

Variable Speed Drives for HVAC Applications

1 - 75HP 208 - 240VAC • 1.5 - 500HP 380 - 480VAC



YORK®



Air-Modulator cuts air-handler energy costs up to 60%

Variable air volume (VAV) control is the most cost-effective approach to HVAC air-handling design. By matching air volume to actual cooling loads, VAV cuts air-handler energy consumption 20% to 60% versus constant air volume systems.

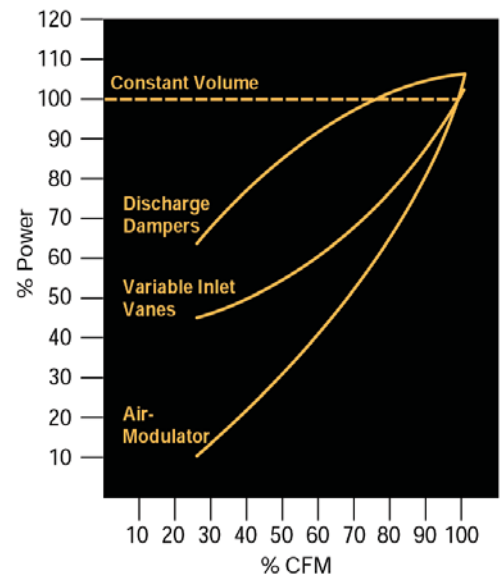
But choosing a VAV system design is only half of the decision. The other half is choosing the most efficient type of fan volume control - the Air-Modulator from YORK.

Air-Modulator: the most efficient VAV technology

In order for a fan to vary its air volume, expressed in cubic feet per minute (CFM), it must either be mechanically throttled or its speed must be controlled. While mechanical fan volume controllers, such as discharge dampers and variable inlet vanes can reduce fan energy consumption somewhat, they cannot match the savings obtainable with the Air-Modulator electronic variable-speed control.

That's because the Air-Modulator takes maximum advantage of the relationship between fan speed and fan horsepower. With the Air-Modulator, any given reduction in fan speed results in a cubic reduction in fan horsepower. For example, a 10% speed reduction means a 27% horsepower

Air-Modulator allows energy-efficient operation during off-peak periods, which typically account for 98% of total operating hours.

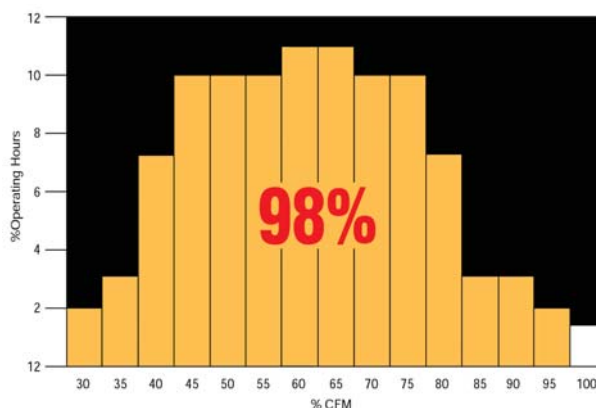


reduction. A 50% speed reduction translates into an astounding 87% horsepower decrease. Such savings far surpass what is offered by mechanical control devices.

Savings that multiply throughout the building and throughout the year

To appreciate the impact of these numbers fully, consider how a VAV air handler operates. It runs many hours throughout the year, but seldom at its full-load air flow. Instead, the majority of its operating hours are spent at partial air flows, which is where the Air-Modulator offers its greatest savings.

Multiply the Air-Modulator savings times the operating hours times the number of air handlers, and the building energy savings become dramatic.



Fan Control Method	Annual Energy Cost	Annual Savings with Air-Modulator
Air-Modulator	\$14,200	————
Variable inlet Vanes	24,300	\$10,100
Discharge Dampers	34,900	20,700
Constant Volume	37,500	23,300

Air-Modulators pay for themselves

Is the Air-Modulator a good investment? With an ROI as high as 100%, the Air-Modulator can pay for itself in as little as a year with the energy savings it offers.

