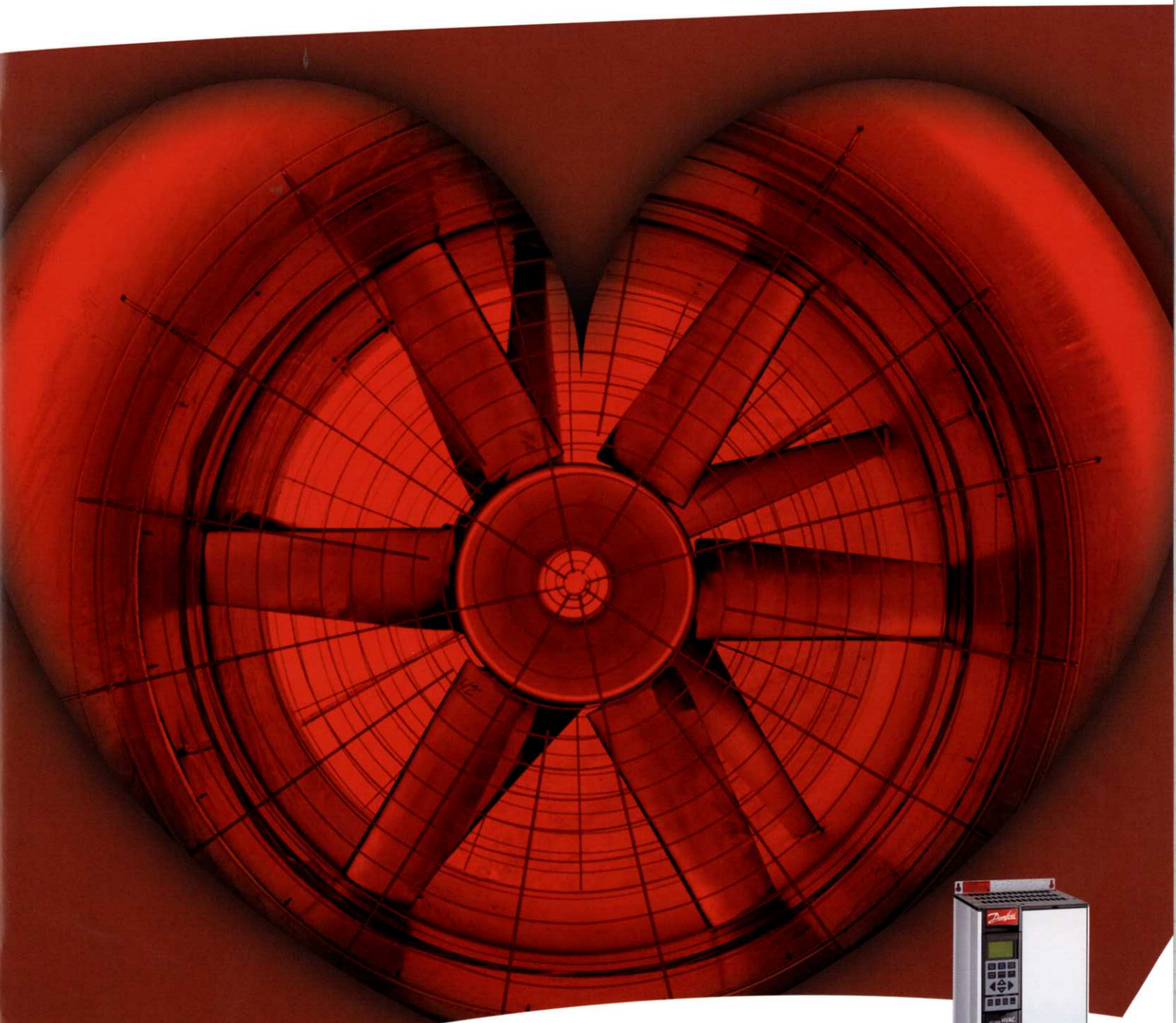
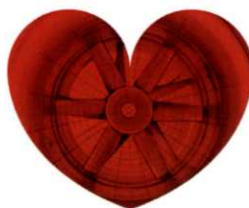


*Danfoss*



Dedicated to your business  
VLT® HVAC Drives





*Ministre de Finances, France*



*City Place, Hong Kong*



*Omega Building, Offenbach, Germany*

# Effective HVAC Solutions

From the world's leading supplier of HVAC drives

## Drives know-how

Nobody knows more about HVAC drives than Danfoss. HVAC is the heart of our company, and our global sales organisation is always ready to serve you, backed by 24-hour technical support.

