



Danfoss Drives
VLT® Product Catalogue



The leading provider of Drives

Two thousand employees headed from Graasten in Denmark develop, manufacture, sell and service electronic motor controls in more than one hundred countries.

Manufacturing takes place in USA – Especially the high power products –and in Asia, but the major production takes place in the plants in Graasten, Denmark, where half of the staff are employed. Danfoss Bauer geared motors are manufactured in Esslingen, Germany.

The success of Danfoss is due to the strong combination of technology and application knowledge throughout the world combined with a highly sophisticated set-up of product development, supply chain, logistics and on-site presence anywhere on the globe.

Our customers are closely involved during every stage of design and development, specifying their needs in terms of features and user interface. Danfoss Drives dedicates itself to every step in every process until the customer has the drive in hand.

The developers at Danfoss Drives have fully adopted modular principles in development as well as design, production and configuration. Each function is developed in parallel on dedicated technology platforms and interfaces between the elements are carefully defined. This allows development to take place for each element in parallel, reducing time to market and ensuring that customers always enjoy the benefits of recently developed features.

This unique modular concept is also the basis for a highly automated quality manufacturing process, where Danfoss Drives takes responsibility for every element – starting with the essential semiconductor power modules. Power Modules are produced in Danfoss Silicon Power in Schleswig, Germany. High quality standards and efficient manufacturing facilities makes Danfoss Silicon Power modules in great demand within industries that provide highly automated power-applications like the automotive sector.

When it comes to quality, delivery and cooperation, Danfoss makes high demands on their suppliers – both from inside and outside of the group.

Due to an unsurpassed level of automation Danfoss can produce a customer configured drive from 1.6 million possible configurations in a manufacturing time of two hours. The unique string type code that fully defines the drive can easily be obtained throughout the world by use of the internet; it determines the configuration of all elements of the drive, both electronics and hardware. Once this unique configuration is passed to the production departments the manufacturing process can begin. Testing is carried out at all stages of the process and begins with optical checks of the PCBs to ensure that components are inserted correctly. Once the PCBs are fully assembled they all must pass an automatic in-circuit test. After assembly is complete all drives are fully tested on motor loads.

During the drives manufacturing cycle the correct manual is being printed and made available for packing. By the use of this process we ensure that not only the correct language but the very latest version of the manual is always produced and shipped with the correct drive. Just in time delivery is a reality.

Once the drive is shipped, one of more than 60 local Danfoss sales companies can ensure that the drive is correctly installed and commissioned. Once the equipment is commissioned, the level of service the customer requires can be defined in an agreement with the customer according to his specific needs. At every step of the way, from development of new technologies and features, the mass production of highly customised products, to installation and service, Danfoss Drives has only the customer in mind.



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VLT® series high power drives reduce energy usage in driven equipment. High efficiency of the VLT® series also drives down energy costs in cooling requirements.

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The VLT® AutomationDrive represents a single drive concept to control the entire range of operations from standard to servo on any machine or production line.

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VLT® 5000

The perfect match for an abundance of industrial applications.

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The VLT® FCM 300 Series is a very compact alternative to the traditional solution with a VLT® frequency converter and motor as separate units.

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VLT® Soft Starter MCD 100

The VLT® Soft Starter MCD 100 provides soft start features for low power applications 1.1 – 11 kW.

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VLT® HVAC Drive

The VLT® HVAC Drive integrates and communicates seamlessly with all HVAC devices, mastered by Building Management Systems or as stand-alone unit.

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VLT® Compact Starter MCD 200

The MCD 200 is a compact and cost effective soft starter range for applications where direct-on-line starting is undesirable. MCD 200 is due to its size and functionality a good alternative to other reduced voltage starting methods such as start/delta starters.

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VLT® 6000 HVAC

The VLT® 6000 HVAC is fully dedicated to the optimum operation of HVAC applications. It offers energy savings and user-friendliness, and all functions are built in.

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VLT® Soft Starter MCD 3000

The MCD 3000 is a total motor starter providing all the best in soft starter functionality. It offers high end functionality whether it is for starting, stopping or protection of motor or application.

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VLT® AQUA Drive

VLT® AQUA Drive the perfect match for pumps and blowers in modern water and wastewater systems.

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VLT® Harmonic Filter AHF 005/010

Connecting the AHF 005/010 harmonic filter in front of a Danfoss frequency converter is an easy and effective way to reduce harmonic distortion.

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VLT® Micro Drive



The VLT® Micro Drive is a general purpose drive that can control AC motors up to 7.5 kW. It's a small drive with maximum strength and reliability.

RoHS compliant

The VLT® Micro Drive is manufactured with respect for the environment, and it complies with the RoHS Directive.

The perfect match for:

- Industrial appliances
- HVAC applications
- OEM

Power range:

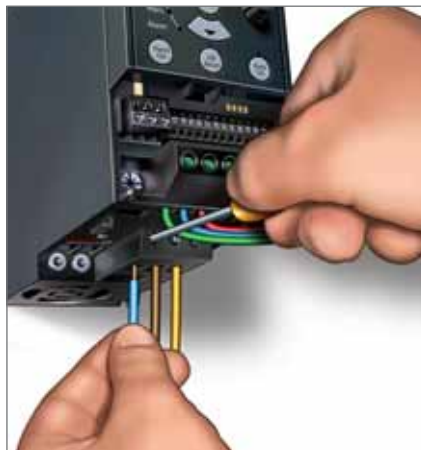
1 phase 200–240 V AC 0.18–2.2 kW
3 phase 200–240 V AC 0.25–3.7 kW
3 phase 380–480 V AC 0.37–7.5 kW

Coated PCB standard

For harsh environments.



Mount



Connect



...and the motor is running

Specifications

Mains supply (L1, L2, L3):

Supply voltage 1 x 200–240 V ± 10%, 3 x 200–240 V ± 10%
 3 x 380–480 V ± 10%

Output data (U, V, W):

Output voltage.....0–100% of supply voltage
 Output frequency 0–200 Hz (VVC+ mode), 0–400 Hz (U/f mode)
 Switching on outputUnlimited
 Ramp times..... 0.05–3600 sec

Digital inputs:

Programmable inputs 5
 Logic..... PNP or NPN
 Voltage level..... 0–24 V

Pulse inputs:

Programmable pulse inputs..... 1*
 Voltage level..... 0–24 V DC (PNP positive logic)
 Pulse input frequency..... 20–5000 Hz

* One of the digital inputs can be used for pulse inputs.

Analog output:

Analog inputs 2
 Modes..... 1 current/1 voltage or current
 Voltage level..... 0–10 V (scaleable)
 Current level..... 0/4–20 mA (scaleable)

Analog output:

Programmable analog outputs 1
 Current range at analog output..... 0/4–20 mA

Relay outputs:

Programmable relay outputs 1 (240 VAC, 2 A)

Approvals:

CE, C-tick, UL

Fieldbus communication:

- FC Protocol
- Modbus RTU

Ordering numbers

Power [kW]	200 V		400 V		
	Current [I-nom.]	1 ph.	3 ph.	Current [I-nom.]	3 ph.
0.18	1.2	132F 0001			
0.25	1.5		132F 0008		
0.37	2.2	132F 0002	132F 0009	1.2	132F 0017
0.75	4.2	132F 0003	132F 0010	2.2	132F 0018
1.5	6.8	132F 0005	132F 0012	3.7	132F 0020
2.2	9.6	132F 0007	132F 0014	5.3	132F 0022
3.0				7.2	132F 0024
3.7	15.2		132F 0016		
4.0	Micro drives from 1.5 kW and up have built in brake chopper			9	132F 0026
5.5				12	132F 0028
7.5				15.5	132F 0030

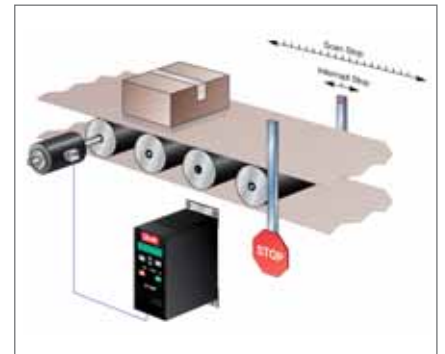
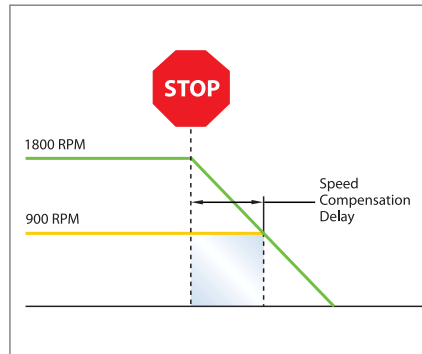
VLT® 2800 Series



The VLT® 2800 series are among the smallest multi purpose drives in the market, designed for space saving side-by-side mounting. Choose to have it with built-in Motor Coils, RFI filter, LC+1B filters e.g.

The VLT® 2800 was designed as an advanced and versatile drive, yet easy to operate. Quick menu Includes all parameters basically needed for commissioning the drive. Offers fast installation and service.

Flexible mounting



Product safety

- 100 % short-circuit proof
- 100 % earth fault protection
- Mains transient protection
- Switching on input
- Switching on output
- Galvanic isolation
- Designed according to EN50178

Precise stop

Conventional units rely on a periodic scan of the Digital Inputs, which initiates the Stop command. This can result in uneven delays while the Drive scans all the other parts of the program taking up to perhaps 10 ms. This is a disadvantage in typical packaging applications. For a conveyor operating at a speed of 1 metre/second, that gives a deviation of ± 10 mm. In the VLT® 2800, the Stop command is an Interrupt rather than part of the scan. The repeating precision is improved. The deviation is only ± 1 mm in the example used above.

Counter Precise Stop

After the start signal is received, the VLT® 2800 operates until the user programmed number of pulses is seen at terminal 33. A Stop signal is generated and the normal stop ramp is used. The counter stop signal is then re-armed and ready again for a new start command. The pulse input is designed to handle 24 V push-pull pulses from an encoder with 1024 ppr. The maximum pulse rate is 67,600 Hz.

Specifications

Mains supply (L1, L2, L3):

Supply voltage:	
VLT 2803-2815 220-240 V (N, L1).....	1 x 220/230/240 V \pm 10%
VLT 2803-2840 200-240 V	3 x 200/208/220/230/240 V \pm 10%
VLT 2805-2882 380-480 V	3 x 380/400/415/440/480 V \pm 10%
Supply frequency	50/60 Hz \pm 3 Hz
Max. imbalance on supply voltage	\pm 2.0% of rated supply voltage
True Power Factor (λ).....	0.90 nominal at rated load
Displacement Power Factor (cos ϕ)	near unity (> 0.98)
Number of connections at supply input L1, L2, L3	2 times/min.
Max. short-circuit value.....	100,000 A

Output data (U, V, W):

Output voltage.....	0 – 100% of supply voltage
Output frequency	0.2 – 132 Hz, 1 – 1000 Hz
Rated motor voltage, 200-240 V units	200/208/220/230/240 V
Rated motor voltage, 380-480 V units	380/400/415/440/460/480 V
Rated motor frequency	50/60 Hz
Switching on output	Unlimited
Ramp times.....	0.02 – 3600 sec.

Torque characteristics:

Starting torque Constant torque).....	160% in 1 min.*
Starting torque (Variable torque)	160% in 1 min.*
Starting torque (parameter 119 High starting torque).....	180% for 0.5 sec.*
Overload torque (Constant torque)	160%*
Overload torque (Variable torque)	160%*

*Percentage relates to frequency converter's nominal current.

Control card, digital inputs:

Number of programmable digital inputs	5
Terminal number	18, 19, 27, 29, 33
Voltage level.....	0 – 24 V DC (PNP positive logic)
Voltage level, logic '0'	< 5 V DC
Voltage level, logic '1'	> 10 V DC
Maximum voltage on input	28 V DC
Input resistance, Ri (terminals 18, 19, 27, 29)	approx. 4 k Ω
Input resistance, Ri (terminal 33)	approx. 2 k Ω

All digital inputs are galvanically isolated from the supply voltage (PELV) and other high-voltage terminals.

Control card, analog inputs:

Number of analog voltage inputs	1
Terminal number	53
Voltage level.....	0 – 10 V DC (scaleable)
Input resistance, Ri	approx. 10 k Ω
Max. voltage	20 V
Number of analog current inputs.....	1
Terminal number	60
Current level.....	0/4 – 20 mA (scaleable)
Input resistance, Ri	approx. 300 Ω
Max. current	30 mA
Resolution for analog inputs	10 bit
Accuracy of analog inputs.....	Max. error 1% of full scale
Scan interval.....	13.3 msec

The analog inputs are galvanically isolated from the supply voltage (PELV) and other high-voltage terminals.

Control card, pulse inputs:

Number of programmable pulse inputs	1
Terminal number	33
Max. frequency at terminal 33	67.6 kHz (Push-pull)
Max. frequency at terminal 33	5 kHz (open collector)
Min. frequency at terminal 33	4 Hz
Voltage level	0 – 24 V DC (PNP positive logic)
Voltage level, logic '0'	< 5 V DC
Voltage level, logic '1'	> 10 V DC
Maximum voltage on input.....	28 V DC
Input resistance, Ri.....	approx. 2 k Ω
Scan interval.....	13.3 msec
Resolution	10 bit
Accuracy (100 Hz – 1 kHz) terminal 33	Max. error: 0.5% of full scale
Accuracy (1 kHz – 67.6 kHz) terminal 33	Max. error: 0.1% of full scale

The pulse input (terminal 33) is galvanically isolated from the supply voltage (PELV) and other high-voltage terminals.

Control card, digital/frequency output:

Number of programmable digital/pulse outputs	1 pcs.
Terminal number	46
Voltage level at digital/frequency output	0 – 24 V DC (O.C PNP)
Max. output current at digital/frequency output.....	25 mA
Max. load at digital/frequency output.....	1 k Ω
Max. capacity at frequency output.....	10 nF
Minimum output frequency at frequency output	16 Hz
Maximum output frequency at frequency output.....	10 kHz
Accuracy on frequency output.....	Max. error: 0.2% of full scale
Resolution on frequency output	10 bit

The digital output is galvanically isolated from the supply voltage (PELV) and other high-voltage terminals.

Control card, analog output:

Number of programmable analog outputs	1
Terminal number	42
Current range at analog output.....	0/4 – 20 mA
Max. load to common at analog output	500 Ω
Accuracy on analog output.....	Max. error: 1.5% of full scale
Resolution on analog output.....	10 bit

The analog output is galvanically isolated from the supply voltage (PELV) and other high-voltage terminals.

