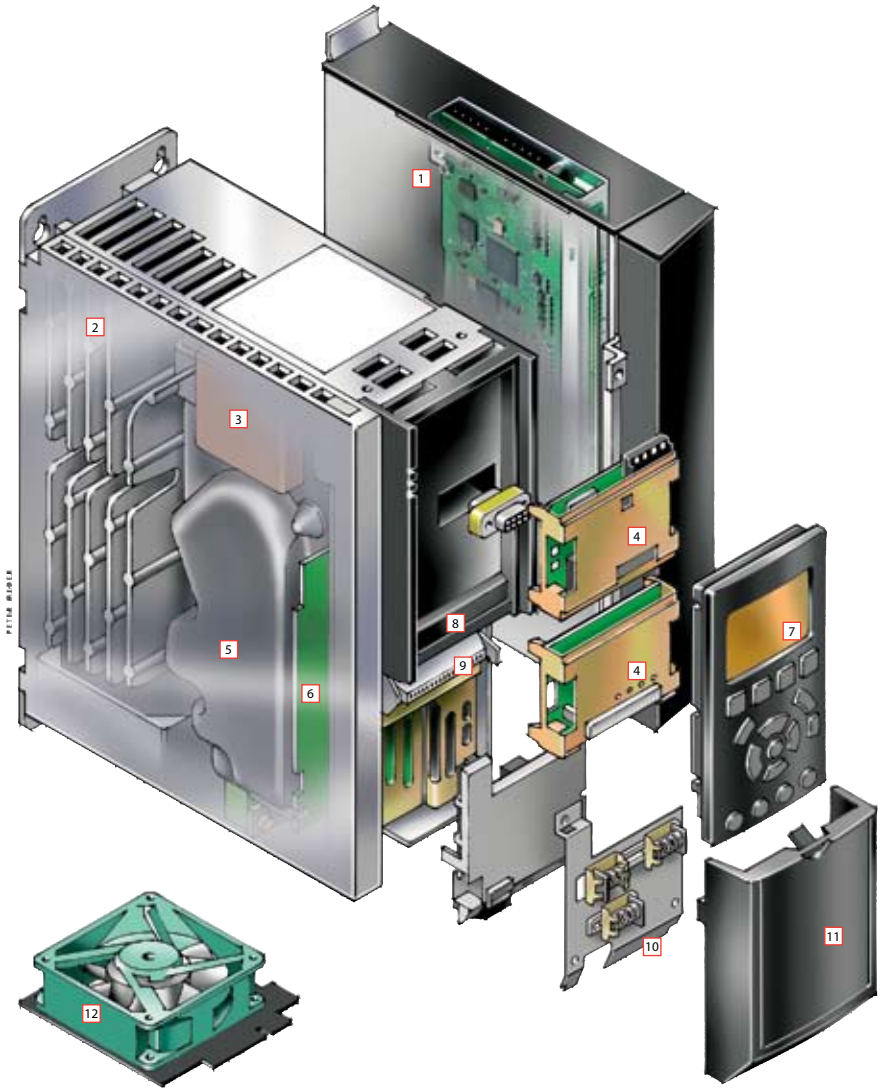
VLT® HVAC Drive

The modular VLT® HVAC Drive is engineered for design simplicity and high performance.



1. *Provision for electronically controlled bypass or advanced controller options*
2. *Cold plate cooling technology*
3. *Balanced DC-link reactors for reduced harmonics*
4. *Field-installable or factory installed and tested option cards provide addtional functionality*
5. *Constructed for reduced RFI/EMI*
6. *Surface mount components for compactness and reliability*
7. *Hot-pluggable keypad with on-board memory and award-winning ergonomic design*
8. *USB interface for easy connection to PC software suite*
9. *Removable terminal strips, angled for easy access*
10. *All power and control wires enter at the bottom of the enclosure*
11. *Easy access to control terminals*
12. *Removable, temperature-controlled fan for easy servicing*

Designed to give you precisely what you need with easy serviceability.

Manufactured to the highest quality standards

The VLT® HVAC Drive is a UL-listed product made in ISO 9001-2000 and ISO 14000 certified facilities.

