



## What to Look for When Purchasing a VSD Air Compressor

### ALL VSD AIR COMPRESSORS ARE NOT CREATED EQUAL

Purchasing a VSD compressor is a big investment - you need to know what to look for and what questions to ask to make sure the compressor you buy will save you the most energy and is the most reliable machine. After all, a good VSD compressor may save you up to 35% in power cost the first year. Another benefit of the VSD compressor is that it helps your company **GO GREEN**.

Here are some standard features that will help you get the most out of your VSD compressor:

- 1.) TEFC inverter duty motor
- 2.) Integrated drive
- 3.) No speed windows
- 4.) Protection against bearing currents
- 5.) Harmonic control
- 6.) Electromagnetic compliance
- 7.) Maximum turndown
- 8.) Drive and compressor microprocessor are linked

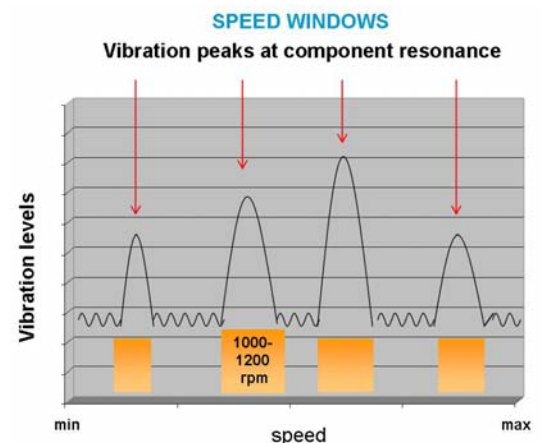
1.) **TEFC inverter duty motors** have inherently higher cooling air flow. Therefore, at lower speeds, there is enough flow to avoid overheating. The efficiency is high in the entire speed range and there is also sufficient torque. When you use a fixed speed motor in a variable speed drive applications, it has a negative effect. When the speed reduces, the cooling air flow will also reduce. This results in overheating of the windings and a consequent reduction in efficiency and motor torque. You want to get the most out of your compressor so the more 'turndown' the more energy savings!



Inverter duty motors have a bigger fan flow to prevent overheating at lower speeds.

2.) **Integrated Drive** - compressor and drive are engineered together for maximum efficiency and turndown. The benefit is an EMC compliant package that is proven and tested. The integrated design also allows for a compact footprint which saves floor space. When the drive is separate from the compressor you lose efficiency. When the drive is designed correctly and the cooling air flow is engineered there is no need for additional fans.

3.) **No Speed Windows** - Speed windows are speed ranges which are avoided in VSD's to prevent resonating frequencies. This wastes a great deal of energy. Having no speed windows ensures that you are getting the best energy savings, constant system pressure and the very best solution for variable demand applications.



4.) **Protection Against Bearing Currents** – Currents are induced in motors when used with inverter drives. If not addressed properly, the currents will flow through the motor bearings and create pitting and premature failure. ‘Vagabond’ currents, if not controlled, will flow from the motor shaft to the compressor shaft causing bearings to pit in the motor and compressor. These are high frequency current pulses generated by high speed switching, causing migration of metal from the rolling elements and races in to the lubricant. This leads to EDM craters and causes premature bearing failure if no inbuilt protection is provided.