Control card, 24 V DC output:

Terminal number	12
Max. load	130 mA

The 24 V DC supply is galvanically isolated from the supply voltage (PELV), but has the same potential as the analogue and digital inputs and outputs.

Control card, 10 V DC output:

Terminal number	50
Output voltage.....	10.5 V \pm 0.5 V
Max. load	15 mA

The 10 V DC supply is galvanically isolated from the supply voltage (PELV) and other high-voltage terminals.

Control card, RS 485 serial communication:

Terminal number	68 (TX+, RX+), 69 (TX-, RX-)
Terminal number 67	+ 5 V
Terminal number 70	Common for terminals 67, 68 and 69

Full galvanic isolation.

Relay outputs:

Number of programmable relay outputs	1
Terminal number, control card	1-3 (break), 1-2 (make)
Max. terminal load (AC) on 1-3, 1-2, control card	240 V AC, 2 A
Min. terminal load on 1-3, 1-2, control card 24 V DC	10 mA, 24 V AC 100 mA

The relay contact is separated from the rest of the circuit by strengthened isolation.

Cable lengths and cross sections:

Max. motor cable length:	
Screened/armoured cable	40 m
Unscreened/unarmoured cable.....	75 m
Screened/armoured cable and motor coil.....	100 m
Unscreened/unarmoured cable and motor coil	200 m
Screened/armoured cable and RFI/1B filter	200 V, 100 m
Screened/armoured cable and RFI/1B or RFI 1B/LC filter	400 V, 25 m
Max. cross section to control wires,	
rigid wire	1.5 mm ² /16 AWG (2 x 0.75 mm ²)
Max. cross section to control cables,	
flexible cable	1 mm ² /18 AWG
Max. cross section to control cables,	
rigid cable with enclosed core.....	0.5 mm ² /20 AWG

When complying with EN 55011 1A and EN 55011 1B the motor cable must in certain instances be reduced.

VLT® AutomationDrive



The VLT® AutomationDrive FC 300 is extremely configurable and runs any motor in any application and any machine for manufacturing.

Specify your requirements and have your drives tailor-made within a couple of hours – for the cost of mass produced stockware.

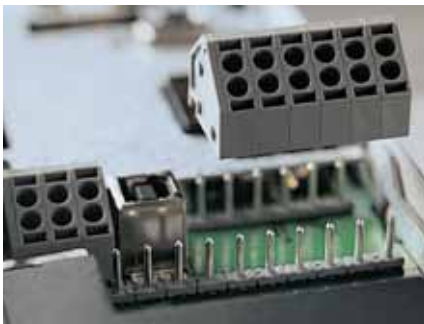
Range:

0.25 – 37 kW (200 – 240 V)
0.75 – 1000 kW (525 – 600 V)
11 – 1000 kW (600 – 690 V)



One-Drive concept

One-Drive concept covering the whole production or machine is a major benefit in commissioning, operating and maintaining the equipment. The make-through modular design makes upgrade easy as well as adaptation of future features. On-board manuals make operation easy and the built in Smart Logic Control allows for basic programming covering many common PLC functions.



Plug and play

You don't have to disconnect wires in the cage clamps to disconnect the VLT® AutomationDrive. Just unplug the cage clamp instead.



Pluggable options

The bus option, as shown above, ready to plug in underneath the front panel. It can be turned upside down if you prefer the cable to enter from the top.



USB pluggable

The VLT® AutomationDrive can be remotely commissioned and monitored through a USB pluggable cable or bus communication. Special software is available: Wizards, Data transfer tool, VLT® Set-up Software MCT 10.



Remote commissioning

Local control of the VLT® AutomationDrive is done by a local control panel. This is plugged in directly or connected through a cable.

Specifications

Mains supply (L1, L2, L3):

Supply voltage	200-240 V ±10%
Supply voltage	FC 301: 380-480 V / FC 302: 380-500 V ±10%
Supply voltage	FC 302: 525-600 V ±10%
Supply frequency	50/60 Hz
Max. imbalance between mains phases	± 3.0% of rated supply voltage
True Power Factor (λ)	0.92 nominal at rated load
Displacement Power Factor (cosφ) near unity	(> 0.98)
Switching on input supply L1, L2, L3 (power-ups)	maximum 2 times/min.
Environment according to EN60664-1 overvoltage category III/pollution degree 2.	

The unit is suitable for use on a circuit capable of delivering not more than 100.000 RMS symmetrical Amperes, 240/500/600 V maximum.

Digital inputs:

Programmable digital inputs	FC 301: 4 (5) / FC 302: 4 (6)
Terminal number	18, 19, 27 ¹⁾ , 29 ¹⁾ , 32, 33, 37 ²⁾
Logic	PNP or NPN ³⁾
Voltage level	0 – 24 V DC
Voltage level, logic '0' PNP	< 5 V DC
Voltage level, logic '1' PNP	> 10 V DC
Voltage level, logic '0' NPN3	> 19 V DC
Voltage level, logic '1' NPN3	< 14 V DC
Maximum voltage on input	28 V DC
Input resistance, Ri	approx. 4 kΩ

All digital inputs are galvanically isolated from the supply voltage (PELV) and other high-voltage terminals.

1) Terminals 27 and 29 can also be programmed as digital outputs.

2) Terminal 37 is only available in FC 302. It can only be used as "safe stop" input.

Terminal 37 is suitable for category 3 installations according to EN 954-1 (safe stop according to category 0 EN 60204-1).

3) Exception: Terminal 37 is fixed PNP logic.

Analogue inputs:

Number of analogue inputs	2
Terminal number	53, 54
Modes	Voltage or current
Mode select	Switch S201 and switch S202
Voltage mode	Switch S201/switch S202 = OFF (U)
Voltage level	FC 301: 0 to + 10 / FC 302: -10 to +10 V (scaleable)
Input resistance, Ri	approx. 10 kΩ
Max. voltage	± 20 V
Current mode	Switch S201/switch S202 = ON (I)
Current level	0/4 to 20 mA (scaleable)
Input resistance, Ri	approx. 200 Ω
Max. current	30 mA
Resolution for analogue inputs	10 bit (+ sign)
Accuracy of analogue inputs	Max. error 0.5% of full scale
Bandwidth	FC 301: 20 Hz / FC 302: 100 Hz

The analogue inputs are galvanically isolated from the supply voltage (PELV) and other high-voltage terminals.

Pulse/encoder inputs:

Programmable pulse/encoder inputs	2/1
Terminal number pulse/encoder	29, 33 ¹⁾ / 18, 32, 33 ²⁾
Max. frequency at terminal 18, 29, 32, 33	110 kHz (Push-pull driven)
Max. frequency at terminal 18, 29, 32, 33	5 kHz (open collector)
Min. frequency at terminal 18, 29, 32, 33	4 Hz
Voltage level	see section on Digital input
Maximum voltage on input	28 V DC
Input resistance, Ri	approx. 4 kΩ
Pulse input accuracy (0.1 – 1 kHz)	Max. error: 0.1% of full scale
Encoder input accuracy (1 – 110 kHz)	Max. error: 0.05% of full scale
	32 (A), 33 (B) and 18 (Z)

The pulse and encoder inputs (terminals 18, 29, 32, 33) are galvanically isolated from the supply voltage (PELV) and other high-voltage terminals.

1) Pulse inputs are 29 and 33

2) Encoder inputs: 18 = Z, 32 = A, and 33 = B

Digital output:

Programmable digital/pulse outputs	2
Terminal number	27, 29 ¹⁾
Voltage level at digital/frequency output	0 – 24 V
Max. load at frequency output	1 kΩ
Max. capacitive load at frequency output	10 nF
Minimum output frequency at frequency output	0 Hz
Maximum output frequency at frequency output	32 kHz
Accuracy of frequency output	Max. error: 0.1 % of full scale
Resolution of frequency outputs	12 bit

1) Terminal 27 and 29 can also be programmed as input.

The digital output is galvanically isolated from the supply voltage (PELV) and other high-voltage terminals.

Relay outputs:

Programmable relay outputs	FC 301: 1 / FC 302: 2
Terminal number, power card	1-3 (break), 1-2 (make), 4-6 (break), 4-5 (make)
Max. terminal load on 1-3 (break), 1-2 (make), 4-6 (break) power card	240 V AC, 2 A
Max. terminal load (AC) on 4-5 (make) power card	400 V AC, 2 A
Min. terminal load on 1-3 (break), 1-2 (make), 4-6 (break), 4-5 (make) power card	24 V DC 10 mA, 24 V AC 100 mA
Environment according to EN 60664-1 overvoltage category III/pollution degree 2.	

The relay contacts are galvanically isolated from the rest of the circuit by reinforced isolation (SELV).

Cable lengths and cross sections:

Max. motor cable length:	
screened/armoured	FC 301: 50 m / FC 302: 150 m
unscreened/unarmoured	FC 301: 75 m / FC 302: 300 m
Max. cross section to motor, mains, load sharing and brake	4 mm ² /10 AWG
Maximum cross section to control wires, rigid wire	1.5 mm ² /16 AWG (2 x 0.75 mm ²)
Maximum cross section to control cables:	
Flexible cable	1 mm ² /18 AWG
Cable with enclosed core	0.5 mm ² /20 AWG
Minimum cross section to control wires	0.25 mm ²

Synchronizing control

The Synchronizing Controller option for VLT® AutomationDrive expands the functional properties of the converter in synchronizing applications.

- Display of actual synchronizing error on control panel.
- Speed synchronizing
- Position (angle) synchronizing with or without marker correction
- On-line adjustable gear ratio
- On-line adjustable position (angle) offset
- Encoder output with virtual master function for synchronization of multiple slaves
- Homing

Positioning control

The Positioning Controller option offers a host of user-friendly benefits based on thought-through and innovative features:

- Direct positioning via Fieldbus
- Relative positioning
- Absolute positioning
- Touch probe positioning
- End limit handling (software and hardware)
- Mechanical brake handling (programmable hold delay)
- Error handling
- Jog speed/manual operation
- Marker related positioning
- Home function

Center Winder with closed-loop tension control

With the closed loop center winder control material is evenly wound up regardless of the production speed.

- Follows line speed
- Diameter calculator adjusts winder reference
- Tension PID adjusts reference

MCB 112 PTC Relay Card

The relay card will stop the motor in case of overheating (signal from sensor) and resume operation when the temperature is normal.

- Protects motor from overheat
- ATEX approved for operation with risk of explosions

Sine-Wave Filters

Sine-wave filters optimize the motor power current providing a sinusoidal phase-to-phase motor voltage. They reduce motor insulation stress, acoustic noise, and bearing currents.

- Reduce motor insulation stress
- Reduce acoustic noise from the motor
- Reduce bearing currents (especially in large motors).

dU/dt Filters

Dv/dt filters eliminate very fast voltage changes (The phase-to-phase voltage still pulse shaped).

- These filters reduce the motor insulations stress and are recommended in applications with older motors, aggressive environments or frequent braking which cause the increase of the DC link voltage.

VLT® 5000 Series



The VLT® Series 5000 available in the power range from 0.75 kW-500 kW suits all industrial applications.

Benefits:

- Saves space and energy – the compact size saves valuable space. The perfect speed matching to actual load reduces your energy costs.
- Easy to commission and use – If you know one drive you also know the others and a Quick Menu guides you easily through the little programming work left for you to make the drive perfect for the job in your plant.
- Multi-Setup – The drive has four independent setups.

- Enclosures IP 20, IP 54, IP 00, Optional coating providing extra protection for aggressive environments. Compliance with international standards.

Built-in RFI filters available for the entire product range complying with EN55011, class 1A and 1B.

Complies also with IEC 61000-3-2 and 61000-3-4 as well as VDE 0160 as regards levels of harmonic suppression. That reduces the dimensions of cables substantially.

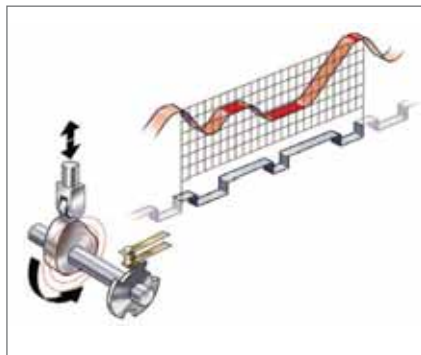
Product range:

200-690 V..... 0.75 kW – 500 kW

Fieldbus options

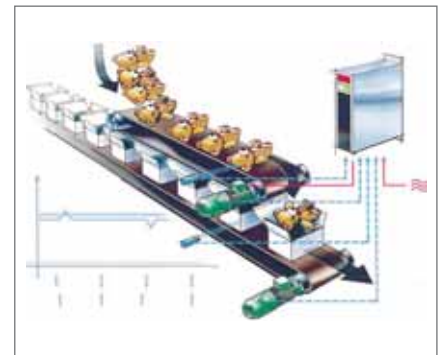
VLT® 5000 have dedicated fieldbus options for:

- Profibus DP V0
- Profibus DP V1
- DeviceNet
- Interbus
- Modbus+
- LonWorks



SyncPos

To complement the comprehensive functionality of VLT® frequency converters Danfoss Drives offers dedicated engineering solutions for your application. Based on the high flexibility of the Programmable SyncPos motion controller we tailor solutions to fit perfectly application requirements.



Marine approvals

- DNV – Det Norske Veritas
- GL – Germanischer Lloyd
- LRS – Lloyds Register of Shipping
- BV – Bureau Veritas
- ABS – American Bureau of Shipping
- RINA – Registro Italiano Navale

Specifications

Mains supply (L1, L2, L3):

Supply voltage:	
200-240 V units.....	3 x 200/208/220/230/240 V \pm 10%
380-500 V units.....	3 x 380/400/415/440/460/500 V \pm 10%
525-600 V units.....	3 x 525/550/575/600 V \pm 10%
Supply frequency:	
Max imbalance of supply voltage:	48-62 Hz +/- 1%
True Power factor (λ)	0.90 nominal at rated load
Displacement Power Factor ($\cos \phi$)	near unity (>0.98)
No. of switchings on supply input L1, L2, L3	approx. 1 time/min.

VLT output data (U, V, W):

Output voltage.....	0-100% of supply voltage
Output frequency.....	0 – 1000 Hz
Rated motor voltage:	
200-240 V units.....	200/208/220/230/240 V
380-500 V units.....	380/400/415/440/460/480/500 V
525-600 V units.....	525/550/575 V
Rated motor frequency	Unlimited
Ramp times.....	0.05-3600 sec.