Control functions designed for the unique needs of HVAC systems

Setting new standards, the modular VLT® HVAC Drive integrates seamlessly with HVAC systems at the lowest cost of ownership in the market. Danfoss' extensive experience in advanced variable frequency drive technology for HVAC applications has produced an unmatched product offering. The VLT HVAC Drive is suited for a range of needs, from simple follower operation to intelligent standalone control. From "drive only" to complete package solutions, the VLT HVAC Drive is the economical, flexible and user-friendly solution in a host of applications.

Complete Range of Drives

- From 1-1/2 to 1350 HP
- NEMA/UL Type 1, 12, and 3R enclosures

Complete Range of Packaged Solutions

- Manufacturing facility is a UL panel shop and an ISO 9001 and 14001 facility
- Full range of electromechanically and electronically controlled packaged solutions to fit the application
- Engineered Drive Systems capability to meet any HVAC panel requirement

Energy Savings

- Energy savings of 50 to 70% are common when compared with constant flow systems
- When compared with other methods of flow control, savings to 40% are typical

Intelligent Control and Comfort

- VLT HVAC Drives precisely maintain exact flow required
- VLT HVAC Intelligent Control with four auto-tuning, multi-input, multi-control PIDs
- The controlled airflow creates a more pleasant environment by reducing drafts and noise
- The obvious change in airflow and sound level caused by cycling is eliminated entirely

Compatible with Virtually all Building Automation Systems

- Johnson Controls' Metasys N2, Siemens Apogee FLN and Modbus RTU communication built into every unit
- LonWorks® and BACnet™ communication optional

Harmonics Control

- All VLT HVAC Drives have dual DC-link reactors, which provide a reduction in input harmonics equal to a 5% AC line reactor without the voltage drop and efficiency losses associated with AC line reactors

EMI/RFI Control

- All VLT HVAC Drives are designed to contain and control EMI and RFI to stringent European standard EN 61800-3
- Additional filtering options are available for even the most sensitive installations

Reduction in Maintenance Costs

- Inherent soft start eliminates the stress on belts, compressors and other driven equipment caused by across-the-line motor starting
- Amount of make-up water and its treatment costs are reduced in cooling towers
- The need to trim impellers on oversized pumps may be eliminated
- Any oversized system can be fine tuned by setting the maximum speed to the maximum desired flow rate

Power Factor

- Near unity displacement power factor
- True power factor of >0.90 at full load
- Power factor higher than that of the motor
- Power factor constant regardless of speed and load

Drive Feature	User Benefit
Hot-pluggable HVAC keypad with memory	Four drive setups can be uploaded to the keypad and saved. To program multiple drives, upload the parameter settings to the keypad, then place that keypad on each of the other drives and download these same settings to every other drive.
Operates without a keypad in place	Assures tamper-proof operation. Drive status shown even with the keypad removed.
Keypad can be easily remote mounted	The standard keypad can be remotely mounted 10 feet from the drive with a standard 9-pin cable. The remotely mounted keypad is gasketed and carries a NEMA/UL Type 12 and NEMA/UL Type 3R rating.
Simple and flexible menu structure	Many installations require nothing more than scrolling through the twelve "QUICK MENU" items to confirm that these defaults are correct. Users can also select up to 20 parameters to be included in a "PERSONAL MENU" for easy access.
Intelligent HVAC controller	Four auto-tuning PIDs control the drive and up to three other devices, eliminating external controllers and reducing cost.
USB Port	PC access to drive parameters without disconnecting the keypad or interrupting communications.
Built-in EIA-485 interface	Fully equipped for serial communication. Up to 31 drives can be connected to one serial bus up to 5,000 feet long.
Built-in HVAC Protocols	The inclusion of all popular HVAC protocols allows the VLT HVAC Drive to become an intelligent part of the building management system.
Automatic Motor Adaptation (AMA)	Measures motor stator resistance and reactance without turning the motor or decoupling the load. The drive then automatically uses this information to optimize performance and efficiency.
Simplified Automatic Energy Optimization (AEO)	Eliminates the need to select a V/Hz pattern. AEO continually monitors the motor's speed and load and adjusts the applied voltage to maximize energy savings. Even at full speed, voltage will be reduced if the load is less than 100%. This automatically compensates for oversized motors or systems that are not fully loaded.
Energy Monitoring	Real energy savings are always available without the additional expense of external equipment.
Advanced Firefighter's Override	Provides options for emergency operation (using the drive only or coordinated with the bypass) that increase the safety of building inhabitants.
Real-Time Clock	Adds sophisticated performance to basic control schemes for increased comfort and energy savings.
High breakaway current	Up to 160% breakaway current available for high friction loads.

