

*Danfoss*



**VLT® AutomationDrive**

# The modular VLT® AutomationDrive

VLT® AutomationDrive allows for mass production and factory testing of highly customised drives. Upgrades and options are plug-and-play easy.

## 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 NEMA 4x.

## Cold plate technology

The drive is built on a rock-solid aluminium base that's integrated with the back panel. This provides high mechanical stability, efficient cooling and the option of cold plate operation.

## 50 °C ambient temperature

The drive is designed to give maximum output at ambient temperatures up to 50°C.

## DC coil

The renowned DC coil ensures very low harmonic disturbance of the power supply, in accordance with IEC-1000-3-2. Compact design means no need for external modules.

## Conformal coating

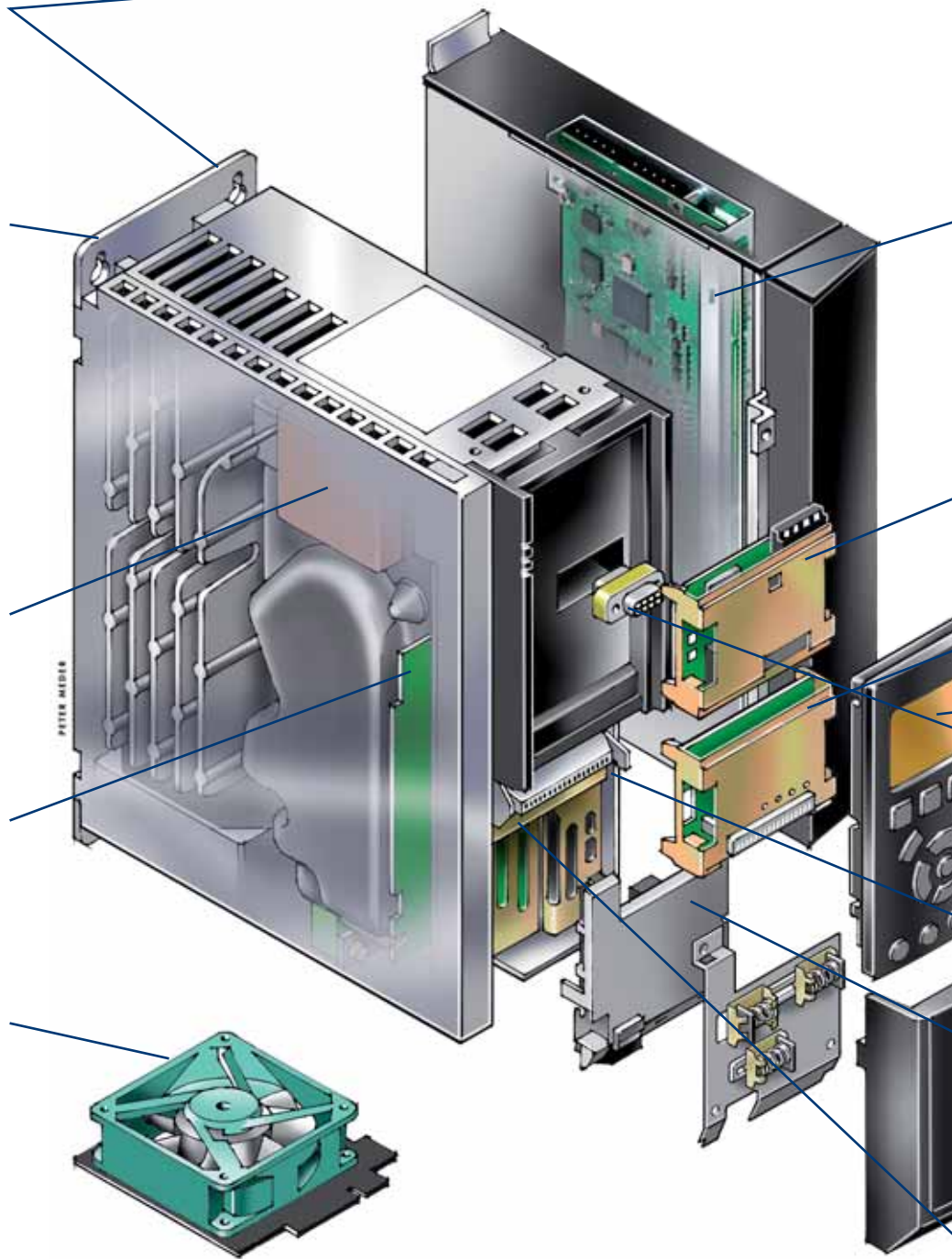
The electronic components are as standard coated as per IEC 60721-3-3, class 3C2. For harsh and aggressive environments, coating as per IEC 60721-3-3, class 3C3 is available.