Control card, digital inputs:

Number of programmable digital inputs	8
Terminal nos.....	16, 17, 18, 19, 27, 29, 32, 33
Voltage level.....	0-24 V DC (PNP positive logics)
Voltage level, logical '0'	< 5 V DC
Voltage level, logical '1'	>10 V DC
Maximum voltage on input	28 V DC
Input resistance, Ri.....	2 k Ω
Scanning time per input.....	3 msec.

Reliable galvanic isolation: All digital inputs are galvanically isolated from the supply voltage (PELV). In addition, the digital inputs can be isolated from the other terminals on the control card by connecting an external 24 V DC supply and opening switch 4. VLT 5001-5250, 525-600 V do not meet PELV.

Control card, analogue inputs:

No. of programmable analogue voltage inputs/thermistor inputs	2
Terminal nos.....	53, 54
Voltage level.....	0 – \pm 10 V DC (scalable)
Input resistance, Ri.....	10 k Ω
No. of programmable analogue current inputs	1
Terminal no.....	60
Current range.....	0/4 – \pm 20 mA (scalable)
Input resistance, Ri.....	200 Ω
Resolution	10 bit + sign
Accuracy on input.....	Max. error 1% of full scale
Scanning time per input.....	3 msec.
Terminal no. ground	55

Reliable galvanic isolation: All analogue inputs are galvanically isolated from the supply voltage (PELV) *as well as other inputs and outputs. * VLT 5001-5250, 525-600 V do not meet PELV.

Control card, pulse/encoder input:

No. of programmable pulse/encoder inputs.....	4
Terminal nos.....	17, 29, 32, 33
Max. frequency on terminal 17	5 kHz
Max. frequency on terminals 29, 32, 33.....	20 kHz (PNP open collector)
Max. frequency on terminals 29, 32, 33.....	65 kHz (Push-pull)
Voltage level.....	0-24 V DC (PNP positive logics)
Voltage level, logical '0'	< 5 V DC
Voltage level, logical '1'	>10 V DC
Maximum voltage on input.....	28 V DC
Input resistance, Ri.....	2 k Ω
Scanning time per input.....	3 msec.
Resolution	10 bit + sign
Accuracy:	
(100-1 kHz), terminals 17, 29, 33	Max. error: 0.5% of full scale
(1-5 kHz), terminal 17	Max. error: 0.1% of full scale
(1-65 kHz), terminals 29, 33.....	Max. error: 0.1% of full scale

Reliable galvanic isolation: All pulse/encoder inputs are galvanically isolated from the supply voltage (PELV)*. In addition, pulse and encoder inputs can be isolated from the other terminals on the control card by connecting an external 24 V DC supply and opening switch 4. * VLT 5001-5250, 525-600 V do not meet PELV.

Control card, digital/pulse and analogue outputs:

No. of programmable digital and analogue outputs	2
Terminal nos.....	42, 45
Voltage level at digital/pulse output.....	0 – 24 V DC
Minimum load to ground (terminal 39) at digital/pulse output	600 Ω
Frequency ranges (digital output used as pulse output)	0-32 kHz
Current range at analogue output.....	0/4 – 20 mA
Maximum load to ground (terminal 39) at analogue output.....	500 Ω
Accuracy of analogue output	Max. error: 1.5% of full scale
Resolution on analogue output.....	8 bit

Reliable galvanic isolation: All digital and analogue outputs are galvanically isolated from the supply voltage (PELV)*, as well as other inputs and outputs. * VLT 5001-5250, 525-600 V do not meet PELV.

Control card, 24 V DC supply:

Terminal nos.....	12, 13
Max. load (short-circuit protection).....	200 mA
Terminal nos. ground	20, 39

Reliable galvanic isolation: The 24 V DC supply is galvanically isolated from the supply voltage (PELV)*, but has the same potential as the analogue outputs. * VLT 5001-5250, 525-600 V do not meet PELV.

Control card, RS 485 serial communication:

Terminal nos.....	68 (TX+, RX+), 69 (TX-, RX-)
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Reliable galvanic isolation: Full galvanic isolation.

Relay outputs:

No. of programmable relay outputs	2
Terminal nos., control card.....	4-5 (make)
Max. terminal load:	
(AC) on 4-5, control card.....	50 V AC, 1 A, 60 VA
(DC) on 4-5, control card.....	75 V DC, 0.1 A, 30 W
(DC) on 4-5, control card for	
UL/cUL applications	30 V AC, 1 A / 42.5 V DC, 1A
Terminal nos., power card	1-3 (break), 1-2 (make)
Max. terminal load (AC) on 1-3, 1-2, power card.....	240 V AC, 2 A, 60 VA
Max. terminal load on 1-3, 1-2, power card	50 V DC, 2 A
Min. terminal load on 1-3, 1-2, power card. 24 V DC	10 mA, 24 V AC 100 mA

Brake resistor terminals (only SB, EB, DE and PB units):

Terminal nos.....	81, 82
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External 24 Volt DC supply:

Terminal nos.....	35, 36
Voltage range	24 V DC \pm 15% (max. 37 V DC for 10 sec.)
Max. voltage ripple	2 V DC
Power consumption.....	15 W – 50 W (50 W for start-up, 20 msec.)
Min. pre-fuse	6 Amp

Reliable galvanic isolation: Full galvanic isolation if the external 24 V DC supply is also of the PELV type.

Cable lengths, cross-sections and connectors:

Max. motor cable length:	
Screened cable	150 m
Unscreened cable.....	300 m
Screened cable VLT 5011 380-500 V	100 m
Screened cable VLT 5011 525-600 V and VLT 5008,	
normal overload mode, 525-600 V	50 m
Max. brake cable length, screened cable.....	20 m
Max. loadsharing cable length,	
screened cable	25 m from frequency converter to DC bar
Max. cable cross-section for 24 V external DC supply -	
VLT 5001-5027 200-240 V; VLT 5001-5102 380-500 V;	
VLT 5001-5062 525-600V	4 mm ² /10 AWG
VLT 5032-5052 200-240 V; VLT 5122-5500 380-500 V;	
VLT 5075-5250 525-600 V.	2.5 mm ² /12 AWG
Max. cross-section for control cables.....	1.5 mm ² /16 AWG
Max. cross-section for serial communication.....	1.5 mm ² /16 AWG

If UL/cUL is to be complied with, cable with temperature class 60/75°C must be used (VLT 5001 - 5062 380 - 500 V, 525 - 600 V and VLT 5001 - 5027 200 - 240V).

If UL/cUL is to be complied with, cable with temperature class 75°C must be used (VLT 5072 - 5500 380 - 500 V, VLT 5032 - 5052 200 - 240 V, VLT 5075 - 5250 525 - 600 V). Connectors are for use of both copper and aluminium cables, unless other is specified.

VLT® 5000 Flux



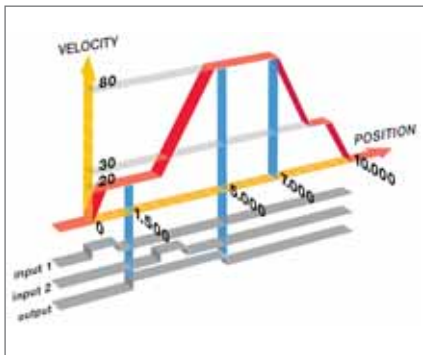
The VLT® 5000 Flux is an extension of the VLT® 5000 series.

Full torque control under acceleration as well as very accurate speed control even at low speed or standstill can be obtained.

Flux control is the future technology for high performance drives. It provides excellent dynamics and accuracy, suited for drives systems with and without feedback.

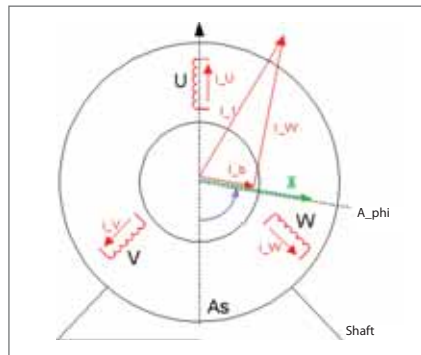
The VLT® 5000 Flux features automatic acquisition of motor equivalent circuit diagram and provides 100% control of flux and torque, taking the system inertia into account.

The VLT® 5000 Flux provides up to 160% torque from 0 to rated speed.



SyncPos

SyncPos makes VLT® 5000 Flux highly programmable and provides synchronising and positioning



Flux principle

The flux principle provides high shaft performance (Torque control about 3 ms), excellent synchronizing also at very low speed. Speed accuracy with open loop: $\pm 0.5\%$ (8 rpm) and with closed loop $\pm 0.001\%$ (0.02 rpm). Flux control provides 180% acceleration torque (0.5 sec), 160% holding torque at 0 RPM for 60 sec (closed loop). The accuracy of torque control is: closed loop $\pm 10\%$.



Plug-in terminals

Plug-in terminals for motor and control cables

Specifications

Mains supply (L1, L2, L3):

Supply voltage 200-240 V units..... 3 x 200/208/220/230/240 V $\pm 10\%$
 Supply voltage 380-500 V units..... 3 x 380/400/415/440/460/500 V $\pm 10\%$
 Supply frequency 48-62 Hz $\pm 1\%$

Max imbalance of supply voltage:

VLT 5001-5011, 380-500 V
 and VLT 5001-5006, 200-240 V $\pm 2.0\%$ of rated supply voltage
 VLT 5016-5062, 380-500 V
 and VLT 5008-5027, 200-240 V $\pm 1.5\%$ of rated supply voltage
 VLT 5072-5500, 380-500 V
 and VLT 5032-5052, 200-240 V $\pm 3.0\%$ of rated supply voltage
 True Power factor (λ) 0.90 nominal at rated load
 Displacement Power Factor ($\cos \phi$) near unity (> 0.98)
 No. of switchings on supply input L1, L2, L3 approx. 1 time/min.

VLT® output data (U, V, W):

Output voltage..... 0-100% of supply voltage
 Output frequency..... 0 – 132 Hz, 0 – 300 Hz
 Rated motor voltage, 200-240 V units 200/208/220/230/240 V
 Rated motor voltage, 380-500 V units 380/400/415/440/460/480/500 V
 Rated motor frequency 50/60 Hz
 Switching on output Unlimited
 Ramp times..... 0.01-3600 sec.

Control card, digital inputs:

Number of programmable digital inputs 8
 Terminal nos 16, 17, 18, 19, 27, 29, 32, 33
 Terminal number for none programmable digital input 37
 Voltage level 0-24 V DC (PNP positive logics)
 Voltage level, logical '0' < 5 V DC
 Voltage level, logical '1' > 10 V DC
 Maximum voltage on input 28 V DC
 Input resistance, Ri(terminal 16, 17, 18, 19, 27, 32, 33) 4 k Ω
 Input resistance, Ri(terminal 29) 2 k Ω
 Scanning time per input 3 msec.

Reliable galvanic isolation: All digital inputs are galvanically isolated from the supply voltage (PELV). In addition, the digital inputs can be isolated from the other terminals on the control card by connecting an external 24 V DC supply and opening switch 4.

Control card, analogue inputs:

No. of programmable analogue voltage inputs/thermistor inputs 2
 Terminal nos 53, 54
 Voltage level 0 – ± 10 V DC (scalable)
 Input resistance, Ri 10 k Ω
 No. of programmable analogue current inputs 1
 Terminal no. 60
 Current range 0/4 – ± 20 mA (scalable)
 Input resistance, Ri 200 Ω
 Resolution 10 bit + sign
 Accuracy on input Max. error 1% of full scale
 Scanning time per input 3 msec.
 Terminal no. ground 55

Reliable galvanic isolation: All analogue inputs are galvanically isolated from the supply voltage (PELV) as well as other inputs and outputs.

Control card, pulse input:

No. of programmable pulse inputs 1
 Terminal no. 29
 Max. frequency on terminal 29 (PNP open collector) 20 kHz
 Max. frequency on terminal 29 (Push-pull) 65 kHz
 Voltage level 0-24 V DC (PNP positive logics)
 Voltage level, logical '0' < 5 V DC
 Voltage level, logical '1' > 10 V DC
 Maximum voltage on input 28 V DC
 Input resistance, Ri 2 k Ω
 Scanning time per input 3 msec.
 Resolution 10 bit + sign
 Accuracy (100-1 kHz), terminal 29 Max. error: 0.5% of full scale
 Accuracy (1-65 kHz), terminal 29 Max. error: 0.1% of full scale

Reliable galvanic isolation: All pulse inputs are galvanically isolated from the supply voltage (PELV). In addition, pulse inputs can be isolated from the other terminals on the control card by connecting an external 24 V DC supply and opening switch 4.

Control card, encoder input:

No. of programmable encoder input connector 1
 Input terminal nos 73, 74, 75, 76, 77, 78
 Voltage level RS 422/485
 Maximum voltage on input ± 7 V DC
 Input resistance, Ri 140 Ω
 Max. input frequency 250 kHz
 Supply terminal nos 47, 49
 Supply voltage 5 V
 Max. supply current 250 mA

Reliable galvanic isolation: All encoder inputs are galvanically isolated from the supply voltage (PELV). In addition, encoder inputs can be isolated from the other terminals on the control card by connecting an external 24 V DC supply and opening switch 4.

Control card, digital/pulse outputs:

No. of programmable digital outputs 2
 Terminal nos 6, 46
 Voltage level at digital/pulse output 0 – 24 V DC
 Minimum load to ground (terminal 39) at digital/pulse output 600 Ω
 Frequency ranges (digital output used as pulse output) 100 Hz-50 kHz
 Refresh time 3 ms
 Accuracy $\pm 0.1\%$ of full range

Galvanic isolation: All digital outputs are galvanically isolated from the supply voltage (PELV) as well as other inputs and outputs.

Control card, analogue outputs:

No. of programmable digital outputs 2
 Terminal nos 42, 45
 Current range at analogue output 0/4 – 20 mA
 Maximum load to ground (terminal 39) at analogue output 500 Ω
 Accuracy of analogue output Max. error: 1% of full scale
 Resolution on analogue output 8 bit

Galvanic isolation: All analogue outputs are galvanically isolated from the supply voltage (PELV) as well as other inputs and outputs.

Control card, 24 V DC supply:

Terminal nos 12, 13
 Max. load (short-circuit protection) 200 mA
 Terminal nos. ground 20, 39

Reliable galvanic isolation: The 24 V DC supply is galvanically isolated from the supply voltage (PELV), but has the same potential as the analogue outputs.

Control card, RS 232 / RS 485 serial communication:

RS 232 RJ-11 connector
 Terminal nos 68 (TX+, RX+), 69 (TX-, RX-)
Full galvanic isolation.