User Benefits

Drive Feature	User Benefit
VVC^{PLUS} Output Switching Pattern	Superior Voltage Vector Control provides high efficiency and full motor performance.
Automatic High Ambient Derate	If the ambient temperature exceeds the normal limit, the drive can be set to warn of its overtemperature and continue to run, keeping the HVAC system functional. To control its temperature, the drive will reduce the output carrier frequency and then, if necessary, reduce the output current.
Preventive maintenance scheduling	The VLT HVAC Drive can monitor system usage and notify the operator when preventive maintenance is required.
Dual DC-link reactors	Non-saturating reactors provide better harmonic performance than a 5% AC line or saturating DC reactor.
Built-in protection	• Motor pre-heat • Overload and thermistor input • No flow, broken belt, dry pump and end-of-curve detection Eliminate the need for external protection devices while maximizing the life of the motor and other system components.
Automatic Switching Frequency Modulation (ASFM)	• Adjusts the carrier frequency based on the load • Provides a quiet motor at critical low flow conditions • Provides full rated output without derate at high load
Protected from input or output switching	Input or output can be disconnected while the drive is running without the need for interlocks to protect the drive.
Full torque to base speed	Direct drive fans run without derating. The full output torque can be set to coincide with the maximum design operating speed of the driven equipment, up to 60 Hz.
Auto ramping	Ensures no-trip acceleration and deceleration.
Flying start	Allows starting into a "windmilling" fan at any speed, in either direction.
Sleep mode	Automatically stops the drive when its speed drops below the "sleep" level for a specified time, and automatically restarts when the speed command exceeds the "wake" level. Provides increased energy savings without separate controllers.
Run-permissive circuit	The ability to accept a "system ready" signal assures that dampers or other auxiliary equipment are in the proper state for drive operation.
Safety Interlock	Provides external fault indication.
UL and C-UL Listed	All drives and options sold for US and Canadian applications carry this safety certification.
CE Marked	All drives carry the CE mark for sale into international markets.
Plenum rated	All drives and options are UL listed for installation in air handling compartments.

HVAC Intelligent Control

VLT HVAC Drives include a PID controller with four setpoints and three feedbacks, a feature not offered anywhere else in the market. The built-in combination of HVAC system control features and flexible I/O result in the highest level of control possible at the lowest overall cost of ownership.

Four on-board, self-tuning PID controllers can operate as an entire air handling unit controller. One PID maintains fan speed while up to three other PID loops can be used to operate other HVAC devices.

In pump applications, short-cycle prevention allows maintained operation within a desired range without the wear and tear produced by system overstarting. Combined with a flowmeter or a differential pressure transmitter, the VLT HVAC Drive can measure and regulate flow and replace throttling valves for more accurate control and energy savings.

Fan tracking allows return fans to maintain the desired pressure by utilizing two air flow sensors. An enhanced sleep mode saves energy and system wear by shuttting down fans during idle periods.

Real-Time Clock

The energy savings potential of the VLT HVAC Drive is maximized with a real-time clock, allowing the system to respond to the changing needs of the building throughout the day and week. The real-time clock allows the system to anticipate conditions or temporarily override the setpoint, enhancing control, comfort and efficiency. It also allows the drive to provide reminders when preventive maintenance is required.

Previously, a building automation system was required to obtain these features. The real-time clock gives these sophisticated functions to any facility.

