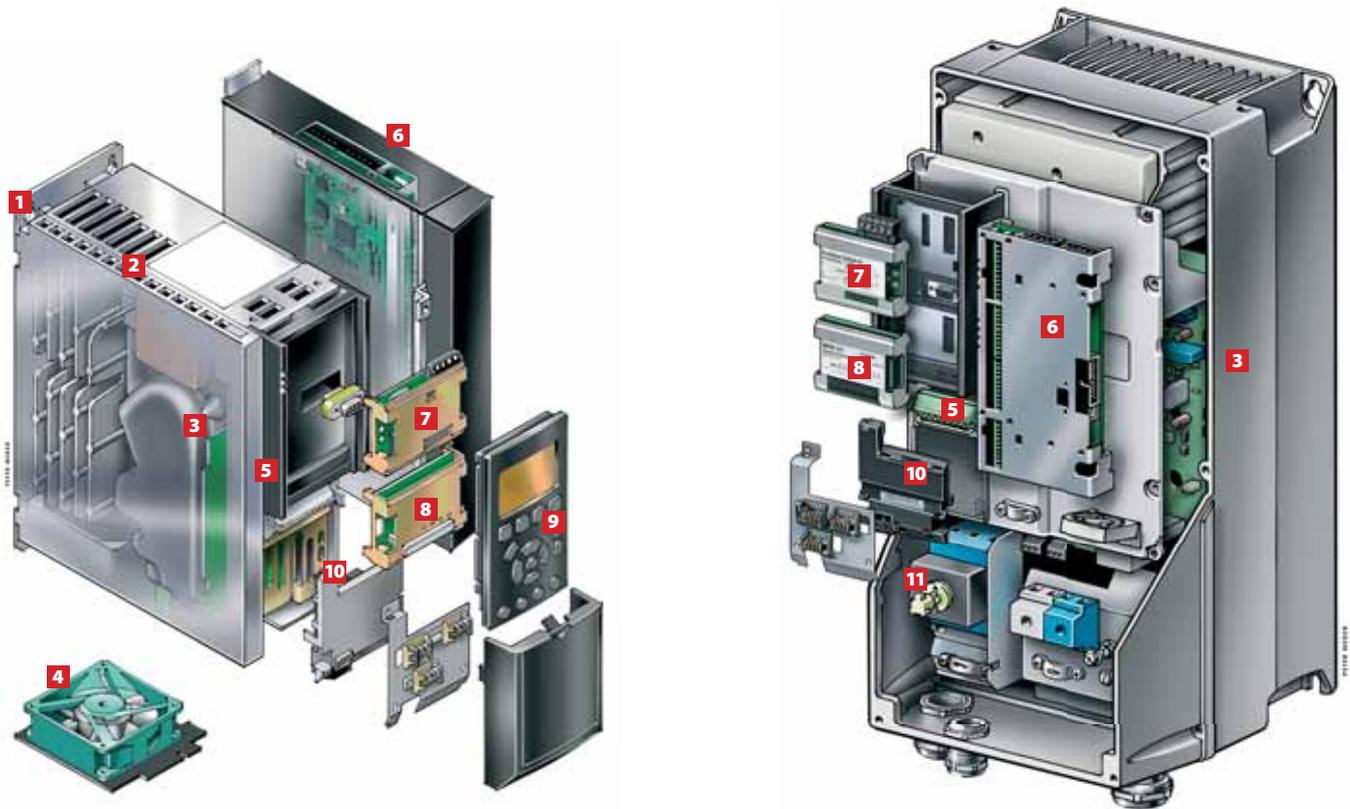




VLT® AutomationDrive Selection Guide

The modular VLT® AutomationDrive FC 300

VLT® AutomationDrive allows for mass production of highly customised drives



1 One drive

– two performance levels

Use the FC 301 version for standard needs and the FC 302 version for applications that need greater functionality and dynamic response.

Enclosure

The drive meets requirements for enclosure class IP 20/Chassis. Optional IP 21/NEMA 1, IP 55/NEMA 12, IP 54/NEMA 12 or IP 66.

2 EMC and Network effects

All versions of VLT® AutomationDrive comply as standard with EMC limits A1 and A2 according to the EN 55011 norm.

The standard integrated DC coils also ensure low harmonic load on the network according to EN 61000-3-12 and increase the lifespan of the dc link capacitors.

3 Conformal coating

The electronic components are, as standard, coated as per IEC 60721-3-3, class 3C2. For harsh and aggressive environments, coating as per IEC 60721-3-3, class 3C3 is available.

4 Removable fan

Like most of the elements, the fan can be quickly removed and remounted for easy cleaning.

5 Control terminals

Specially developed spring-loaded cage clamps enhance reliability and facilitate easy commissioning and service.

6 Programmable option

Free-programmable MCO 305 option for synchronisation, positioning, cam control, center winding and more.

7 Fieldbus option

Options for bus communication (Profibus DPV1, DeviceNet, CANopen, EtherNet/IP etc.), synchronisation, user programs, etc., are delivered ready to plug-and-play.

8 I/O extensions

A host of I/O options are available – factory mounted or as retrofit:

- General purpose I/O
- CI Encoder
- Resolver
- Relay options
- ATEX
- Safe interface



9 Display options

Danfoss Drives' removable Local Control Panel is now available in 28 languages. Six of these are built-in (including Chinese), two of the languages can be changed by the user. The info button makes the printed manual virtually redundant.

Alternatively the drive can be commissioned via the built-in USB/RS485 connection or a field-bus from the VLT® set-up software MCT 10.

The Automatic Motor Adaptation, Quick Set-Up menu and large graphic display make commissioning and operation a breeze. Your choice of numerical display, graphical display or blind cover.

10 24 V

The 24 V supply keeps the VLT® AutomationDrive logic "alive" when the AC mains is removed.

Safety

The VLT® AutomationDrive FC 302 comes standard with safe stop functionality. The solution is approved by authorities for category 3 installations in accordance with EN 954-1 and SIL2/IEC 61508.

This feature prevents the drive from starting unintently. Enhanced safety features are available as options.

11 Mains switch option

This switch interrupts the mains supply and has a free useable auxiliary contact.

Built-in Smart Logic Controller

The Smart Logic Controller is a simple but clever way to keep your drive, motor and application working together.

The controller monitors a specified event. When an event occurs, the controller triggers a specified act and starts monitoring the next event continuing for up to 20 steps before returning to step one.



Danfoss Drives received the Frost & Sullivan Award for Product Innovation 2006 for the unique VLT® AutomationDrive series.

Intelligent heat management

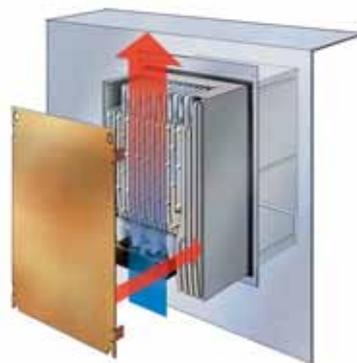
Cooling can take place in various ways for different benefits

Total separation between cooling air and electronics allows for solutions where heat is removed from outside of the cabinets.

With VLT® AutomationDrive, a flanged heat sink kit is available for mounting the drive in the backplate of a cabinet.

Forced convection cooling

A fan blows cold air through the cooling ribs of the aluminium base. The channel is easily cleaned without touching the electronics.



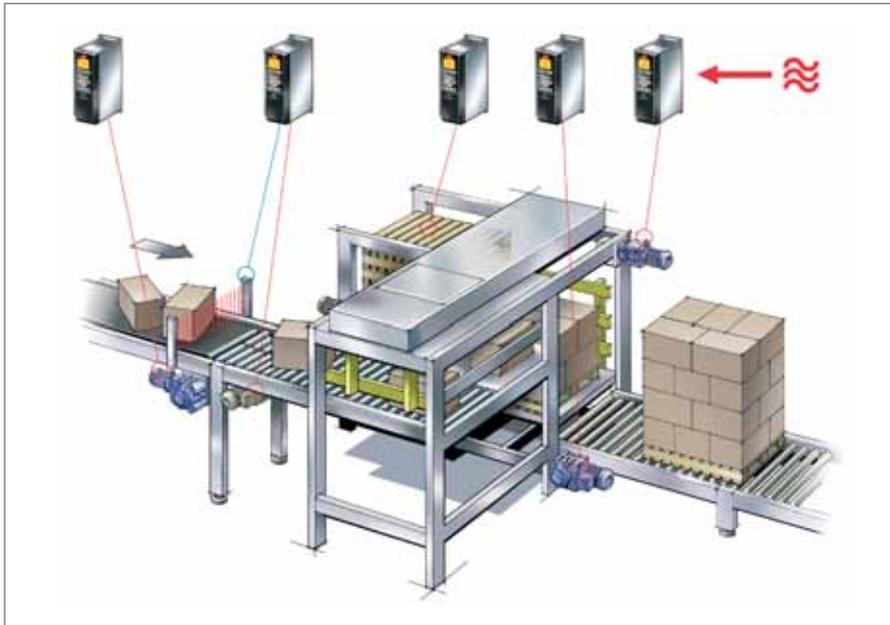
Cold plate cooling

External cooling is possible through the back side of the aluminium base.



Users can order all facilities simply by defining it on the code string. You will receive a fully assembled and tested device. If needed, many options can be ordered to retrofit later.

Just one drive series to run an entire production line



A VLT® AutomationDrive FC 301 operating a conveyor belt at constant speed is based on the same platform as a VLT® AutomationDrive FC 302 for positioning and synchronising to control hoists with changing loads.

The VLT® AutomationDrive FC 300 is a single drive concept that controls all operations from standard to servo motors on any machine or production line.

The standard version covers a wide range of functions such as PLC functionality, automatic fine-tuning of motor control and self-analysis of performance.

The VLT® AutomationDrive FC 301 holds many excellent features like VVC+ vector control, Automatic Motor Adaptation, PID controller and/or RS485-/USB connection.

The variant FC 302 has higher performance such as faster response times, servo-performance with Flux-vector control and additional I/O options.

You will find a comparison between the versions on page 13 in this booklet. Both versions are equipped with user friendly control panels, spring loaded cage clamps and housing designs.

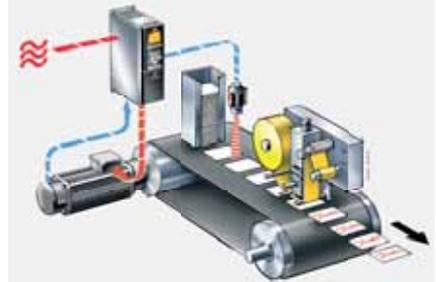
Nearly all options are available for both performance levels.

The fieldbus option ready to plug in beneath the front panel. It can be turned upside down if you prefer to have the cable on top.

The VLT® AutomationDrive is controlled locally via a control panel. This is plugged in directly or connected via a cable.



VLT® AutomationDrive FC 302 runs permanent magnet motors



VLT® AutomationDrive FC 302 exploits the full potential of permanent magnet motors in high dynamic applications.

Fast processors enable it to precisely control position, acceleration and torque – with or without encoder feedback.

All supply voltages

The VLT® AutomationDrive series covers the power range from 0.25 to 1400 kW. It supports supply voltages in the ranges 200, 380 – 480/500 V, 525 – 600 V and 690 V. Also, operation in special network grids such as IT Net is possible.

Large selection of encoder interfaces: HTL/TTL incremental, with Resolver or SinCos HIPERFACE, SSI or EnDat absolute encoders.



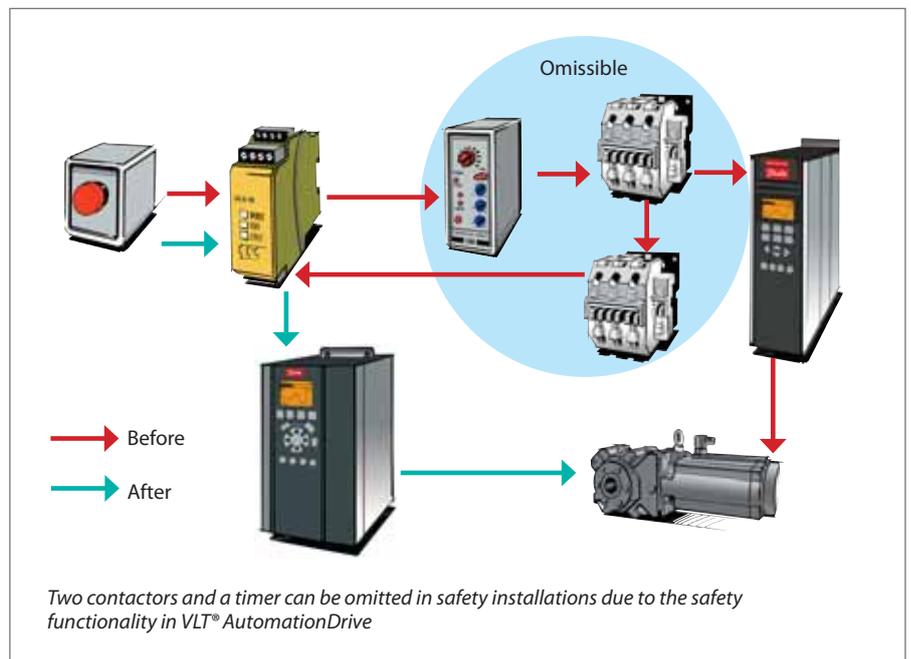
One wire safety

The VLT® AutomationDrive FC 302 comes as standard with safe stop functionality suitable for category 3 installations as defined by EN 954-1 and SIL 2/IEC 61508. This feature prevents a drive from starting accidentally.

This is crucial for applications where preventing unintended starts are of vital importance. The FC 302 terminal 37 can be used as "safe coast" for this purpose – the stop function satisfies stop category 0 EN 60204-1.

Expensive and bulky external components can be omitted, wiring simplified, and down-time minimised with this solution. And the safety signals can be transferred via discrete signals wiring (in compact machinery) or safe bus communication (in extended manufacturing plants).

The coupling of the Pilz safety relay and VLT® AutomationDrive is perfect to obtain safe stop category 1, because VLT® AutomationDrive is approved for safety category 3 applications.



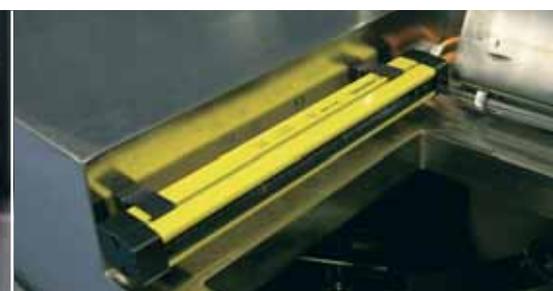
The electrical connection is extremely simple – just one wire
VLT® AutomationDrive is approved for providing safe stop in category 3 installations without the need for feedback signals from the drive to the safety relay.