## Removable fan

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

## RFI

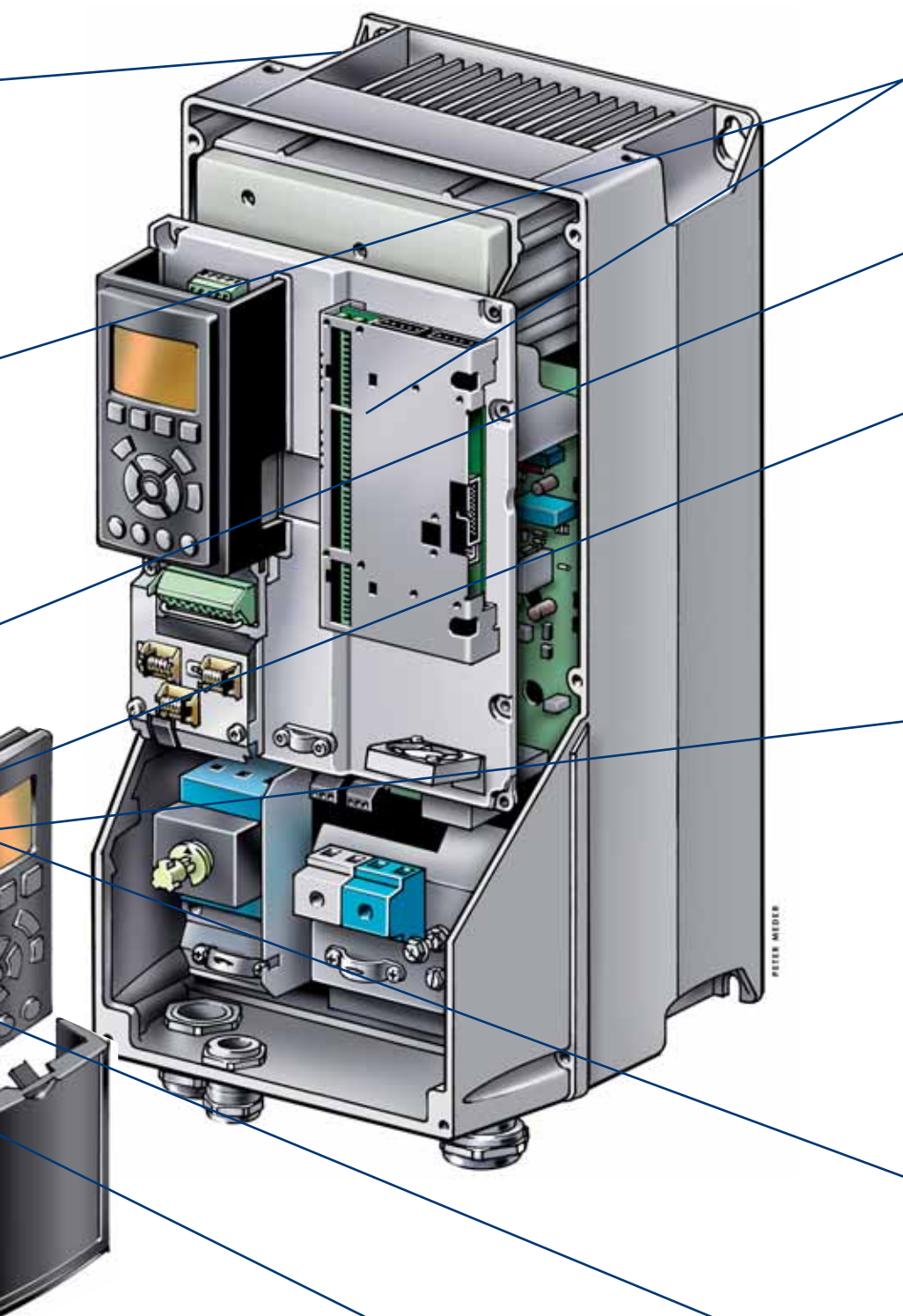
RFI available with A1/B1 and A2, for compliance with IEC 61000 and EN 61800 standards.