Relay outputs:

No. of programmable relay outputs 2
 Terminal nos., control card 4-5 (make)
 Max. terminal load:
 (AC) on 4-5, control card 50 V AC, 1 A, 60 VA
 (DC-1, IEC847) on 4-5, control card 75 V DC, 0.1 A, 30 W
 (DC-1, IEC947) on 4-5, control card
 for UL/cUL applications 30 V AC, 1 A / 42.5 V DC, 1 A
 Terminal nos., power card 1-3 (break), 1-2 (make)
 Max. terminal load (AC) on 1-3, 1-2, power card 40 V AC, 2 A, 60 VA
 Max. terminal load (DC-1, IEC947) on 1-3, 1-2, power card 50 V DC, 2 A
 Min. terminal load on 1-3, 1-2, power card. 24 V DC 10 mA, 24 V AC 100 mA

Brake resistor terminals (only SB, EB, DE and PB units):

Terminal nos. 81, 82

External 24 Volt DC supply:

Terminal nos 35, 36
 Voltage range 24 V DC $\pm 15\%$ (max. 37 V DC for 10 sec.)
 Max. voltage ripple 2 V DC
 Power consumption 15 W – 50 W (50 W for start-up, 20 msec.)
 Min. pre-fuse 6 Amp

Reliable galvanic isolation: Full galvanic isolation if the external 24 V DC supply is also of the PELV type.

VLT® HVAC Drive



The VLT® HVAC Drive integrates and communicates seamlessly with all HVAC devices, mastered by Building Management Systems or as stand-alone unit. HVAC-specific features make it economical, flexible and user-friendly and makes HVAC operation child's play.

Lowest cost of ownership

The modular concept allows you to pay only for features you need and to customise your solutions and minimise system costs. The HVAC Drive is maintenance free, compact and easily mounted inside a HVAC unit or panel. Advanced, adaptable drive technology in the HVAC Drive generates significant energy savings while ensuring perfect comfort levels.

- Built-in real time clock
- Smart Logic Controller
- 4 auto-tuned PID controllers
- Easy to use menu structure
- Integrates with all BMS protocols
- Graphical display
- Optional mains disconnect switch
- Automatic Energy Optimisation
- Energy monitoring

Power range:

200-240 V.....	1.1 kW – 45 kW
380-480 V.....	1.1 kW – 400 kW
525-600 V.....	1.1 kW – 400 kW

Dedicated pump features

- Pump Cascade Controller
- Sleep Mode
- Sensorless Pressure/Flow Control
- Dry Pump Protection
- Continuous pumping, also at overload
- End of Curve monitoring
- Flow compensation at setpoint

Dedicated fan features

- Broken belt detection
- Resonance Monitoring
- Fire Override mode
- Stairwell pressurisation
- Automated skip frequencies
- Supply and return flow balancing
- Very fast flying start
- Conversion of feedback signal

Dedicated compressor features

- Capacity Modulation
- Constant torque above 20 Hz
- Cascade Controller
- 160% break away torque
- Set point in temperature or pressure conversion
- Reduced number of starts and stops

Specifications

Mains supply (L1, L2, L3):

Supply voltage:	200-240 V ±10%
Supply voltage:	380-500 V ±10%
Supply voltage:	525-600 V ±10%
Supply frequency	50/60 Hz
Displacement Power Factor (cos φ) near unity.....	(> 0.98)
Switching on input supply L1, L2, L3.....	1-2 times/min.

Output data (U, V, W):

Output voltage.....	0-100% of supply voltage
Switching on output	Unlimited
Ramp times	1 – 3600 sec.
Closed loop	0-132 Hz

Digital inputs:

Programmable digital inputs, FC 102:	6*
Logic	PNP or NPN
Voltage level	0 – 24 VDC

*2 can be used as digital outs

Analog inputs:

Analog inputs	2
Modes	Voltage or current
Voltage level.....	-10 to +10 V (scaleable)
Current level	0/4 to 20 mA (scaleable)

Pulse inputs:

Programmable pulse inputs	2
Voltage level	0 – 24 VDC (PNP positive logic)
Pulse input accuracy	(0.1 – 110 kHz)

Utilize some of the digital inputs

Analog output:

Programmable analog outputs.....	1
Current range at analog output	0/4 – 20 mA

Relay outputs:

Programmable relay outputs:.....	2
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(240 VAC, 2 A and 400 VAC, 2 A)

Fieldbus communication:

Standard built in:	Optional:
• FC Protocol	• LonWorks
• N2 Metasys	• BACnet
• FLN Apogee	• DeviceNet
• Modbus RTU	• Profibus

Cable lengths and cross sections:

Max. motor cable length:	
Screened/armoured	VLT® HVAC Drive: 150 m
Unscreened/unarmoured.....	VLT® HVAC Drive: 300 m
Max. cross section to motor, mains, load sharing and brake (see section <i>Electrical Data</i> for more information), (1.1 kW – 7.5 kW)	
	4 mm ² /10 AWG
Max. cross section to motor, mains, load sharing and brake (see section <i>Electrical Data</i> for more information), (11-18.5 kW)	
	16 mm ² /6 AWG
Max. cross section to motor, mains, load sharing and brake (see section <i>Electrical Data</i> for more information), (22-30 kW).....	
	35 mm ² /2 AWG
Maximum cross section to control terminals:	
Rigid wire.....	1.5 mm ² /16 AWG (2 x 0.75 mm ²)
Flexible cable	1 mm ² /18 AWG
Cable with enclosed core	0.5 mm ² /20 AWG
Minimum cross section to control terminals.....	0.25 mm ²

Application options

A wide range of integrated HVAC options can be fitted in the drive:

General purpose I/O option:

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

Relay option:

3 relay outputs

Analogue I/O option:

3 Pt1000 / Ni1000 inputs, 3 analog voltage outputs

External 24 VDC supply option :

24 VDC external supply can be connected to supply control- and option cards.

Brake chopper option:

Built in resistor for removing energy in case of high dynamics or high inertia loads.

Ambient temperature rating:

50°C

Power options

Danfoss Drives offers a wide range of external power options for use together with our FC102 drive in critical networks or applications:

- **Advanced harmonic filters:** For critical demands on harmonic distortion
- **dv/dt filters:** For special demands on motor isolation protection
- **Sine filters** (LC filters): For noiseless motor

HVAC PC software

- **MCT 10**
– ideal for commissioning and servicing the drive
- **VLT HVAC Planet**
– an interactive design guide including application examples
- **VLT Energy Box**
– comprehensive energy analysis tool, shows the drive pay-back time
- **MCT 31**
– harmonics calculations tool

VLT® 6000 HVAC



The Danfoss VLT® 6000 HVAC, dedicated to HVAC applications, provides unsurpassed performance, energy savings and improved control of HVAC systems – including interfacing with building management systems. Precise control of temperature, pressure and flow in HVAC applications results in the best environmental performance for building owners and operators.

Range:

1.1 – 400 kW (380-460 V)

Fan benefits:

- Bypass. The fan motor steps over speeds which cause mechanical vibration.

- Sleep Mode. The drive automatically stops cooling when temperature is at a low level for a pre-determined time.
- De-Icing. Reverses the fan to remove ice accumulation from intake louvres. The VLT® drive can reverse airflow direction for timed durations to prevent ice accumulation for both the intake louvres and exhaust fan blades.
- 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 effects of a cold start.

Easy to commission and use

If you know one drive you also know the others. A Quick Menu guides you easily through the little programming work left for you to make the drive perfect for the job in your plant.

The VLT® 6000 HVAC provides full control of the motor directly from the user interface. "HAND START" enables start and control of motor speed, "OFF" turns off the motor and "AUTO START" shifts control to digital inputs and/or serial communication.

Performance and energy saving

Using frequency converters in HVAC systems is mostly a question of ultimate energy savings. VLT® 6000 HVAC is designed with HVAC systems in mind.

Consequently it contains a series of HVAC dedicated functionalities.

- Automatic Energy Optimizer, makes it possible to save up to an additional 5-10% on the energy bill. This function optimises the magnetising current to the motor according to the specific load.
- The sleep mode function. If a pump or fan is running at low speed and not really contributing to the controlled parameter, e.g. temperature, pressure etc. it is turned off automatically. When the system again calls for energy, the drive starts up the motor again.

- Frequency bypass. The drive can be programmed to bypass up to 4 frequencies avoiding frequencies that provoke resonance between the pump/fan and the cabinet. that creates noise and eventually cause damage to the components.
- Sensorless Pump Control. For pump OEM's Danfoss Drives offers a new unique feature called Sensorless Pump Control. This feature enables the drive to control pressure in a water system without using a pressure transmitter. This saves costs for the pump manufacturer in commissioning and direct costs in transmitter, installation etc.

Specifications

Mains supply (L1, L2, L3):

Supply voltage 200 - 690 V units	3 x 200 – 690 V, $\pm 10\%$
Supply frequency	48 – 62 Hz $\pm 1\%$
Max. imbalance of supply voltage	$\pm 3\%$
VLT 6002-6011, 380-460 V and 525-600 V	
and VLT 6002-6005, 200-240 V	$\pm 2.0\%$ of rated supply voltage
VLT 6016-6072, 380-460 V and 525-600 V	
and VLT 6006-6032, 200-240 V	$\pm 1.5\%$ of rated supply voltage
VLT 6102-6550, 380-460 V and	
VLT 6042-6062, 200-240 V	$\pm 3.0\%$ of rated supply voltage
VLT 6100-6275, 525-600 V	$\pm 3\%$ of rated supply voltage
True Power factor (λ)	0.90 nominal at rated load
Displacement Power Factor ($\cos\phi$)	near unity (>0.98)
No. of switches on supply input L1, L2, L3	approx. 1 time/2 min.
Max. short-circuit current	100.000 A

Output data (U, V, W):

Output voltage	0 – 100% of supply voltage
Output frequency 6002-6032, 200-240V	0 – 120 Hz, 0 – 1000 Hz
Output frequency	0 – 1000 Hz
Rated motor voltage:	
200-240 V units	200/208/220/230/240 V
380-460 V units	380/400/415/440/460 V
525-600 V units	525/550/575 V
Rated motor frequency	50/60 Hz
Switching on output	Unlimited
Ramp times	1 – 3600 sec.

Torque characteristics:

Starting torque	130% for 1 min.
Starting torque	
(parameter 110 High break-away torque)	160% for 0.5 sec.
Acceleration torque	100%
Overload torque	110%

Control card, digital inputs:

Number of programmable digital inputs	8
Terminal nos.	16, 17, 18, 19, 27, 29, 32, 33
Voltage level	0-24 V DC (PNP positive logics)
Voltage level, logical '0'	< 5 V DC
Voltage level, logical '1'	> 10 V DC
Maximum voltage on input	28 V DC
Input resistance, Ri	2 k
Scanning time per input	3 msec.

Reliable galvanic isolation: All digital inputs are galvanically isolated from the supply voltage (PELV). In addition, the digital inputs can be isolated from the other terminals on the control card by connecting an external 24 V DC supply and opening switch 4.

Control card, analogue inputs

No. of programmable analogue voltage inputs/thermistor inputs	2
Terminal nos.	53, 54
Voltage level	0 – 10 V DC (scalable)
Input resistance, Ri	approx. 10 k
No. of programmable analogue current inputs	1
Terminal no ground	55
Current range	0/4 – 20 mA (scalable)
Input resistance, Ri	200
Resolution	10 bit + sign
Accuracy on input	Max. error 1% of full scale
Scanning time per input	3 msec.

Reliable galvanic isolation: All analogue inputs are galvanically isolated from the supply voltage (PELV) and other high-voltage terminals.

Control card, pulse input:

No. of programmable pulse inputs	3
Terminal nos.	17, 29, 33
Max. frequency on terminal 17	5 kHz
Max. frequency on terminals 29, 33	20 kHz (PNP open collector)
Max. frequency on terminals 29, 33	65 kHz (Push-pull)
Voltage level	0-24 V DC (PNP positive logics)
Voltage level, logical '0'	< 5 V DC
Voltage level, logical '1'	> 10 V DC
Maximum voltage on input	28 V DC
Input resistance, Ri	2 k
Scanning time per input	3 msec.
Resolution	10 bit + sign

Accuracy:

(100-1 kHz), terminals 17, 29, 33	Max. error: 0.5% of full scale
(1-5 kHz), terminal 17	Max. error: 0.1% of full scale
(1-65 kHz), terminals 29, 33	Max. error: 0.1% of full scale

Reliable galvanic isolation: All pulse inputs are galvanically isolated from the supply voltage (PELV).

In addition, pulse inputs can be isolated from the other terminals on the control card by connecting an external 24 V DC supply and opening switch 4.

Control card, digital/pulse and analogue outputs:

No. of programmable digital and analogue outputs	2
Terminal nos.	42, 45
Voltage level at digital/pulse output	0 – 24 V DC
Minimum load to ground (terminal 39) at digital/pulse output	600
Frequency ranges (digital output used as pulse output)	0-32 kHz
Current range at analogue output	0/4 – 20 mA
Maximum load to ground (terminal 39) at analogue output	500
Accuracy of analogue output	Max. error: 1.5% of full scale
Resolution on analogue output	8 bit

Reliable galvanic isolation: All digital and analogue outputs are galvanically isolated from the supply voltage (PELV) and other high-voltage terminals.

Control card, 24 V DC supply:

Terminal nos.	12, 13
Max. load	200 mA
Terminal nos. ground	20, 39

Reliable galvanic isolation: The 24 V DC supply is galvanically isolated from the supply voltage (PELV), but has the same potential as the analogue outputs.

Control card, RS 485 serial communication:

Terminal nos.	68 (TX+, RX+), 69 (TX-, RX-)
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Reliable galvanic isolation: Full galvanic isolation (PELV).

Relay outputs:

No. of programmable relay outputs	2
Terminal nos., control card	4-5 (make)
Max. terminal load:	
(AC) on 4-5, control card	50 V AC, 1 A, 60 VA
(DC-1 (IEC 947)) on 4-5, control card	75 V DC, 1 A, 30 W
(DC-1) on 4-5, control card for	
UL/cUL applications	30 V AC, 1 A /42.5 V DC, 1A
Terminal nos., power card and relay card	1-3 (break), 1-2 (make)
Max. terminal load (AC) on 1-3, 1-2 power card	240 V AC, 2 A, 60 VA
Max. terminal load DC-1 (IEC 947) on 1-3, 1-2,	
power card and relay card	50 V DC, 2 A
Min. terminal load on 1-3, 1-2,	
power card	24 V DC, 10 mA, 24 V AC, 100 mA

External 24 Volt DC supply

(only with VLT 6152-6550, 380-460 V):

Terminal nos.	35, 36
Voltage range	24 V DC $\pm 15\%$ (max. 37 V DC for 10 sec.)
Max. voltage ripple	2 V DC
Power consumption	15 W – 50 W (50 W for start-up, 20 msec.)
Min. pre-fuse	6 Amp

Reliable galvanic isolation: Full galvanic isolation if the external 24 V DC supply is also of the PELV type.