The modular security concept of the VLT® AutomationDrive Platform
VLT® AutomationDrive is prepared for the future, prepared to adapt additional security features. Special security options are being prepared.

Hazardous situations are avoided without interrupting the mains supply.

Terminal 37 can be used as "safe coast" for safe stop – the stop function satisfies stop category 0 EN 60204-1.

Security-related elements can be switched directly to the FC 300.



Perfect for all conditions

VLT® drives are available in IP 20 enclosures, optimised for installation in panels

The installation volume and/or the mounting surface are reduced by up to 60% compared with the previous series.

The service sections nevertheless fulfil the highest requirements even for applications with high overload, long motor cables and ambient temperatures up to 50° C (55° C with derating).

Optimised design

Optimised efficiency and intelligent cooling technology make the compact and service-friendly design possible. Even equipment such as EMC filters, harmonics suppression and brake modules are integrated in the enclosure.

Save installation time

The IP 20 series is designed for easy accessibility and time-saving installation. Mechanical fastening points are

easy to access from the front even with automatic tools. All terminals are sufficiently dimensioned and clearly marked.

One needs only loosen a few screws to get to the terminals. Accessories for bonding of screened cables are included.

The compact enclosures are easier to install. This is important especially within existing installations with poor accessibility.

Modular and fully compatible

The IP 20 enclosed series completes the enclosure program of the modular VLT® series with IP 21, IP 55 and IP 66 enclosures. They all support completely the modular platform of the VLT® series.



An extensive range of options and accessories is available, optimising the drive for the respective application.

Optimised EMC performance

VLT® AutomationDrive meets the product standard EN 61800-3 regarding EMC without additional external components – even with long motor cables – and corresponds to the EMC guidelines 2004/108/EC. Therefore it behaves extremely well compared to other drives.

Even more important for practical use is compliance with the environment standard EN 55011, Class B (residential) and Class A1 (industrial area).

This ensures reliable plant operation through full compliance with all EMC requirements and product standard prescribed warnings and restrictions.

On the power side, integrated chokes minimise the network effects drastically and thus keep within the limits of EN 61000-3-12.

The fully dimensioned intermediate circuit makes the VLT® AutomationDrive stable and highly dynamic even

with short supply voltage drops or other poor network conditions.

Limits according to EN 55011	Class B	Class A1	Class A2	Exceeding class A2
Categories according to EN 61800-3	C1	C2	C3	C4

Comparison of limits EN 55011/61800-3

High reliability even in harsh environments



Because of the high-density integration, the tight housings of VLT® AutomationDrive are significantly smaller when compared with other drives of the same performance.

For example, the FC drives from 3 kW to about 22 kW take up only 68% of the mounting surface required for the former VLT® 5000 up to 7.5 kW.

The cables are mounted tightly through glands in the base plate. Since no additional 24 V control voltage is needed and access to the drive control can be password protected, the drive can be installed as a stand-alone device, making expensive cabinets omissible.

FC 300 devices in IP55/IP66 enclosure. Also here, all components such as EMC filter and DC-DC chokes are integrated. The cables enter drop-safe from the bottom side.

All VLT® AutomationDrive versions have manganese phosphor rear bodies. The back of IP 66 versions is dip-coated with epoxy or polyester spray finish (60-100 µm). The cover is powder coated (80-100 µm).

IP 66 enclosed drives are suitable for installation outdoor and in washdown areas.

The silicone gasket is tested with different detergents so the drives

withstand the harsh cleaning agents in the food & beverage industry.

Cooling air is kept outside the device to prevent any pollution of the electronics. The surfaces are smooth and can easily be cleaned.

Furthermore, all components such as EMC filters for Class A1/B1 according to EN 55011, as well as the DC coils, are protected inside the drive.

The VLT® AutomationDrive is also available with a mains switch option. This switch interrupts the mains supply and has a free useable auxiliary contact."



An external watertight USB plug connected to the control card inside IP 55/66 enclosures makes USB access easy.



Special mounting accessories are available to reduce costs and time for retrofitting.

Spring-loaded connectors save considerable time and costs, both in installation and service.

Built-in circuit chokes reduce the impact on the supply network and increase the lifetime of the drive.



Built-in Smart Logic Controller

Smart Logic

The Smart Logic Controller is a simple but clever way to keep your drive, motor and application working together.

The controller monitors a specified event. When an event occurs, the controller triggers a specified act and starts monitoring the next event, continuing for up to 20 steps before returning to step one.

The Smart Logic Controller is able to monitor any parameter that can be defined as "true" or "false". This includes digital commands but also logic expressions, allowing even sensor outputs to influence the operation. Temperature, pressure, torque,

flow, time, load, frequency, voltage and other parameters combined with the operators ">", "<", "=", "and" and "or" forms logical statements.

That is why Danfoss calls it a "logic" controller. And it is why you can program the controller to react to almost any event you choose.



Control functions can be partially or completely performed by the drive, due to the easily defined logic functions.

VLT® Motion Control Option

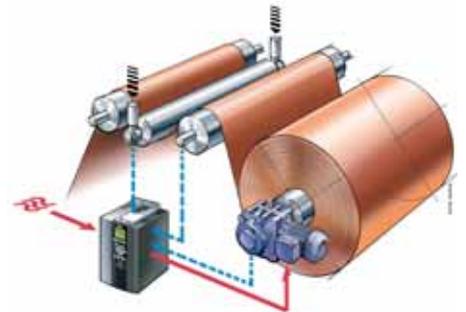
The Motion Control Option MCO 305 is an integrated programmable motion controller. It adds even more functionality and flexibility to the drives.

With the Motion Control Option, the VLT® AutomationDrive becomes an intelligent drive featuring highly accurate, dynamic motion control, synchronisation (electronic shaft), positioning and electronic CAM control. Programmability lets you implement

a variety of application functions, such as monitoring and intelligent error handling. Dedicated options are pre-programmed for specific tasks:

Dedicated options

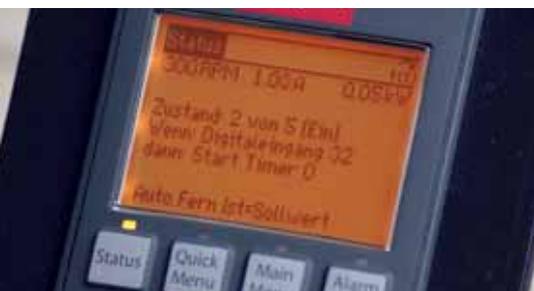
- VLT® Synchronizing Controller MCO 350
- VLT® Positioning Controller MCO 351
- VLT® Center Winder MCO 352



You can analyse and operate the Smart Logic Controller with the graphical LCP.

To disconnect wires, simply unplug the terminal blocks.

The VLT® AutomationDrive is controlled locally via a control panel. This is plugged in directly or connected via a cable to the robust Sub-D terminal – also while the drive is running.



Easy retrofit with VLT® AutomationDrive

To reduce costly downtime replacing or repairing older drives and fieldbus components, Danfoss offers a complete and sophisticated upgrading concept for the conversion of plants with widespread VLT® 3000 and VLT® 5000.

The aim of this approach is to reduce storage and spare part problems, keep the expense of modifications to a minimum and make the switch to the new technology platform quick and easy.

Fast conversion

Sophisticated conversion kits reduce downtime, modernising existing installations.

Conversion kit

Conversion kits are available to facilitate exchange from earlier VLT® drives.

The kit facilitates:

- Mechanical adaption
- Electric adaption
- Parameter adaption
- Profibus adaption



Small footprint

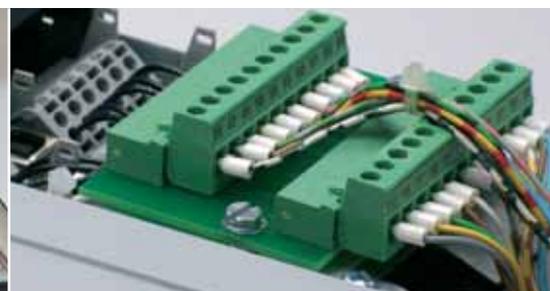
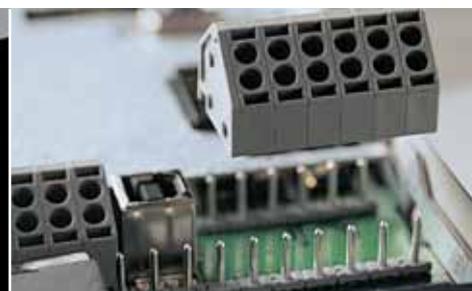
VLT® AutomationDrive has a compact design. All power sizes are smaller than their predecessors. No dimension has increased and volumes are typically 20% smaller.

Even though the drives can still be mounted "side by side" with 0 mm clearance.

The fan speed is regulated according to the temperature of the drive and can easily be removed and remounted for cleaning.

To disconnect wires, simply unplug the terminal blocks.

With the terminal adapter it is possible to re-use existing wiring from VLT® 3000 or VLT® 5000.



User friendly control panel

1 Graphical display

- International letters and signs
- Displays bars and graphs
- Easy overview
- Possible to select 28 languages
- iF awarded design

2 Menu structure

- Based on the well known matrix-system in today's VLT® drives
- Easy shortcuts for the experienced user
- Edit and operate in different setups simultaneously

3 Other benefits

- Removable during operation
- Up- and download functionality
- IP 65 rating when mounted in a panel door
- Up to 5 different variables visible at a time
- Manual speed/torque setting



4 Illumination

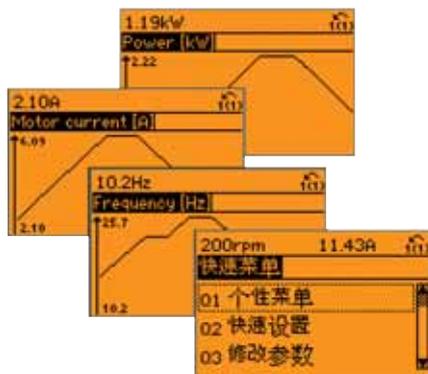
- Relevant buttons are illuminated when active
- Other LED's indicate the status of the drive

5 Quick Menu

- A Danfoss defined Quick Menu
- A personal defined Quick Menu
- A Changes Made Menu lists the parameters unique to your application
- A Function Setup menu provides quick and easy setup for specific applications
- A Logging menu provides access to operation history

6 Intuitive functions

- Info ("on board manual")
- Cancel ("undo")
- Alarm log (quick access)



LCP Panel mounting kit

The kit lets you mount the LCP in an IP 65 cabinet front.



The VLT® AutomationDrive has an award-winning Local Control Panel and a well structured menu system that ensures fast commissioning and trouble-free operation of the many powerful functions.

Three panel options: graphical, numerical, blind cover.

The VLT® AutomationDrive is controlled locally via a control panel. This is plugged in directly or connected via a cable.

The VLT® AutomationDrive can be remote commissioned and monitored via a USB cable or fieldbus communication. Special software is available: Wizards, Data transfer tool, VLT® Set-up Software MCT 10, and Language changer.



VLT® Motion Control Tool MCT 10

Setup software provides easy control of details as well as a general overview of drive systems, large or small. The tool handles all drives-related data.

Explorer-like interface

The MCT 10 software features an explorer-like interface design and functionality to ease both use and learning of the facilities.

More efficient service organisation

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

More efficient commissioning

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

Basic

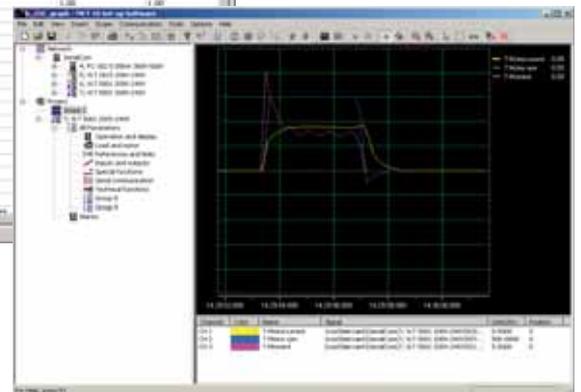
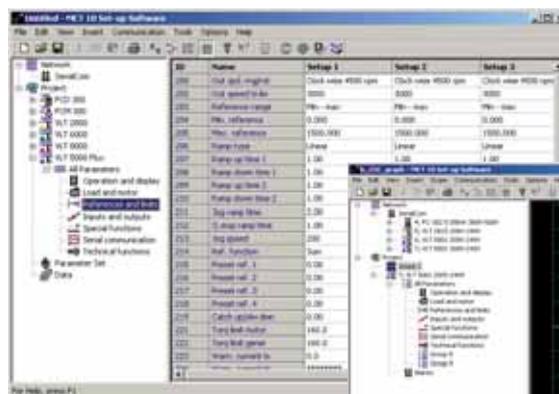
- Scope & Graph
- Alarm history in saved projects
- MCO 305 support
- Graphical Smart Logic Controller, Preventive Maintenance and Basic Cascade Controller (FC 102/FC 202 only)
- Multiple fieldbus support
- VLT® 5000 to FC 302 Drive Conversion Wizard

Advanced

- No limitation in number of drives
- Motor database
- Real-time logging from drive
- Sensorless pump control

Fieldbusses

- ProfiBus
- RS485
- USB
- Ethernet-TSC



MCT 10 has a Windows-like design, leading to intuitive operation.

Two modes

Online mode

In the online mode, you work with the actual setup of the drives in question. Your actions will have immediate effect on the performance of the drive(s).

Project oriented

In project mode you work with the drive parameters as a "virtual" setup. This allows you to adjust the whole system before you implement it into the drives and put it in action. In project mode you can set the system

up even before the drives are installed. A single command will update the whole system. In case a drive is exchanged, it is easily set up to perform exactly as its predecessor.

System requirements

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

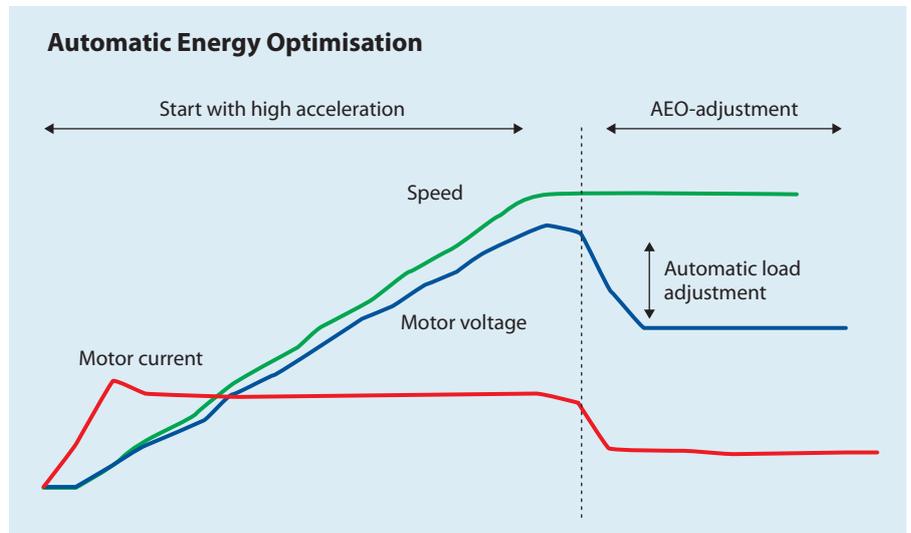
Energy saving products

VLT® products and solutions contribute to environmental protection by reducing energy consumption and optimising the use of resources. Reliable and efficient automation systems from Danfoss Drives have increased companies' productivity, saved energy and improved comfort levels.