Thereafter, the savings go directly into the bottom line. How many investments offer you that kind of return?

The perfect choice for retrofits

The Air-Modulator is the perfect choice for retrofit on air-handling equipment from YORK, Carrier, Trane, and other major suppliers. Its small size fits easily into crowded equipment rooms, and can be mounted on a wall remote from the fan.

For more than air handlers

Air handlers aren't the only HVAC equipment that can benefit from the Air-Modulator. Chilled-water pumps can also be operated at variable speeds by putting two-way valves on the chilled-water coils and Air-Modulators on the pumps. The savings for a constant speed pump is potentially similar to that for a constant-speed air handler.

Cooling towers benefit, too

YORK's extensive experience in optimizing cooling tower and chiller performance proves that optimum chiller plant power consumption is achieved by minimizing entering condenser water temperature, therefore, tower fans are employed over a large portion of the operating hours. Energy savings can be achieved when:

- Wide swings occur in outdoor ambient temperature
- Chillers operate at low loads
- 24 hour chiller plant operation is required





Air-Modulator is designed specifically for HVAC

Compatible with standard motors and controls

The Air-Modulator is engineered specifically for HVAC, so it's directly compatible with standard HVAC pneumatic and electric control signals. And there's no need for special high-efficiency motors. The Air-Modulator is easily applied to standard motors, making retrofit easy and less expensive.

Current-limiting capability eliminates the need for expensive fans

Because the Air-Modulator can be set to limit amperage draw, expensive airfoil fans with their non-overloading current-draw characteristics are no longer needed. Instead, less expensive forward-curved fans can be used.

Less fan noise for greater comfort

The benefit of energy savings means nothing if the VAV system creates disruptive noise that disturbs building occupants. Unlike mechanical fan control devices (such as variable inlet vanes and discharge dampers), the Air-Modulator has no air-flow obstructions, so it's quieter than any mechanical fan control method.

Also, because the fan runs slower, it runs quieter. Measured sound levels can be as much as 75% lower if the Air-Modulator is used instead of mechanical control devices.

Less motor noise, too

Many variable-speed drives can set up vibrations within the motor, causing a high-pitch whine.

The Air-Modulator uses the latest electronic technology to reduce this motor noise by up to 85%. This is especially important when motors are mounted inside air handlers where motor noise can easily enter the air stream and building spaces.

Quick air balancing saves time and money

With the Air-Modulator, fan speed can be adjusted "in-flight" and with electronic precision, making air system balancing quicker and more accurate. No more shutting the fan off every time a pulley adjustment is needed and then "guesstimating" how much of an adjustment to make. Plus, the Air-Modulator eliminates the need for expensive and troublesome adjustable speed pulleys.



As variable inlet vanes close they obstruct the air flow...



...increasing airborne noise.



Air-Modulator's current-limiting capability eliminates the need for expensive airfoil fans (foreground), permitting the use of less expensive forward-curved fans (background).

Reduces maintenance costs - extends equipment life

Solid-state reliability

Mechanical fan control devices typically require costly maintenance. Not so with devices using solid-state electronics, where there's nothing to adjust, nothing to lubricate, and nothing to wear out. In short, the Air-Modulator requires limited routine maintenance and is inherently reliable for trouble-free operation.

Built-in protection and easy fault determination

The Air Modulator drive guards against such damaging electrical characteristics and disturbances as overcurrents, overloads, overvoltages, overheating, ground faults, phase loss, and short circuits. It shuts itself down safely, and will automatically restart when the fault or problem is cleared. To aid in troubleshooting of the Air-Modulator, the exclusive YORK keypad will display in English language the cause of the drive fault or problem. With a unique HELP key the drive will guide the user to possible solutions to the problem. This feature is like having an on-line, built-in troubleshooting guide and manual right on the keypad display.

Soft start extends equipment life

Unlike conventional motor starters, the Air-Modulator prevents the sudden current surges that shock motors and drives during start-up. Starting the fan slowly, and bringing it up to speed gradually, reduces the stresses on the equipment. The result is prolonged motor, belt, pulley, and bearing life.