Cable lengths and cross-sections:

Max. motor cable length:	
screened cable	150 m
Unscreened cable	300 m
Screened cable VLT 6011 380-460 V	100 m
Screened cable VLT 6011 525-600 V	50 m
Max. DC-bus cable length, screened cable	25 m
from frequency converter to DC bar.	

Max. cross-section for:

24 V external DC supply	2.5 mm ² /12 AWG
Control cables	1.5 mm ² /16 AWG
Serial communication	1.5 mm ² /16 AWG

If UL/cUL is to be complied with, cable with temperature class 60/75°C must be used (VLT 6002 – 6072 380 – 460 V, 525-600 V and VLT 6002 – 6032 200 – 240 V).

If UL/cUL is to be complied with, cable with temperature class 75°C must be used (VLT 6042 – 6062 200 – 240 V, VLT 6102 – 6550 380 – 460 V, VLT 6100 – 6275 525 – 600 V).

Connectors are for use of both copper and aluminium cables, unless other is specified.

VLT® AQUA Drive



Danfoss VLT® AQUA Drive is dedicated to water and wastewater applications. With a wide range of powerful standard and optional features, the VLT® AQUA Drive provides the lowest overall cost of ownership for water and wastewater applications.

- **Save energy**
The VLT® AQUA Drive offers considerable energy savings
- **Save space**
The compact design of the VLT® AQUA Drive makes it easily fit in even small installation spaces.
- **Save cost and protect your system**
with a series of pump-specific features.

- **Save cabinet**

NEMA/UL Type 12 (IP 54/55) enclosure solution is available in the whole power range.

NEMA/UL Type 4X (IP 66) version available

- **Save time**

VLT® AQUA Drive is designed with the installer and operator in mind in order to save time in installation, commissioning and maintenance.

Power range:

200-240 V.....	0.25 kW – 45 kW
380-480 V.....	0.37 kW – 450 kW
525-600 V.....	0.75 kW – 90 kW
525-690 V.....	132 kW – 630 kW

Dedicated water features

Auto tuning of the PI controllers

With auto tuning of the PI controllers, the drive monitors how the system reacts on corrections made by the drive – and learns from it, so that precise and stable operation is achieved quickly.

Pipe Fill Mode

Enables controlled (closed loop) filling of pipes.

Prevents water hammering, bursting water pipes or blowing off sprinkler heads.

End of Pump Curve

detects breaks and leakage

The feature detects breaks and leakage. End of curve triggers an alarm, shuts off the pump, or performs another user-defined action.

Dry Pump Protection lowers maintenance costs

The VLT® AQUA Drive constantly evaluates the condition of the pump, based on internal frequency/power measurements.

Standard cascade controller

The in-built cascade controller controls up to three pumps with fixed lead pump.

Motor Alternation

This built-in logic controls alternation between two pumps in duty/stand-by applications. Motion of the stand-by pump prevents sticking of the pump. An internal timer assures equal usage of the pumps.

Flow compensation

The flow compensation feature reduces the pressure set point according to the flow – which saves energy.

Initial/Final Ramp

The initial ramp provides fast acceleration of pumps to minimum speed, from where the normal ramp takes over. This prevents damage on thrust and bearings.

Sensorless Pressure or Flow Control

Sensorless pressure or flow control is a patented VLT® feature that allows pump manufacturers to control the constant head (pressure) or flow levels without the use of sensors.

Specifications

Mains supply (L1, L2, L3):

Supply voltage	200-240 V ±10%
Supply voltage	380-480 V ±10%
Supply voltage	525-600 V ±10%
Supply voltage	525-690 V ±10%
Supply frequency	50/60 Hz
True power factor (λ)	≥ 0.9
Switching on input supply L1, L2, L3	1-2 times/min.

Output data (U, V, W):

Output voltage.....	0-100% of supply voltage
Switching on output	Unlimited
Ramp times.....	1-3600 sec.
Closed loop.....	0-132 Hz

**VLT® AQUA Drive can provide 110% current for 1 minute.
Higher overload rating is achieved by oversizing the drive.*

Digital inputs:

Programmable digital inputs	6*
Logic.....	PNP or NPN
Voltage level.....	0-24 VDC

**2 can be used as digital outputs.*

Analog inputs:

Analog inputs	2
Modes	Voltage or current
Voltage level.....	0 to 10 V (scaleable)
Current level.....	0/4 to 20 mA (scaleable)

Pulse inputs:

Programmable pulse inputs.....	2
Voltage level.....	0-24 VDC (PNP positive logic)
Pulse input accuracy	(0.1 – 110 kHz)

Utilize some of the digital inputs

Analog output:

Programmable analog outputs.....	1
Current range at analog output.....	0/4 – 20 mA

Relay outputs:

Programmable relay outputs	2
----------------------------------	---

(240 VAC, 2 A and 400 VAC, 2 A)

Fieldbus communication:

<i>Standard built in:</i>	<i>Optional:</i>
• FC Protocol	• Profibus
• Modbus RTU	• DeviceNet
	• LonWorks

Ambient temp.:

Up to	50° C
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A wide range of integrated water application options can be fit into the drive:

General purpose I/O option:

3 digital inputs, 2 digital outputs, 1 analog current output, 2 analog voltage inputs.

Relay option/cascade controller option:

3 relay outputs.

External 24 VDC supply option:

24 VDC external supply can be connected to supply control- and option cards.

Brake chopper option:

Connected to an external brake resistor, the brake chopper limits the load on the intermediate circuit in case the motor acts as generator.

Application options

3 digital inputs, 2 digital outputs, 1 analog current output, 2 analog voltage inputs.

Relay option:

3 relay outputs

Cascade controller option:

Up to 8 relays. Master/slave operation.

External 24 VDC supply option:

24 VDC external supply can be connected to supply control- and option cards

Brake chopper option:

Connected to an external brake resistor, the brake chopper limits the load on the intermediate circuit in case the motor acts as generator.

VLT® 8000 AQUA



The Danfoss VLT® 8000 AQUA is a dedicated drive for Water and Wastewater applications.

It has all the good traditional features a Danfoss drive is known for – but on top of that it offers a little bit extra. This drive is built for both constant torque and variable torque in applications including water, sludge and dosing pumps, aeration blowers, pumps, irrigation equipment, water desalination machines etc. For these applications specific software features have been developed to ensure optimum control and energy savings.

Range:

4-400 kW 380 – 480 V

Easy to commission and use

If you know one drive you also know the others. A Quick Menu guides you easily through the little programming work left for you to make the drive perfect for the job in your plant. The VLT® 8000 AQUA provides full control of the motor directly from the user interface. "HAND START" enables start and control of motor speed, "OFF" turns off the motor and "AUTO START" shifts control to digital inputs and/or serial communication.

Performance and energy saving

Water and Wastewater applications are typically characterised by machines with high power consumption. So in these applications there is also typically great energy saving potential. With large power machines a good and precise control of e.g. water pumps is very important to avoid water hammering.

These aspects have been taken into account when designing the VLT® 8000 AQUA. Among the useful dedicated solutions included are:

- VLT® 8000 AQUA includes both Variable and Constant Torque operation.
- The unique Danfoss Drives AEO function (Automatic Energy Optimizer), makes it possible to save up to an additional 5-10% on the energy bill.

This function optimises the magnetising current to the motor according to the specific load. Consequently valuable energy is saved and not wasted on heating up the air around the motor.

- The VLT® 8000 AQUA provides an initial ramp for fast ramping of pumps and blowers. This eliminates damage and reduces wear of the devices.
- With the Fill Mode feature, it is possible to avoid water hammering when starting up systems, i.e. irrigation, water supply etc. This is a closed loop pressure control functionality, which ensures that ramping up the speed to maximum reference does not occur before the pipes are filled up.

Specifications

Mains supply (L1, L2, L3):

Supply voltage:	
200-240 V units.....	3 x 200/208/220/230/240 V $\pm 10\%$
380-480 V units.....	3 x 380/400/415/440/460/480 V $\pm 10\%$
525-600 V units.....	3 x 525/550/575/600 V $\pm 10\%$
Supply frequency	50/60 Hz +/- 1%
Max. imbalance of supply voltage:	
VLT® 8006 - 8011 AQUA / 380 - 480 V and	
VLT® 8002 - 8011 AQUA / 525 - 600V	$\pm 2.0\%$ of rated supply voltage
VLT® 8016 - 8072 AQUA / 525 - 600 V, 380 - 480 V,	
VLT® 8006 - 8032 AQUA / 200 - 240 V.....	$\pm 1.5\%$ of rated supply voltage
VLT® 8100 - 8300 AQUA / 525 - 600 V,	
VLT® 8102 - 8600 AQUA / 380 - 480 V	
and VLT® 8042 - 8062 AQUA / 200 - 240 V.....	$\pm 3.0\%$ of rated supply voltage
Displacement factor/cos. ϕ	near unity (> 0.98)
True Power Factor (λ).....	nominal 0.90 at rated load
Input Mains (L1, L2, L3) Allowable On-OFF	
Switching Sequences approx.....	1 time/2 min.
Max. short-circuit current.....	100 kA

VLT® output data (U, V, W):

Output voltage.....	0-100% of supply voltage
Output frequency.....	0 - 1000 Hz
Rated motor voltage:	
200-240 V units.....	200/208/220/230/240 V
380-480 V units.....	380/400/415/440/460/480 V
525-600 V units.....	525/550/575 V
Rated motor frequency	50/60 Hz
Switching on output	Unlimited
Ramp times.....	1 - 3600 sec.

Control card, digital inputs:

Number of programmable digital inputs.....	8
Voltage level.....	0-24 V DC (PNP positive logics)
Voltage level, logical "0".....	< 5 V DC
Voltage level, logical "1"	> 10 V DC
Maximum voltage on input.....	28 V DC
Input resistance, Ri.....	approx. 2 k Ω
Scanning time per input.....	3 msec.

Reliable galvanic isolation: All digital inputs are galvanically isolated from the supply voltage (PELV). In addition, the digital inputs can be isolated from the other terminals on the control card by connecting an external 24 V DC supply and opening switch 4.

Control card, analogue inputs:

No. of programmable analogue voltage inputs/thermistor inputs	2
Voltage level.....	0 - 10 V DC (scalable)
Input resistance, Ri.....	approx. 10 Ω
No. of programmable analogue current inputs	1
Terminal no. earth	55
Current range.....	0/4 - 20 mA (scalable)
Input resistance, Ri.....	approx. 200 Ω
Resolution	10 bit + sign
Accuracy on input.....	Max. error 1% of full scale
Scanning time per input.....	3 msec.

Reliable galvanic isolation: All analogue inputs are galvanically isolated from the supply voltage (PELV) and other high-voltage terminals.

Control card, pulse input:

No. of programmable pulse inputs.....	3
Max. frequency on terminal 17	5 kHz
Max. frequency on terminals 29, 33.....	20 kHz (PNP open collector)
Max. frequency on terminals 29, 33.....	65 kHz (Push-pull)
Voltage level.....	0-24 V DC (PNP positive logics)
Voltage level, logic "0".....	< 5 V DC
Voltage level, logic "1"	> 10 V DC
Maximum voltage on input.....	28 V DC
Input resistance, Ri.....	approx. 2 k Ω
Scanning time per input.....	3 msec.
Resolution	10 bit + sign
Accuracy:	
(100-1 kHz), terminals 17, 29, 33	Max. error: 0.5% of full scale
(1-5 kHz), terminal 17.....	Max. error: 0.1% of full scale
(1-65 kHz), terminals 29, 33.....	Max. error: 0.1% of full scale

Reliable galvanic isolation: All pulse inputs are galvanically isolated from the supply voltage (PELV). In addition, pulse inputs can be isolated from the other terminals on the control card by connecting an external 24 V DC supply and opening switch 4.

Torque characteristics:

Starting torque.....	110% for 1 min.
Starting torque (parameter 110 High break-away torque)	
Max. torque.....	130% for 0.5 s.
Acceleration torque.....	100%
Overload torque	110%

Control card, digital/pulse and analogue outputs:

No. of programmable digital and analogue outputs	2
Terminal nos.....	42, 45
Voltage level at digital/pulse output.....	0 - 24 V DC
Minimum load to frame (terminal 39) at digital/pulse output	600 Ω
Frequency ranges (digital output used as pulse output)	0 - 32 kHz
Current range at analogue output	0/4 - 20 mA
Maximum load to frame (terminal 39) at analog output .	500 Ω
Accuracy of analogue output	Max. error: 1.5% of full scale
Resolution on analogue output.....	8 bit

Reliable galvanic isolation: All digital and analog outputs are galvanically isolated from the supply voltage (PELV) and other high-voltage terminals.

External 24 Volt DC supply:

(only available with VLT® 8152-8600, 380-480 V)

Voltage range	24 V DC $\pm 15\%$ (max. 37 V DC for 10 sec.)
Max. voltage ripple	2 V DC
Power consumption	15 W - 50 W (50Wfor start-up, 20 msec.)
Min. pre-fuse	6 Amp

Reliable galvanic isolation: Full galvanic isolation if the external 24 V DC supply is also of the PELV type.

Control card, RS 485 serial communication:

Terminal nos.....	68 (TX+, RX+), 69 (TX-, RX-)
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Reliable galvanic isolation: Full galvanic isolation (PELV).

Relay outputs:

No. of programmable relay outputs.....	2
Max. terminal load:	
(AC) on 4-5, control card	50 V AC, 1 A, 60 VA
(DC-1 (IEC 947)) on 4-5, control card	75 V DC, 1 A, 30 W
(DC-1) on 4-5, control card for	
UL/cUL applications	30 V AC, 1 A / 42.5 V DC, 1A
Terminal nos., power card and relay card	1-3 (break), 1-2 (make)
Max. terminal load:	
(AC) on 1-3, 1-2 power card	240 V AC, 2 A, 60 VA
DC-1 (IEC 947) on 1-3, 1-2,	
power card and relay card.....	50 V DC, 2 A
Min. terminal load on 1-3, 1-2, power card	24 V DC, 10 mA, 24 V AC, 100 mA

Control card, 24 V DC supply:

Terminal nos.....	12, 13
Max. load	200 mA
Terminal nos. earth	20, 39

Reliable galvanic isolation: The 24 V DC supply is galvanically isolated from the supply voltage (PELV), but has the same potential as the analogue outputs.