The variable speed drives sector has a huge role to play in energy conservation, providing true variable control of fans and pumps. Wherever a centrifugal fan or pump is being run damped or throttled, energy is wasted across the regulating device, creating heat or noise. In HVAC applications, substantial energy savings, even as great as 48%, have been demonstrated in the past.

Reduced heat loss and better system efficiency

With an efficiency of up to 98% and a power factor above 0.9, the FC inverter series performs significantly better than comparable devices.



The figures include losses in coils and filters. Less heat loss leads to savings in the costs related to removal of the excess heat.

Low stand-by consumption

Speed controlled cooling and the energy saving design of the control electronics ensures low consumption at stand-by. Due to short start-up time, it is possible to de-couple the drive completely from the net.

The control card can – if necessary – be kept “alive” with external 24 V supply.

Energy saving change of speed

Acceleration and deceleration of applications can be carefully adapted to the application needs. Optimally designed ramps ensure smooth dynamic behaviour.

Automatic load adjustment

The Automatic Energy Optimization (AEO) provides additional savings of up to 5%.

This feature provides additional current to the motor at low speed to maintain an optimal magnetisation and efficiency.

Runs high efficiency PM motors

Permanent magnet motors have advantages in terms of efficiency and design.

The VLT® AutomationDrive FC 302 can operate both asynchronous and PM motors – even in open loop.

Common DC link

For applications with long braking cycles and several axes, the use of a common DC link lowers both operating and installation costs significantly. The DC coupling between the inverter circuits means that regenerative energy from decelerating motors is reused in the other motors.

One drive – two performance levels

Special needs require special features and performance

	FC 301 (A1-Enclosure)	FC 301	FC 302
Power range 200 – 240 V [kW]	0.25 – 1.5	0.25 – 37	0.25 – 37
Power range 380 – (480) 500 V [kW]	0.37 – 1.5	0.37 – 75	0.37 – 1100
Power range 525 – 600 V [kW]	–	–	0.75 – 7.5
Power range 525 – 690 V [kW]	–	–	11 – 1000
IP 00	–	√	√
IP 20/21 (NEMA1)	√	√	√
IP 54/IP 55 (NEMA12)	–	√	√
IP 66	–	√	√
Ambient temperature °C Avg. 24 hours (IP 21) w/o de-rating	50° C	50° C	50° C
VVC+ vector control	√	√	√
Flux vector control	–	–	√
Cable length – screened/unscreened	25/50 m	50/75 m	150/300 m
Permanent magnet motor operation (w/wo feedback)	–	–	√
KTY-monitoring of temperature	√	√	√
Monitoring of over-voltage	√	√	√
Smart Logic Control	√	√	√
Safety function Safe Torque Off (STO – EN 61800-5-2)	Option	–	√
Galvanic isolation PELV	√	√	√
Conformal coated PCBs (IEC 721-3-3)	Standard	Standard	Standard
Removable fan	√	√	√
RS 485 and USB-interface	√	√	√
Graphical/numerical control panel (LCP 102/101)	Option	Option	Option
Up/download of settings from LCP (LCP 102)	√	√	√
Info/Help function (LCP 102)	√	√	√
28 languages built-in	√	√	√
Password protection	√	√	√
Personal menu (macro)	√	√	√
Pluggable control terminals	√	√	√
Analogue input (changeable)	0 ... +10 V	0 ... +10 V	-10 ... +10 V
Analogue output resolution	12 bit	12 bit	12 bit
Programmable digital input	5(4)	5 (4)	6 (4)
Programmable digital output changeable	1	1	2
Programmable Relay Output	1	1	2
Process PID control	√	√	√
Flying start – catch spinning motor	√	√	√
Automatic Energy Optimization (AEO)	√	√	√
Precise Start/Stop	√	√	√
Number of fixed parameter sets	8/32	8/32	8/32
Digital motor potentiometer	√	√	√
Integrated motor database	√	√	√
Programmable power drop procedure	√	√	√
Options:			
Profibus, DeviceNet, CANopen, EtherNet/IP, PROFINet	√	√	√
MCB 101 – Extended input/outputs	√	√	√
MCB 102 – Encoder option	√	√	√
MCB 103 – Resolver option	√	√	√
MCB 105 – Relay option	√	√	√
MCB 108 – Safe PLC interface	√	√	√
MCB 112 – ATEX- PTC-monitoring	–	–	√
MCO 305 – Motion Control Option	–	√	√
MCB 107 – External 24 V supply	–	√	√

Specifications

(Basic unit without extensions)

Main supply (L1, L2, L3)	FC 301	FC 302
Supply voltage	200 – 240 V ±10%	
Supply voltage	380 – 480 V ±10%	380 – 500 V ±10%
Supply voltage		525 – 600 V ±10%
Supply voltage		525 – 690 V ±10%
Supply frequency	50/60 Hz	
Displacement power factor (cos φ) near unity	> 0.98	
Harmonic disturbance	Meets EN 61000-3-12	

Output data (U, V, W)	FC 301	FC 302
Output voltage	0 – 100% of supply voltage	
Output frequency	0.2-1000 Hz	0-1000 Hz
Switching on output	Unlimited	
Ramp times	0.02-3600 sec.	

Digital inputs	FC 301	FC 302
Programmable digital inputs	4(5) > 5	4(6) > 6
Changeable to digital output	1 (terminal 27)	2 (terminal 27, 29)
Logic	PNP or NPN	
Voltage level	0 – 24 V DC	
Maximum voltage on input	28 V DC	
Input resistance, Ri	Approx. 4 kΩ	
Scan interval	5 ms	1 ms

Analogue inputs	FC 301	FC 302
Analogue inputs	2	
Modes	Voltage or current	
Voltage level	0 to +10 V (scaleable)	-10 to +10 V (scaleable)
Current level	0/4 to 20 mA (scaleable)	
Accuracy of analogue inputs	Max. error: 0.5% of full scale	

Pulse/encoder inputs	FC 301	FC 302
Programmable pulse/encoder inputs	2/1	
Voltage level	0 – 24 V DC (PNP positive logic)	
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)	

Digital output	FC 301	FC 302
Programmable digital/pulse outputs	1	2
Voltage level at digital/frequency output	0 – 24 V DC	
Max. output current (sink or source)	40 mA	
Maximum output frequency at frequency output	0 to 32 kHz	
Accuracy on frequency output	Max. error: 0.1% of full scale	

Analogue output	FC 301	FC 302
Programmable analogue outputs	1	
Current range at analogue output	0/4 – 20 mA	
Max. load to common at analogue output (clamp 30)	500 Ω	
Accuracy on analogue output	Max. error: 1% of full scale	

Control card	FC 301	FC 302
USB interface	1.1 (Full Speed)	
USB plug	Type "B"	
RS485 interface	Up to 115 kbaud	
Max. load (10 V)	15 mA	
Max. load (24 V)	130 mA	200 mA

Relay output	FC 301	FC 302
Programmable relay outputs	1	2
Max. terminal load (AC) 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 20 mA	

Surroundings/external	FC 301	FC 302
Enclosure	IP00, IP20, IP21, IP54, IP55, IP66	
Vibration test	1.0 g (D-enclosure: 0.7 g)	
Max. relative humidity	5% – 95% (IEC 721-3-3; Class 3C3 (non-condensing) during operation)	
Aggressive environment (IEC 721-3-3)	Uncoated class 3C2, optional coated class 3C3	
Ambient temperature	Max. 50° C	
Galvanic isolation of all	I/O supplies according to PELV	

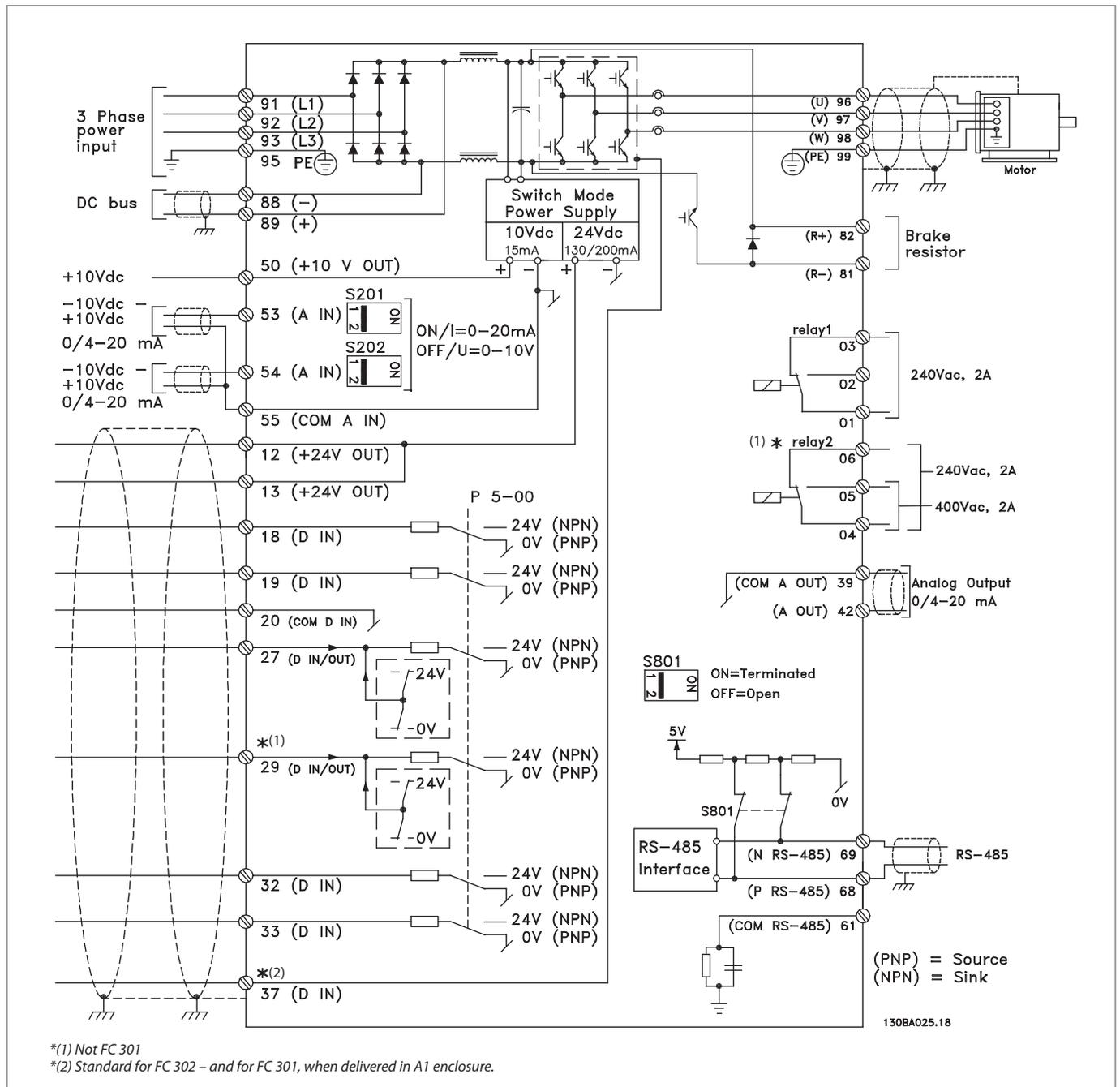
Protection mode for longest possible up-time
<ul style="list-style-type: none"> • Electronic thermal motor protection against overload • Temperature monitoring of the heat sink ensures that the FC 300 cuts out if the temperature reaches 100 °C • The FC 300 is protected against short-circuits on motor terminals U, V, W • The FC 300 is protected against earth fault on motor terminals U, V, W • Protection against mains phase loss



Global Marine

Connection examples

The numbers represent the terminals on the drive.



The diagram shows the port terminals of the FC 301 and FC 302. Additional options will expand the number of terminals.

The numbers indicated refer to the terminal numbers of the drives. Brake resistance (terminals 81 and 82) and intermediate circuit connection

(terminals 88 and 89) must be specified when configuring/ordering. Users can set the mode of the analogue inputs 53 and 54 using the S201 and S202 switches.

All FC 301/302 have an RS485 and a USB interface as standard. The RS485 terminations are integrated in the

drive (S801). The drive can be equipped with a fieldbus option if necessary.

To switch from NPN to PNP logic for the digital signals, use parameter 5-00.