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



The new VLT® series local control panel (LCP) was given the international iF design award in 2004. The panel was chosen from a total of 1,003 entries from 34 countries in the category "interface in communication".



#### Advanced option

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

#### Fieldbus option

Options for bus communication (Profibus, Devicenet, CanOpen etc.), synchronisation, user programs, etc., are delivered ready to go.

#### Application option

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

#### Display options

Danfoss Drives removable Local Control Panel now comes with an improved user-interface. Choose between six built-in languages (including Chinese) or have it customised with any language you like. Two of the languages can be changed by the user. The info button makes the printed manual virtually redundant. Users have been involved throughout development to ensure great functionality and performance. The user group has significantly influenced design and function of the Local Control Panel. 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.

#### Hot-pluggable LCP

The local control panel (LCP) can be plugged in or unplugged during operation. Settings are easily transferred via the control panel from one drive to another or from a PC with MCT-10 set-up software.

#### Control terminals

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

#### Safety

The VLT® AutomationDrive FC 302 comes standard with the safe stop functionality. The solution is approved by authorities for category 3 installations in accordance with EN 954-1. This feature prevents the drive from starting unintended. Enhanced safety features are available as options.

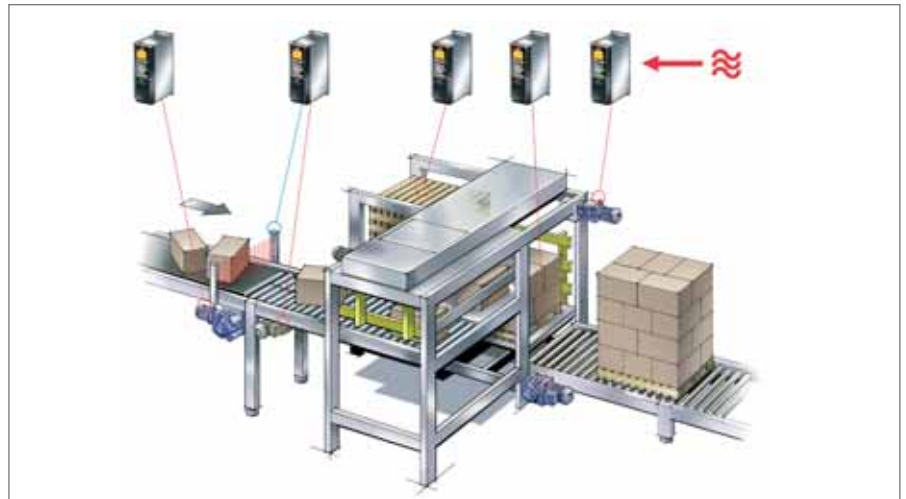
#### 24 V

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



# Just one drive to run a complete production line

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 versions cover a wide range of functions such as PLC functionality, automatic fine-tuning of motor control and self-analysis of performance. Positioning, synchronizing, load estimation and even servo performance are available too. All versions share an identical user interface, so once you've operated one you can use them all.



## Add flexibility to precision

The new VLT® AutomationDrive lets you alter production speed without rebuilding the conveyor. The Precise Pulse Stop feature ensures that products always are where they should be on the line.