The reduced drive stress is even greater when the air-modulator is applied to cooling towers. A tower equipped with fan cycling control will see numerous cycling starts every day. If the tower fan is equipped with an Air-Modulator, its gentle ramping start will extend the life of the fan drive components, especially the gear box.

YORK service-expertise in both electronic and HVAC systems

With YORK, you receive single-source service expertise in both electronic controls and HVAC systems, from the company that introduced HVAC speed controls in 1978. No finger-pointing, no hassles, and no runaround. Even if the Air-Modulator is installed on competitive equipment, we'll take maintenance responsibility for both, giving you one less potential headache.



New advanced control panel for easy operation and complete control

Interactive maintenance assistant

Maintenance scheduling no longer requires guesswork. The HVAC drive alerts you when maintenance is required based on your individual requirements.

Intuitive to operate

Big bold display
Real time clock
Parameter backup and restore

Pre-configured HVAC application macros

14 different HVAC application macros are pre-programmed into the HVAC drive. Application macros for supply and return fans, cooling tower fans, booster pumps and condensers are available, just to name a few. The user can create two additional application macros, selectable manually or through a digital input. To illustrate this, the user can create "summer" and "winter" application macros and select between these according to the time of the year.

Interactive diagnostic assistant

Should a fault occur, the diagnostic assistant displays, in plain language, possible causes and potential solutions.

N2, FLN, Modbus, and BACnet embedded

Commonly used HVAC fieldbuses are embedded into the memory of the drive, ensuring that they are always there if you need them. YORK has a long history in building automation, with thousands installed drives utilizing serial communications.

LonWorks and Profibus

LonWorks, Profibus and other plug-in modules fit under the cover of the drive. A single twisted pair avoids great lengths of conventional cabling, reducing cost and increasing system reliability.



Fault logger

The fault logger of the HVAC drive is especially useful in tracking down drive trips through its use of the real-time clock. In addition to recording both time and date, the fault logger also takes a snapshot of 7 diagnostic values - like motor speed and output current. You know what happened and when.

Built-in timers

External time circuits are no longer needed. Built-in timers - utilizing the real-time clock - allow starting and stopping the drive or changing the speed according to the time of day or night. Relay outputs can be operated with timers to control any auxiliary equipment on site.

Swinging reactor - up to 64% less harmonics

Patent-pending swinging choke means the AYK Series Drive reduces harmonics by up to 64% at partial loads when compared to a PWM AFD with no chokes. There is no need to oversize the supply cables.

Built-in EMI/RFI filters

The AYK Series Drive meets the EMC product standard EN61800-3 for the 1st Environment. These filters eliminate the need for any additional external filtering hardware.

Two PID controllers as standard

The HVAC drive has two independent PID controllers built in. As an example: one PID controller works with the AFD to maintain the duct static pressure; simultaneously, the other PID controller can be used to control a separate external device, e.g. a chilled water valve. All of this can, of course, be monitored and controlled through serial communications.

Compact size

Reduced size for ease of mounting



Flux optimization

This standard feature means the drive supplies only the voltage and current necessary to drive the load. This results in reduced energy consumption and much lower motor noise levels. Silent operation mode further reduces motor audible noise for sensitive applications.

The motor can deliver full output at 40°C - shouldn't the AFD to the same?

YORK's HVAC drive is rated for continuous operation to 40°C with full current, without being compromised by temperature variations within any 24-hour period. Full circulation is available, precisely when needed - usually when it is hot outside. At 50°C, only 10% de-rating is required for UL Type 1.