With the real-time clock, the fault log in all VLT HVAC Drives contains not only a list of the ten most recent drive faults, but also the year, month, day, hour and minute of each fault, greatly simplifying troubleshooting.

Firefighter's Override Mode

In any enclosed space, fire and smoke control is a major life-safety concern. Firefighter's override mode allows the HVAC system to control, contain and extract fire and smoke using air flow and air pressure. When operating in override, the drive ignores most operating conditions that would otherwise cause it to fault and shut down. It continues to operate as long as possible regardless of line, load or environmental conditions.

Firefighter's override can run the drive at any speed in forward or reverse. It can be activated either by a normally open or normally closed contact from the fire panel or through the building automation system. The drive can be set to switch automatically to a constant speed bypass if operation through the drive becomes impossible due to failure of the drive's power circuitry. The bypass will then run the motor at full speed from the power line until firefighter's override is deactivated.

Firefighter's override is standard in all VLT HVAC Drives, and can be configured through user-accessible parameters. It can be set up and activated at any time. As fire codes or the needs of the facility change, the adaptable VLT HVAC Drive is ready.

Cascade Controller

With features and functions that eliminate the need for PLCs and other external controllers, the Cascade Controller increases the efficiency of your multiple pump or blower systems. Through accurate flow, pressure and level control, it provides lower energy consumption than valve throttling or the traditional across-the-line on/off cycling of pumps and blowers.

The Cascade Controller allows staging of up to four additional drives and/or fixed speed motors. Using the master drive's PID controller, this can provide a wide range of control in large pumping systems.

Other features serve to minimize wear and tear on driven equipment. Lead pump alternation functionality distributes running time equally among all connected pumps, maximizing their overall life.

Award-winning control panel

Input from our extensive user group significantly influenced the design and function of the new generation Local Control Panel. The removable LCP now comes with an improved user interface. Choose between eight built-in languages or have it customized with any language you like. Two of the languages can be changed by the user. The info button accesses virtually all information contained in the printed operation manual.

All drive parameters are accessible through the keypad. The Quick Menu key offers immediate access to 12 startup parameters, including Motor Power, Motor Voltage, Motor Nominal Speed, Ramp Up/Down Time, and Minimum/ Maximum Frequency.

Each type of keypad is interchangeable with all VLT HVAC Drives, regardless of which keypad is specified at the time of the order.

Control Panel Options

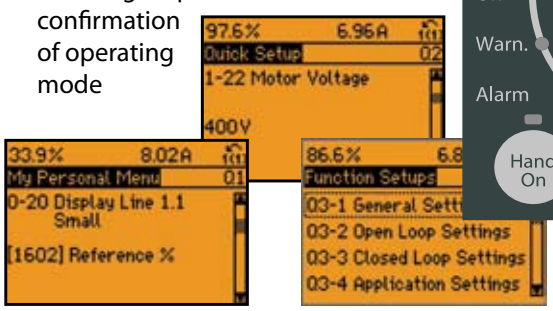
- Award-winning graphical display and keypad
- Numeric keypad with basic data display
- Blind cover, no display (allows the user to program and control the drive via network communication while locking out local control)

User-Friendly Keypad

- Hot-pluggable, with upload and download capability
- Specialized bypass keypad provides bypass-specific functionality with easy, one-button access to bypass mode
- INFO key provides easy access to help information with onboard manual
- New BACK and OK buttons simplify programming
- Status lights provide visual confirmation of operating mode

Graphical Display

- On-screen scroll bars and graphs
- Up to four meters can be displayed simultaneously
- Two-level password protection



Flexible, Easy Menu Structure

- Intuitive navigation
- Four independent setups for unmatched flexibility
- Electronically Controlled Bypass-specific menus
- ***HVAC Applications Menu***—Easy access to the relevant parameters for each of the most common HVAC applications
- ***Personal Menu***—Contains up to 20 user-selected parameters for customized access
- ***Quick Setup Menu***—Allows input of motor nameplate data for rapid and easy commissioning
- ***Changes Made Menu***—Provides easy access to previously modified parameters (either the ten most recent or all changes made since installation)

design award winner

The VLT® HVAC Drive Local Control Panel won the international iF design award. The Danfoss LCP beat out 1000 entries from 34 countries in the "interface in communication" category.

