable speed drive on the market offers the performance and features of the Frick® Vyper™ VSD.

Quick response to load variations, make the Vyper™ VSD ideal for industries such as bottling plants. Typical carbo-cooler facilities utilize reciprocating compressors, which undergo high cycling rates due to the rapid rise and fall of the load. Continual starts and stops cause these compressors to wear out quickly. Replacement with a conventional screw compressor with mechanical capacity control cannot provide the rapid response to load fluctuations required for this industry.

The Frick® Vyper™ VSD is the answer! Vyper™ VSD provides fast and precise motor speed control of capacity while greatly reducing mechanical wear of the compressor. The screw compressor's mechanical slide valve remains fixed at full load while capacity is fully modulated by the speed of the motor. Vyper's rapid response can increase capacity from 20% to 100% in less than 8 seconds. If the load approaches zero, Vyper's unique STANDBY mode allows the system to idle at zero speed for up to 120 minutes with no energy consumption. When the load returns, Vyper™ VSD instantly accelerates the motor at 6.0 Hz/sec to the required capacity. Overshoot is eliminated with tunable PI settings within the Quantum™LX control panel. Compressor wear is greatly reduced when operating the Vyper™ VSD as the trim compressor. The constant speed compressors are used to handle the base load with slide valves fully loaded, while the VSD controlled Frick® screw compressor follows the fluctuating load with speed control. This arrangement not only reduces slide valve wear on the screw compressor, but also decreases the frequency of starts and stops by the other compressors in the system. This results in less frequent rebuild and greatly reduced maintenance and operating costs for the overall system.



Vyper™ VSD is part of an integrated system designed for optimum performance. Low speed operation is achieved with the Frick® screw compressor's antifriction bearings, which can operate at speeds as low as 720 rpm indefinitely. These bearings are located in oil reservoirs meaning that lubrication is always present, without the need for an oil pump. Specially designed motors for VSD service allow operation at full amps and minimum speed as long as needed. **NOTE: All motors are NOT suitable for VSD applications. Please consult your Frick® representative for an existing motor evaluation.**

Less Motor Strain: The Frick® Vyper™ VSD gradually increases motor speed during start up which reduces the mechanical and electrical strain from starting torque and current inrush. Inrush current is drastically lower at start up, which promotes higher reliability and longer motor life than with traditional starting systems.

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Reduced energy consumption: Reduced energy consumption is a high priority in nearly all plants. Energy charges will be reduced because of the improved efficiency that variable speed control offers during part load operation. This means improved payback when installing new equipment with the Frick® Vyper™ VSD. Some utilities may offer incentives for installation of VSD units. These incentives need to be factored into your return on investment calculations. Figure 1 shows the difference between power consumption of standard slide valve unloading and a variable speed screw compressor unloading. Variable speed unloading consumes less energy than conventional mechanical unloading. When compared to multiple reciprocating compressors in bottling applications, Vyper's superior control of fluctuating suction pressure may allow plant operation at higher average suction pressure. Every 1 PSI increase in suction pressure yields approximately 2% improvement in efficiency. Better capacity control results in less total float of the suction pressure. Actual energy savings are dependent upon the amount of hours spent at each load point, and the electrical cost per kW-hr.

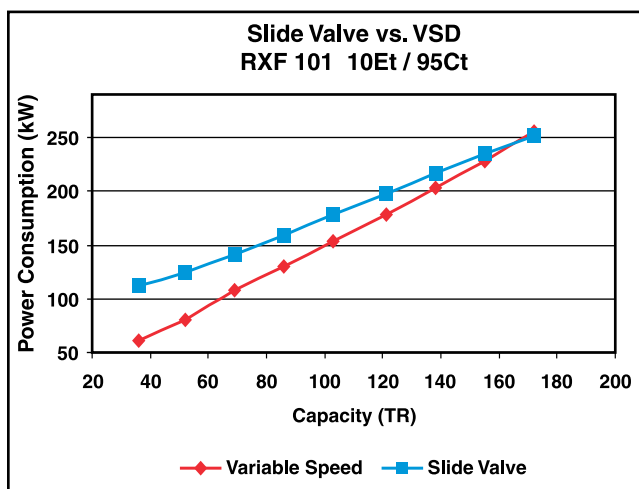


Figure 1 - Slide Valve vs. Variable Speed Drive (VSD)

Compression Ratio: Compression Ratio plays a large role in the improvement of the part load efficiency provided by using a VSD. The part load efficiency by slide valve control is better at lower compression ratios. Conversely the improvement of the part load efficiency by using a VSD becomes increasingly better at higher compression ratios. Contact your Frick® representative for more detail.