## HVAC know-how

The Danfoss global HVAC team also commands unsurpassed knowledge of your business. Not only do we supply dedicated products, we also provide advice and assistance in fully integrating these products into your system.

## Market leading product

The Danfoss VLT® 6000 HVAC is the flagship product in our range, providing unsurpassed performance, energy savings, dedicated functionality and communication protocols for interfacing with building management systems.

## Local service – worldwide

The high reliability of Danfoss drives means minimal downtime. However, knowing the importance of continuous operation, Danfoss has established a worldwide service organization to meet your needs at only a moment's notice.

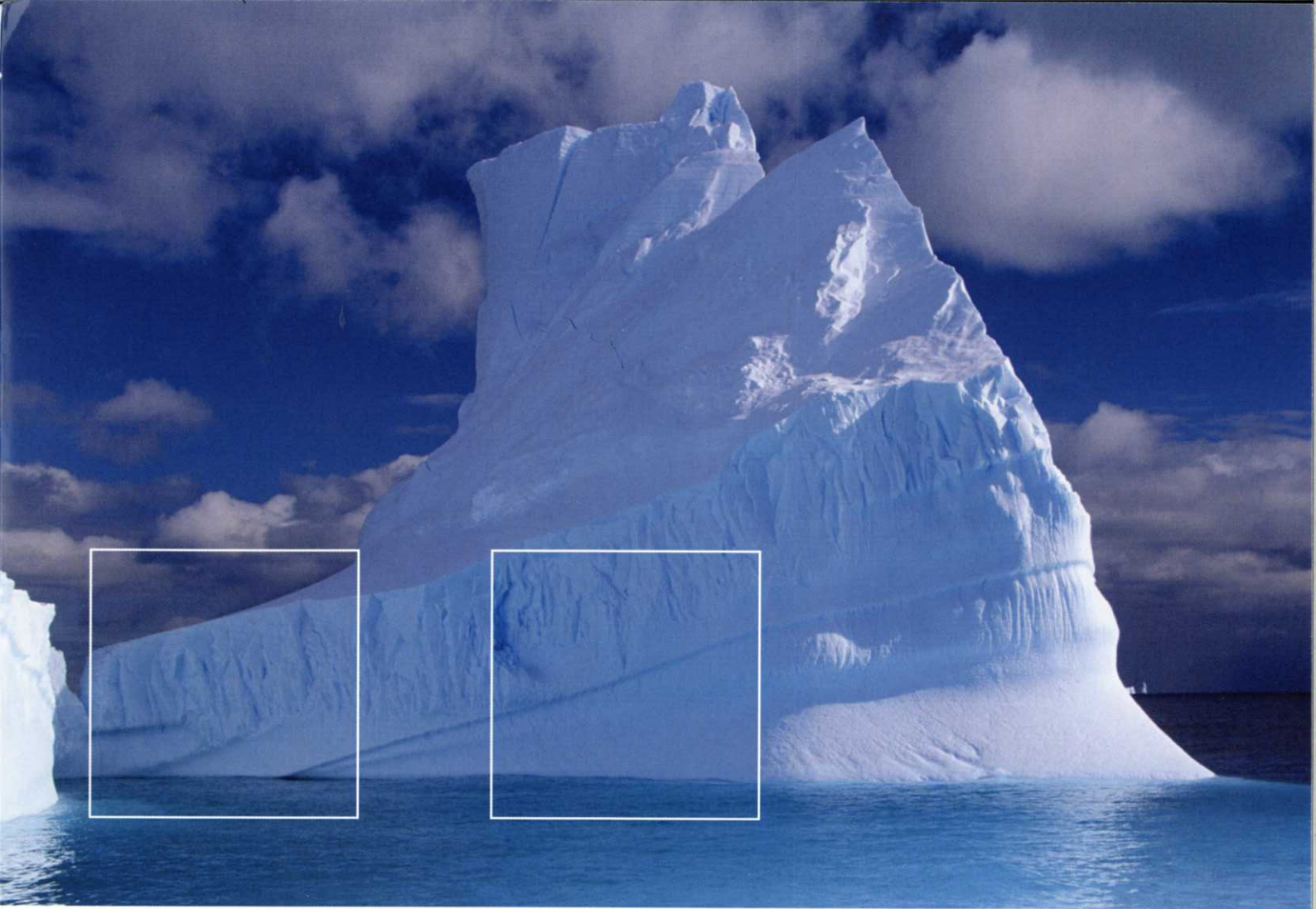
## All over the world

Danfoss' knowledge of HVAC applications and expertise in drives are available throughout the world from experienced staff stationed in branch offices and authorized service companies.