Ordering type code for VLT® AutomationDrive

[1] [2] [3] [4] [5] [6] [7] [8] [9] [10] [11] [12] [13] [14] [15] [16] [17] [18]
 FC [] - [] - [] - [] - [] - [] - [] - [] - [] - X - X - SXX X - [] - [] - [] - [] - [] - [] - []

[1] Application

301	VLT® AutomationDrive FC 301
302	VLT® AutomationDrive FC 302

[2] Power Size

PK25
PK37
PK55
PK75
P1K1
P1K5
P2K2
P3K0
P3K7
P4K0
P5K5
P7K5
P11K
P15K
P18K
P22K
P30K
P37K
P45K
Pxxx
P200

See ratings data on page 16 for power ratings

[3] AC Line Voltage

T2	3 x 200/240 V AC
T4	3 x 380/480 V AC (FC 301)
T5	3 x 380/500 V AC (FC 302)
T6	3 x 525/600 V AC (FC 302)
T7	3 x 525/690 V AC (FC 302)

[4] Enclosure

For cabinet mounting:

E00	IP 00 (enclosure D3, D4)
Z20	IP 20 (enclosure A1, FC 301 only)
E20	IP 20 (enclosure A2, A3, B3, B4, C3, C4)

Standalone:

E21	IP 21 (enclosure B1, B2, C1, C2, D1, D2)
E54	IP 54 (enclosure D1, D2)
E55	IP 55 (enclosure A5, B1, B2, C1, C2)
E66	IP 66 (enclosure A5, B1, B2, C1, C2)

Special designs:

C00	IP 00 (enclosure E00 – air duct in stainless steel)
P20	IP 20 (enclosure B4, C3, C4 – rear heat sink)
E2M	IP 21 (enclosure D1, D2 – protective cover)
P21	IP 21 (Enclosure as E21 – rear heat sink)
E5M	IP 54 (enclosure D1, D2 – protective cover)
P55	IP 55 (enclosure as E55 – rear heat sink)

[5] RFI Filter (EN 55011)

H1	RFI-Filter Class A1/B
H2	No RFI-Filter, Class A2
H3	RFI-Filter Class A1/B ¹⁾
H4	RFI-Filter, Class A1 ²⁾
H6	RFI-Filter für Marine ²⁾
HX	No RFI-Filter (only 600 V)

[6] Braking & Safety

X	No brake IGBT
B	Brake IGBT mounted
T	Safe stop without brake ¹⁾ (FC 301 – only in A1 enclosure)
U	With brake and Safe Stop ¹⁾ (FC 301 – only in A1 enclosure)

[7] Display (Local Control Panel)

X	Blank faceplate, no LCP installed
G	LCP 102 – Numeric LCP installed
N	LCP 101 – Graphic LCP installed

[8] Conformal Coating (IEC 721-3-3)

X	No conformal coating (Class 3C3)
C	Conformal coating on all PCBs (Class 3C2)

[9] Mains Input

X	No option
1	Mains disconnect
3	Mains disconnect and fuses ²⁾
5	Mains disconnect, fuses and load sharing ²⁾
7	Fuses ²⁾
8	Mains disconnect and load sharing ³⁾
A	Fuses & load sharing terminals ²⁾
D	Load sharing terminals ³⁾

[12] LCP Language

X	Standard language package including English, German, French, Spanish, Danish, Italian and Finnish
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Consult factory for other language options

[13] A Option (Fieldbus)

AX	No fieldbus option
A0	MCA 101 – Profibus DPV1
A4	MCA 104 – DeviceNet
A6	MCA 105 – CANopen
AN	MCA 121 – Ethernet/IP

[14] B Option (Application)

BX	No application option
BK	MCB 101 – general purpose I/O
BR	MCB 102 – encoder input
BU	MCB 103 – resolver input
BP	MCB 105 – relay expansion
BZ	MCB 108 – safety PLC interface
B2	MCB 112 – ATEX-PTC thermistor

[15] C0 Option (Motion Control Option)

CX	No motion control option
C4	MCO 305/350/351 motion control, synchronising and/or positioning (see [17])

[16] C1 Option (Extended Relay)

X	No option
R	MCB 113 – extended relay (FC 302 only)

[17] Software for Motion Control Option

XX	No motion software <i>Note: C4 option in [15] selected with no motion software in [17] will require programming by a qualified individual</i>
10	MCO 350 synchronising control software (must select C4 in position [15])
11	MCO 351 positioning control software (must select C4 in position [15])
12	MCO 352 – Center winder (Choose C4 under field [15])

[18] D Option (Control Power Backup Input)

DX	No DC input installed
D0	MCB 107 24 VDC backup input

1) FC 301/A1 enclosures only
 2) D1, D2, D3, D4 enclosures only
 3) B1, B2, C1, C2 enclosures only

Please beware that not all combinations are possible. Find help configuring your drive with the online configurator found under: driveconfig.danfoss.com

Based on your selection, Danfoss manufactures the desired VLT® AutomationDrive. You will receive a fully assembled frequency converter, tested under full load conditions.



200 – 240 VAC

Enclosure		IP 20		A1									
		IP 20 (IP 21)		A2					A3				
				PK25	PK37	PK55	PK75	P1K1	P1K5	P2K2	P3K0	P3K7	
Typical Shaft Output			[kW]	0.25	0.37	0.55	0.75	1.1	1.5	2.2	3	3.7	
Output Current	Continuous	$I_{VLT,N}$	[A]	1.8	2.4	3.5	4.6	6.6	7.5	10.6	12.5	16.7	
	Intermittent/60 s	$I_{VLT,MAX}$	[A]	2.9	3.8	5.6	7.4	10.6	12.0	17.0	20.0	26.7	
Output Power													
Continuous (208 V)			$S_{VLT,N}$	[kVA]	0.65	0.86	1.26	1.66	2.38	2.70	3.82	4.50	6.00
Rated Input Current	Continuous	$I_{L,N}$	[A]	1.6	2.2	3.2	4.1	5.9	6.8	9.5	11.3	15.0	
	Intermittent/60 s	$I_{L,MAX}$	[A]	2.6	3.5	5.1	6.6	9.4	10.9	15.2	18.1	24.0	
Estimated power loss at rated maximum load			[W]	21	29	42	54	63	82	116	155	185	
Efficiency				0.94		0.95		0.96					
Max. cable cross-section (input mains terminals, motor output terminals, brake resistor terminals)			[mm ²] ([AWG])	0.2 – 4 (24 – 10)									
Max. external input (mains) fuses			[A]	10				20			32		
Weight													
IP 20 (A1)			[kg]	2.7				–					
IP 20 (A2/A3)			[kg]	4.7	4.8		4.9			6.6			
IP 55, IP 66 (A5)			[kg]	13.5									

Enclosure		IP 20		B3				B4		
		IP 21, IP 55, IP 66		B1				B2		
				P5K5		P7K5		P11K		
		Intermittent		HO	NO	HO	NO	HO	NO	
Typical Shaft Output			[kW]	5.5	7.5		11		15	
Output Current	Continuous	$I_{VLT,N}$	[A]	24.2	30.8		46.2		59.4	
	Intermittent/60 s	$I_{VLT,MAX}$	[A]	38.7	33.9	49.3	50.8	73.9	65.3	
Output Power										
Continuous (208 V)			$S_{VLT,N}$	[kVA]	8.7	11.1		16.6		21.4
Rated Input Current	Continuous	$I_{L,N}$	[A]	22	28		42		54	
	Intermittent/60 s	$I_{L,MAX}$	[A]	35.2	30.8	44.8	46.2	67.2	59.4	
Estimated power loss at rated maximum load			[W]	239	310	371	514	463	602	
Efficiency				0.96		0.96		0.96		
Max. cable cross-section (input mains terminals, motor output terminals, brake resistor terminals)			[mm ²] ([AWG])	16 (6)				35 (2)		
Max. external input (mains) fuses			[A]	63				80		
Weight										
IP 20			[kg]	12				23.5		
IP 21, IP 55, IP 66			[kg]	23				27		

Enclosure		IP 20		B4		C3				C4				
		IP 21, IP 55, IP 66		C1		C2		C2		C2				
				P15K		P18K5		P22K		P30K		P37K		
		Intermittent		HO	NO	HO	NO	HO	NO	HO	NO	HO	NO	
Typical Shaft Output			[kW]	15	18.5	22		30		37		45		
Output Current	Continuous	$I_{VLT,N}$	[A]	59.4	74.8		88		115		143		170	
	Intermittent/60 s	$I_{VLT,MAX}$	[A]	89.1	82.3	112	96.8	132	127	173	157	215	187	
Output Power														
Continuous (208 V)			$S_{VLT,N}$	[kVA]	21.4	26.9	26.9	31.7	31.7	41.4	41.4	51.5	51.5	61.2
Rated Input Current	Continuous	$I_{L,N}$	[A]	54	68		80		104		130		154	
	Intermittent/60 s	$I_{L,MAX}$	[A]	81	74.8	102	88	120	114	156	143	195	169	
Estimated power loss at rated maximum load			[W]	624	737	740	845	874	1140	1143	1353	1400	1636	
Efficiency				0.96		0.97								
Max. cable cross-section (IP 20)			[mm ²] ([AWG])	35 (2)		90 (3/0)				120 (4/0)				
Max. cable cross-section (IP 21, IP 55, IP 66)			[mm ²] ([AWG])	90 (3/0)						120 (4/0)				
Max. external input (mains) fuses			[A]	125				160		200		250		
Weight														
IP 20			[kg]	23.5		35				50				
IP 21, IP 55, IP 66			[kg]	45				65						

HO (High overload) = 160%/60 s, NO (Normal overload) = 110%/60 s

380 – 480/500 VAC

Enclosure		IP 20		A1				A2				A3			
		IP 20 (IP 21)		A2								A3			
		IP 55, IP 66		A5											
				PK37	PK55	PK75	P1K1	P1K5	P2K2	P3K0	P4K0	P5K5	P7K5		
Typical Shaft Output			[kW]	0.37	0.55	0.75	1.1	1.5	2.2	3	4	5.5	7.5		
Output Current 380 – 440 V	Continuous	$I_{VLT,N}$	[A]	1.3	1.8	2.4	3	4.1	5.6	7.2	10	13	16		
	Intermittent 160%/60 s	$I_{VLT,max}$	[A]	2.1	2.9	3.8	4.8	6.6	9.0	11.5	16	20.8	25.6		
Output Current 441 – 480/500 V	Continuous	$I_{VLT,N}$	[A]	1.2	1.6	2.1	2.7	3.4	4.8	6.3	8.2	11	14.5		
	Intermittent 160%/60 s	$I_{VLT,max}$	[A]	1.9	2.6	3.4	4.3	5.4	7.7	10.1	13.1	17.6	23.2		
Output Power	400 V	$S_{VLT,N}$	[kVA]	0.9	1.3	1.7	2.1	2.8	3.9	5.0	6.9	9.0	11.0		
	460 V			0.9	1.3	1.7	2.4	2.7	3.8	5.0	6.5	8.8	11.6		
Rated Input Current 380 – 440 V	Continuous	$I_{L,N}$	[A]	1.2	1.6	2.2	2.7	3.7	5.0	6.5	9.0	11.7	14.4		
	Intermittent 160%/60 s	$I_{L,MAX}$	[A]	1.9	2.6	3.5	4.3	5.9	8.0	10.4	14.4	18.7	23.0		
Rated Input Current 441 – 480/500 V	Continuous	$I_{L,N}$	[A]	1.0	1.4	1.9	2.7	3.1	4.3	5.7	7.4	9.9	13.0		
	Intermittent 160%/60 s	$I_{L,MAX}$	[A]	1.6	2.2	3.0	4.3	5.0	6.9	9.1	11.8	15.8	20.8		
Estimated power loss at rated maximum load			[W]	35	42	46	58	62	88	116	124	187	255		
Efficiency				0.93	0.95	0.96		0.97							
Max. cable cross-section (input mains terminals, motor output terminals, brake resistor terminals)			[mm ²] ([AWG])	0.2 – 4 (24 – 10)											
Max. external input (mains) fuses			[A]	10				20			32				
Weight															
IP 20			[kg]	4.7			4.8				6.6				
IP 55, IP 66			[kg]	13.5								14.2			

Enclosure		IP 20		B3				B4					
		IP 21, IP 55, IP 66		B1				B2					
				P11K		P15K		P18K		P22K			
		Intermittent		HO	NO	HO	NO	HO	NO	HO	NO		
Typical Shaft Output			[kW]	11	15	18.5		22.0		30.0			
Output Current 380 – 440 V	Continuous	$I_{VLT,N}$	[A]	24	32		37.5		44				
	Intermittent 160%/60 s	$I_{VLT,max}$	[A]	38.4	35.2	51.2	41.3	60	48.4	70.4	67.1		
Output Current 441 – 480/500 V	Continuous	$I_{VLT,N}$	[A]	21	27		34		40				
	Intermittent 160%/60 s	$I_{VLT,max}$	[A]	33.6	29.7	43.2	37.4	54.4	44	64	57.2		
Output Power	400 V	$S_{VLT,N}$	[kVA]	16.6	22.2		26		30.5		42.3		
	460 V			21.5		27.1		31.9		41.4			
Rated Input Current 380 – 440 V	Continuous	$I_{L,N}$	[A]	22	29		34		40		55		
	Intermittent 160%/60 s	$I_{L,MAX}$	[A]	35.2	31.9	46.4	37.4	54.4	44	64	60.5		
Rated Input Current 441 – 480/500 V	Continuous	$I_{L,N}$	[A]	19	25		31		36		47		
	Intermittent 160%/60 s	$I_{L,MAX}$	[A]	30.4	27.5	40	34.1	49.6	39.6	57.6	51.7		
Estimated power loss at rated maximum load			[W]	291	392	379	465	444	525	547	739		
Efficiency				0.98									
Max. cable cross-section			[mm ²] ([AWG])	16 (6)				35 (2)					
Max. external input (mains) fuses			[A]	63						80			
Weight													
IP 20			[kg]	12				23.5					
IP 21, IP 55, IP 66			[kg]	23				27					

HO (High overload) = 160%/60 s, NO (Normal overload) = 110%/60 s

380 – 480/500 VAC

Enclosure	IP 20		B4	C3				C4					
	IP 21, IP 55, IP 66		C1								C2		
			P30K		P37K		P45K		P55K		P75K		
Intermittent			HO	NO	HO	NO	HO	NO	HO	NO	HO	NO	
Typical Shaft Output			[kW]	30	37	45		55		75	90		
Output Current (380 – 440 V)	Continuous	I_{VLTN}	[A]	61	73	90		106		147	177		
	Intermittent/60 s	I_{VLTmax}	[A]	91.5	80.3	110	99	135	117	159	162	195	
Output Current (441 – 480/500 V)	Continuous	I_{VLTN}	[A]	52	65		80		105		130		
	Intermittent/60 s	I_{VLTmax}	[A]	78	71.5	97.5	88	120	116	158	143	195	
Output Power	400 V	S_{VLTN}	[kVA]	42.3	50.6		62.4		73.4		102	123	
	460 V	S_{VLTN}	[kVA]	51.8		63.7		83.7		104	128		
Rated Input Current (380 – 440V)	Continuous	I_{LN}	[A]	55	66		82		96		133		
	Intermittent/60 s	I_{LMAX}	[A]	82.5	72.6	99	90.2	123	106	144	146	200	
Rated Input Current (441 – 480/500 V)	Continuous	I_{LN}	[A]	47	59		73		95		118		
	Intermittent/60 s	I_{LMAX}	[A]	70.5	64.9	88.5	80.3	110	105	143	130	177	
Estimated power loss at rated maximum load			[W]	570	698	697	843	891	1083	1022	1384	1232	
Efficiency				0.98								0.99	
Max. cable cross-section (IP 20, input mains terminals, motor output terminals)			[mm ²] ([AWG])	35 (2)		50 (1)				95 (4/0)		150 (300mcm)	
Max. cable cross-section (IP 20, DC Link, brake resistor terminals)			[mm ²] ([AWG])	35 (2)		50 (1)				95 (4/0)			
Max. cable cross-section (IP 21, IP 55, IP 66)			[mm ²] ([AWG])	90 (3/0)						120 (4/0)			
Max. external input (mains) fuses			[A]	100		125		160		250			
Weight													
IP 20			[kg]	23.5		35				50			
IP 21, IP 55, IP 66			[kg]	45				65					