Look for Built-in features prevent bearing current damage

Motor side bearings

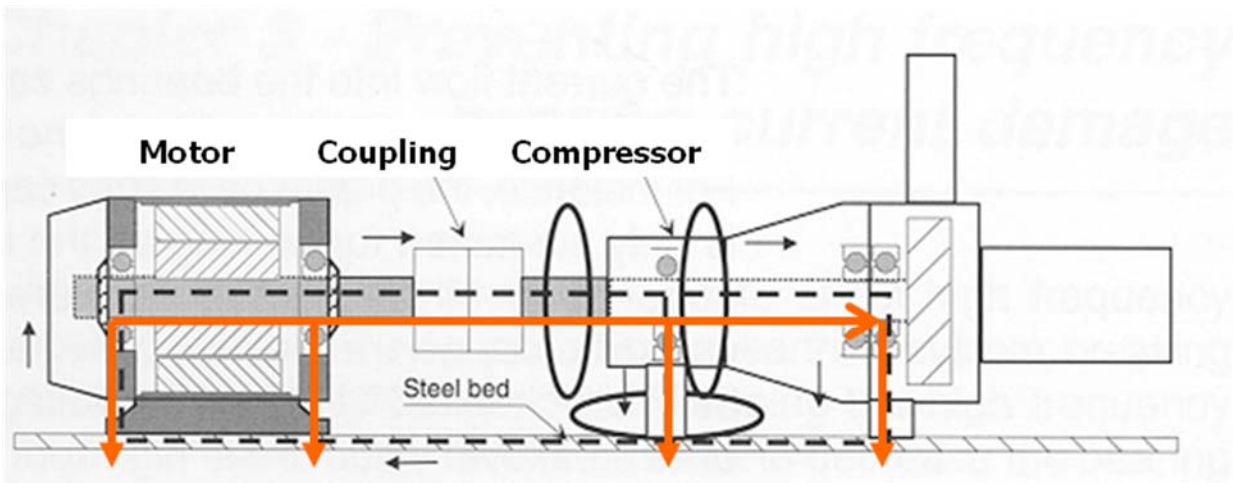
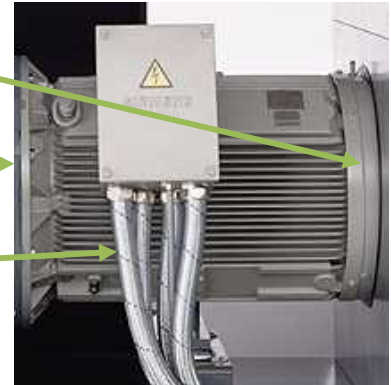
- Insulated motor bearings
- Brushes to carry away the currents

Compressor side bearings

- Flex couplings - no metal contact between motor side and compressor side couplings

Other measures

- HF straps or armour around the cables to carry away induced currents on the motor frames and as an anti emissions measure.
- Rubber buffers



‘Vagabond’ circulating bearing current, where the current loop is external to the motor.

- Line Reactors, the drive performance is significantly improved, the drives input rectifier is protected from failure or damage, and drive harmonic demands are tamed. Line Reactors act as an interface buffer between solid state power circuits and the line or the motor. All drives, in any application, will benefit when applied with Line Reactors.

**Other Benefits of Input Line Reactors**

- Virtual elimination of nuisance tripping of drives due to utility power factor correction capacitor switching
- Attenuation of line harmonics
- Extended switching component life (Transistors, SCR's)

- Extended motor life
- Reduced motor operating temperature
- Reduced audible motor noise
- Minimized power disturbances
- Filtered electrical noise (pulse distortion and line notching)
- Waveform improvement

5.) **Harmonic Control** With the design function of high speed switching, raw output of the inverter is polluted with harmonic distortions – which results in package efficiency losses. VSD compressors with integrated choke will limit the voltage harmonic distortion to 3...4% on most electrical networks. Filters are required.

6.) **Electromagnetic Compatibility** It is defined as the “Compatibility of electronic equipment within the electromagnetic environment, in which that equipment is working”

There are two parts of EMC:

- **Control** VSD packages do not interfere with the operation of other equipment.
- **Immunity** VSD packages will not be adversely affected by electromagnetic emissions from other equipment.

**EMC  
COMPLIANT**

VSD equipment, if uncontrolled, emits electromagnetic waves which will interfere with instrumentation signals and other equipment. If unprotected it is also susceptible to external electromagnetic waves as well.

VSD packages must meet or exceed Directive 89/336/EEC of the EC, which defines very stringent levels of emission and immunity. Advanced electronics and filters minimize losses and control Emissions and harmonic distortions to within the relevant EC standards. Emissions can disturb other equipment, while immunity protects our equipment from emission from other equipment. RFI filter will meet this standard.

7.) **Maximum turndown** - proper design and selection of components allow for maximum turndown. This is proven by CAGI performance numbers. This means that the torques are sustained at lower speeds. Heating up of the windings is avoided at lower speeds by the provision of an over-sized fan. The efficiency is maintained at a relatively high level even at low speeds. VSD packages should turndown to the 15-20% level. Maximum turndown equals more energy savings!

8.) **Drive and Microprocessor are linked** - complete communication between the drive and our Elektronikon allows for the best possible operation of the controls and the compressor with complete monitoring and troubleshooting. Also allows for two programmable pressure settings (real-time clock) to enable a lower pressure setting can be utilized. Lower average operating pressure means less energy consumption.

All VSD air compressors are not created equal. When comparing different VSD machines it's important to consider the above features to ensure you'll receive the most energy savings along with the most reliable machine for your application.