Setup and display

The VLT HVAC Drive makes setup and operation easy. With a remarkably user-friendly interface, intuitive menu structures and powerful tools that streamline installation and troubleshooting, the VLT HVAC Drive saves valuable time, resulting in a lower overall cost of ownership.

- **Transfer of parameters**—Parameters can be programmed into one drive and downloaded to other drives via the drive's keypad or MCT 10 software.
- **Remote mounting kit available**— An optional kit allows remote mounting of the VLT HVAC Drive keypad up to 10 feet away. Removal of the keypad does not affect the drive's NEMA/UL Type 1 or NEMA/UL Type 12 rating, and the gasketed keypad itself carries a NEMA/UL Type 12 and NEMA/UL Type 3R rating.
- **Continuous monitoring with or without the keypad**—With or without a keypad, the VLT HVAC Drive's ON, WARNING and ALARM status lights are always visible.
- **Plain language alarms and warnings**—Alarms and warnings are displayed in easy-to-understand form, eliminating the need for decoding or referring to long tables in manuals.
- **Complete programmability of display**—The keypad's four line, backlit, alphanumeric display can be programmed to display four different measurements at a time. Choose from many options, including: °F, °C, %, Pa, bar, RPM, frequency, gallons/min., $ft.^3$/sec., or p.s.i.

PC software programming tools

MCT 10 Motion Control Tool

MCT 10 facilitates programming by enabling control of entire parameter sets, including copying from one drive to another within the interface.

Based on the familiar Windows technology and format, MCT 10 is intuitive and easy to use. Project drive folders can be named and organized to closely match HVAC system layout. Word, Notepad, and other file types can be placed into the project folders where they are most relevant.

- Supports current Danfoss product line as well as legacy drive models

MCT 31 Harmonics Calculation Tool

MCT 31 calculates system harmonic distortion for both Danfoss and non-Danfoss drives. It is also able to calculate the effects of using various additional harmonic reduction measures including Danfoss Advanced Harmonic Filtration.

- Project-oriented for simplified calculations on several transformers
- Easy to compare different harmonic solutions within the same project
- Supports current Danfoss product line as well as legacy drive models

USB Connectivity

The VLT HVAC Drive can be remote commissioned and monitored through a USB connection.

VLT Energy Box

VLT Energy Box PC software performs a thorough, real-life energy analysis of the application and calculates the payback time for the drive.

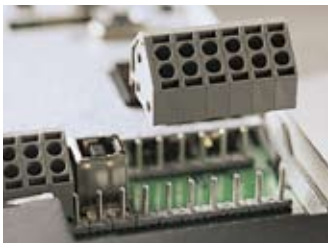
Powerful and flexible control

Impressive range of standard I/O

- 2 analog inputs (current or voltage) for sensors, setpoint sources or basic speed command
- 6 digital inputs (either PNP or NPN) for hardwired start/stop, safeties, run permissive, preset speed and much more—two can be used as digital outputs
- 1 analog output for indication of operation or to control other HVAC devices
- 2 Form C relay outputs (240V, 2 amps) for remote indication of operation or to control other HVAC devices
- 200mA of 24 VDC to power customer devices such as sensors and valves

Control built for performance

- I/O and communication terminals are galvanically isolated and separated from power terminals to limit interference
- Terminals are spring loaded for security
- Terminals accept a wide range of wire sizes
- Unpluggable terminals



Advanced options made easy

Self identifying option cards fit seamlessly under the drive keypad. These factory or field installable cards eliminate the need for external devices, simplifying installation and resulting in a lower overall cost of ownership.