Economizer Advantages: Economizers are used on screw compressors to improve system efficiency and increase capacity. A traditional screw compressor with mechanical capacity control only achieves Economizer advantages at high load conditions, above 80% approximately. When the mechanical slide valve moves to unload the compressor, it exposes the economizer port to suction pressure, thus losing the Economizing advantage. However, when the compressor's capacity is controlled by a variable-speed drive the slide valve stays loaded at 100%. This provides proportional economizer boost throughout the entire operating envelope, effectively segregating the suction pressure gas from the higher pressure economizer flash gas. The economizer will boost efficiency at all part-load conditions, when capacity control is achieved exclusively by motor speed. The capability of the Frick® rotary screw compressor to operate down to 720rpm indefinitely provides an edge in this regard over compressors that are limited to a minimum of 1800 rpm due

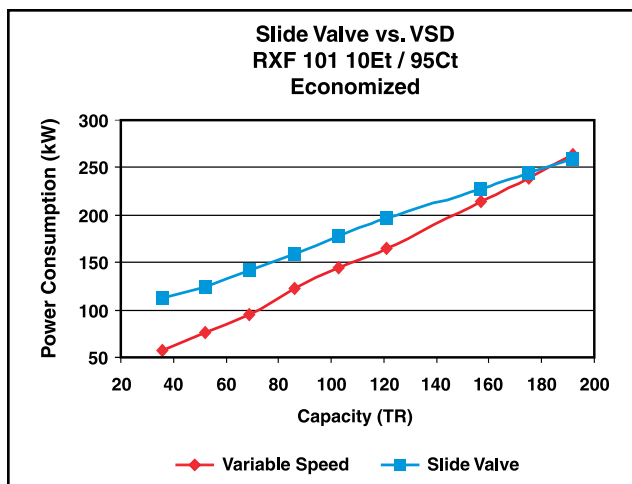


Figure 2 - Slide Valve vs. VSD, Economized

to design. The chart above shows the power consumption advantages of full-load-range Economizing with a Frick® Vyper™ VSD system.

Liquid Cooled Advantage: The Frick® Vyper™ VSD is internally cooled with a factory-calibrated liquid cooling circuit which offers many advantages over traditional air-cooled systems. The liquid circuit provides precisely controlled coolant temperatures to the heat-generating components and delivers coolant into locations that no air-over fan could penetrate. The Vyper's liquid cooling performs independently of fluctuating ambient conditions. The NEMA 4 rated cabinet seals the internal electronics and piping from corrosive refrigerant vapors, as well as dust or airborne contaminants in the engine room, while providing superior cooling for the internal electronic components. Efficient liquid cooling also allows for smaller cabinet size and longer component life than traditional air-cooled units.

Air-cooled VSDs are derated for ambient temperatures that exceed rated maximums or at elevations above 3300 feet (1000 meters). This derating creates higher initial cost since a higher rated drive needs to be provided for a lower rated application. This is not the case with Vyper™ which is liquid cooled. In regard to ambient temperature, the temperature control valve adjusts to keep the temperature of the drive within specification. For high elevation, a simple adjustment of the temperature control setpoint is all that needs to be done.

Installation Flexibility: The standard Vyper™ VSD utilizes facility cooling fluid in the rear-mounted heat exchanger to remove heat from the internal VSD cooling fluid. NPT connections on the heat exchanger are provided for customer piping to the heat exchanger.

An electronically controlled mixing valve is used to regulate cabinet temperature and is designed to use facility water or glycol. In addition to providing cooling for the electronics, a glycol-cooled unit can provide "free" heat to the facility glycol loop used in cold storage facilities to keep floors and critical work areas ice free.

The Vyper™ VSD cabinet can be directly mounted onto a compressor package, with power electronics factory prewired and tested. For retrofit, the Vyper™ VSD can also be remote mounted. The remote-mounted Vyper™ VSD comes complete with a factory-supplied stand for ease of installation anywhere within fifty feet of total cable length from the drive output to the motor.