Cable lengths and cross-sections:

Max. motor cable length:	
Screened cable	150 m/500 ft
Unscreened cable.....	300 m/1000 ft
Screened cable VLT® 8011 380-480 V	100 m/330 ft
Screened cable VLT® 8011 525-600 V	50 m/164 ft
Max. DC-bus cable length,	
screened cable	25 m/82 ft from frequency converter to DC bar
Max. cross-section for:	
24 V external DC supply	2.5 mm ² /12 AWG
Control cables.....	1.5 mm ² /16 AWG
Serial communication	1.5 mm ² /16 AWG

Connectors are for use of both copper and aluminium cables, unless other is specified.

Control characteristics:

Frequency range.....	0 - 120 Hz
Resolution on output frequency	± 0.003 Hz
System response time.....	3 msec.
Speed, control range (open loop.....	1:100 of synchro. speed
Speed, accuracy (open loop). < 1500 rpm:	max. error ± 7.5 rpm
> 1500 rpm:	max. error of 0.5% of actual speed
Process, accuracy (closed loop). < 1500 rpm:	max. error ± 1.5 rpm
> 1500 rpm:	max. error of 0.1% of actual speed

All control characteristics are based on a 4-pole asynchronous motor.

VLT® High Power Drives



VLT® Series High Horsepower drives reduce energy usage in driven equipment. High efficiency of the VLT® series also drives down energy costs in cooling requirements.

98% efficiency greatly reduces energy consumption not only in driven equipment, but also in heat removal requirements. Smaller footprint reduces space requirements.

The perfect match for:

- Industrial appliances
- HVAC applications
- OEM

Power range:

3 x 380 – 440 V AC 110 – 1000 kW
3 x 460 – 500 V AC 150 – 1250 HP
3 x 690 V AC 45 – 1200 kW
3 x 525 – 575 V AC 100 – 1300 HP

Complete voltage range from 380-690 volts.

Available in IP00 chassis, IP 21/NEMA 1 and IP 54/NEMA 12 enclosure protection.

Modular configuration provides solutions for 125 – 1250 HP @ 460 V/ 575 V by paralleling proven power modules.

Ducted Cooling

An innovative air cooling system provides the capability to route cooling air for power components through a back channel, significantly reducing contamination of electronic components.

Cooling air can either be ducted in and out the back of the enclosure, or ducted from the bottom to the top of the enclosure. In either case, 85% of the cooling air volume never enters the controls area, making heat sink cleaning easy and reducing the air volume inside of the enclosure.

- NEMA12 seal between power and control cooling air
- Reduced air volume inside the enclosure
- Removes 85% of losses using drive main fan
- Fewer contaminants enter the enclosure
- Pre-engineered, thermally tested cooling kits available for IP 00 enclosures



Currents and powers

Normal Overload (VT)		High Overload (CT)		
I _N Amps	P _N kW*	I _H Amps	P _H kW*	Frame
380 – 440 V				
212	110	177	90	D1
260	132	212	110	D1
315	160	260	132	D2
395	200	315	160	D2
480	250	395	200	D2
600	315	480	250	E1
658	355	600	315	E1
745	400	658	355	E1
800	450	695	400	E1
880	500	745	450	E2
990	560	880	500	E2
1120	630	990	560	E2
1260	710	1120	630	E3
1460	900	1260	710	E3
1700	1000	1460	800	E3
690 V				
54	45	46	37	D1
73	55	54	45	D1
86	75	73	55	D1
108	90	86	75	D1
131	110	108	90	D1
155	132	131	110	D1
192	160	155	132	D1
242	200	192	160	D2
290	250	242	200	D2
344	315	290	250	D2
400	400	344	315	D2
490	500	400	400	E1
560	560	490	500	E1
630	630	560	560	E1
730	710	630	630	E2
898	800	730	710	E2
1060	1000	898	800	E3
1260	1200	1060	1000	E3

*kW at 400 volts

Normal Overload (VT)		High Overload (CT)		
I _N Amps	P _N HP ⁺	I _H Amps	P _H HP ⁺	Frame
460 – 500 V				
190	150	160	125	D1
240	200	190	150	D1
302	250	240	200	D2
361	300	302	250	D2
443	350	361	300	D2
540	450	443	350	E1
590	500	540	450	E1
678	550/600	590	500	E1
730	600	678	550	E1
880	650	678	600	E2
990	700	780	650	E2
1120	800	890	700	E2
1260	900	1050	800	E3
1460	1100	1160	900	E3
1530	1250	1380	1100	E3
525 – 575 V				
108	100	86	75	D1
131	125	108	100	D1
155	150	131	125	D1
192	200	155	150	D1
242	250	192	200	D2
290	300	242	250	D2
344	350	290	300	D2
400	400	344	350	D2
490	500	400	400	E1
570	550	490	500	E1
630	650	570	550	E1
730	750	630	650	E2
898	900	730	750	E2
1060	1100	898	900	E3
1260	1300	1060	1100	E3

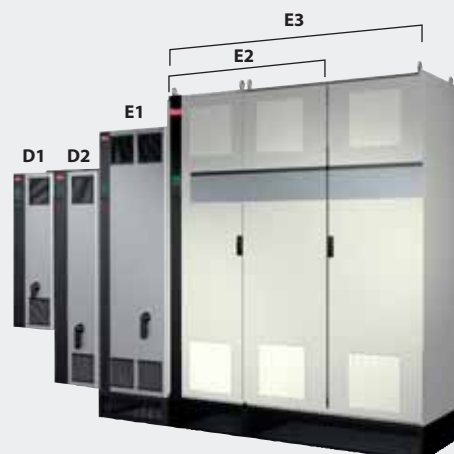
⁺HP at 460 V for 460 – 500 V drives and 525 Volts for 525 - 575 V drives

Dimensions

Chassis	Height (in)	Width (in)	Depth (in)
D1	39	16	35
D2	50	16	15
D3	61	23	20

NEMA 1 & NEMA 12

D1	46	17	15
D2	62	17	15
E1	79	24	19

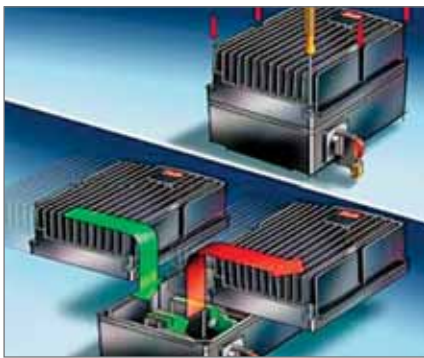
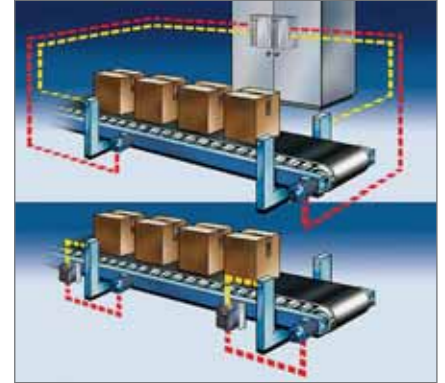


VLT® Decentral FCD 300



The VLT® FCD 300 is a complete frequency converter designed for decentral mounting. The FCD can be mounted on the wall close to the motor, or directly on the motor. The FCD 300 comes in a high enclosure class, IP66, to withstand normal cleaning methods. The design offers a smooth cleaning friendly surface without any difficult to clean spots. The FCD 300 comes in a robust painted surface.

The decentral design reduces the need for central control panels and space-consuming motor control cabinets are eliminated. Reduced need for wiring long screened motor cables.



Plug-and-drive

All the advanced and reliable electronics needed to ensure your motors act smoothly, responsively and economically at each command are hidden inside the box lid and plug into connectors when mounted onto the bottom section. The bottom section contains maintenance-free Cage Clamp connectors and looping facilities for power and fieldbus cables well protected against dust, hosing and cleaning agents. Once installed, commissioning and upgrading can be performed in no time by plugging in another control lid.



Hygienic

Protected in small, tight, robust, dirt repelling enclosures the FCD 300 meets conditions found in the food and beverage industry, where frequent wash downs are required.



Flexible installation

The FCD 300 series facilitates internal power line looping. Terminals for 4 mm² power cables inside the enclosure allows connection of up to 10+ units.



Control

Decentral drives are complete variable speed drives to be set up and controlled through a remote control panel or fieldbus communication and Danfoss' dedicated MCT 10 set-up software.

Specifications

Mains supply:

Supply voltage FCD 305-335.....	3 x 380/400/415/440/480 V ±10%
Supply frequency.....	50/60 Hz
Max. imbalance on supply voltage.....	± 2.0% of rated supply voltage
Power factor (400 V) / cos. 1.....	0.90/1.0 at rated load
Number of connections at supply input L1, L2, L3.....	2 times/min.

Torque characteristics:

Starting torque (Constant torque).....	maximum 160% for 1 min.*
Starting torque.....	maximum 180% up to 0.5 sec.*
Overload current (Constant torque).....	maximum 160% for 1 min.*

*Percentage relates to FC 300's nominal current.

Control card, digital inputs:

Number of programmable digital inputs.....	5
Terminal number.....	18, 19, 27, 29, 33
Voltage level.....	0 – 24 V DC (PNP positive logic)
Voltage level, logic '0'.....	< 5 V DC
Voltage level, logic '1'.....	> 10 V DC
Maximum voltage on input.....	28 V DC
Input resistance, Ri (terminals 18, 19, 27).....	approx. 4 kΩ
Input resistance, Ri (terminal 29, 33).....	approx. 2 kΩ

All digital inputs are galvanically isolated from the supply voltage (PELV) and other high-voltage terminals, and can be functionally separated from other control terminals by opening switch S100.

Control card, analogue inputs:

Number of analogue voltage inputs.....	1 pcs.
Terminal number.....	53
Voltage level.....	± 0 – 10 V DC (scaleable)
Input resistance, Ri.....	approx. 10 kΩ
Max. voltage.....	20 V
Number of analogue current inputs.....	1 pcs.
Terminal number.....	60
Current level.....	0/4 – 20 mA (scaleable)
Input resistance, Ri.....	approx. 300 Ω
Max. current.....	30 mA
Resolution for analogue inputs.....	10 bit
Accuracy of analogue inputs.....	Max. error 1% of full scale
Scan interval.....	13.3 msec

The analogue inputs are galvanically isolated from the supply voltage (PELV) and other high-voltage terminals.

Control card, pulse inputs:

Number of programmable pulse inputs.....	2
Terminal number.....	29, 33
Max. frequency at terminal 29/33.....	110 kHz (Push-pull)
Max. frequency at terminal 29/33.....	5 kHz (open collector)
Min. frequency at terminal 33.....	4 Hz
Min. frequency at terminal 29.....	30 Hz
Voltage level.....	0 – 24 V DC (PNP positive logic)
Voltage level, logic '0'.....	< 5 V DC
Voltage level, logic '1'.....	> 10 V DC
Maximum voltage on input.....	28 V DC
Input resistance, Ri.....	approx. 2 kΩ
Scan interval.....	13.3 msec
Resolution.....	10 bit
Accuracy (100 Hz – 1 kHz) terminal 33.....	Max. error: 0.5% of full scale
Accuracy (1 kHz – 67.6 kHz) terminal 33.....	Max. error: 0.1% of full scale

The pulse input is galvanically isolated from the supply voltage (PELV) and other high-voltage terminals.

Control card, digital/frequency output:

Number of programmable digital/pulse outputs.....	1 pcs.
Terminal number.....	46
Voltage level at digital/frequency output.....	0 – 24 V DC (O.C PNP)
Max. output current at digital/frequency output.....	25 mA.
Max. load at digital/frequency output.....	1 kΩ
Max. capacity at frequency output.....	10 nF
Minimum output frequency at frequency output.....	16 Hz
Maximum output frequency at frequency output.....	10 kHz
Accuracy on frequency output.....	Max. error: 0.2 % of full scale
Resolution on frequency output.....	10 bit

The digital output is galvanically isolated from the supply voltage (PELV) and other high-voltage terminals.

Control card, analog output:

Number of programmable analog outputs.....	1
Terminal number.....	42
Current range at analog output.....	0/4 – 20 mA
Max. load to common at analog output.....	500 Ω
Accuracy on analog output.....	Max. error: 1.5 % of full scale
Resolution on analog output.....	10 bit

The analog output is galvanically isolated from the supply voltage (PELV) and other high-voltage terminals.

Control card, 24 V DC output:

Terminal number.....	12
Max. load supplied from mains/24 V external.....	240/65 mA

The 24 V DC supply is galvanically isolated from the supply voltage (PELV), but has the same potential as the analogue and digital inputs and outputs.

Control card, 10 V DC output:

Terminal number.....	50
Output voltage.....	10.5 V ±0.5 V
Max. load.....	15 mA

The 10 V DC supply is galvanically isolated from the supply voltage (PELV) and other high-voltage terminals.

Control card, RS 485 serial communication:

Terminal number.....	68 (TX+, RX+), 69 (TX-, RX-)
Terminal number 67.....	+ 5 V
Terminal number 70.....	Common for terminals 67, 68 and 69

Full galvanic isolation.

Relay outputs:

Number of programmable relay outputs.....	1
Terminal number, control card.....	1-3 (break), 1-2 (make)
Max. terminal load (AC) on 1-3, 1-2, control card.....	240 V AC, 2 A

Min. terminal load on 1-3, 1-2, control card 24 V DC 10 mA, 24 V AC 100 mA.

The relay contact is separated from the rest of the circuit by strengthened isolation.

External 24 Volt DC supply:

Terminal nos.....	35, 36
Voltage range.....	21-28 V (max. 37 V DC for 10 sec.)
Max. voltage ripple.....	2 V DC
Power consumption with/without mains supply.....	< 1 W/5-12 W

Reliable galvanic isolation: Full galvanic isolation if the external 24 V DC supply is also of the PELV type.

Cable lengths and cross sections:

Max. motor cable length:	
Screened/armoured cable.....	10 m
Unscreened/unarmoured cable.....	10 m
Max. cross section to control:	
Wires, rigid wire.....	4.0 mm ² /10 AWG
Cables, flexible cable.....	2.5 mm ² /12 AWG
Cables, cable with ferrules.....	2.5 mm ² /12 AWG
Max. cross section extra terminals for 24 V ext:	
T73 version, rigid cables.....	6.0 mm ² /9 AWG
T73 version, flexible cable.....	4 mm ² /10 AWG
T73 version, cable with ferrules.....	4 mm ² /10 AWG
Max. cross section PE.....	10 mm ² /7 AWG
Max. cross section external PE for T73 version.....	16 mm ² /5 AWG

If UL/CUL is to be complied with, cable with temperature class 60/75°C must be used.