Option cards

For additional control and monitoring capabilities:

Relay Option Card

- 3 Form C relay outputs

Analog I/O Card

- 3 analog voltage outputs
- 3 Pt100/Ni1000 inputs

General Purpose I/O Card

- 3 digital inputs
- 2 digital outputs
- 1 analog current output
- 2 analog voltage inputs

External 24 VDC Card

- Allows 24 VDC external supply to be connected to the drive for powering of control and options

Battery Backup Card

- Battery backup provides constant power for real-time clock during power loss

Built-in serial communications

The VLT HVAC Drive offers "out-of-the-box" communication capabilities that are unmatched in variable frequency drives, reducing or eliminating the need for external devices. The result is feature-rich control in an easy to manage package, with an exceptionally low overall cost of ownership.

Built-in serial communication for Modbus RTU, Johnson Controls Metasys® N2, and Siemens Apogee® FLN—All VLT HVAC Drives are built with the ability to communicate seamlessly over networks using these protocols.

BACnet™ and LonWorks® available as option cards—A field-installable LonWorks® or BACnet™ option card mounts easily and securely inside the VLT HVAC Drive.

Standard EIA-485 interface – Up to 31 drives can be connected to one serial bus up to 5,000 feet long. With an optional repeater, as many as 126 drives can be accommodated.

Ease of installation and operation – All VLT HVAC Drives are built with the ability to communicate seamlessly on a serial communications network via a simple two-wire connection. The drive can be programmed either through the network or through the drive's keypad. Hand and hard-wired operation of the drive are both possible even with serial communications enabled.

Apogee® is a registered tradename of Siemens Building Technologies Inc.
BACnet™ is a tradename of ASHRAE (American Society of Heating, Refrigerating and Air-Conditioning Engineers)
LonWorks® is a registered tradename of Echelon Corp.
Metasys® is a registered tradename of Johnson Controls
Modbus® is a registered tradename of Groupe Schneider

Protective features

With an unmatched combination of drive, motor, and system protection features, the VLT HVAC Drive is the most cost-effective overall solution on the market. Designed and built for long-term, worry-free operation without the need for external devices to protect driven equipment, the VLT HVAC Drive provides secure, reliable results, right out of the box.

System Protection

Belt Monitoring

The VLT HVAC Drive's sophisticated belt monitoring measures both speed and load and calculates the difference between actual torque and expected torque at all speeds. A time delay allows for reduced load during deceleration.

No Flow Detection

Operation under dead head conditions provides no flow to the system and may damage the pump. Differential pressure switches or flow sensors to monitor flow increase the installation costs and add complexity. The VLT HVAC Drive can automatically detect no flow situations and take the appropriate corrective action.

End of Curve Protection

The VLT HVAC Drive can automatically detect over-flow conditions that indicate operation off the end of the pump curve. Its response can be customized to trigger an alarm and stop the pump, issue a warning while maintaining operation, or perform a variety of other functions to protect both the pump and the system.

Automated Vibration Avoidance

Fan and pump systems often have resonant speeds that must be avoided to reduce vibration and noise. The VLT HVAC Drive automates the process of setting up frequency avoidance bands, minimizing system commissioning time.

VLT HVAC Drives provide the lowest overall cost of ownership by including as standard DC-link reactors, which minimize harmonic current distortion without the need for external reactors.

Drive Protection

Metal oxide varistors (MOVs) and capacitor snubbers in both the AC and DC input circuitry reduce the impact of voltage spikes on the input. In addition, a balanced pair of DC-link reactors between the input rectifier and the bank of DC-bus capacitors reduces the severity of any current surge resulting from abrupt changes in the AC supply line.

Conformal Coating is available to protect electronic components in aggressive environments.

Motor Protection

The VLT HVAC Drive's built-in I^2T motor overload, thermistor input and motor preheat functions increase the life of the controlled motor without the added cost of separately supplied protection. The drive's built-in I^2T motor overload is UL-listed as a true overload device, eliminating the need for external motor protection hardware.

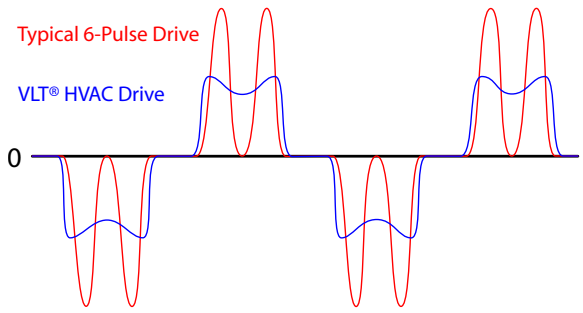
Motor Preheating Function

The VLT HVAC Drive can be programmed to introduce a small amount of current to the motor whenever it is at rest. This prevents condensation inside the motor, extending its life without the need for space heaters or other external equipment.