Harmonic Filter: All VSD's create a certain amount of distortion to the supply voltage/current sine wave which may disrupt operation of other sensitive electronics on the same power source. Frick® offers a harmonic filter and high frequency trap designed to meet the IEEE Std 519-1992. The filter is offered as a means to reduce Total Harmonic Distortion (THD) levels on the input current waveform drawn by the VSD. Reducing the THD effect of the drive reduces the possibility of causing electrical interference with other sensitive electronic equipment connected to the same power source. Typical current THD produced by a Vyper™ VSD is 20-30%.

The IEEE 519 Harmonic filter reduces the current THD to 8% or less. The filter is highly recommended in installations where sensitive electronics are used and uninterrupted operation is required. A facility site survey will determine if the Harmonic filter is required. The IEEE 519 Harmonic Filter can be factory installed and tested or installed as a field retrofit to any existing Vyper™ VSD. Unlike most air-cooled drives the harmonic filter of the Vyper™ is part of the drive not an external component.

Frick® Quantum™LX Control Panel: It's easy to learn and to use. The flat panel high contrast screens are menu driven with flexible analog inputs, flash setpoint memory, and replaceable input-output modules. Built-in diagnostic functions simplify troubleshooting. On-screen calibrations and operator-friendly graphics, real time and historical trending, and smart safeties mean trouble-free operation. The electronic interface between the control panel and the Vyper™ VSD has been factory designed and tested. The Vyper™ VSD electronic controls, which were designed to operate together, eliminate potential integration problems with third party non-matched equipment. In addition, both the Vyper™ VSD and Quantum™LX can be serviced on-site without needing to be shipped to a service center, which reduces downtime. In the unlikely event of a shutdown, the Frick® Quantum™LX panel provides troubleshooting messages and shutdown data which speeds analysis and enables quick problem identification.

Incoming Power Requirements: All Vypers provide a removable plate on the top left of the drive that designates the point of entry for the incoming power. This is the only acceptable point of entry for the power into a Vyper™ drive. For remote mounted 305 & 437HP Vyper™ drives there is also provided a removable plate on the top right that designates the point of exit for the power to the motor. These plates are to be removed for the proper sized holes to be punched and then re-installed. For remote mounted 700 & 912 Vypers the power comes through the top of a separate motor connection box. The holes on this box can be punched in place since there is no chance for filings to fall into the electronics of the drive.

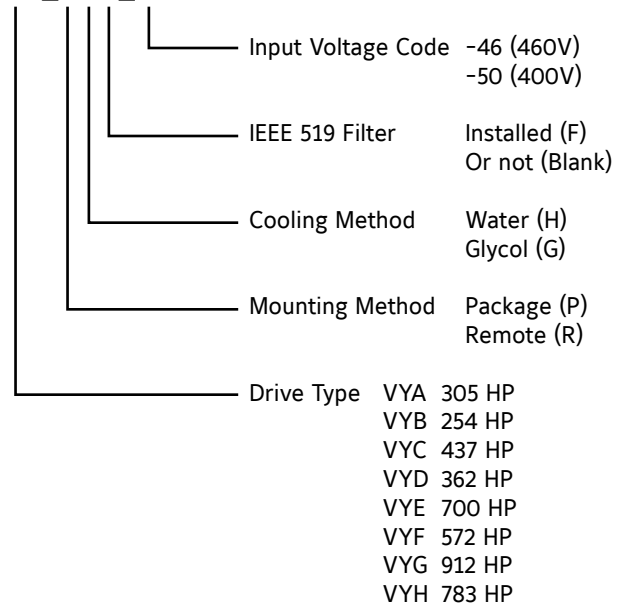
Under no circumstances is it acceptable to bring power into or take power out of a Vyper™ at any other point.

It is possible to come up through the floor, alongside of the Vyper™, then turn in and down into the drive. All NEC codes relative to conductor size and bend radius must be followed.

Vyper™ VSD Nomenclature:

Vyper™ Variable Speed Drive model numbers are determined by using the **MODEL NUMBER EXPLANATION** below. All available options are defined within the model name.