### Speed or slow the entire line

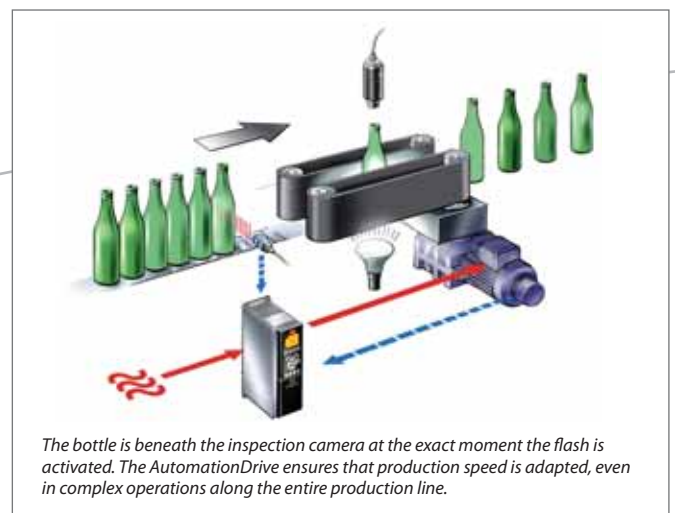
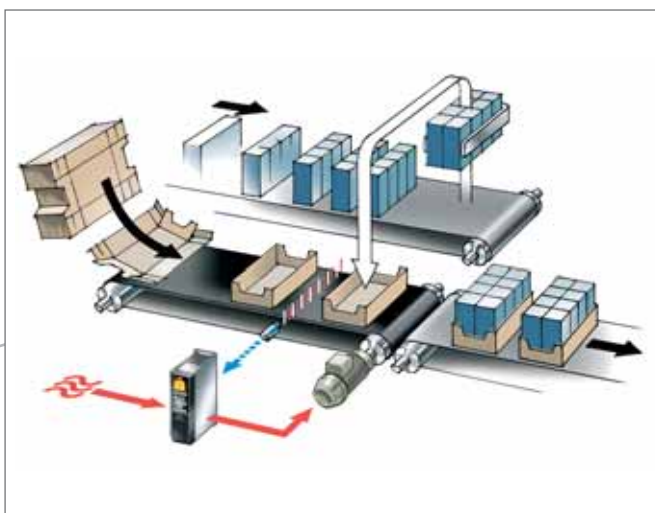
Production speed can be changed at any time. Even if the application involves several parts. The Precise

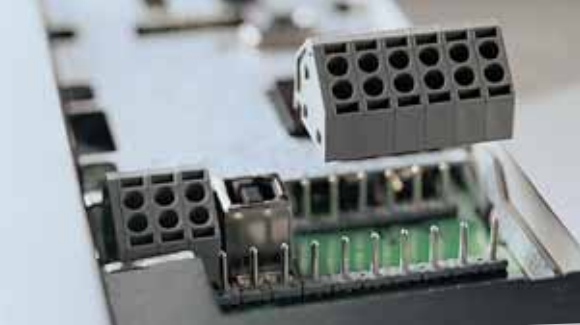
Pulse Reference feature makes the conveyors follow the encoder from master conveyor or virtual master drive, ensuring that all conveyors are in sync.

### Benefits:

- The conveyor can be stopped at a precise location using an open loop system independent of production speed.

- Precise Pulse Stop compensates for the speed of the object when it passes the stop sensor. This results in a precise stop, regardless of production speed.





To disconnect wires, simply unplug the terminal blocks.



Plug-and-play is the way with the VLT® AutomationDrive. Even the power supply, sensor cables and looping connections are convenient plugs.