Use copper wires only.

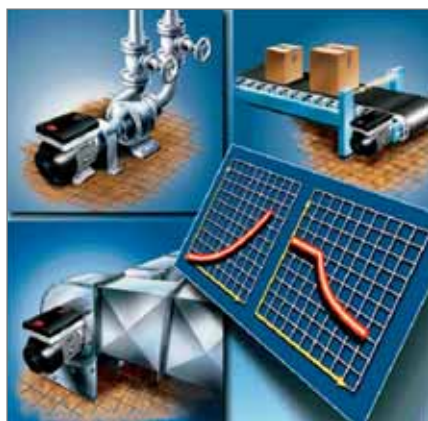
VLT® DriveMotor FCM 300



The VLT® FCM 300 Series is a very compact alternative to the traditional solution with a VLT® frequency converter and motor as separate units. The frequency converter is attached in place of the motor terminal box. It is no higher than the standard terminal box – not wider nor longer than the motor.

Benefits

- Motor and drive perfectly matched to each other
- No panel space required – the DriveMotor is placed on the machine
- Simplified installation
- No power cable length limitation
- Straightforward EMC compliance
- Flexible mounting – face-flange, foot/flange, foot/face
- Retrofit without mechanical changes



FCM applications

Typical applications are air handling units, pumps, conveyors and small machines for example labelling machines.



Control panel

Local control panel is used for operating, drivemotor setup and diagnostics. The LCP can be handheld or mounted in a panel front (IP 65).

Operation Pad

A local operation pad can be used for speed up/speed down, start/stop, and jog e.g.. Other features are speed indication by LED, mounting on FCM or kit for wall mounting.



Communication

- RS 485 serial port as standard
- Profibus DP version (3 or 12 Mbaud)

Specifications

Mains supply, TT, TN and IT* (L1, L2, L3):

Supply voltage 380-480 V units.....3 x 380/400/415/440/460/480 V $\pm 10\%$
Supply frequency50/60 Hz
Max. imbalance of supply voltage $\pm 2\%$ of rated supply voltage
Power factor/cos ϕ max. 0.9/1.0 at rated load
No. of switching operations on
supply input L1, L2, L3.....approx. 1 time/2 min

**) Not valid for RFI class 1B units*

Torque characteristics:

Starting torque/overload torque..... 160 % for 1 min
Continuous torque..... see above

Control card, digital/pulse inputs:

Number of programmable digital inputs 4
Terminal nos X101-2, -3, -4, -5
Voltage level 0-24 V DC (PNP positive logics)
Voltage level, logic '0' < 5 V DC
Voltage level, logic '1' > 10 V DC
Maximum voltage on input 28 V DC
Input resistance, Ri..... approx. 2 k Ω
Scanning time..... 20 msec

Control card, pulse input:

No. of programmable pulse inputs 1
Terminal nos. X101-3
Max. frequency on terminal 3,
open collector/push pull 24 V 8 kHz/70 kHz
Resolution 10 bit
Accuracy (0.1-1 kHz), terminal 3..... Max. error: 0.5% of full scale
Accuracy (1-12 kHz), terminal 3..... Max. error: 0.1% of full scale

Control card, analogue inputs:

No. of programmable analogue voltage inputs 1
Terminal nos X101-2
Voltage level 0 – 10 V DC (scalable)
Input resistance, Ri..... approx. 10 k Ω
No. of programmable analogue current inputs 1
Terminal no. X101-1
Current range 0 – 20 mA (scalable)
Input resistance, Ri. approx. 500 k Ω
Resolution 9 bit
Accuracy on input Max. error 1% of full scale
Scanning time 20 msec.

Control card, digital/pulse and analogue outputs:

No. of programmable digital and analogue outputs 1
Terminal nos X101-9
Voltage level at digital output/load..... 0 – 24 V DC/25 mA
Current at analogue output 0 – 20 mA
Maximum load to frame (terminal 8)
at analogue output RLOAD \leq 500 Ω
Accuracy of analogue output Max. error: 1.5% of full scale
Resolution on analogue output 8 bit

Relay output:

No. of programmable outputs..... 1
Terminal nos..... 1-2 (make), 1-3 (brake) terminal X102
Voltage level at contact/load (AC)..... 250 V AC, 5A-AC load
Voltage level at contact/load (DC) 30 V DC, 5A;
40 V DC, 2A 100 V DC, 0.5A

Control card, RS 485 serial communication:

Terminal nos..... X100-1, -2

Control characteristics (frequency converter):

Frequency range..... 0 – 132 Hz
Resolution on output frequency 0.1%
System response time..... Max. 40 msec.
Speed accuracy (open loop, CT mode, 4 P motor
driven in speed range 150-1500 rPm)..... +/- 15 rpm

VLT® Soft Starter MCD 100



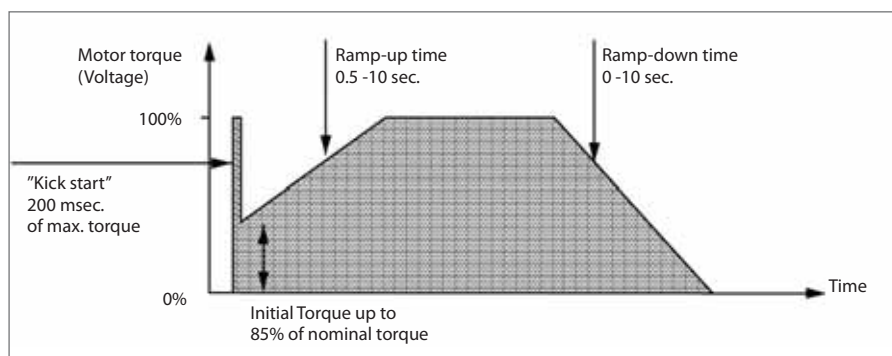
MCD 100 is a cost effective and extremely compact soft starter for AC motors up to 11 kW. Due to a unique semiconductor design MCD 100 is a true “fit and forget” product. Selection can be made on the basis of the motor power – exactly as with traditional contactors.

The range features three different products, MCD 100-001 (1,5 kW), MCD 100-007 (7,5 kW) and MCD 100-011 (11 kW). All sizes are rated for line voltage up to 600 V AC.

MCD 100 products provide timed voltage ramp up and down. Ramp time can be individually adjusted with rotary switches from 0,4 to 10 seconds. The start torque can be adjusted from 0 to 85% of the direct on-line torque.

- A robust semiconductor design – selection can be based on motor power which ensures easy selection.
- Can be used for an almost unlimited number of starts per hour without derating.

- A universal control voltage (24-480 V AC/ V DC) – simplifies selection and keeps stock at a minimum.
- A “fit and forget” contactor design – simplifies installation and reduces required panel space.
- Digitally controlled rotary switches – secures precise settings and simplifies installation.
- Ratings for heavy duty as standard – simplifies installation and reduces the risk of breakdown



Timed voltage ramp

- Micro Soft Start Controller for motors up to 11kW
- Extremely robust SCR design with heavy ratings as standard
- Unlimited number of starts per hour
- Contactor style design for easy selection, installation and commissioning

Specifications

Mains supply (L1, L2, L3):

MCD 100 3 x 208 VAC ~ 600 VAC (+10% / -15%)
Supply frequency (at start) 45Hz – 66 Hz

Control circuit (A1, A2):

MCD 100 24 – 480 VAC/VDC (-15% +10%)

Environmental:

Degree of protection MCD 100 IP 20
Operating Temperatures..... -5°C / +40°C (60°C with de-rating)
Pollution Degree..... Pollution Degree 3

EMC Emission:

Equipment class (EMC) Class A
Conducted radio frequency emission:
0.15 MHz – 0.5 MHz < 90 dB (µV)
0.5 MHz – 5 MHz < 76 dB (µV)
5 MHz – 30 MHz 80-60 dB (µV)
Radiated radio frequency emission:
30 MHz – 230 MHz < 30 dB (µV/m)
230 MHz – 1000 MHz < 37 dB (µV/m)

This product has been designed for Class A equipment. Use of the product in domestic environments may cause radio interference, in which case the user may be required to employ additional mitigation methods.

EMC Immunity:

Electro static discharge 4 kV contact discharge, 8 kV air discharge
Radio-frequency electromagnetic field:
0.15 MHz – 1000 MHz 140 dB (µV)
Rated impulse withstand voltage
(Fast transients 5/50 ns – Burst) 4 kV line to earth
Rated insulation voltage
(Surges 1.2/50 µs – 8/20 µs) 4 kV line to earth, 2 kV line to line
Voltage dip and short
time interruption 100 ms (at 40% nominal voltage)

Short Circuit:

Rated short-circuit current MCD 100-001 normal fuses: 25 A gL/gG
SCR I2t rating for semiconductor fuses: 72 A2s
Rated short-circuit current MCD 100-007 normal fuses: 50 A gL/gG
SCR I2t rating for semiconductor fuses: 1800 A2s
Rated short-circuit current MCD 100-011 normal fuses: 80 A gL/gG
SCR I2t rating for semiconductor fuses: 6300 A2s

Heat Dissipation:

MCD 100-001 max. 4 watts
MCD 100-007 to MCD 100-011 2 watts/Ampere

Standards Approvals:

UL/C-UL UL508
CE IEC 60947-4-2

VLT® Compact Starter MCD 200



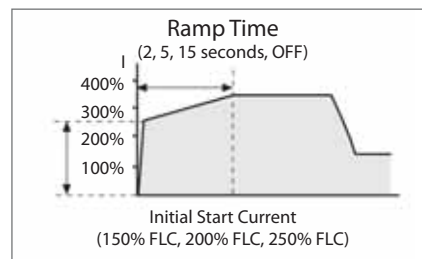
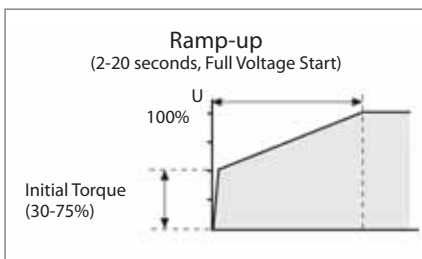
The Compact Starter MCD 200 cover the power range 7.5 – 110 kW.

Due to extensive use of the latest technology, such as new semiconductor control algorithms and bypass design, the new soft starters are very compact and heat dissipation is at a very low level. There is no need for extra ventilation or bypass contactors. This simplifies installation and keeps panel space at a minimum.

The MCD 200 features a variety of accessories. Add-on modules provide essential serial communication and a Remote Operator module allows for remote control and motor performance monitoring, which makes MCD 200 ideal for panel installation.

MCD 200 comes in two versions. MCD 201 is the basic version offering timed voltage ramps, MCD 202 is the advanced version providing current limit soft start, timed voltage ramp down, and motor protection.

- Current ratings for normal and heavy starting
- Versions for 200- 575 VAC
- Voltage ramps or current limit ramp soft start
- Built-in motor protection
- Compact design with internal bypass system for minimum power loss
- Add on modules for remote operation and serial communication
- Software for sizing, control and monitoring



Timed voltage ramp MCD 201

Current Limit MCD202:

- Compact Soft Starter for motors up to 110kW
- Voltage ramps, current limit start and integrated motor protection
- Integral bypass design reduce heat dissipation
- Wide power range with advanced accessory modules

Optional:

- Modules for serial communication
- Remote operation kit
- PC software
- Remote operation kit

Specifications

Mains supply (L1, L2, L3):

MCD 200-xxx-T4-xxx	3 x 200 VAC ~ 440 VAC (+10%/-15%)
MCD 200-xxx-T6-xxx	3 x 200 VAC ~ 575 VAC (+10%/-15%)
Supply frequency (at start)	45 Hz – 66 Hz
Supply frequency	48-62 Hz +/-1%

Control supply (A1,AL2,A3):

MCD 200-xxx-xx-CV1	24 VAC/VDC (±20%)
MCD 200- xxx-xx-CV3	110-240 VAC (+10%/-15%) or 380-440 VAC (+10%/-15%)

Control Inputs:

Start Terminal N1	Normally Open, 300 VAC max.
Stop Terminal N2	Normally Closed 300 VAC max.

Relay Outputs:

Main Contactor (Terminals 13 & 14)	Normally Open
Main Contactor (Terminals 13 & 14)	6A, 30 VDC resistive/2 A, 400 VAC, AC11
Programmable Relay (Terminals 23 & 24)	Normally Open
Programmable Relay (Terminals 23 & 24)	6A, 30 VDC resistive/2 A, 400 VAC, AC11

Environmental:

Degree of protection MCD 200-007 to MCD 200-055	IP 20
Degree of protection MCD 200-075 to MCD 200-110	IP 00
Operating Temperatures	-10°C / +60°C
Humidity	5%-95% Relative Humidity
Pollution Degree	Pollution Degree 3
Vibration	IEC 60068 Test Fc Sinusoidal
Vibration	4 Hz – 13.2 Hz: ± 1mm displacement
Vibration	13.2 Hz – 100 Hz: ± 0.7 g

EMC Emission:

Equipment class (EMC)	Class A
Conducted radio frequency emission:	
0.15 MHz – 0.5 MHz	< 90 dB (µV)
0.5 MHz – 5 MHz	< 76 dB (µV)
Conducted radio frequency emission – 5 MHz – 30 MHz	80-60 dB (µV)
Radiated radio frequency emission:	
30 MHz – 230 MHz	< 30 dB (µV/m)
230 MHz – 1000 MHz	< 37 dB (µV/m)

This product has been designed for Class A equipment. Use of the product in domestic environments may cause radio interference, in which case the user may be required to employ additional mitigation methods.

EMC Immunity:

Equipment class (EMC)	4 kV contact discharge, 8 kV air discharge
Radio-frequency electromagnetic field:	
0.15 MHz - 1000 MHz	140 dB (µV)
Rated impulse withstand voltage (Fast transients 5/50 ns)	2 kV line to earth
Rated insulation voltage (Surges 1.2/50 µs – 8/20 ms)	2 kV line to earth, 1 kV line to line
Voltage dip and short time interruption	100 ms (at 40% nominal voltage)

Short Circuit:

Rated short-circuit current MCD 200-007 to MCD 200-037	5 kA
Rated short-circuit current MCD 200-045 to MCD 200-110	10 kA

Heat Dissipation:

During Start	3 watts/Ampere
During Run	< 4 watts

Standards Approvals:

C-tick	IEC 60947-4-2
UL/C-UL	UL508
CE	IEC 60947-4-2
CCC	GB 14048.6

VLT® Soft Starter MCD 3000

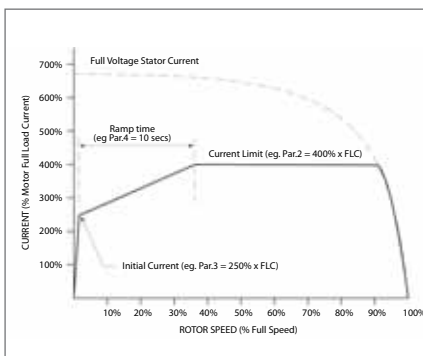


The VLT® MCD 3000 soft starters cover the power range 7,5 – 800 kW.