VYA_RHF_46



Horsepower	Supply Frequency	Supply Voltage
254	50	342-423
305	60	414-508
362	50	342-423
437	60	414-508
572	50	342-423
700	60	414-508
783	50	342-423
912	60	414-508

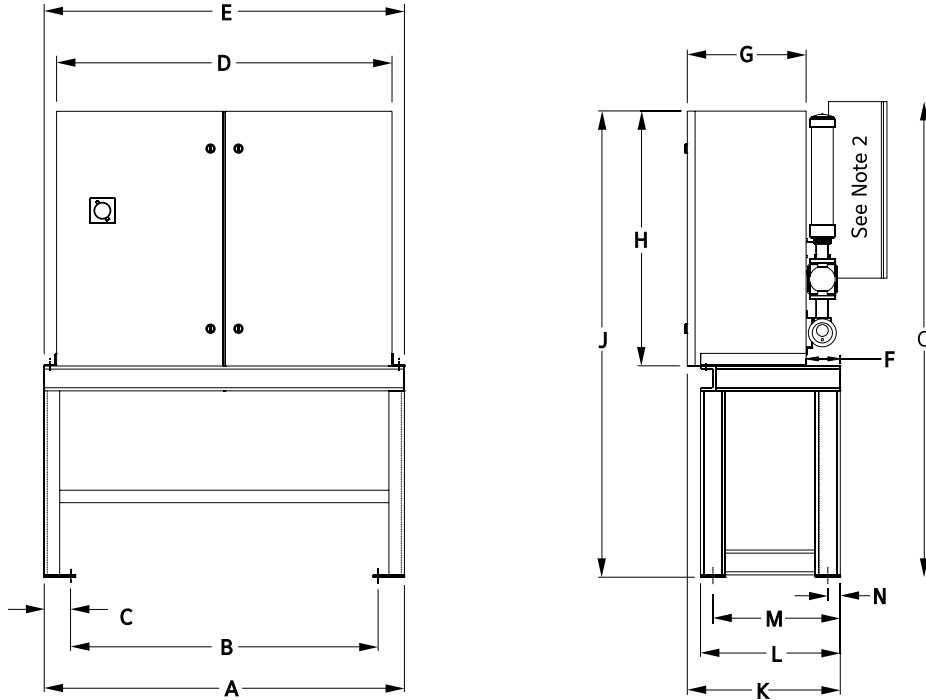
Frick® Vyper™ VSD Models

Model No.	Frick P/N	Description 305 HP / 254 HP
VYA_PH_46	720C0105G01	305 HP, Water Cooled, 460V, 60 Hz, Package Mount
VYA_RH_46	720C0105G02	305 HP, Water Cooled, 460V, 60 Hz, Remote Mount
VYA_PHF_46	720C0105G03	305 HP, Water Cooled, w/ Filter, 460V, 60 Hz, Package Mount
VYA_RHF_46	720C0105G04	305 HP Water Cooled w/ Filter 460V 60 Hz Remote Mount
VYA_PG_46	720C0105G05	305 HP Glycol Cooled, 460V 60 Hz Package Mount
VYA_RG_46	720C0105G06	305 HP Glycol Cooled 460V 60 Hz Remote Mount
VYA_PGF_46	720C0105G07	305 HP Glycol Cooled w/ Filter 460V 60 Hz Package Mount
VYA_RGF_46	720C0105G08	305 HP Glycol Cooled w/ Filter 460V 60 Hz Remote Mount
VYB_PH_50	720C0105G13	254 HP Water Cooled 400V, 50 Hz Package Mount
VYB_RH_50	720C0105G14	254 HP Water Cooled 400V 50 Hz Remote Mount
VYB_PHF_50	720C0105G15	254 HP Water Cooled w/ Filter, 400V 50 Hz Package Mount
VYB_RHF_50	720C0105G16	254 HP, Water Cooled w/ Filter, 400V 50 Hz Remote Mount
VYB_PG_50	720C0105G17	254 HP Glycol Cooled 400V, 50 Hz Package Mount
VYB_RG_50	720C0105G18	254 HP Glycol Cooled 400V 50 Hz Remote Mount
VYB_PGF_50	720C0105G19	254 HP Glycol Cooled w/ Filter 400V 50 Hz Package Mount
VYB_RGF_50	720C0105G20	254 HP, Glycol Cooled, w/ Filter, 400V, 50 Hz, Remote Mount
Model No.	Frick P/N	Description 437 HP / 362 HP
VYC_PH_46	720C0133G01	437 HP, Water Cooled, 460V, 60 Hz, Package Mount
VYC_RH_46	720C0133G02	437 HP, Water Cooled, 460V, 60 Hz, Remote Mount
VYC_PHF_46	720C0133G03	437 HP, Water Cooled, w/ Filter, 460V, 60 Hz, Package Mount
VYC_RHF_46	720C0133G04	437 HP, Water Cooled w/ Filter 460V, 60 Hz Remote Mount
VYC_PG_46	720C0133G05	437 HP, Glycol Cooled, 460V, 60 Hz, Package Mount
VYC_RG_46	720C0133G06	437 HP, Glycol Cooled, 460V, 60 Hz, Remote Mount
VYC_PGF_46	720C0133G07	437 HP, Glycol Cooled, w/ Filter, 460V, 60 Hz, Package Mount
VYC_RGF_46	720C0133G08	437 HP, Glycol Cooled, w/ Filter, 460V, 60 Hz, Remote Mount
VYD_PH_50	720C0133G13	362 HP, Water Cooled, 400V, 50 Hz, Package Mount
VYD_RH_50	720C0133G14	362 HP, Water Cooled, 400V, 50 Hz, Remote Mount
VYD_PHF_50	720C0133G15	362 HP, Water Cooled, w/ Filter, 400V, 50 Hz Package Mount
VYD_RHF_50	720C0133G16	362 HP, Water Cooled, w/ Filter, 400V, 50 Hz, Remote Mount
VYD_PG_50	720C0133G17	362 HP, Glycol Cooled 400V, 50 Hz, Package Mount
VYD_RG_50	720C0133G18	362 HP, Glycol Cooled, 400V 50 Hz, Remote Mount
VYD_PGF_50	720C0133G19	362 HP Glycol Cooled w/ Filter 400V 50 Hz Package Mount
VYD_RGF_50	720C0133G20	362 HP Glycol Cooled w/ Filter 400V 50 Hz Remote Mount