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

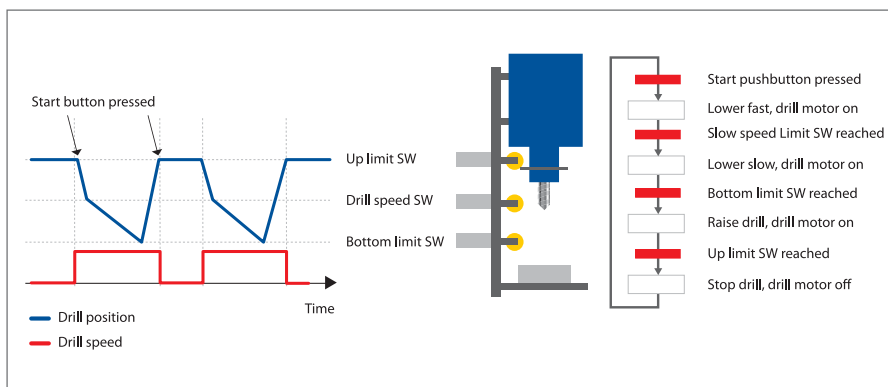
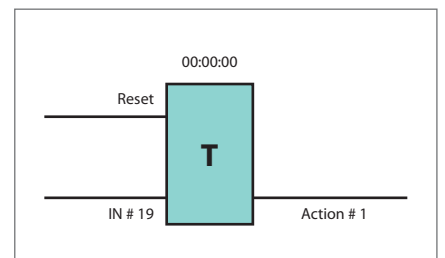
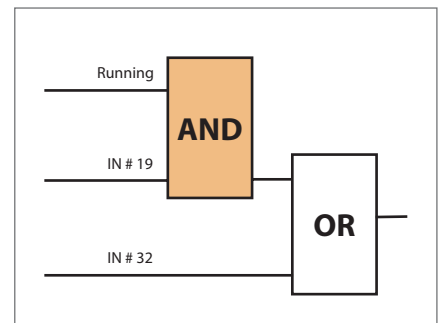
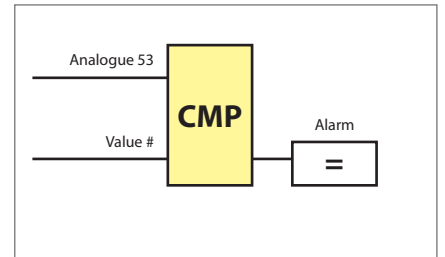
## Built-in Smart Logic Controller

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 the event occurs, the controller triggers a specified act and starts monitoring the next event continuing for up to 20 different 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, flow, time, load, frequency, voltage and other parameters combined with the operators ">", "<", "=", "and" and "or" forms logical statements.

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



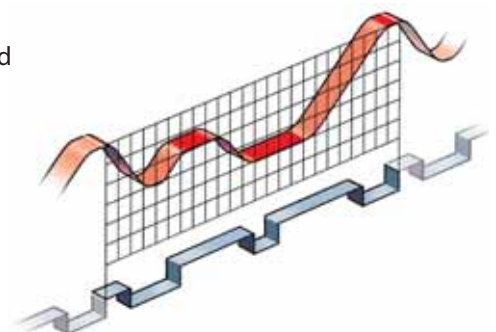
## VLT® MCO 305 Motion Controller

The MCO 305 is an integrated programmable Motion Controller. It adds even more functionality and flexibility to these drives.

With the MCO 305, the VLT® AutomationDrive becomes an intelligent drive featuring highly accurate, dynamic motion control, synchronisa-

tion (electronic shaft), positioning and electronic Cam control.

Programmability lets you implement a variety of application functions, such as monitoring and intelligent error handling.



# Award-winning control panel

## Graphical display

- International letters and signs
- Showing bars and graphs
- Easy overview
- Possible to select 27 languages
- iF awarded design

## 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

## Illumination

- Important buttons are illuminated when active



## Menu structure

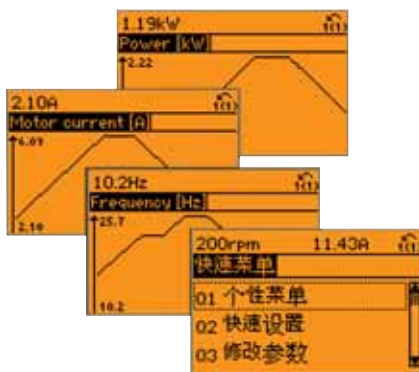
- Based on the well known matrix system in today's VLT® drives
- Easy shortcuts for the experienced user
- Edit and operate in different setups simultaneously

## Quick Menus

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

## New buttons

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



The VLT® AQUA Drive 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 bus communication. Special software is available: Wizards, Data transfer tool, VLT® Set-up Software, MCT 10 and Language changer.