MCD 3000 is a total motor starting solution. Current transformers measure the motor current and provide feedback for controlled motor voltage ramp up, but also for numerous motor protection functions. A numeric display and logic keypad buttons makes programming easy and operational status such as motor current is shown via the display.

The MCD 3000 is wall mountable, however a Remote Operator module allows for remote control and motor performance monitoring making it ideal for panel installation.

- Current ratings for normal and heavy starting
- Versions for 200 – 690 VAC
- Current limit soft start with initial current ramp up
- Four different auto-adjustable ramp down profiles
- Numerous motor protection features
- Built-in local control panel with display
- Pass word protection of parameters
- DC brake function
- Internal delta wiring kit
- Software for sizing, control and monitoring



Current ramp

MCD 3000

- Fully featured Soft Starter for motors up to 800 kW
- Total motor starting solution
- Advanced start, stop and protection features
- Local programming keypad and display

Optional:

- Modules for serial communication
- Remote operator kit
- PC software



Remote operation kit

- Start/stop, reset
- LED for start, run, trip
- Trip codes
- Current display
- Motor temp. display
- 4 – 20 mA output

Specifications

Mains supply (L1, L2, L3):

Supply voltage MCD3000-T5	3 x 200 VAC ~ 525 VAC
	3 x 200 VAC ~ 440 VAC (Inside Delta Connection)
Supply voltage MCD3000-T7	x 200 VAC ~ 690 VAC
	3 x 200 VAC ~ 440 VAC (Inside Delta Connection)
Supply frequency (at start)	50 HZ (± 2 Hz) / 60 HZ (± 2 Hz)
Supply frequency (during start)	>45 Hz (50 Hz supply) or >55Hz (60 Hz supply)
Supply frequency (during run)	>48 Hz (50 Hz supply) or >58 Hz (60 Hz supply)
Electronics control voltage	230 VAC (+10%/-15%) or 400 VAC (+10%/-15%)

Control Inputs:

Start (Terminals 15 & 16)	Normally Open, Active 24 VDC, 8 mA approx.
Stop (Terminals 17 & 18)	Normally Closed, Active 24 VDC, 8 mA approx.
Reset (Terminals 25 & 26)	Normally Closed, Active 24 VDC, 8 mA approx.
Parameter Set (Terminals 27 & 28)	Normally Open, Active 24 VDC, 8 mA approx.

Relay Outputs:

Programmable Output A1 (Terminals 13 & 14)	Normally Open, 5 A @ 250 VAC/360 VA, 5 A @ 30 VDC resistive
Programmable Output B2 (Terminals 21, 22 & 24)	Changeover, 5 A @ 250 VAC/360 VA, 5 A @ 30 VDC resistive
Output C3 (Terminals 33 & 34)	Normally Open, 5 A@250 VAC/360 VA, 5 A@30 VDC resistive

- 1) Programmable functions:
Line contactor, Run, High current flag, Low current flag
- 2) Programmable functions:
Tripped, Output on, High current flag, Low current flag, Line contactor
- 3) Programmable functions:
Run, D.C.Brake Contactor Control, Off

Environmental:

Degree of protection MCD3007 to MCD3132	IP 21
Degree of protection MCD3185 to MCD3800	IP 20
Operating Temperatures	-5°C /+60°C
Rated short-circuit current (with semi-conductor fuses)	100 kA
Rated insulation voltage (Surges)	2 kV line to earth, 1 kV line to line
Rated impulse withstand voltage (Fast transients)	2 kV
Pollution Degree	Pollution Degree 3
Electro static discharge	4 kV contact discharge, 8 kV air discharge
Equipment class (EMC)	Class A
Radio-frequency electromagnetic field	0.15 MHz – 80 MHz: 140 dBµV 80 MHz – 1 GHz: 10 V/m

This product has been designed for Class A equipment. Use of the product in domestic environments may cause radio interference, in which case the user may be required to employ additional mitigation methods.

Standards Approvals:

C√	CISPR-11
UL1	UL508
C-UL1	CSA 22.2 No. 14
CE	IEC 60947-4-2

1) Requires use of semi-conductor fuses. Excludes models MCD3600~MCD3800

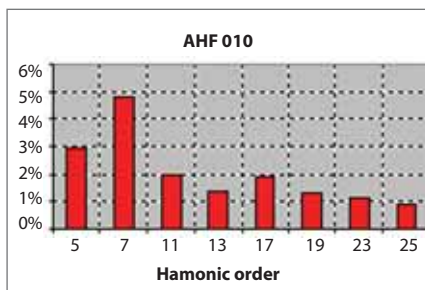
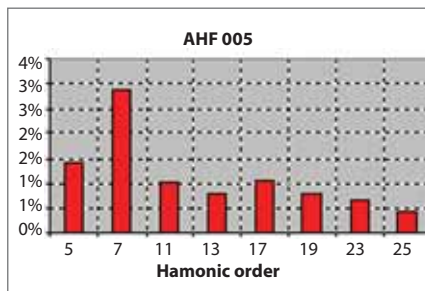
VLT® Harmonic Filter AHF 005/010



The Danfoss AHF 005 and AHF 010 are advanced harmonic filters not to be confused with traditional harmonic trap filters. The Danfoss harmonic filters have been specially designed to match the Danfoss frequency drives.

AHF 010 reduces the harmonic current to less than 10% and the AHF 005 reduces the harmonic current to less than 5%.

Excellent performance



Danfoss harmonic filters perform excellently.

The figures show the reduction of each of the sub-harmonic orders at full load.

Calculation Danfoss has created a PC based program MCT31 for calculation of harmonics with different principles for suppression. It can calculate the harmonics for Danfoss Frequency Converters depending on actual system (transformer, cables, other loads etc.)

Features

- Small compact housing that fits into a panel
- Easy to use in retrofit applications
- AHF 010 reduces the total harmonic current distortion to 10%
- AHF 005 reduces the total harmonic current distortion to 5%
- One filter module can be used for several frequency drives
- High efficiency (> 0.98)
- User-friendly commissioning – no adjustment necessary
- No routine maintenance required

Specifications

General technical data:

The reduction of the low harmonic current emission to the rated THiD implies, that the THvD of the non-influenced mains voltage is lower than 2% and the ratio of short circuit power to installed load (R SCE) is at least 66%.

Under these conditions the THiD of the mains current of the frequency converter is reduced to 10% or 5% (typical values at nominal load).

If these conditions are not or only partially fulfilled, a significant reduction of the harmonic components can still be achieved, but the rated THiD values may not be achieved.

VLT® Power Options dU/dt filter



dU/dt filters reduce the dU/dt values on the motor terminal phase-to-phase voltage. The phase-to-phase voltage is still pulse shaped.

Compared to sine-wave filters, dU/dt filters cut-off frequencies above the switching frequency. Having small inductance and capacitance, the filter is cheaper.

The filters reduce the motor insulation stress and are recommended in applications with risk of flashover.

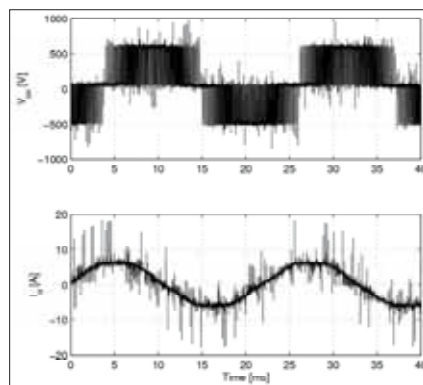
The perfect solution for:

- Applications with older motors
- Aggressive environments
- Applications with frequent braking

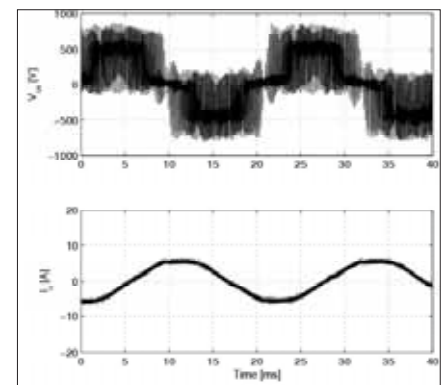
Range

3 x 200 – 500 V

3 x 525 – 690 V



Voltage and current without filter



Voltage and current with filter

Specifications

Voltage rating.....	3 x 200 – 500 V and 3 x 525 – 690 V
Nominal current I_N @ 50 Hz.....	11 – 1200 Amp for higher power modules can be paralleled
Motor frequency.....	6-60 Hz without derating 120 Hz with derating
Ambient temperature.....	-25° to 40°C without derating
Min. switching frequency.....	f_{min} 1,5 kHz – 4 kHz depending on filter type
Max. switching frequency.....	f_{max} 8 kHz
Overload capacity.....	150 % for 60 sec every 10 min.
Enclosure degree.....	IP 00 and IP 20
Approvals.....	CE, UL508

VLT® Motion Control Tool MCT 10

Setup software provides easy control of details as well as a general overview of systems, large or small.

- Handles all drive related data
- One PC tool for all tasks
- Handles all drives products and parameters
- "Explorer-like" view
- Option programming
- Online and offline commissioning
- Scope & logging
- Alarm history
- Multiple interfaces for easy connection
- USB
- Profi bus
- RS485
- Internet download
<http://www.danfoss.com/drives>



Features

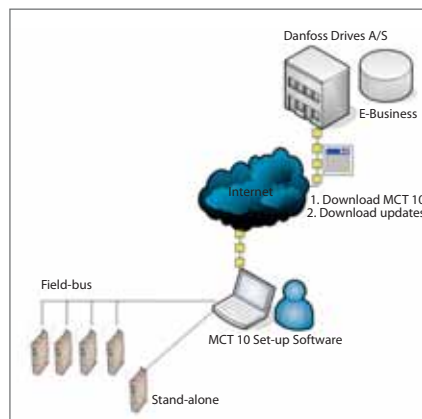


Basic:

- Scope & Graph
- Alarm history in saved projects
- No limitation in number of drives
- SyncPos support

Advanced:

- PROFIsafe option
- Copy protected "HW dongle"



More efficient commissioning

- Off-line commissioning offsite
- Save/send/mail projects anywhere
- Easy field-bus handling, multiple drives in project file. Enables service organization to be more efficient

Enables service organization to be more efficient

- Scope & logging: analyse problems easily
- Read out alarms, warnings and fault log in one view.
- Compare saved project with on-line drive

System requirements

- MS Windows® NT 4.0, 2000 and XP
- Pentium III 350 MHz or better
- 256 Mb RAM or better
- 200Mb free hard disk space
- CD-ROM drive
- VGA or XGA graphic adapter
- Mouse

VLT® Service – Your way

DrivePro™ is an efficient productivity programme tailored to meet your specific needs. All the necessary VLT® Service facilities are at your disposal, which will minimize downtime and increase productivity at your factory. This means that DrivePro™ pays for itself in no time.

DrivePro™ service products are designed to be customised and combined.



Keep you running

Current drives update

The SmartStep service programme ensures that Danfoss Products are replaced before breakdown.

Commissioning and regular adjustments

The mechanical condition of machinery changes over time. Regular adjustments can prevent failure messages and production stops.

Preventive maintenance

Proactive maintenance gives you the peace of mind that comes with knowing your drives have been properly inspected and maintained.

Keep you fit

Training

Specialised service courses enable your own maintenance staff to carry out troubleshooting and service.

Stock maintenance & consignment

The DrivePro™ stock maintenance & consignment programme provides two variants of stock properties. Danfoss ensures the best choice of equipment is present at the stock.

Harmonic Survey

The DrivePro™ Harmonic Survey covers the installation of relevant instruments, as well as analysis and consultancy regarding actions to be taken.

Environmentally sound disposal

Danfoss provides controlled environmentally sound disposal of redundant drives in line with local requirements.

Fix your costs

Fixed price

Stick to your drive repair budget. Material, labour and transport to a Danfoss lab are included.

Post-warranty agreement

After the 12-month factory warranty expires, you can extend your warranty up to 5 years. Contact your local Danfoss office for an extended warranty.

Transport insurance

Danfoss takes full responsibility for damage to drives in transit. No complicated procedures. A simple note, and Danfoss will fix it.

Response time

Customised fast response service night and day keeps processes running.



Protects environment

VLT® products are manufactured with respect for both the physical and the social environments.

All activities are planned and performed taking into account the individual employee, the work environment and the external environment. Production takes place without noise, smoke or other pollution and secure disposal of the products is assured.

UN Global Compact

Danfoss has signed the UN Global Compact on social and environmental responsibility and our companies act responsibly towards local societies.

EU Directives

All factories are certified according to ISO 14001 standard and fulfil the EU Directives for General Product Safety (GPSD) and the Machinery directive. Danfoss Drives is in all product series implementing the EU Directive concerning Hazardous Substances in Electrical and Electronic Equipment (RoHS) and is designing all new product series according to the EU Directive on Waste Electrical and Electronic Equipment (WEEE).

Products impact

One year's production of VLT® drives will save energy equivalent to the energy production of an atomic power plant. Better process control at the same time improves product quality and reduces waste and wear on equipment.

What VLT® is all about

Danfoss Drives is the world leader among dedicated drives providers – and still gaining market share.

Dedicated to drives

Dedication has been a key word since 1968, when Danfoss introduced the world's first mass produced variable speed drive for AC motors – and named it VLT®.

Two thousand employees develop, manufacture, sell and service drives and softstarters in more than one hundred countries, focused only on drives and softstarters.

Intelligent and innovative

Developers at Danfoss Drives have fully adopted modular principles in development as well as design, production and configuration.

Tomorrow's features are developed in parallel using dedicated technology platforms. This allows the development of all elements to take place in parallel, at the same time reducing time to market and ensuring that customers always enjoy the benefits of the latest features.

Rely on the experts

We take responsibility for every element in our products. The fact that we develop and produce our own features, hardware, software, power modules, printed circuit boards, and accessories is your guarantee for reliable products.

Local backup – globally

VLT® motor controllers are operating in applications all over the world and Danfoss Drives' experts located in more than 100 countries are ready to support our customers with application advice and service wherever they may be. Danfoss Drives experts don't stop until the customer's drive challenges are solved.

