# Danfoss Graham VLT® 6000

The VLT® 6000 Series of adjustable frequency drives is specially designed for the unique requirements of HVAC applications. Standard features include PID control, DC link reactor for harmonics control, and energy optimizing capabilities. Low motor noise and high efficiency are also inherent in the VLT® 6000. Danfoss Graham, the specialist in applying AC drives to HVAC applications, supplies pre-engineered bypass panels and other controls as required.

## PERFORMANCE RANGES

208 V – 1 to 60 HP
460 V – 1 to 600 HP
575 V – 2 to 60 HP

## ENCLOSURES

Drive Enclosures – NEMA 1 all drive voltages, NEMA 12 all drive voltages except 575

Drive and Option Enclosures – NEMA 1, NEMA 3R, NEMA 12

## EASE OF USE

**Customized Setup** – All drives ship with customer's specific application pre-programmed. After input of motor nameplate data, drive is ready for service.

**VLT 6000 Keypad** – All drives operate identically. All keypads are identical and interchangeable. Parameters from one drive can be downloaded to others. Remote mounting available.

- Displays four independent meters simultaneously. User can see at a glance drive frequency, current, output kW, and output kW-h or any four of twenty-five possible displays.
- Display can show one of many process variables, including %, °F, °C, Pa, bar, RPM, in. wg., gal/s, gal/min, gal/hr, $ft^3$/sec, $ft^3$/min, $ft^3$/hr, lb/$in^2$ and others.

## DEPTH OF FEATURES

**Built-in Two Setpoint PID Controller** – No need to supply a separate set point or PID controller.

**Automatic Energy Optimization (AEO)** – There is no need to select a V/Hz curve because the drive constantly adjusts the voltage applied to the motor to optimize energy savings even under changing speed and load conditions. Automatically compensates for oversized motors or systems that are not fully loaded.

**Automatic Motor Adaptation (AMA)** – Drive measures motor's stator resistance and reactance, and uses this information to optimize performance and efficiency. Motor does not have to be run and load does not have to be disconnected for AMA test to be performed.

**Automatic Switching Frequency Modulation (ASFM)** – Provides quiet motor operation at critical low flow conditions and full output without derate at high load.

**Exclusive Digital Voltage Vector Control** – Provides nearly perfect output current sine wave. Full rated motor voltage at rated frequency. High efficiency for both drive and motor. Full motor performance at maximum speed without derate or additional motor heating.

**Drive will Monitor:**

- Output current on all three phases.
- For loss of control signal.
- For loss of load or broken belt.
- For output short circuit.
- For low or missing input phase.
- Electronic $I^2t$ Class 20 motor overload.
- For line undervoltage and overvoltage, DC bus undervoltage and overvoltage, output overcurrent.

## COMMUNICATIONS

**RS-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 N2 and FLN Communication** – Fully equipped for communicating with Johnson Controls N2 and Siemens FLN protocols.

**PC Communication** – Exclusive VLT® Software Dialog allows direct communication with up to 99 VLT drives. All parameters can be audited, set, saved to disk and printed out. Desired configurations can be uploaded from drive to computer and downloaded to other drives. Drive performance can be logged for analysis.

## OPTIONS

**Bypass, Disconnect, Fuses, Circuit Breakers** – All option panels assembled at the factory. UL panel shop. All drives and panels are built in ISO 9001 certified facilities.

**Integrated Bypass** – Vertical bypass configuration that economizes space in crowded installations.

**EMI, RFI Filters, Input AC Line Reactors** – Built-in DC link reactors can be supplemented with optional harmonic protection.

**Communication Options** – LonWorks and Modbus communications cards.

**Cascade Controller Card** – Allows staging of up to four additional motors or drives.

## SPECIFICATIONS

| | |
|---|---|
| Input Voltages | 200 - 240; 380 - 460; 575 V AC |
| Motor Voltages | 200, 208, 220, 230, 240; or 380, 400, 415, 440, 460; or 575 |
| Input Voltage Range for Full Output | Nominal ±10% |
| Undervoltage Trip Point | 164, 313 or 450 V AC |
| Overvoltage Trip Point | 299, 538 or 707 V AC |
| Input Frequency | 50 or 60 Hz, ± 2 Hz |
| Output Frequency | Selectable 0 to 120 Hz |
| Drive Efficiency | 97% or greater at full load and nominal motor speed |
| Displacement Power Factor | 0.98 or greater at all speeds and loads |
| Follower Signal | 0 to 5 V DC, 0 to 10 V DC, 0 to 20 mA, 4 to 20 mA, direct and inverse acting |
| Lost Analog Reference Action | Selectable to go to a preset speed, go to maximum speed, stay at last speed, stop, turn off, or stop and trip |
| Time Delay for Lost Analog Reference Action | 1 to 99 sec. |
| Output Current Limit Setting | Adjustable to 110% of drive rating |
| Current Limit Timer | 0 to 60 sec. or infinite |
| Adjustable Maximum Speed | From minimum speed setting to 120 Hz |
| Adjustable Minimum Speed | From maximum speed setting to 0 Hz |
| Adjustable Acceleration Time | To 3,600 sec. to base speed |
| Adjustable Deceleration Time | To 3,600 sec. from base speed |
| Adjustable Auto Restart Time Delay | 0 to 600 sec. |
| Breakaway Torque Time (1.6 times motor nameplate current) | 0.0 to 0.5 sec. |
| Maximum Number of Preset Speeds | 16 |
| Maximum Number of Frequency Stepovers | 4 |
| Maximum Number of Accel/Decel Rates | 4 |
| Number of Programmable Digital Inputs | 8 |
| Number of Programmable Analog Inputs | Three - 2 voltage, 1 current |
| Number of Programmable Analog Outputs | Two |
| Number of Programmable Relay Outputs | Two - 1 standard Form A 30 V AC, 1 A, 1 standard Form C 240 V AC, 2 A, One or four additional optional |
| Low Frequency and High Frequency Warnings | 0 to 120 Hz |
| Low Current and High Current Warnings | 0 to maximum current |
| Low Reference and High Reference Warnings | -999,999 to 999,999 |
| Low Feedback and High Feedback Warnings | -999,999 to 999,999 |
| Start Voltage | 0 to 10% |
| Delayed Start | 0 to 120 sec. |
| DC Braking Time | 0 to 60 sec. |
| DC Braking Start | 0 to maximum frequency |
| DC Braking Current | 0 to 50% of rated motor current |
| Automatic Restart Attempts | 0 to 20 |
| Automatic Restart Time Delay | 0 to 600 sec. between each attempt |
| Relay ON Delay and Relay OFF Delay | 0 to 600 sec. |
| Display Languages | English, Spanish, French, German, Italian, Portuguese, Swedish, Dutch, Danish |
| Ambient Operating Temperature Range | 14°F to 104°F (-10°C to 40°C) |
| Humidity | <95%, non-condensing |
| Maximum Elevation without Derate | 3,300 ft. (1000 m) |

Specifications are subject to change without notice. VLT is a registered trademark.


**Danfoss Graham**
Division of Danfoss Inc.

8800 W. Bradley Road
P.O. Box 245041
Milwaukee, WI 53224
Phone: (414) 355-8800 Fax: (414) 355-6117
Toll Free: (800) 621-8806
E-Mail: graham@grahamdrives.com Website:



VLT® 6000 SS
9/00