Frick® Vyper™ VSD Models (cont'd)

Model No.	Frick P/N	Description 700 HP / 572 HP
VYE_PH_S-46	720C0168G01	700 HP, Water Cooled, 460 Volts, Package Mount, 3 HP Oil Pump
VYE_PH_M-46	720C0168G02	700 HP, Water Cooled, 460 Volts, Package Mount, 5 HP Oil Pump
VYE_PH_L-46	720C0168G03	700 HP, Water Cooled, 460 Volts, Package Mount, 7.5 HP Oil Pump
VYE_PHFS-46	720C0168G04	700 HP, Water Cooled, w/ Filter, 460 Volts, Package Mount, 3 HP Oil Pump
VYE_PHFM-46	720C0168G05	700 HP, Water Cooled, w/ Filter, 460 Volts, Package Mount, 5 HP Oil Pump
VYE_PHFL-46	720C0168G06	700 HP, Water Cooled, w/ Filter, 460 Volts, Package Mount, 7.5 HP Oil Pump
VYE_RH_S-46	720C0168G07	700 HP, Water Cooled, 460 Volts, Remote Mount, 3 HP Oil Pump
VYE_RH_M-46	720C0168G08	700 HP, Water Cooled, 460 Volts, Remote Mount, 5 HP Oil Pump
VYE_RH_L-46	720C0168G09	700 HP, Water Cooled, 460 Volts, Remote Mount, 7.5 HP Oil Pump
VYE_RHFS-46	720C0168G10	700 HP, Water Cooled, w/ Filter, 460 Volts, Remote Mount, 3 HP Oil Pump
VYE_RHFM-46	720C0168G11	700 HP, Water Cooled, w/ Filter, 460 Volts, Remote Mount, 5 HP Oil Pump
VYE_RHFL-46	720C0168G12	700 HP, Water Cooled, w/ Filter, 460 Volts, Remote Mount, 7.5 HP Oil Pump
VYF_PH_S-50	720C0168G13	572 HP, Water Cooled, 400 Volts, Package Mount, 3 HP Oil Pump
VYF_PH_M-50	720C0168G14	572 HP, Water Cooled, 400 Volts, Package Mount, 5 HP Oil Pump
VYF_PH_L-50	720C0168G15	572 HP, Water Cooled, 400 Volts, Package Mount, 7.5 HP Oil Pump
VYF_PHFS-50	720C0168G16	572 HP, Water Cooled, w/ Filter, 400 Volts, Package Mount, 3 HP Oil Pump
VYF_PHFM-50	720C0168G17	572 HP, Water Cooled, w/ Filter, 400 Volts, Package Mount, 5 HP Oil Pump
VYF_PHFL-50	720C0168G18	572 HP, Water Cooled, w/ Filter, 400 Volts, Package Mount, 7.5 HP Oil Pump
VYF_RH_S-50	720C0168G19	572 HP, Water Cooled, 400 Volts, Remote Mount, 3 HP Oil Pump
VYF_RH_M-50	720C0168G20	572 HP, Water Cooled, 400 Volts, Remote Mount, 5 HP Oil Pump
VYF_RH_L-50	720C0168G21	572 HP, Water Cooled, 400 Volts, Remote Mount, 7.5 HP Oil Pump
VYF_RHFS-50	720C0168G22	572 HP, Water Cooled, w/ Filter, 400 Volts, Remote Mount, 3 HP Oil Pump
VYF_RHFM-50	720C0168G23	572 HP, Water Cooled, w/ Filter, 400 Volts, Remote Mount, 5 HP Oil Pump
VYF_RHFL-50	720C0168G24	572 HP, Water Cooled, w/ Filter, 400 Volts, Remote Mount, 7.5 HP Oil Pump
Model No.	Frick P/N	Description 912 HP / 752 HP
VYG_PH_M-46	720C0169G01	912 HP, Water Cooled, 460 Volts, Package Mount, 5 HP Oil Pump