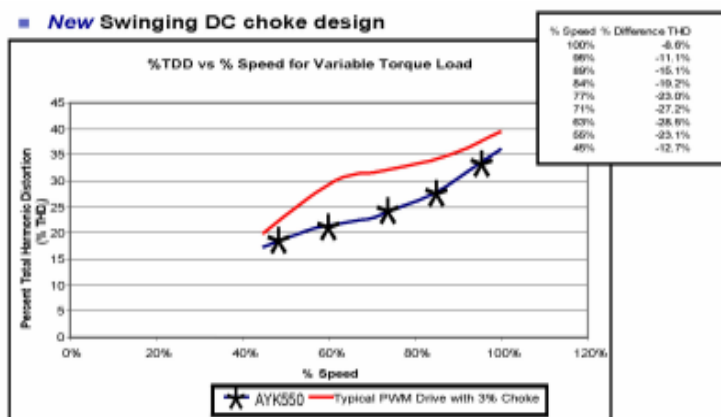


Top 10 Selling Features

The following key points are unique selling features to the YORK AYK550 Air-Modulator. These features should be emphasized to consultants, engineers, architects, and end users as they provide exceptional value and reliability compared to other VFDs on the market.

#1 New "Swinging DC Line Choke"

- Equivalent to 5% Input Line Reactor
- Designed to reduce harmonics at full and partial loads
- Perfect for variable torque centrifugal loads
- More inductance per volume/weight



#2 Improved Built-In RFI/EMI Filter

- Meets EMC EN61800-3 for First Environment restricted distribution 30 meter cable length
- CE marked for EMC compliance

#3 High Input Transient Protection

- 4 MOVs ahead of diode bridge for surge suppression
- 120 Joule rated 1600V diode module.
- Complies with UL 1449 ANSI 61.4

#4 New Current Measurement Technique

- More accurate signal for kW, Amps, kWhr
- More accurate metering at low loads

#5 Enhanced Control Board

- Fireman's override circuit for tie in to building fire management systems
- 2 programmable analog outputs
- 6 programmable digital inputs
- 3 programmable relay outputs (Form C)
- More EEPROM memory with enhanced software
- Faster responding analog and digital inputs
- Standard run permissive circuit to operate dampers before motor operation

#6 Advanced Numeric Keypad with:

- Start up, diagnostic and maintenance assistants
- Real-time clock
- Full graphic display with big bold letters
- Displays 3 process variables for monitoring
- Dedicated HELP key
- Backup and restore copy function
- Hand - OFF - Auto and Speed Up/Down buttons
- Intuitive to operate

#7 New Fault Logger

- Real-time "snapshot" of last 3 faults - fault name, time, speed, frequency, voltage, current, torque, DI status
- Logs up to 10 faults with fault name only

#8 Built-in Serial Communication Protocols

- Siemen's FLN, Johnson N2, Modbus RTU, and BACnet
- All embedded in firmware as standard
- LONworks available as an option

#9 Optimized Cooling Fan Design

- Logic controlled on/off operation tied to VFD operation
- Easily removable with one connection
- Complete fan change out in less than 1 minute

#10 High Fault Current

- UL rated to 100,000 AIC at 460VAC
- Package will meet demands of today's electrical systems
- Applies to Base Drive, AO, and CM options only. Factory mounted drive packages require SQ from YORK Marketing for High Fault Withstand.

YORK Package Configurations

The following Air-Mod configurations are available as standard product offerings:



Base Drive

"OO" Configuration

- AYK550 VFD NEMA 1 Rated
- NEMA 1 Conduit Box
- 100,000 AIC Fault Current Rated



Base Drive with Fused Disconnect

"AO" Configuration

- AYK550 VFD NEMA 1 Rated
- Fused Main Disconnect with Pad Lockable Handle
- 100,000 AIC Fault Current Rated