## Local contact – worldwide

All customers receive first-rate service directly from a local Danfoss representative. This efficient service and communication is provided by people who understand the drives, applications and equipment, as well as the local language, culture and business.





# The true potential

lies beneath the surface

On the surface, a drive is often viewed in isolation as a pure capital expenditure item. However, optimum cost efficiency is realised when the drive has been fully integrated into the system. Danfoss' HVAC expertise can help you configure and install the drive as a fully integrated system component, identifying real-time installation savings in the system that can virtually offset the initial capital cost of the drive. Below the surface, we are able to

maximize the "real" savings, delivering the best return on investment, providing optimum performance and environmental conditions through our extensive experience in integrating Danfoss technology into your new or existing applications. How do we do this? We combine HVAC-designed product functionality, application knowledge and integration expertise, thus delivering lower system costs and optimum energy savings.

Dedicated to your business  
VLT® HVAC Drives



# How we have dedicated the VLT® 6000 series to HVAC

## 1 Frequency bypass

The fan motor in the cooling tower steps over speeds that cause mechanical vibration in the tower, preventing potential damage to mechanical components in the system.

## 2 Minimum frequency

A minimum output frequency ensures sufficient fan-speed operation for the adequate lubrication of the tower fan gearbox.

## 3 De-icing

Under severe winter weather conditions, it may be necessary to reverse the cooling tower fan to remove accumulated ice from the intake louvers. The VLT® drive can reverse airflow direction for timed durations to prevent ice accumulation on both the intake louvers and the exhaust fan blades.

## 4 Sleep mode

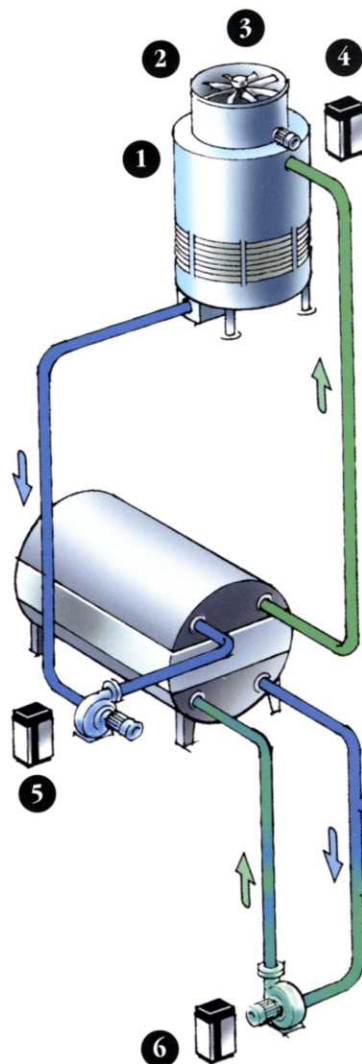
The VLT® drive automatically stops the cooling tower fan when the basin water temperature remains at a low level for a pre-determined amount of time.

## 5 Automatic Energy Optimization (AEO)

The drive continuously monitors the relationship between voltage and current in the motor and adjusts the output voltage to minimize current and maximize motor and drive efficiency.

## 6 Motor preheat

To extend the life of a motor in a damp environment, a small amount of current can be trickled into the motor to protect it from condensation and the effects of a cold start.



## 7 Automatic Switching Frequency Modulation (ASFM)

There is no need to derate the drive output at high load. ASFM adjusts the switching frequency based on motor current demand, rather than motor speed. This ensures that the best possible switching frequency is provided, matching both performance and noise control.