Enclosure	IP 21, IP 54		D1	D2									
	IP 00		D3	D4									
			P90K	P110		P132		P160		P200			
Intermittent			HO	NO	HO	NO	HO	NO	HO	NO	HO	NO	
Typical Shaft Output			(400 V)	90	110	132		160		200		250	
			(500 V)	110	132	160		200		250		315	
Output Current (400 V)	Continuous	I_{VLTN}	[A]	177	212	260		315		395		480	
	Intermittent/60 s	I_{VLTmax}	[A]	266	233	318	286	390	347	473	435	593	
Output Current (460/500 V)	Continuous	I_{VLTN}	[A]	160	190		240		302		361		
	Intermittent/60 s	I_{VLTmax}	[A]	240	209	285	264	360	332	453	397	542	
Output Power	400 V	S_{VLTN}	[kVA]	123	147		180		218		274		
	460 V	S_{VLTN}	[kVA]	127	151		191		241		288		
	500 V	S_{VLTN}	[kVA]	139	165		208		262		313		
Rated Input Current (400 V)	Continuous	I_{LN}	[A]	171	204	251		304		381		463	
Rated Input Current (460/500 V)	Continuous	I_{LN}	[A]	154	183	231		291		348		427	
Estimated power loss at rated maximum load			[W]	2641	3234	2995	3782	3425	4213	3910	5119	4625	
Efficiency				0.98									
Max. cable cross-section (input mains terminals, motor output terminals, brake resistor terminals, DC Link)			[mm ²] ([AWG])	2 x 70 (2 x 2/0)				2 x 185 (2 x 350 mcm)					
Max. external input (mains) fuses			[A]	300		350		400		500		600	
Weight													
IP 00			[kg]	82		91		112		123		138	
IP 21, IP 54			[kg]	96		104		125		136		151	

HO (High overload) = 160%/60 s, NO (Normal overload) = 110%/60 s

525 – 600 VAC

(FC 302 only)

Enclosure	IP 20 (IP 21)		A3								
	IP 55, IP 66		A5								
			PK75	P1K1	P1K5	P2K2	P3K0	P4K0	P5K5	P7K5	
Typical Shaft Output (575 V)	[kW]		0.75	1.1	1.5	2.2	3	4	5.5	7.5	
Output Current											
Continuous (525 – 550 V)	[A]		1.8	2.6	2.9	4.1	5.2	6.4	9.5	11.5	
Intermittent (525 – 550 V)	[A]		2.9	4.2	4.6	6.6	8.3	10.2	15.2	18.4	
Continuous (551 – 600 V)	[A]		1.7	2.4	2.7	3.9	4.9	6.1	9.0	11.0	
Intermittent (551 – 600 V)	[A]		2.7	3.8	4.3	6.2	7.8	9.8	14.4	17.6	
Output Power											
Continuous (525 V)	[kVA]		1.7	2.5	2.8	3.9	5.0	6.1	9.0	11.0	
Continuous (575 V)	[kVA]		1.7	2.4	2.7	3.9	4.9	6.1	9.0	11.0	
Estimated power loss at rated maximum load	[W]		35	50	65	92	122	145	195	261	
Rated Input Current											
Continuous (525 – 600 V)	[A]		1.7	2.4	2.7	4.1	5.2	5.8	8.6	10.4	
Intermittent (525 – 600 V)	[A]		2.7	3.8	4.3	6.6	8.3	9.3	13.8	16.6	
Efficiency											
0.97											
Max. cable cross-section (input mains terminals, motor output terminals, brake resistor terminals)	[mm ²] ([AWG])		0.2 – 4 mm ² (24 – 10)					0.2 – 4 mm ² (24 – 10)			
Max. external input (mains) fuses	[A]		10			20			32		
Weight											
IP 20	[kg]		6.5							6.6	
IP 55, IP 66	[kg]		13.5							14.2	

Enclosure	IP 20		B3				B4					
	IP 21, IP 55, IP 66		B1				B2				C1	
			P11K		P15K		P18K5		P22K		P30K	
			HO	NO	HO	NO	HO	NO	HO	NO	HO	NO
Typical Shaft Output (575 V)	[kW]		11	15	18.5		22		30		37	
Output Current												
Continuous (525-550 V)	[A]		19	23	28		36		43		54	
Intermittent (525-550 V)	[A]		30	25	37	31	45	40	58	47	65	59
Continuous (525-600 V)	[A]		18	22		27		34		41		52
Intermittent (525-600 V)	[A]		29	24	35	30	43	37	54	45	62	57
Output Power												
Continuous (500 V)	[kVA]		18.1	21.9		26.7		34.3		41.0		51.4
Continuous (575 V)	[kVA]		17.9	21.9		26.9		33.9		40.8		51.8
Rated Input Current												
Continuous 550 V	[A]		17.2	20.9		25.4		32.7		39		49
Intermittent (550 V)	[A]		28	23	33	28	41	36	52	43	59	54
Continuous (575 V)	[A]		16	20		24		31		37		47
Intermittent (575 V)	[A]		26	22	32	27	39	34	50	41	56	52
Estimated power loss at rated maximum load	[W]		225		285		329		700		700	
Efficiency												
0.98												
Max. cable cross-section IP 20 (input mains terminals, motor output terminals, brake resistor terminals, DC Link)	[mm ²] ([AWG])		16 (6)				35 (2)					
Max. cable cross-section IP 21, 55, 66 (input mains terminals, motor output terminals, brake resistor terminals, DC Link)	[mm ²] ([AWG])										90 (3/0)	
Max. external input (mains) fuses	[A]		63		63		63		80		100	
Weight												
IP 20	[kg]		12				23.5					
IP 21, IP 55, IP 66	[kg]		23				27					

HO (High overload) = 160%/60 s, NO (Normal overload) = 110%/60 s

525 – 600 VAC

(FC 302 only)

Enclosure	IP 21, IP 55, IP 66			C1				C2				
	IP 20			C3				C4				
				P37K		P45K		P55K		P75K		
Intermittent				HO	NO	HO	NO	HO	NO	HO	NO	
Typical Shaft Output (575 V)				[kW]	37	45	55	75	90			
Output Current												
Continuous (525 – 550 V)		$I_{VLT,N}$	[A]	54	65	87	105	137				
Intermittent (525 – 550 V)		$I_{VLT,max}$	[A]	81	72	98	96	131	116	158	151	
Continuous (525 – 600 V)		$I_{VLT,N}$	[A]	52	62	83	100	131				
Intermittent (525 – 600 V)		$I_{VLT,max}$	[A]	78	68	93	91	125	110	150	144	
Output Power												
Continuous (550 V)		$S_{VLT,N}$	[kVA]	51.4	61.9	82.9	100	130.5				
Continuous (575 V)				51.8	61.7	82.7	99.6	130.5				
Rated Input Current												
Continuous (550 V)		$I_{L,N}$	[A]	49	59	78.9	95.3	124.3				
Intermittent (550 V)		$I_{L,MAX}$	[A]	74	65	89	87	118	105	143	137	
Continuous (575 V)		$I_{L,N}$	[A]	47	56	75	91	119				
Intermittent (575 V)		$I_{L,MAX}$	[A]	70	62	85	83	113	100	137	131	
Estimated power loss at rated maximum load				[W]	850	1100	1400	1500				
Efficiency					0.98							
Max. cable cross-section (IP 20, input mains terminals, motor output terminals)			[mm ²] ([AWG])	50 (1)				95 (4/0)	150 (300 mcm)			
Max. cable cross-section (IP 20, DC Link, brake resistor terminals)			[mm ²] ([AWG])	90 (3/0)				95 (4/0)				
Max. cable cross-section (IP 21, 55, 66, input mains terminals, motor output terminals, brake resistor terminals, DC Link)			[mm ²] ([AWG])	90 (3/0)				120 (4/0)				
Max. external input (mains) fuses			[A]	125	160	250						
Weight	IP 20		[kg]	35				50				
	IP 21, IP 55, IP 66		[kg]	45				65				

HO (High overload) = 160%/60 s, NO (Normal overload) = 110%/60 s

690 VAC

(FC 302 only)

Enclosure	IP 21/IP 55	B2								C2												
		P11K		P15K		P18K5		P22K		P30K		P37K		P45K		P55K		P75K				
Intermittent		HO	NO	HO	NO	HO	NO	HO	NO	HO	NO	HO	NO	HO	NO	HO	NO	HO	NO			
Typical Shaft Output (690 V)		[kW]	11	15	18.5	22	30	37	45	55	75	90										
Output Current																						
Continuous (525 – 550 V)		[A]	14	19	23	28	36	43	54	65	87	105										
Intermittent (525 – 550 V)		[A]	22.4	20.9	30.4	25.3	36.8	30.8	44.8	39.6	54	47.3	64.5	59.4	81	71.5	97.5	95.7	130.5	115.5		
Continuous (551 – 690 V)		[A]	13	18	22	27	34	41	52	62	83	100										
Intermittent (551 – 690 V)		[A]	20.8	19.8	28.8	24.2	35.2	29.7	43.2	37.4	51	45.1	61.5	57.2	78	68.2	93	91.3	124.5	110		
Output Power																						
Continuous (550 V)		[kVA]	13.3	18.1	21.9	26.7	34.3	41.0	51.4	61.9	82.9	100										
Continuous (575 V)		[kVA]	12.9	17.9	21.9	26.9	33.9	40.8	51.8	61.7	82.7	99.6										
Continuous (690 V)		[kVA]	15.5	21.5	26.3	32.3	40.6	49.0	62.1	74.1	99.2	119.5										
Rated Input Current																						
Continuous (525 – 690 V)		[A]	15	19.5	24	29	36	49	59	71	87	99										
Intermittent (525 – 690 V)		[A]	23.2	21.5	31.2	26.4	38.4	31.9	46.4	39.6	54	53.9	72	64.9	87	78.1	105	95.7	129	108.9		
Estimated power loss at rated maximum load		[W]	228	285	335	375	480	592	720	880	1200											
Efficiency			0.98																			
Max. cable cross-section (input mains terminals, motor output terminals, brake resistor terminals, DC Link)		[mm ²] ([AWG])	35 (1/0)																			
Max. external input (mains) fuses		[A]	63				80				100				125				160			
Weight		[kg]	27								65											

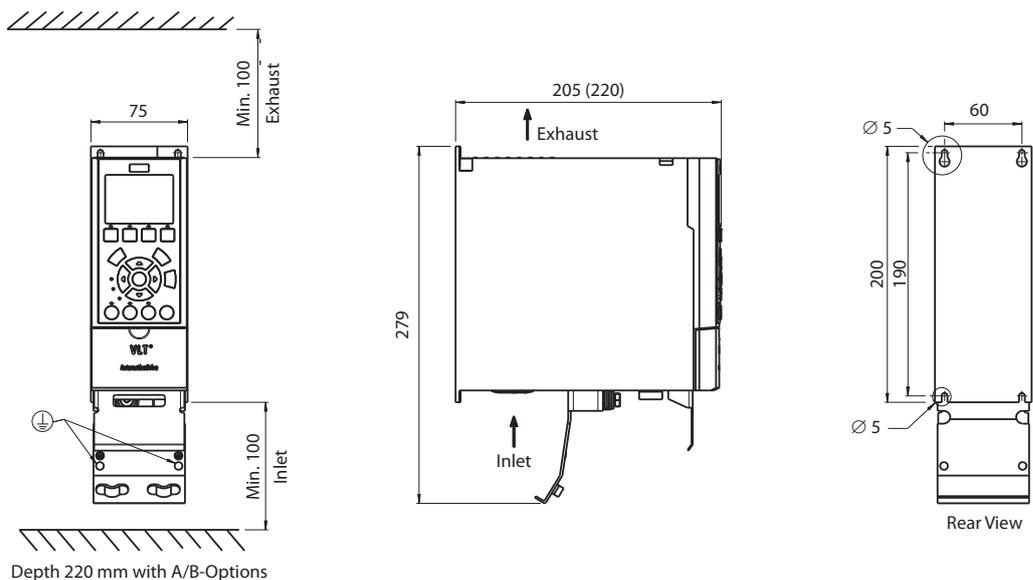
Enclosure	IP 00 IP 21/IP 54	D3				D4														
		D1				D2														
		P90K		P110		P132		P160		P200										
Intermittent		HO	NO	HO	NO	HO	NO	HO	NO	HO	NO									
Typical Shaft Output (690 V)		[kW]	90	110	132	160	200	250												
Output Current																				
Continuous (575 – 690 V)		[A]	108	131	155	192	242	290												
Intermittent (575 – 690 V)		[A]	162	144	197	171	233	211	288	266	363	319								
Output Power																				
Continuous (550 V)		[kVA]	108	131	154	191	241	289												
Continuous (575 V)		[kVA]	108	130	154	191	241	289												
Continuous (690 V)		[kVA]	129	157	185	229	289	347												
Rated Input Current																				
Continuous (550 V)		[A]	110	130	158	198	245	299												
Continuous (575 V)		[A]	106	124	151	189	234	286												
Continuous (690 V)		[A]	109	128	155	197	240	296												
Estimated power loss at rated maximum load		[W]	2264	2662	2664	3114	2953	3612	3451	4292	4275	5156								
Efficiency			0.98																	
Max. cable cross-section IP 20 (input mains terminals, motor output terminals, brake resistor terminals, DC Link)		[mm ²] ([AWG])	2 x 70 (2 x 2/0)						2 x 185 (2 x 350 mcm)											
Max. external input (mains) fuses		[A]	250				315				350				400					
Weight																				
IP 00		[kg]	82				91				112				123					
IP 21, IP 54		[kg]	96				104				125				136					