Harmonic Mitigation

DC-link reactors limit harmonic distortion on the power line, reducing RMS input current by more than 40% compared to drives without input reactors.

Other drive manufacturers address harmonics with AC line reactors, usually external to the drive. Often, these optional AC line reactors are 50% larger than the DC-link reactors standard on the VLT HVAC Drive. This results in significant additional heat generation and reduced efficiency.The harmonic performance of the DC-link reactors in the VLT HVAC Drive is equal to that of a 5% AC line reactor, but without the associated voltage drop and efficiency losses.



Intelligent heat management

Total separation between cooling air and electronics circulation air keeps electronics clean and cool, and provides a solution where heat needs to be removed outside the cabinets. A Through-Panel Mounting Kit is available for mounting the drive in the backplate of a cabinet.

Forced convection cooling

A fan blows cold air through the cooling ribs of the aluminum base. The channel is easily cleaned without touching electronics. All drives are equipped with forced convection cooling.

Wall mounted with forced cooling through the heatsink.

Through-panel mounting

Cold plate cooling

External cooling is possible through the back side of the aluminum base. The solid aluminum base is integrated with the back panel to provide high mechanical stability, efficient cooling and the option of cold plate operation. Cold plate cooling is available on all A frame size drives.

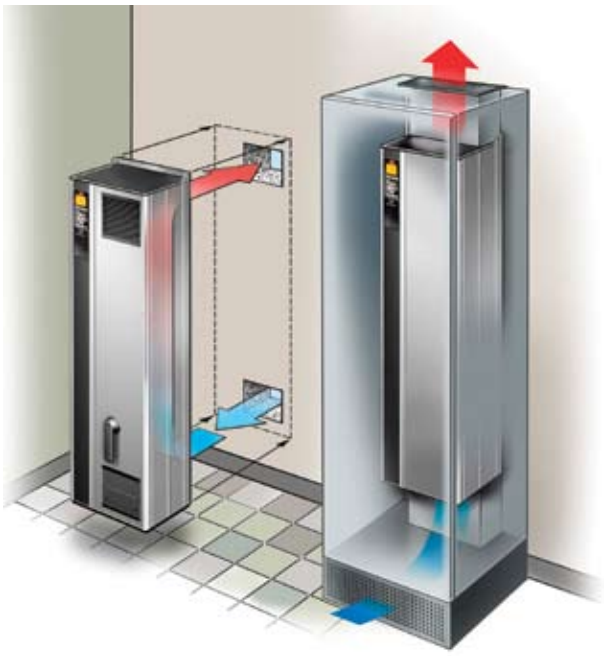
Back-channel cooling

The intelligent heat management of VLT® drives removes 85% of the heat losses via finned heat sinks, which transfer the heat to the back channel cooling air. This back channel is separated from the electronics area by an IP54 seal. This method of cooling greatly reduces contamination of the control electronics area, resulting in longer life and higher reliability. The remaining 15% of heat losses are removed from the control electronics area using lower-volume door fans.

The excess heat from the back channel is either dispersed into the control room or it can be directly removed from the building. An optional back-channel cooling duct kit is available to aid in the installation of IP00/Chassis drives into Rittal TS8 enclosures. Back channel cooling is available on all D and E frame size drives.

Small footprint

Throughout the entire power range, all sizes of VLT® HVAC Drives are even smaller than comparable previous drives. No dimension has increased, and volumes are typically 20% smaller.



A smart, dedicated kit allows chassis/IP00 enclosures to be mounted in Rittal cabinets so cool air removes 85% of excess heat without contact with the electronics.