## 8 High and low feedback warning

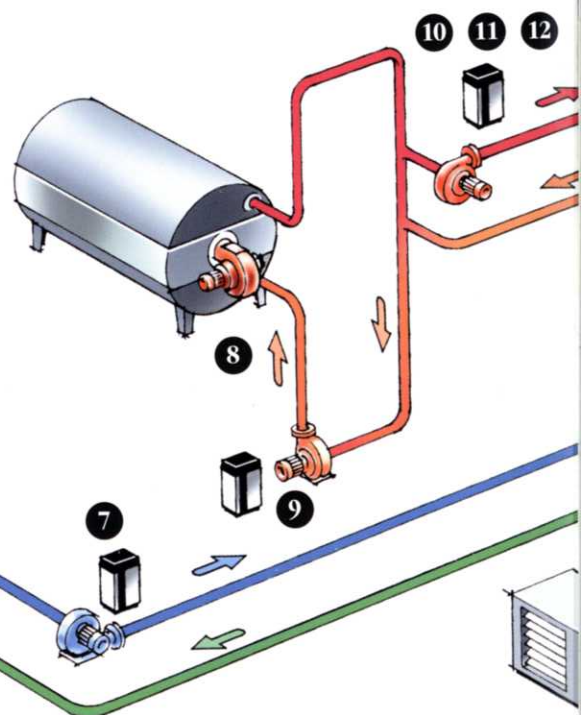
A selected high and low hot water differential pressure feedback signal monitored by the VLT® drive can indicate system problems prior to the boiler tripping off.

## 9 Metering

The local control panel of the drive can be used to display up to four parameters, including kWh, hours run, motor thermal load, or up to 28 user defined parameters such as m<sup>3</sup>/h.

## 10 Single input PID controller

A built-in controller operates independently and eliminates the need for a building-automation system to maintain constant flow in systems. A signal from a temperature or flow transmitter connected to the drive is all that is required.



## 11 Two set-point PID controller

An integral PID controller maintains the desired flow conditions in the system. The drive accepts two feedback signals and two set-points, making two-zone control available for system performance optimization.

