Form E100-200 SPC (SEP 2005)

SPECIFICATIONS

File:	**EQUIPMENT MANUAL - Section 100**
Replaces:	**E100-200 SPC (APR 2005)**
Dist:	**1, 1a, 1b, 1c, 4, 4b, 4c**

Vyper™ Variable Speed Drive

305/254 HP
435/362 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 ammonia vapors while the Quantum™LX control panel provides a user-friendly interface for ease of operation. The drive is available in either 305 HP or 435 HP versions and can be mounted either remotely or directly on the compressor package. An optional IEEE 519 Harmonic filter is available for power signal 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 carbocooler 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 can not provide the rapid response to load fluctuations.

The Frick® Vyper™ VSD is the answer! Vyper™ VSD provides fast and precise motor speed control of capacity while greatly reducing compressor mechanical wear. 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 80 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 PID settings within the Quantum™LX control panel. Compressor wear is greatly reduced when operating the Vyper™ VSD as a trim compressor by allowing other compressors to handle the base load and the VSD controlled Frick® screw compressor to follow the fluctuating load. 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 ups which reduces the mechanical and electrical strain from starting inrush. Inrush current is drastically lower at start up, which promotes higher reliability and longer motor life than with traditional starting systems.

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 unloaded operation. This means improved payback when installing new equipment with the Frick® Vyper™ VSD (Some utilities even offer incentives for installation of VSD units.) 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.

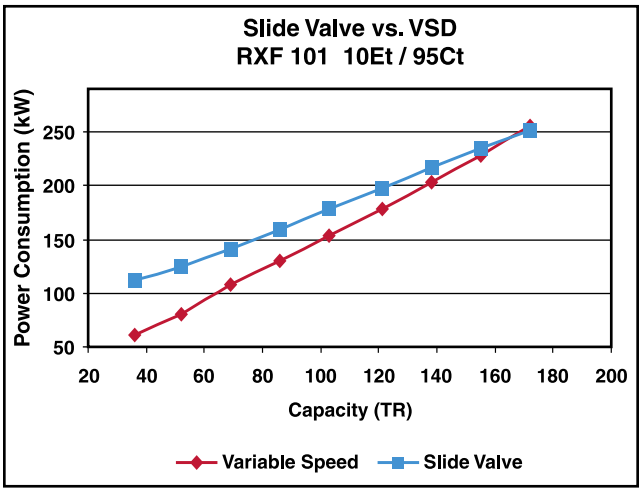


Figure 1 - Slide Valve vs Variable Speed Drive (VSD)

Economizer Advantages: Economizers are used on screw compressors to improve efficiency and increase capacity. A traditional screw compressor with mechanical capacity control only achieves Economizer advantages at high load conditions above approximately 80%. When the mechanical slide valve moves to unload the compressor, it exposes the economizer port to suction pressure, thus losing the Economizing advantage. However, a compressor controlled by variable-speed drive maintains the slide valve at 100% load position throughout the entire operating envelope while effectively segregating the suction pressure gas from the higher pressure economizer flash gas. The economizer boosts efficiency at all part-load conditions and capacity control is achieved exclusively by motor speed. The chart below shows the power consumption advantages of full-load-range Economizing with a Frick® Vyper™ VSD system.

The Frick® Vyper™ VSD comes in several sizes to meet customer needs. The required supply voltage are:

Horsepower	Supply Frequency (H)	Supply Voltage (V)
254	50	342-423
305	60	414-508
362	50	342-423
435	60	414-508