HO (High overload) = 160%/60 s, NO (Normal overload) = 110%/60 s

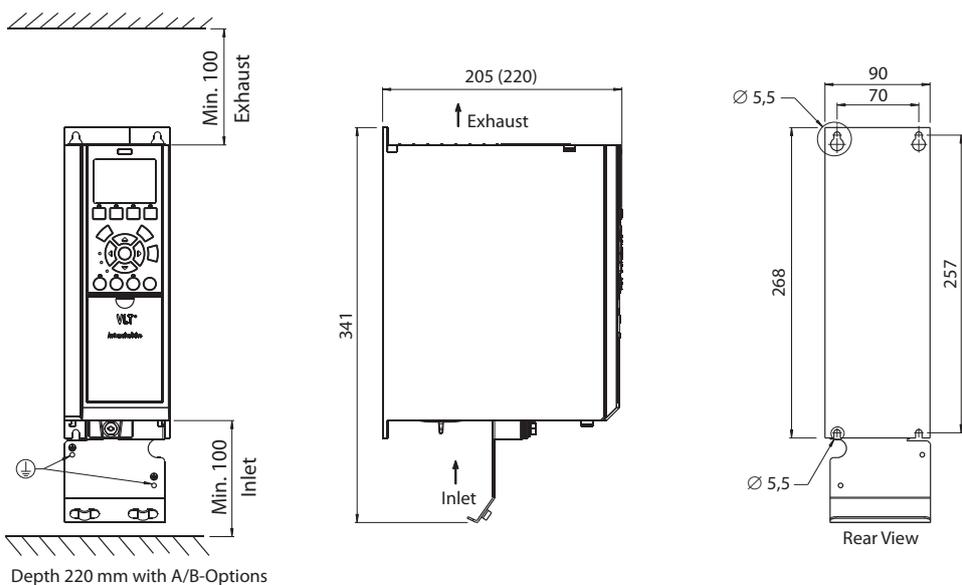
Dimensions VLT® AutomationDrive

In mm

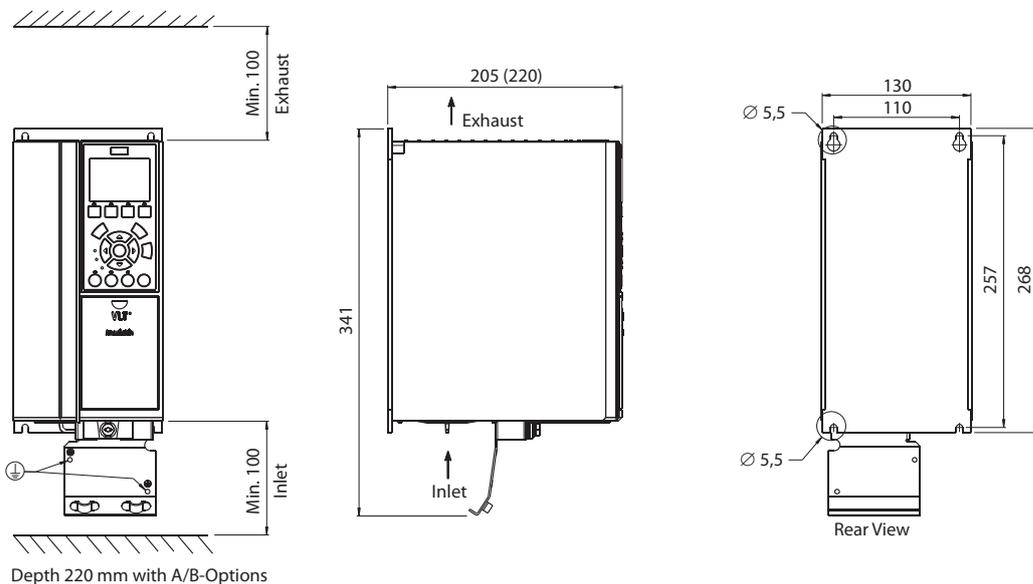
A1 Enclosures



A2 Enclosures

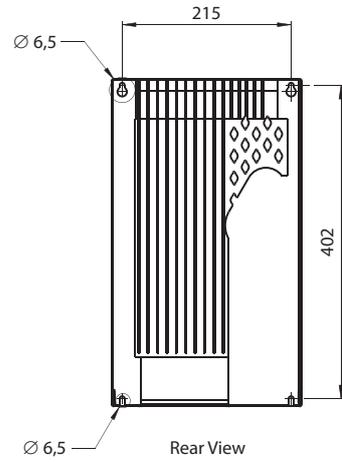
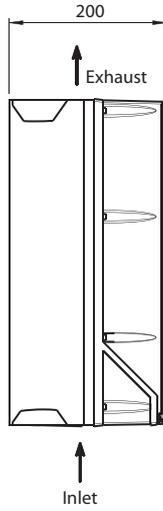
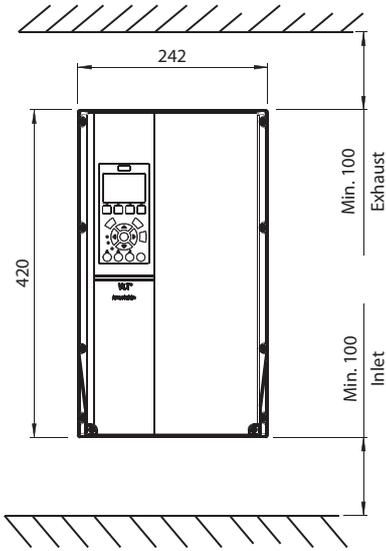


A3 Enclosures

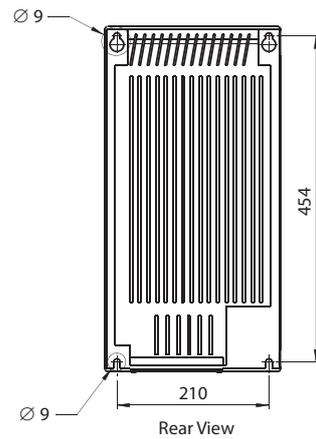
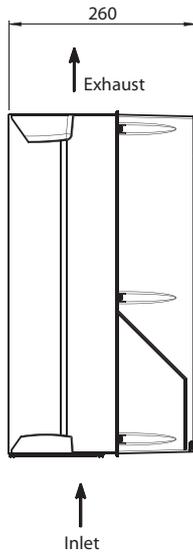
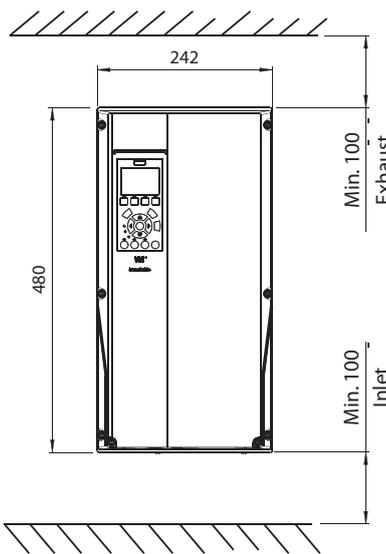


Dimensions VLT® AutomationDrive

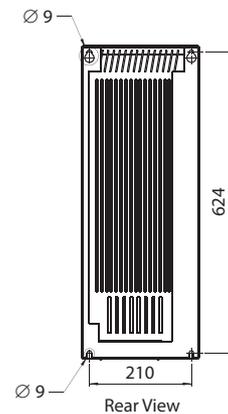
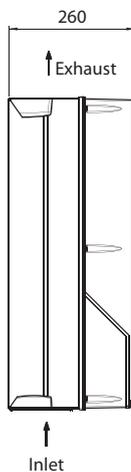
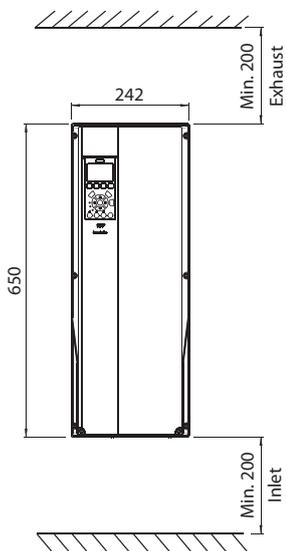
In mm



A5 Enclosures



B1 Enclosures

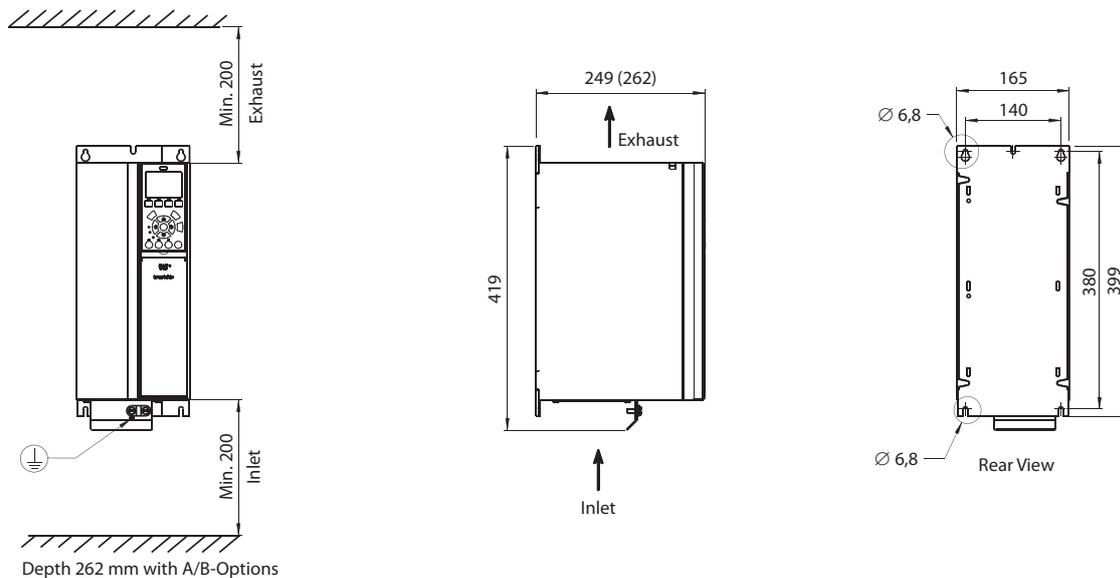


B2 Enclosures

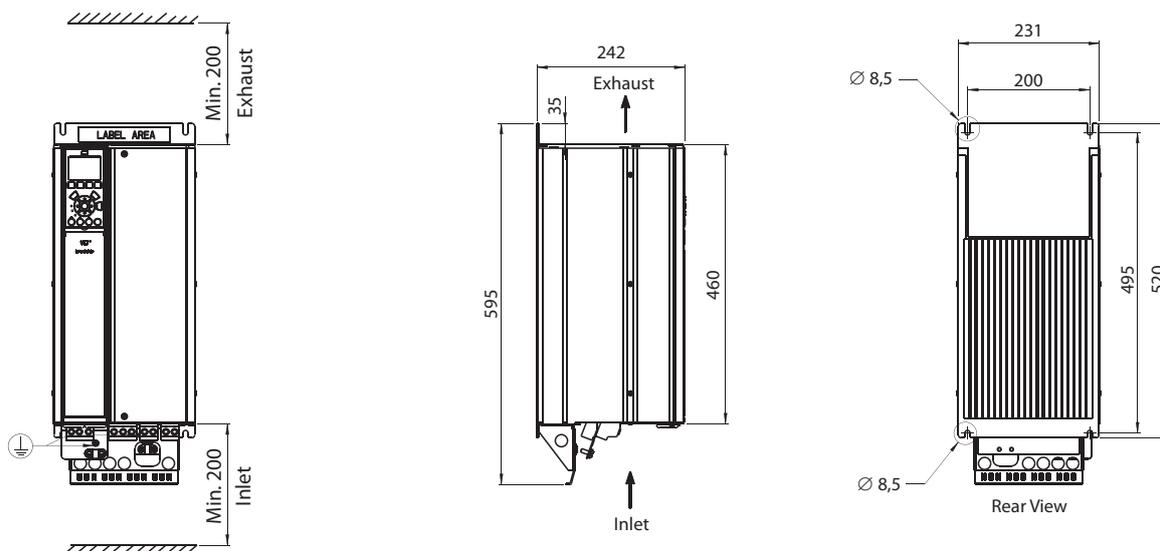
Dimensions VLT® AutomationDrive

In mm

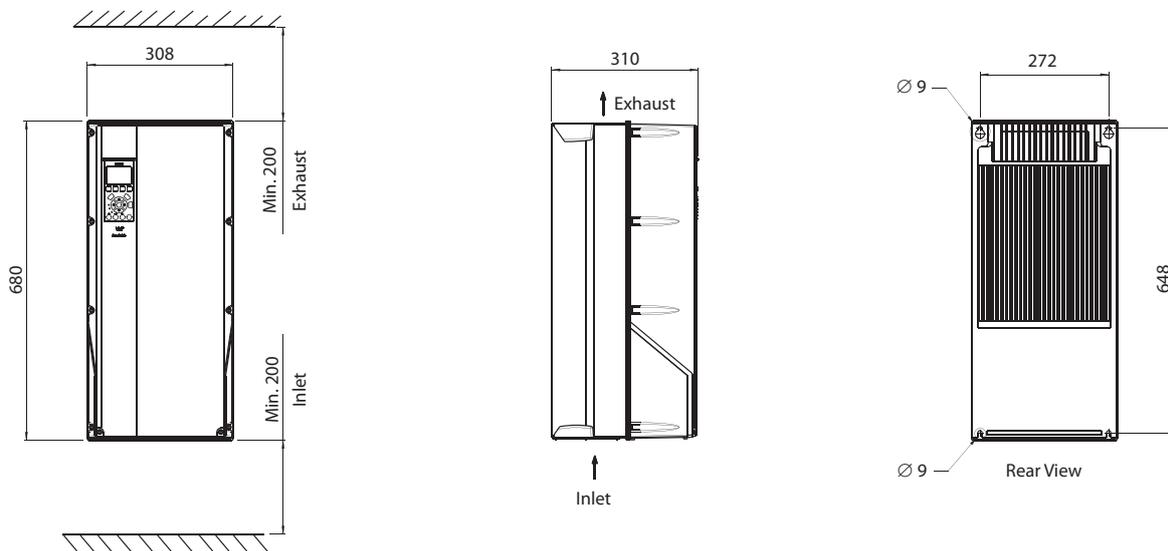
B3 Enclosures



B4 Enclosures

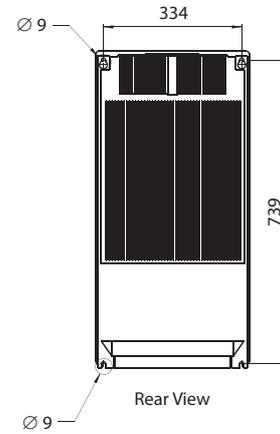
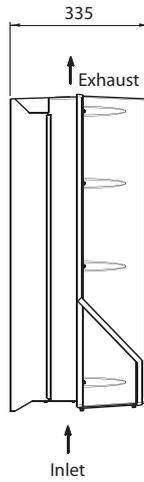
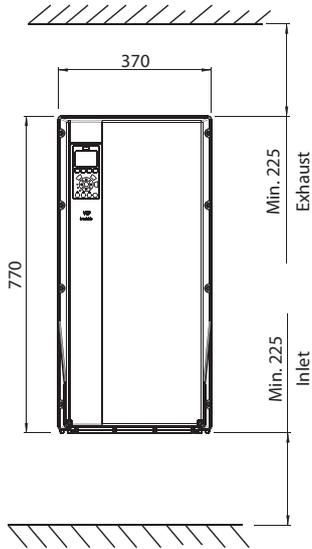


C1 Enclosures

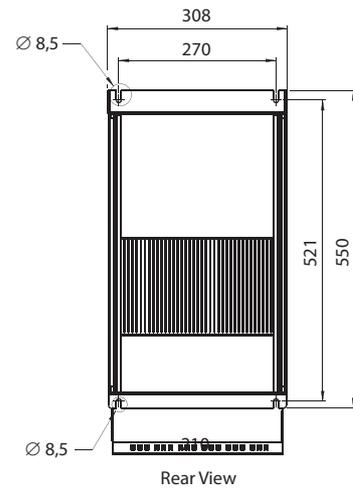
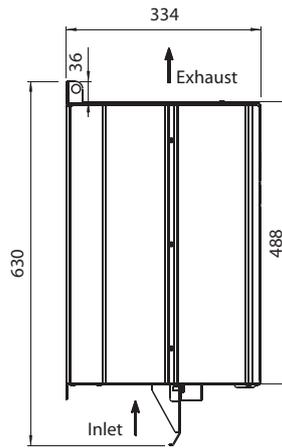
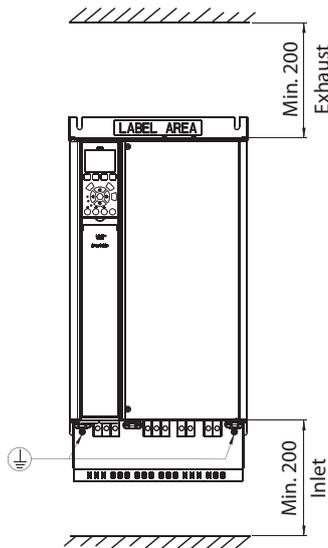