Packaged Panel Solutions

Flexibility is the key to Danfoss packaged drive solutions. From our unique feature-rich standard packages to our Engineered Drive Systems, Danfoss supplies the package to meet the application. Our packaged solutions are all manufactured in our own UL-certified facilities, without outsourcing, and supported by the same stringent manufacturing standards and warranties as VLT Series drive products. Being your single source supplier of both VFDs and packaged solutions is just one more way that Danfoss reduces your total cost of ownership.

Danfoss packaged panel solutions are built in Milwaukee, Wisconsin.

Typical Package Options

- Two-contactor bypass
- Three-contactor bypass
- Contactor motor selection
- Multiple motor operation
- Main input disconnect
- Main input fusing
- Drive fusing
- Input AC line reactors
- Output dV/dt filters
- 100,000 amp short circuit current rated package
- Common start/stop
- Control switches
- Indicator lights
- Meters
- System communications
- Auxiliary enclosure for customer-supplied equipment
- Multiple drives in a single enclosure
- NEMA/UL Type 1, 12, 3R, or 4X to meet customer requirements

Packaged Panel Solutions

Integrated Disconnect Package

- Why supply separate drives and disconnects when you can get them in the smallest, easiest package possible?
- Reduced installation cost & time
- Can be ordered with or without drive input fusing

Engineered Drive Systems

Custom enclosures, soft start bypass panel, custom wiring and pilot devices, or NEMA/UL Type 4 and 4X panels. You name the package and we can engineer and build the unit in our in-house UL panel shop.

Enhanced Packages

VLT HVAC Drives through 75 HP at 460 or 600 volts and 30 HP at 208 or 230 volts may also be supplied with a UL-listed Type 3R enclosure suitable for outdoor use. These weather-resistant enclosures allow the versatile VLT HVAC Drive to be located with all of its options on a rooftop or other outdoor location.

Enclosure fans help keep the drive within its temperature limits in high ambient temperatures, and a thermostatically controlled heater helps prevent condensation in cool, damp environments.

NEMA Type 3R enclosures are available for locations exposed to weather.

Panel solution products are packaged according to the functional requirements of the system, commonly referred to as Tier 1, 2 and 3 . Examples of Tier 1, 2 and 3 enclosure are shown below.

***Tier 1**: Drive or drive with fuse and/or disconnect*

***Tier 2**: Drive with bypass or non-bypass drive with input AC line reactor, output LC filter and/or contactor motor selection*

***Tier 3**: Drive with bypass and input AC line reactor, output LC filter and/or contactor motor selection.*

Electronically Controlled Bypass (ECB)

Danfoss ECB is Electronically Controlled Bypass done right. With the highest level of performance and protection, and the easiest operator interface on the market, our ECB offers the best solution for even the most critical of applications.

Enhanced Performance and Protection

Motor Protection

- Phase loss / imbalance protection
- Overload motor protection in bypass
- Overload reset from drive keypad, drive digital input or over BAS

24 VDC Switch Mode Power Supply

- Operates off of any two of the three input phases
- Continued drive operation at a reduced load when any input phase is lost
- Eliminates contactor dropout on voltage conditions as low as 70% of nominal voltage
- Separate power source for drive logic
- Eliminates the need for an undevoltage relay

Additional Protection Features

- Drive input fuses supplied with every panel
- Bypass run-time hour meter
- Password protection prevents unauthorized bypass operation
- Manual bypass initiation override ensures operation
- Bypass control through the drive Smart Logic Controller and Real-Time clock
- Bypass fault logging and time stamping

Bypass-specific keypad provides one-touch access to bypass operation

Electro-Mechanical Bypass (EMB)

For users who prefer the traditional bypass control methods of relay logic and selector switches.

Door Mounted Operators

- Drive-Off-Bypass selector
- Bypass pilot light indication
- Test selection added with three contactor bypass units

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- Eliminates the need for an undevoltage relay

Traditional Doesn't Have to be Featureless

- The same flexible power configurations as the ECB
- Common start/stop available
- Run permissive available
- Basic Firefighter's Override available, which runs the motor in bypass, ignoring stop commands
- Automatic bypass with adjustable time delay is available
- Class 20 overload