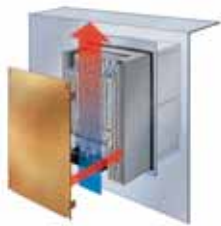


# Intelligent heat management

## Cooling can take place in two ways for different benefits

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

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



Flanged heatsink.

### Forced convection cooling

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



Wall mounted with forced cooling through the heatsink.

### Cold plate cooling

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



Coated control boards are available for harsh environments.

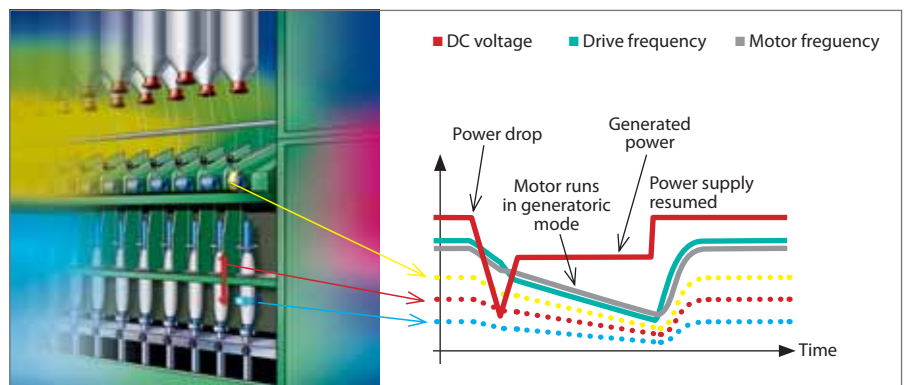


*Innovative design reduces the risk of contaminants entering the drive and the panel and ensures a long life of the drives. With the duct cooling kit excess heat can be ventilated outside the control room – and outside the building. The need for additional air conditioning components and the energy consumption of these components are limited.*

*A smart, dedicated kit allows D1 and D2 enclosures to be mounted in Rittal cabinets so cool air removes 85% of excess heat without contact to the electronics.*

## Kinetic backup

The VLT® AutomationDrive can utilize power generated from the kinetic energy for controlled ramp-down in case of power loss. The application is ready for quick restart when the power returns.



# Reliable, accurate load handling

The VLT® AutomationDrive estimates motor currents generated by actual loads and compensates to make the crane start and stop smoothly just where it should. The same benefits apply to hoists and elevators.

## Small loads handled quicker

The ability to change speed automatically allows equipment to operate at a partial or minimum load. The drive estimates the load and maximises production speed.

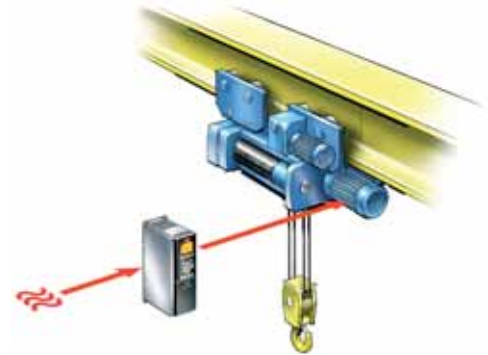
## Gentle on goods – and brakes

When stopped, the VLT® AutomationDrive will slow the hoist to zero before activating the mechanical brake. This

results in gentler handling and virtually eliminates wear on the brakes.

### Benefits:

- Low torque ripple gives smooth operation.
- Precise load estimation allows for precise positioning regardless of load.
- Load estimation saves time and speeds up production – safely and intelligently.
- Full holding torque capability at 0 RPM gives a smooth ride and reduces mechanical wear on gears and brakes – less maintenance and more production uptime.



## Conversion kit

A conversion kit is available to facilitate exchange from earlier VLT® drives. The backplate has pre-drilled holes. Cabelling from VLT® 3000 and VLT® 5000 can be reused with the terminal adapter.