Dimensions VLT® AutomationDrive

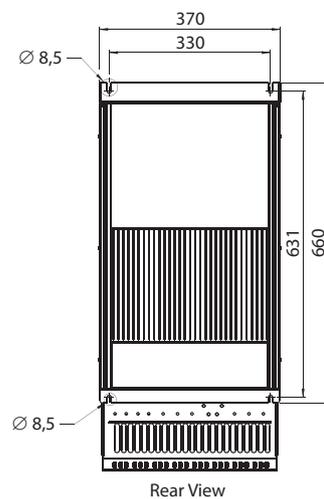
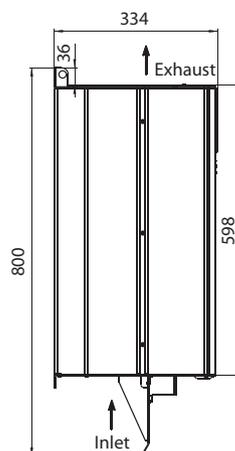
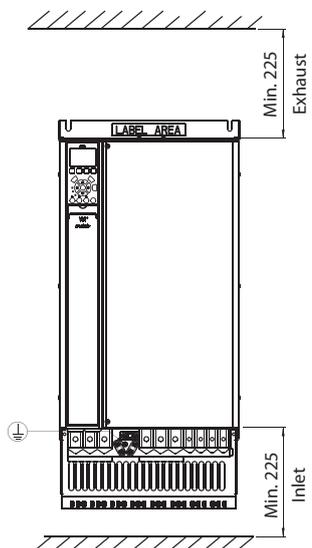
In mm



C2 Enclosures



C3 Enclosures

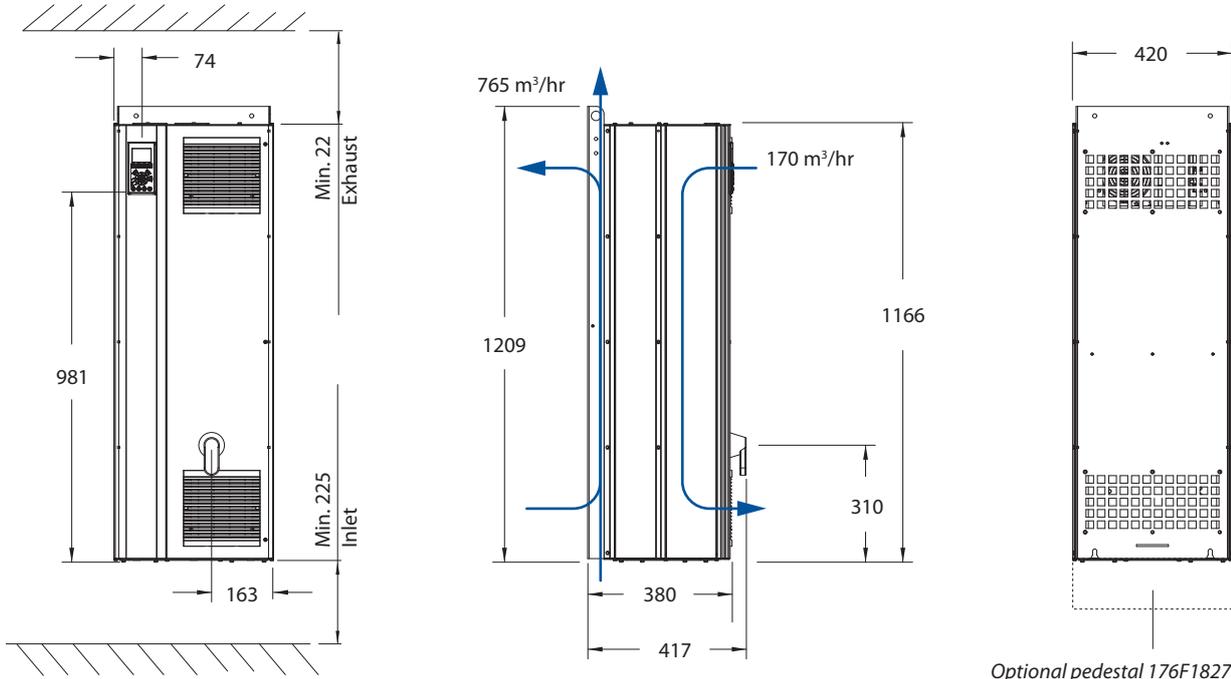


C4 Enclosures

Dimensions VLT® AutomationDrive

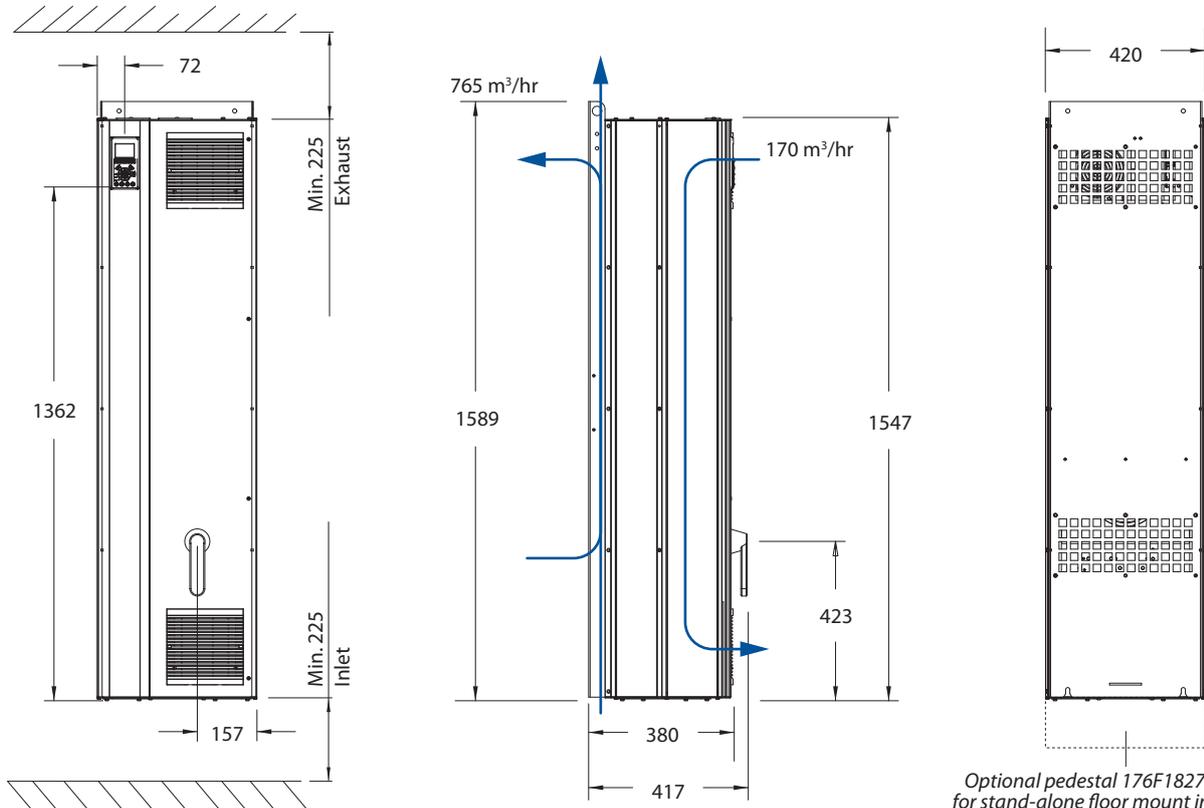
In mm

D1 Enclosures (Floor- or cabinet Mount)



Optional pedestal 176F1827 available for stand-alone floor mount installations (adds 200 mm to height)

D2 Enclosures (Floor- or cabinet Mount)

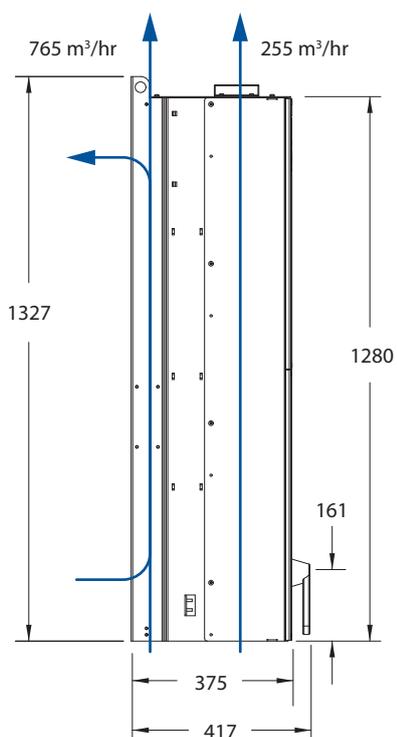
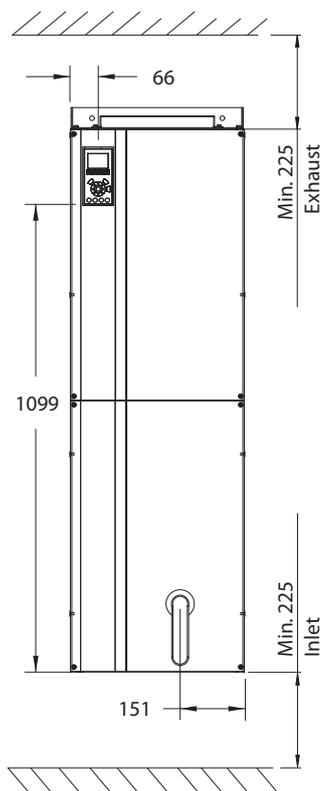
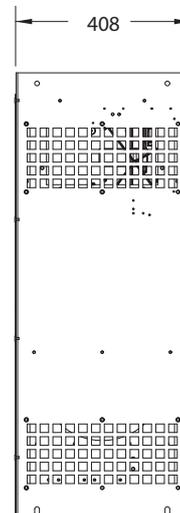
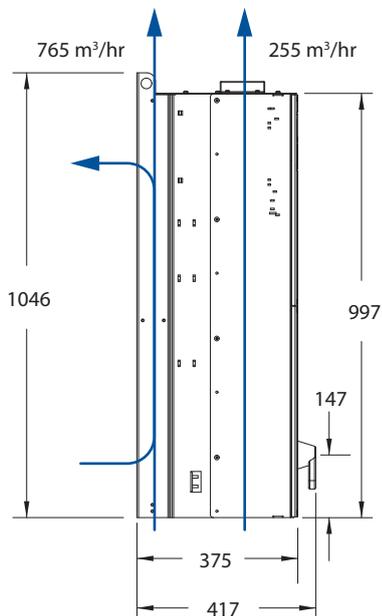
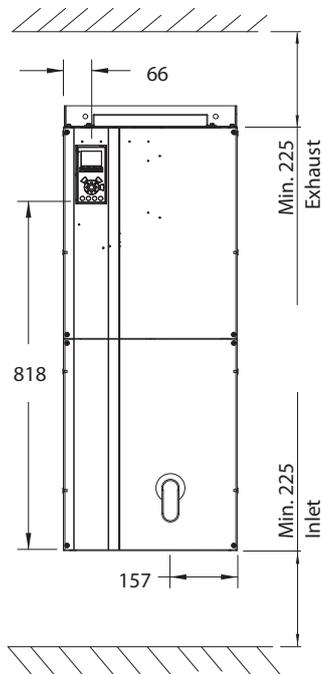


Optional pedestal 176F1827 available for stand-alone floor mount installations (adds 200 mm to height)

Drives shown with optional disconnect switch

Dimensions VLT® AutomationDrive

In mm



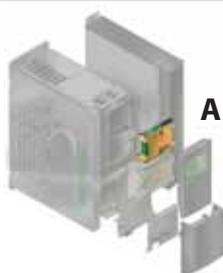
Drives shown with optional disconnect switch

D3 Enclosures (Cabinet Mount)

D4 Enclosures (Cabinet Mount)

VLT® AutomationDrive Options

Typecode Position



13



VLT® PROFIBUS DP V1 MCA 101

- PROFIBUS DP V1 gives you wide compatibility, a high level of availability, support for all major PLC vendors, and compatibility with future versions
- Fast, efficient communication, transparent installation, advanced diagnosis and parameterisation and auto-configuration of process data via GSD-file
- A-cyclic parameterisation using PROFIBUS DP V1, PROFdrive or Danfoss FC profile state machines, PROFIBUS DP V1, Master Class 1 and 2

Ordering number 130B1100 uncoated – 130B1200 coated (Class 3C3/IEC 60721-3-3)

13



VLT® DeviceNet MCA 104

- This modern communications model offers key capabilities that let you effectively determine what information is needed and when
- You will also benefit from ODVA's strong conformance testing policies, which ensure that products are interoperable

Ordering number 130B1102 uncoated – 130B1202 coated (Class 3C3/IEC 60721-3-3)

13



VLT® CANOpen MCA 105

High flexibility and low cost are two of the “cornerstones” for CANOpen. The CANOpen option for the VLT® AutomationDrive is fully equipped with both high priority access to control and status of the drive (PDO Communication) and access to all parameters through acyclic data (SDO Communication). For interoperability the option has implemented the DSP402 AC drive profile. This all guarantees standardised handling, interoperability and low cost.

Ordering number 130B1103 uncoated – 130B1205 coated (Class 3C3/IEC 60721-3-3)

13



VLT® 3000 Converter MCA 113

The conversion kit is a special version of the fieldbus options that emulate the VLT® 3000 commands in the VLT® AutomationDrive. This is useful for users who want to keep the PLC program. The VLT® 3000 can then be replaced by the VLT® AutomationDrive, or the system can be expanded without costly changes to the PLC program. For upgrade to a different fieldbus, the installed converter is easily removed and replaced with a new option. This secures the investment without loss of flexibility.

Available as additional option only (not factory installed)
Ordering number 130B1245 – coated (Class 3C3/IEC 60721-3-3)

13



VLT® 5000 Converter MCA 114

The conversion kit is a special version of the fieldbus options that emulate the VLT® 5000 commands in the VLT® AutomationDrive. This is useful for users who want to keep the PLC program. The VLT® 5000 can then be replaced by the VLT® AutomationDrive, or the system can be expanded without costly changes to the PLC program. For upgrade to a different fieldbus, the installed converter is easily removed and replaced with a new option. This secures the investment without loss of flexibility. The option supports DPV1.