VYG_PH_L-46	720C0169G02	912 HP, Water Cooled, 460 Volts, Package Mount, 7.5 HP Oil Pump
VYG_PHFM-46	720C0169G03	912 HP, Water Cooled, w/ Filter, 460 Volts, Package Mount, 5 HP Oil Pump
VYG_PHFL-46	720C0169G04	912 HP, Water Cooled, w/ Filter, 460 Volts, Package Mount, 7.5 HP Oil Pump
VYG_RH_M-46	720C0169G05	912 HP, Water Cooled, 460 Volts, Remote Mount, 5 HP Oil Pump
VYG_RH_L-46	720C0169G06	912 HP, Water Cooled, 460 Volts, Remote Mount, 7.5 HP Oil Pump
VYG_RHFM-46	720C0169G07	912 HP, Water Cooled, w/ Filter, 460 Volts, Remote Mount, 5 HP Oil Pump
VYG_RHFL-46	720C0169G08	912 HP, Water Cooled, w/ Filter, 460 Volts, Remote Mount, 7.5 HP Oil Pump
VYH_PH_M-50	720C0169G09	752 HP, Water Cooled, 400 Volts, Package Mount, 5 HP Oil Pump
VYH_PH_L-50	720C0169G10	752 HP, Water Cooled, 400 Volts, Package Mount, 7.5 HP Oil Pump
VYH_PHFM-50	720C0169G11	752 HP, Water Cooled, w/ Filter, 400 Volts, Package Mount, 5 HP Oil Pump
VYH_PHFL-50	720C0169G12	752 HP, Water Cooled, w/ Filter, 400 Volts, Package Mount, 7.5 HP Oil Pump
VYH_RH_M-50	720C0169G13	752 HP, Water Cooled, 400 Volts, Remote Mount, 5 HP Oil Pump
VYH_RH_L-50	720C0169G14	752 HP, Water Cooled, 400 Volts, Remote Mount, 7.5 HP Oil Pump
VYH_RHFM-50	720C0169G15	752 HP, Water Cooled, w/ Filter, 400 Volts, Remote Mount, 5 HP Oil Pump
VYH_RHFL-50	720C0169G16	752 HP, Water Cooled, w/ Filter, 400 Volts, Remote Mount, 7.5 HP Oil Pump

FRICK® VYPER™ VARIABLE SPEED DRIVE
SPECIFICATIONS



DIMENSIONS														
HP	A	B	C	D	E	F	G	H	J	K	L	M	N	O
305/254	51	42.5	4.25	47	51	5.5	17	36	70	22.5	20.4	16.4	2	-
437/362	58	49.5	4.25	54	58	5.5	19.1	41	75	24.6	22.5	18.5	2	-
700/572	63.25	55	4.25	59	63	8	26.375	51	78	28.7	25.4	21.4	2	86
912/783	63.25	55	4.25	59	63	8	26.375	52	78	28.7	25.4	21.4	2	86

Notes:

1. Dimensions in inches.
2. Motor connection box used with the 700 & 912 HP (572/783 HP 50Hz) models only. Motor connection box door must be able to swing open at least 90°. See article 110 of the NEC for required space in front of "live" parts with access panels or doors. The stand is optional for 700 & 912 HP (572/783 HP 50Hz) models.
3. Considering all applicable codes regarding spacing and clearance, be sure to provide adequate space behind the drive for servicing the cooling circuit (recommended 18" minimum).



Frick® Vyper™ Variable Speed Drive
mounted on RWF II 134
Screw Compressor Package

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