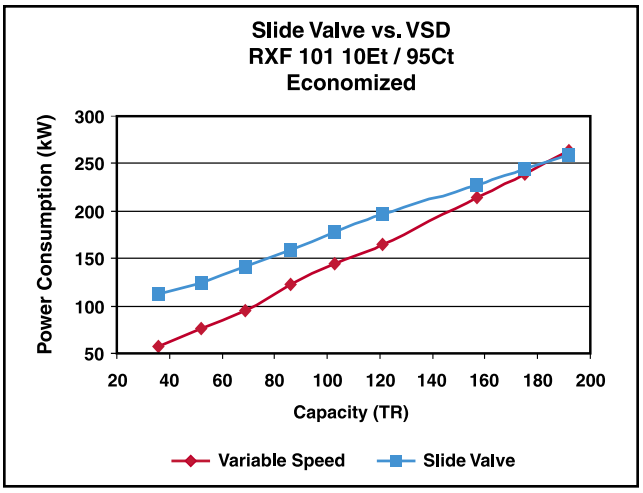


Figure 2 - Slide Valve vs VSD, Economized

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.

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. There are 1½" NPT water connections provided for 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 line feet of the compressor motor .

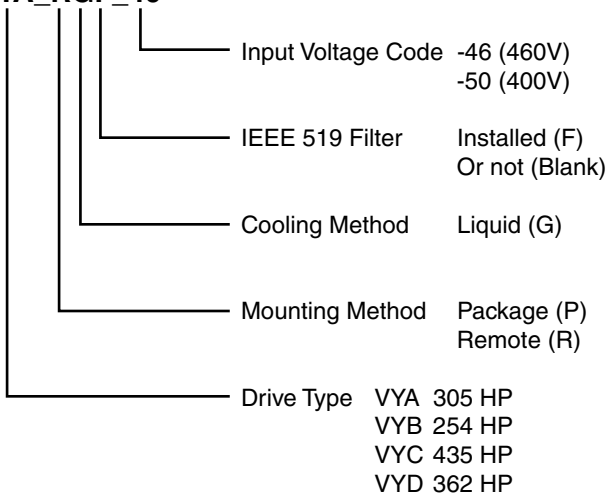
Harmonic Filter Option: All VSD's create a certain amount of stray electronic noise which may disrupt operation of other sensitive electronics on the same power source. Frick® offers an optional harmonic filter and high frequency trap designed to meet the IEEE Std 519-1992. The filter is offered as a means to "clean up" the input current waveform drawn by the Vyper™ VSD from the AC line, thus reducing the possibility of causing electrical interference with other sensitive electronic equipment connected to the same power source. Typical current THD (Total Harmonic Distortion) 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 such as hospitals, airports, radar installations, and computer networking facilities, which require “clean” power. A facility site survey can indicate if the Harmonic filter option is needed. The IEEE 519 Harmonic Filter can be installed as a field retrofit to any existing Vyper™ VSD or can be factory installed.

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 nonmatched 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.

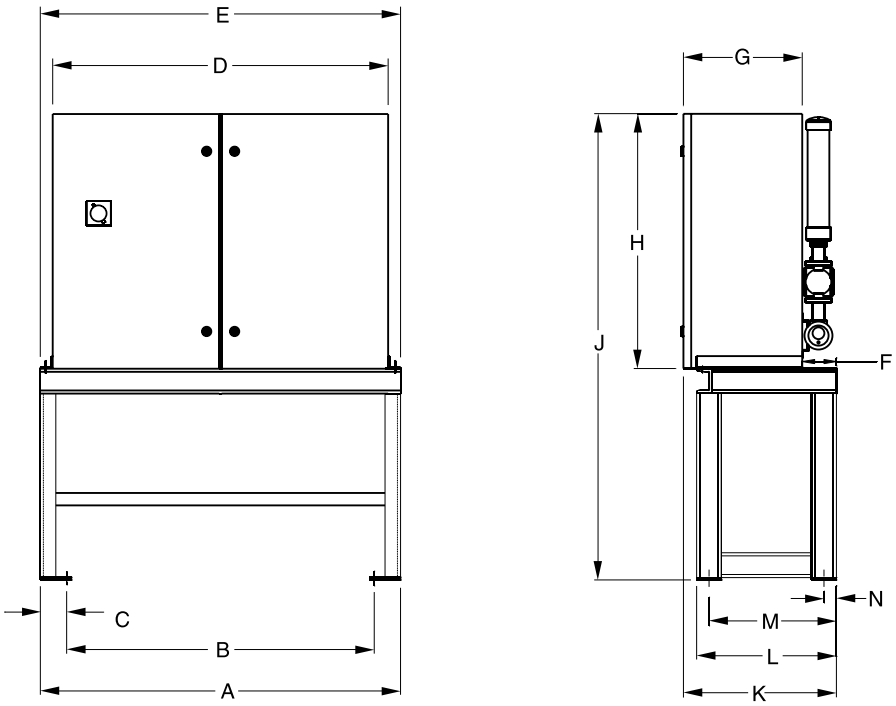
Vyper™ VSD Nomenclature:
Vyper™ Variable Speed Drive model numbers are determined by using the **MODEL NUMBER EXPLANATION** below. All available options are defined within the model name.