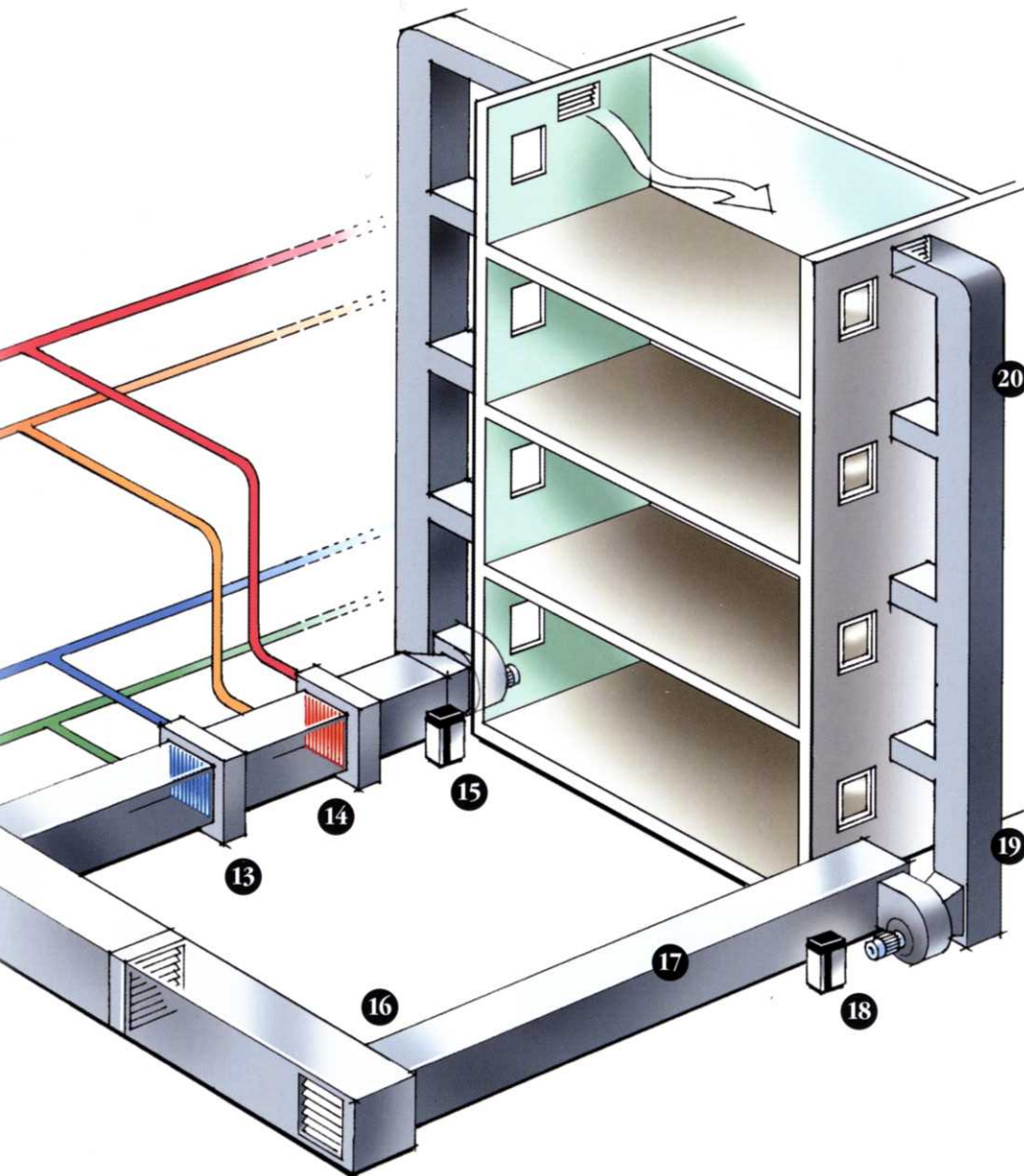
## 12 High and low frequency warning

Useful in staging on or off additional equipment, such as pumps or fans when the motor speed is either too high or too low. A specific frequency can be set for warning and to stage external devices on or off.



### 13 Stand-alone operation

The PID controller provides variable air volume features without dependence on a building-automation system. This eliminates the need for additional direct digital control and I/O modules.



### 14 Minimum speed control

Under minimal loads, this feature provides the required minimum air changes in a zone to ensure adequate air quality. Under increased zone loads, such as with occupancy, the fan speed increases to maintain the desired environmental conditions.

### 15 Automatic restart

Automatic power-up after a trip-out enhances automated operation for remotely controlled systems.

### 16 Run permissive

A "system ready" signal prior to operation prevents the drive from starting and ensures that dampers or other system equipment are in the proper state before starting the motor. This feature reduces the number of I/O points and installation costs.

### 20 Fireman's override

Primarily used for fire safety applications, the drive can override fan operation to provide a life-safety application, such as building pressurisation or a smoke-purge operation.

### 19 Broken belt detection

The drive monitors the V-belt on a fan or pump and gives a warning when a malfunction such as a broken belt occurs.

### 18 Motor soft start

Smooth acceleration of the pump reduces noise, peak current, thermal motor load, and mechanical stress to the hot water pump system caused by water hammer. In addition, smooth acceleration extends motor life.

### 17 Two input PID controller

The PID controller offers unequalled flexibility. For IGV retrofitting, two static pressure transmitters can be used to control supply fan capacity. One controls the fan-motor speed based on actual static pressure. The second functions as a discharge operating with a high limit to prevent damage to the ductwork. Manual resetting of the duct sensor is eliminated. The controller also adjusts return fan speed by measuring the supply and return static pressure to maintain a differential that ensures a balanced system.

Dedicated to your business  
VLT® HVAC Drives





IP20 Panel Mount  
VLT® 6000 HVAC

IP54 Wall Mount  
VLT® 6000 HVAC



VLT® 2800



VLT® DriveMotor  
FCM 300

## The dedicated drive

— all you need is built right in

Features for providing precise and accurate control are standard in the VLT® 6000 HVAC drive

### Integration

- Built in RFI filters protected to 1st environment and EN55011 to 1A with 150m of motor cable and 1B with 50m of cable
- Built-in DC link coils – reduced harmonic distortion
- Full IP54 enclosure – fully protected field mounting unit
- Two input PID controls – two feedback lines for two-zone control
- Serial communication – RS485 FC Protocol, Metasys N2, FLN Apochee, Lon Works, Modbus RTU, Profibus, BACnet® and Devicenet

### Energy saving

- Automatic Energy Optimisation (AEO) – reduces energy consumption for lightly loaded motors
- Automatic Motor Adaptation (AMA) – optimises motor performance

- Sleep mode – the motor is stopped and restarted in variable load conditions
- Temperature-dependent fan – fan operates when required, extending the life of the fan and drive

### Protection

- Unlimited switching on the output of the drive – allows isolation of motor from drive
- Earth and short circuit – full fault protection
- Skip frequencies – avoids resonance in the system

### Reliable

- High-ambient operation – can tolerate warm environments
- Auto-derating – protects the drive from overheating
- Auto-ramping – prevents the drive from tripping when decelerating
- Automatic restart – Auto-reset after trip

### User friendly

- Local control panel – clear text display readout
- Quick set-up menu – accesses most common settings
- Hand-Off-Auto function – fast and easy commissioning

### Harmonic filters

VLT® drives have built-in DC link chokes to minimise harmonic distortion of the mains supply. Further harmonic reduction is possible using Danfoss harmonic filters as stand-alone options. These offer a total harmonic distortion of either 10% or 5%.