Base Drive with Bypass, VFD Service Disconnect, Main Fused Disconnect

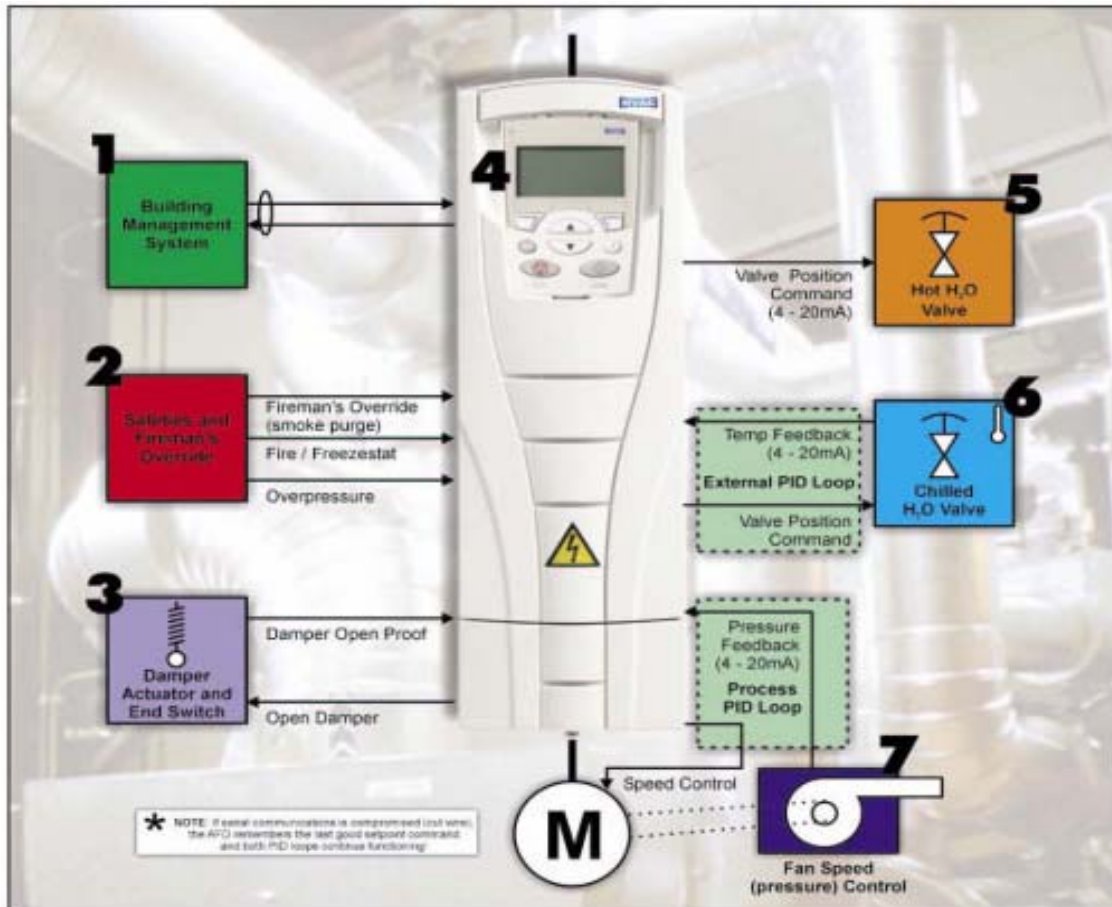
"CM" Configuration

- AYK550 VFD NEMA 1 Rated
- Main Fused Disconnect Switch with Pad Lockable Handle
- VFD Input Service Disconnect Switch for Isolation During Repair
- 2 Contactor ByPass
- Class 20 Motor Overload
- Control Transformer
- VFD/Off/ByPass Selector
- Power On/Bypass On Pilot Light
- 100,000 AIC Fault Current Rated





More than just a drive . . . it's a Unitary Controller



- 1) The BMS commands start/stop; internal/external PID setpoints; command digital (relay) outputs, and analog (4-20mA) outputs and reset faults. The BMS reads drive outputs; controlled variable feedback; Hand/Auto selected indication; kWhrs (R); Operating hrs (R); drive amps (broken belt indication); drive temperature; all warnings, faults, and much more.
- 2) Receive and monitor hard-wired devices - firestat/freezestat safety contacts, smoke purge commands - over the serial link.
- 3) Open an isolation damper, override a VAV box or any device that requires a maintained contact closure for control. Receive damper end-switch proof contact.
- 4) The Keypad Display indicates feedback and setpoint in inches of water column - or programmable units intuitive to the user.
- 5) BMS commands a drive analog output to control hot or chilled water valves or any device requiring a 0-20mA input.
- 6) The drive's external PID Loop Controller controls a chilled water valve or any device requiring a 0-20mA input. Feedback signal is hard-wired to AFD and setpoint is sent via serial comms.
- 7) Use the drive's process PID Loop Controller to maintain supply fan pressure via adjusting fan speed. Pressure feedback is hard-wired to AFD and setpoint is sent via serial comms.