Available as additional option only (not factory installed)
Ordering number 130B1246 – coated (Class 3C3/IEC 60721-3-3)

13



VLT® EtherNet IP MCA 121

The EtherNet option is based on the newest technology available for industrial use and handles even the most demanding requirements. EtherNet/IP extends commercial off-the-shelf EtherNet to the Common Industrial Protocol (CIP™) – the same upper-layer protocol and object model found in DeviceNet.

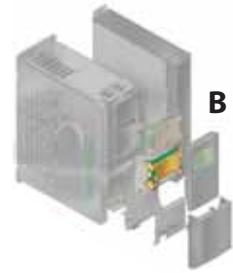
The VLT® MCA 121 offers advanced features as:

- Built-in high performance switch enabling line-topology, and eliminating the need for external switches
- Advanced switch and diagnoses functions
- Built-in web server
- E-mail client for service notification

Ordering number 130B1119 uncoated – 130B1219 coated (Class 3C3 / IEC 60721-3-3)

Installation of options is a matter of plug-and-play

VLT® AutomationDrive Options



Typecode Position

VLT® General Purpose I/O MCB 101

The I/O option offers an extended number of control inputs and outputs.

- 3 digital inputs 0-24 V: Logic '0' < 5 V; Logic '1' > 10V
- 2 analogue inputs 0-10 V; Resolution 10 bit plus sign
- 2 digital outputs NPN/PNP push pull
- 1 analogue output 0/4-20 mA
- Spring loaded connection
- Separate parameter settings

Ordering number 130B1125 uncoated – 130B1212 coated (Class 3C3/IEC 60721-3-3)



14

VLT® Encoder Input MCB 102

A universal option for connection of encoder feedback from either a motor or a process. Feedback for asynchronous or brushless servo (Permanent Magnet) motors.

- Encoder module supports: incremental-, SinCos-, SSI- and EnDat interfaces
- Power supply for encoders
- RS422 interface
- Connection to all standard 5 V incremental encoders

Ordering number 130B1115 uncoated – 130B1203 coated (Class 3C3/IEC 60721-3-3)



14

VLT® Resolver Input MCB 103

Supports resolver feedback from brushless servo motors, and feedback for flux vector controlled asynchronous motors in rough environments.

- Primary voltage 4 – 8 Vrms
- Primary frequency 2.5 – 15 kHz
- Primary current max 50 mA rms
- Secondary input voltage 4 Vrms
- Resolution 10 bit @ 4 Vrms input amplitude

Ordering number 130B1127 uncoated – 130B1227 coated (Class 3C3/IEC 60721-3-3)



14

VLT® Relay Option MCB 105

Lets you extend relay functions with 3 additional relay outputs.

- Max. terminal load:
- AC-1 Resistive load 240 V AC 2 A
 - AC-15 Inductive load @cos φ 0.4 240 V AC 0.2 A
 - DC-1 Resistive load 24 V DC 1 A
 - DC-13 Inductive load @cos φ 0.4 24 V DC 0.1 A
- Min. terminal load:
- DC 5 V 10 mA
 - Max switch rate at rated load/min. load 6 min⁻¹/20 sec⁻¹

Ordering number 130B1110 uncoated – 130B1210 coated (Class 3C3/IEC 60721-3-3)



14

VLT® Safe PLC I/O MCB 108

The FC 302 provides a safety input based on a single pole 24 V DC input.

- For the majority of applications this input enables the user to implement safety in a cost-effective way. For applications that work with more advanced products like Safety PLC, Lightcurtains etc. the new Safe PLC interface enables the connection of a two wire safety link
- The Safe PLC Interface allows the Safe PLC to interrupt on the plus or the minus link without interfering the sense signal of the Safe PLC

Ordering number 130B1120 uncoated – 130B1220 coated (Class 3C3/IEC 60721-3-3)



14

VLT® ATEX-PTC Thermistor Card MCB 112

With the MCB 112 PTC Thermistor Card, the Danfoss VLT® AutomationDrive FC 302 offers improved monitoring of the motor condition compared to the built-in ETR function and thermistor terminal.

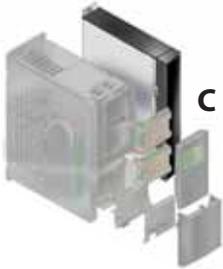
- Protects the motor from overheating
- ATEX approved for use in potentially explosive atmospheres
- Uses Safe Stop function, which is approved in accordance with Cat. 3 EN954-1

Ordering number 130B1137 – coated (Class 3C3 / IEC 60721-3-3)



14

VLT® AutomationDrive Options

Typecode Position		
15+17		<p>VLT® Motion Control MCO 305</p> <p>MCO 305 is optimised for all types of positioning and synchronising applications.</p> <ul style="list-style-type: none"> • Basic features: Synchronisation (electronic shaft), positioning and electronic CAM control • 2 inputs supporting both incremental and absolute encoders • 1 encoder output (virtual master function) • 10 digital inputs • 8 digital outputs • Sending and receiving data via fieldbus interface (requires fieldbus option) • PC software tools for programming and commissioning <p>Ordering number 130B1134 uncoated – 130B1234 coated (Class 3C3/IEC 60721-3-3)</p>
15+17		<p>VLT® Synchronizing Control MCO 350</p> <p>The Synchronizing Controller option for VLT® AutomationDrive expands the functional properties of the converter in synchronising applications. It replaces traditional mechanical solutions.</p> <ul style="list-style-type: none"> • Display of actual synchronising error on frequency converter control panel • Speed synchronising • Position (angle) synchronising with or without marker correction • On-line adjustable gear ratio and adjustable position (angle) offset • Encoder output with virtual master function for synchronisation of multiple followers • Homing <p>Ordering number 130B1152 uncoated – 130B1252 coated (Class 3C3/IEC 60721-3-3)</p>
15+17		<p>VLT® Positioning Control MCO 351</p> <p>The Positioning Controller option offers a host of user-friendly benefits for positioning applications in many industries. They are based on a range of thought-through and innovative features.</p> <ul style="list-style-type: none"> • Direct positioning via Fieldbus • Relative, absolute and touch probe positioning and marked related positioning • End limit handling (software and hardware) • Mechanical brake handling (programmable hold delay) • Error handling • Jog speed/manual operation • Home function <p>Ordering number 130B1153 uncoated – 130B1253 coated (Class 3C3/IEC 60721-3-3)</p>
15+17		<p>VLT® Center Winder MCO 352</p> <p>With the closed loop center winder control, material is evenly wound up regardless of the production speed.</p> <ul style="list-style-type: none"> • Follows line speed • Diameter calculator adjusts winder reference • Tension PID adjusts reference <p>Ordering number 130B1165 uncoated – 130B1265 coated (Class 3C3/IEC 60721-3-3)</p>
16		<p>VLT® Extended Relay Card MCB 113</p> <p>The Extended Relay Card MCB 113 adds inputs/outputs to VLT® AutomationDrive for increased flexibility.</p> <ul style="list-style-type: none"> • 7 digital inputs..... 0..24 V • 2 analogue outputs..... 0/4..20 mA • 4 SPDT relays • Rating of load relays 240 V AC/2 A (Ohm) • Meets NAMUR recommendations • Galvanic isolation capability <p>Ordering number 130B1164 uncoated – 130B1264 coated (Class 3C3/IEC 60721-3-3)</p>
15+17		<p>VLT® A/B in C Option Adapter MCF 106</p> <p>The A/B in C Option Adapter allows mounting of further A and B options in the C slot</p> <ul style="list-style-type: none"> • Further 2 B-options • Further an A- and a B-option (no A-option mounted in A-slot) • Limitations due to the facts that the drive cannot handle more than one fieldbus at the time, cannot handle several identical options, and that the physical layout of options can cause limitations. <p>VLT® Relay Card MCB 105 and VLT® PTC Thermistor Card MCB 112 are not supported by the adapter and must thus only be installed in the standard slot B of the Control Card.</p> <p>Ordering number 130B1130 uncoated – 130B1230 coated (Class 3C3/IEC 60721-3-3) <i>Depending on the cabinet, the retrofitting of a C-option might require appropriate mounting accessories. Please contact Danfoss.</i></p>

Installation of options is a matter of plug-and-play

VLT® AutomationDrive Options



Typecode Position

VLT® 24 V DC Supply Option MCB 107

The option is used to connect an external DC supply to keep the control section and any installed option active when mains power is down.

- Input voltage range 24 V DC +/- 15% (max. 37 V in 10 sec.)
- Max. input current 2.2 A
- Max. cable length 75 m
- Input capacitance load < 10 uF
- Power-up delay < 0.6 s
- Easy to install in drives in existing machines
- Keeps the control board and options active during power cuts
- Keeps fieldbuses active during power cuts

Ordering number 130B1108 uncoated – 130B1208 coated (Class 3C3/IEC 60721-3-3)



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Typecode Position

LCP 102 Graphical Local Control Panel

- Multi-language display
- Status messages
- Quick Menu for easy commissioning
- Parameter setting and explanation of parameter function
- Adjustment of parameters
- Full parameter backup and copy function
- Alarm logging
- Info button – explains the function of the selected item on display
- Hand-operated start/stop, or automatic mode selection
- Reset function
- Trend graph

Ordering number 130B1107



7

LCP 101 Numerical Local Control Panel

The numerical control panel offers an excellent MMI interface to the drive.

- Status messages
- Quick menu for easy commissioning
- Parameter setting and adjustment
- Hand-operated start/stop function or automatic mode select
- Reset function

Ordering number 130B1124



7

LCP Panel Mounting Kit

For easy installation of the LCP 101 and LCP 102 in e.g. a cabinet.

- IP65 (front)
- Thumb screws for tool-free installation
- Incl. 3 meters of cables in industry quality (also available separately)
- With or without LCP operating unit
- Each time easy to install

Ordering number 130B1117 (Mounting kit for all LCP's including fasteners, 3 m cable and gasket)

Ordering number 130B1113 (Incl. graphical LCP, fasteners, 3 m cable and gasket)

Ordering number 130B1114 (Incl. numerical LCP, fasteners and gasket)

Ordering number 130B1129 (LCP front mounting IP55/IP66) – Ordering number 175Z0929 (cable only)

Ordering number 130B1170 (Panel Mounting Kit for all LCP w.o. cable)



VLT® AutomationDrive Accessories



Profibus Adapter Sub-D9 Connector

The adapter makes linking of fieldbus connections pluggable. For use with option A.

- Option to use prefabricated Profibus cabling
- For retrofit



Adapters for VLT® 3000 and VLT® 5000

Prefabricated terminal plates are available for simple upgrading of existing installations with VLT® 3000 and VLT® 5000 drives.

- No drilling needed
- No wiring faults
- Shorter downtime
- Security for old plants



Screw terminals

Screw terminals as an alternative to the standard springloaded terminals.

- Pluggable
- Terminal name is described

Ordering number 130B1116



IP 21/Type 12 (NEMA1) Kit

The IP 21/Type 12 (NEMA1) kit is used for installation of VLT® drives in dry environments.

The enclosure kits are available for frame sizes A1, A2, A3, B3, B4, C3 and C4

- Supports VLT® drives from 1.1 to 90 kW
- Used on standard VLT® drives with or without mounted option modules
- IP 41 on top side
- PG 16 and PG 21 holes for glands

Ordering numbers: 130B1121 for frame size A1, 130B1122 for frame size A2, 130B1123 for frame size A3, 130B1187 for frame size B3, 130B1189 for frame size B4, 130B1191 for frame size C3, 130B1193 for frame size C4



Kit for panel through mount

Mounting kit for external cooling of the heatsink for appliances with A5, B1, B2, C1 and C2 housing.

- The air conditioned installation space can be reduced.
- Additional cooling may be omitted
- No contamination of electronics by forced ventilation
- Facilitates integrated assembly
- Reduced cabinet depth/less space



USB Extension

USB extension for IP 55 and IP 66 enclosures. Makes the USB connector available outside the drive. The USB extension is designed for mounting in a cable gland in the bottom of the drive, which makes PC communication very easy even in drives with high IP rating.

USB extension for A5-B1 enclosures, 350 mm cable, ordering number 130B1155

USB extension for B2-C enclosures, 650 mm cable, ordering number 130B1156

VLT® AutomationDrive Accessories



VLT® Brake Resistors

Energy generated during braking is absorbed by the resistors, protecting electrical components from heating up. Danfoss brake resistors cover the full power range.

- Quick braking of heavy loads
- Braking energy is only absorbed into the brake resistor
- External mounting makes it possible to use the generated heat
- All necessary approvals are available



VLT® Harmonic Filter AHF 005/010 MCE

Easy, effective harmonic distortion reduction by connecting the AHF 005/010 harmonic filter in front of a Danfoss frequency converter.

- AHF 005 reduces total harmonic current distortion to 5%
- AHF 010 reduces total harmonic current distortion to 10%
- Small compact housing that can be fitted into a panel
- Easy to use in retrofit applications
- User-friendly start-up – no adjustment necessary
- No routine maintenance required



VLT® Sine-Wave Filters MCC 101

Sine-wave filters are placed between the frequency converter and the motor to optimise the motor power current. It provides a sinusoidal phase-to-phase motor voltage. The filters reduce motor insulation stress, acoustic noise from the motor, and bearing currents (especially in large motors).

- Reduces motor insulation stress
- Reduces acoustic noise from the motor
- Reduces bearing currents (especially in large motors)
- Enables use of longer motor cables
- Reduces losses in the motor
- Prolongs service lifetime
- IP 20 or IP 21



VLT® dU/dt filter MCC 102

VLT® dU/dt filters are placed between the frequency converter and the motor to eliminate very fast voltage changes. The motor terminal phase-to-phase voltage is still pulse shaped but its dU/dt values are reduced.

- These filters reduce stress on the motor's insulation and are recommended in applications with older motors, aggressive environments or frequent braking which cause increased DC link voltage.
- IP 20 or IP 21



SVCD – regenerative braking

Transferring the generated power from a decelerating motor back into the power supply enables braking of virtually unlimited duration.

- Energy efficient braking
- Self-synchronisation
- DC-DC coupling of multiple drives possible
- High efficiency through IGBT technology
- Simple operation
- Overload protection in regenerative operation





Environmentally responsible

VLT® products are manufactured with respect for the safety and well-being of people and the environment.

All activities are planned and performed taking into account the individual employee, the work environment and the external environment. Production takes place with a minimum of noise, smoke or other pollution and environmentally safe disposal of the products is pre-prepared.

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

Impact on energy savings

One year's energy savings from our annual production of VLT® drives will save the energy equivalent to the energy production from a major 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®.

Twenty five hundred employees develop, manufacture, sell and service drives and soft starters in more than one hundred countries, focused only on drives and soft starters.

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 of our products. The fact that we develop and produce our own features, hardware, software, power modules, printed circuit boards, and accessories is your guarantee of 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.





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