### Set-up software

HVAC installations are easily set up using VLT® Motion Control Tool software (MCT10). Danfoss Drives provide a range of PC programs for facilitating set-up, commissioning and monitoring drives. The MCT 10 software is used to copy and manage documents, compare previous and present drive settings, print and display data.





|                                |  |  |  |
|--------------------------------|--|--|--|
| Type                           | VLT® 2800  | VLT® 6000  | FCM 300  |
| Power range/Voltage range      | 0.37-1.5 kW/1x200-240 V<br>0.37-4 kW/3x200-240 V<br>0.75-18.5 kW/3x380-480 V   | 1.1-45 kW/ 3x200-230 V<br>1.1-400 kW/3x380-460 V   | 0.55-7.5 kW/3x380-480 V  |
| Enclosure                      | IP20<br><br><b>Optional:</b><br>IP21/NEMA1   | Chassis, IP20,<br>IP54<br><b>Optional:</b><br>IP21/NEMA1   | IP55<br><br><b>Optional:</b><br>IP56, IP66   |
| RFI filter                     | <b>Optional:</b><br>Class A1 (integrated)<br>Class B1 (with external module;<br>integrated in 11-18.5 kW)                | Class B1 with 50 m of cable<br><br>Class A1 with 150m of cable   | Class A grp. 1 (integrated)<br><b>Optional:</b><br>Class B grp. 1 (integrated)                               |
| Filter for harmonic distortion | Built-in DC coils<br><b>Optional:</b><br>Harmonic Filters 10 or 5% THD   | Built-in DC coils<br><b>Optional:</b><br>Harmonic Filters 10 or 5% THD   | Built-in DC coils<br><b>Optional:</b><br>Harmonic Filters 10 or 5% THD                                       |
| Display/local control          | Numeric LED/local control (integrated)<br><b>Optional:</b><br>Alphanumeric LCD/local control<br>(connectable)            | <b>Optional:</b><br>Alphanumeric LCD/local control<br>(attachable)   | <b>Optional:</b><br>Alphanumeric LCD/local control<br>(connectable) and local operation<br>pad (connectable) |
| Control inputs                 | Analogue inputs: 2<br>Digital inputs: 5  | Analogue inputs: 3<br>Digital inputs: 8  | Analogue inputs: 2 (1)<br>Digital inputs: 3 (4)  |
| Signal outputs                 | Analogue outputs: 1<br>Digital outputs: 1<br>Relay outputs: 1  | Analogue outputs: 2 (0)<br>Digital outputs: 0 (2)<br>Relay outputs: 2  | Digital outputs: 1 or<br>(Analogue outputs: 1)   |
| Serial communication           | RS485 Port as standard, FC protocol<br>or Metasys<br><b>Optional:</b><br>Profibus, Devicenet (integrated),<br>Modbus RTU | RS485, Metasys N2, FLN as standard<br><b>Optional:</b><br>Profibus, LonWorks (built-in cards),<br>Modbus RTU, BACnet®, Devicenet | RS485 Port as standard<br><br><b>Optional:</b><br>Profibus (integrated)                                      |
| Application adaptation         |  | <b>Optional:</b><br>Relay Card, Cascade Controller<br>(both built-in cards)  |  |





# Ongoing excellence

Constant effort to improve

Having committed ourselves to responsible HVAC control and management, our range of Danfoss VLT® drives for HVAC applications is comprehensive and able to meet any requirements. VLT® drives, cascade controllers and specialized features are all central to this task – and all products are available in a broad range of motor outputs and supply voltages. We naturally also offer first-rate global service, technical assistance and professional training to go with our products.

The focus is clear at Danfoss Motion Controls: as a leading supplier of motion control solutions to HVAC markets throughout the world, we have spent years accumulating our technical and application know-how. Today, a long list of references leaves no doubt that the Danfoss name is widely accepted as being synonymous with first-rate quality and operational security. This is what a constant effort to improve means to us.

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