VYA_RGF_46



Frick® Vyper™ VSD Models

MODEL NO.	FRICK P/N	DESCRIPTION - 305 HP / 254 HP
VYA_PG_46	720C0105G05	305 HP Liquid Cooled, 460V 60 Hz Package Mount
VYA_RG_46	720C0105G06	305 HP Liquid Cooled 460V 60 Hz Remote Mount
VYA_PGF_46	720C0105G07	305 HP Liquid Cooled w/ Filter 460V 60 Hz Package Mount
VYA_RGF_46	720C0105G08	305 HP Liquid Cooled w/ Filter 460V 60 Hz Remote Mount
VYB_PG_50	720C0105G17	254 HP Liquid Cooled 400V, 50 Hz Package Mount
VYB_RG_50	720C0105G18	254 HP Liquid Cooled 400V 50 Hz Remote Mount
VYB_PGF_50	720C0105G19	254 HP Liquid Cooled w/ Filter 400V 50 Hz Package Mount
VYB_RGF_50	720C0105G20	254 HP, Liquid Cooled, w/ Filter, 400V, 50 Hz, Remote Mount
MODEL NO.	**FRICK P/N**	**DESCRIPTION - 435 HP / 362 HP**
VYC_PG_46	720C0133G05	435 HP, Liquid Cooled, 460V, 60 Hz, Package Mount
VYC_RG_46	720C0133G06	435 HP, Liquid Cooled, 460V, 60 Hz, Remote Mount
VYC_PGF_46	720C0133G07	435 HP, Liquid Cooled, w/ Filter, 460V, 60 Hz, Package Mount
VYC_RGF_46	720C0133G08	435 HP, Liquid Cooled, w/ Filter, 460V, 60 Hz, Remote Mount
VYD_PG_50	720C0133G17	362 HP, Liquid Cooled 400V, 50 Hz, Package Mount
VYD_RG_50	720C0133G18	362 HP, Liquid Cooled, 400V 50 Hz, Remote Mount
VYD_PGF_50	720C0133G19	362 HP Liquid Cooled w/ Filter 400V 50 Hz Package Mount
VYD_RGF_50	720C0133G20	362 HP Liquid Cooled w/ Filter 400V 50 Hz Remote Mount



HP	DIMENSIONS												
	A	B	C	D	E	F	G	H	J	K	L	M	N
305/254	51	42.5	4.25	47	51	5.5	17	36	70	22.5	20.4	16.4	2
435/362	58	49.5	4.25	54	58	5.5	19.1	41	75	24.6	22.5	18.5	2

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

Form E100-200 SPC (905)
Supersedes: E100-200 SPC (405)
Subject to change without notice
Printed in USA • GUI 2000 905 .50

YORK Refrigeration Systems
100 CV Avenue • P.O. Box 997
Waynesboro, PA USA 17268-0997
Phone: 717-762-2121 • FAX: 717-762-8624
www.frickcold.com