Keypad & Firmware Features



The new AYK Series Drive Keypad takes the typical operator interface to a new level.

YORK AYK Series Drive Keypads use full language, no codes. And this keypad emulates the human interface of a cell phone. Easy as a mobile phone, and you control a panel with intuitive handling in 14 languages.

The new YORK AYK Series Drive has pioneered several new-to-the-market features such as Maintenance Assistants, Diagnostic Assistants, Programming Assistants, and Help Screens.

For example, if there's a trip off line, pressing the Help Key brings the user to the Diagnostic Assistant; it suggests possible causes of the trip and probable corrective actions.

Programming Assistants configure the drive for an application. For example, the PID Assistant prompts

the user through a series of 12 questions; and uses the answers to these questions to set 26 parameters inside of the drive's program. No need to navigate the drive menus!

The Maintenance Assistant alerts users when equipment maintenance is required, based on selected inputs. Utilize the Revolution Counter and Maintenance Assistant to signal personnel when it's time to replace the pump packing.

The Keypad features two soft keys; their functions change according to the operating state of the panel. Hand-Off-Auto buttons provide local control for local-speed and start/stop control.

The Help Button brings up a description of what the effect of parameter changes would be - in full sentences!

Faults can be time and date stamped via the real-time clock. A fault logger stores status information such as amps, volts, and presence of a run command at the time of the fault.

What people are saying . . .

Facility Managers

"With YORK's standard built-in hardware like the 5% swinging choke and the EMI / RFI Filter, I know that any sensitive equipment in my facility will not be adversely affected by drive operation."

"I love the Help Button. I call it my panic button - it quite simply is always available to guide me with useful information."

"The Maintenance Assistant is another great feature of the Drive. I simply do not need to worry about when it is time to service the equipment. The drive tells me when it is time to send people to perform maintenance."

Temperature Control Contractors

"YORK understands the HVAC Market. I save time and money because I do not need to supply interposing relays and control logic to accomplish 'real world' functions such as Fireman's override and damper end-switch proof. YORK has these and many more features built-in."

"The YORK AYK Series Drive is actually a drive and unitary controller in one. I have 13 free I/O points with every YORK drive provided."

"The second PID loop built into the YORK HVAC Drive allows me to control cooling tower bypass valves or other control valves with no additional hardware or cost."

"The YORK HVAC Drive is a Temperature Controls Engineer's dream . . . on-board passthrough I/O, a free PID loop controller, and broken belt indication. Damper end-switch and smoke purge controls are built-in at no additional charge!"

"Finally, a BACnet-compatible HVAC drive without the need for expensive and unwieldy third-party gateways."

Specifying Engineers

"The 5% swinging choke means I do not need to oversize my supply transformer and cables to meet NEC 430-2."

"Specifying a drive that meets EMC product standards for the First Environment means I will not have job site EMI / RFI issues or complaints."

"The built-in communications suite means I can have intelligent drive applications regardless of which temperature control contactor is successful on the project"

"YORK supplies submittal packages that provide the detailed information and drawings I need to verify quickly that the YORK drive meets my specification requirements. That information saves me a lot of time."

Contractors

"A keypad that functions like a cell phone - what could be easier"

"With the Hand Macro, I can move air to dry out the new construction paint and drywall mud without calling for a certified start-up. There's no need for multiple trips to my job site by the YORK Technicians to commission the drives, and that saves me money."

"YORK AYK Series Drive enclosures are UL Listed and UL Plenum Rated. I can mount the drive in most locations without worries."

"I don't have to search for external components like timers and PID controllers and then worry about their compatibility. It's all there, in the drive."