## 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.



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

## IP 55 for harsh environments IP 66 for wash down areas

All VLT® AutomationDrive versions have manganic phosphor rear bodies. The back of IP 66 is dip-coated with epoxy or polyester spray finish (60-100 µm). The cover is powder coated (80-100 µm). The IP 66 enclosed drives are suited for installation outdoor and in wash-down areas. The silicone gasket is tested with different detergents so the drives withstand the harsh cleaning agents in the food & beverage industry.





# Accessories

## Dynamic braking

The VLT® AutomationDrive can be ordered with a built-in dynamic brake option utilizing the latest IGBT technology to provide fast deceleration of the connected motor. The dynamic brake option is built into the FC 300 at time of purchase and cannot be retrofitted in the field.

Brake resistor(s) must be used in conjunction with the dynamic brake to dissipate the heat/power regenerated by the motor during deceleration or overhauling load. Select the appropriate resistor for your application from the following charts. Brake resistors must be ordered separately and field installed by the customer.



## Disconnect switch available

Mounting the optional disconnect switch on the front of B, C, D or E enclosures eliminates the need for an external switch-box.



## Advanced harmonic filters

VLT® Harmonic Filter AHF 010/005. AHF 010 reduces the harmonic current to less than 10%, while the AHF 005 lowers this current to less than 5%.

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



## Profibus adaptor Sub-D9 connector

The adaptor makes linking of fieldbus connections pluggable.

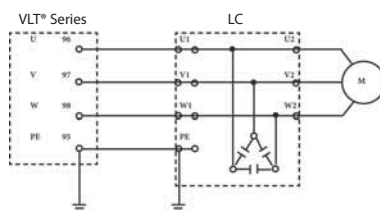
## Sinewave filters

When the speed of a motor is controlled by a drive, resonance noise from the motor can occur. This is due to the construction of the motor and the switching of IGBTs. The frequency of the resonance will correspond to the switching frequency of the drive.

In applications where this noise is undesirable, Danfoss offers Sinewave filters for the FC 300 to dampen the acoustics.

These filters are installed electrically between the FC 300 and the motor to reduce voltage rise time

(dv/dt), peak voltage ( $V_{max}$ ) and the ripple current to the motor, thus reducing the noise generated. Refer to the following table to find the appropriate Sinewave filter. Sinewave filters must be ordered separately and field installed by the customer.



## LCP Panel mounting kit

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

# One drive – two performance levels

*Special needs require special features and performance*

	FC 301 A1*	FC 301	FC 302
Power range 200 – 240 V [kW]	0.25 – 1.5	0.25 – 45	0.37 – 45
Power range 380 – (480) 500 V [kW]	0.37 – 1.5	0.37 – 45	0.37 – 1.1 M
Power range 550 – 600 V [kW]	–	–	0.75 – 7.5
Power range 525 – 690 V [kW]	–	–	11 – 1.2 M
Amb. temp °C Avg.24 hours (IP 21) w/o de-rating	45	45	45
Ambient temp °C max (IP21) w/o de-rating	50	50	50
Ambient temp °C max with de-rating	55	55	55
IP 21/NEMA type1/IP 55/NEMA type12	√	√	√
IP 66/NEMA type 4x	–	–	√
Smart Logic Control	√	√	√
Logic Rule Control	√	√	√
Safe Stop input function approved	√	–	√
Local Control Panel numerical or graphical	√	√	√
Info/Help function	√	√	√
Personal menu (macro)	√	√	√
Regional settings (US mode)	√	√	√
Language settings	√	√	√
Change made restore previous setting	√	√	√
Password protection	√	√	√
Analogue input	0 to +10 V	0 to +10 V	-10 to +10 V
Digital inputs	5	5	6
Digital transistor outputs <sup>1)</sup>	1	1	2
Relay outputs	1	1	2
Analogue output resolution	12 bit	12 bit	12 bit
PC connection: RS 485 and USB	√	√	√
Default motor data	√	√	√
Permanent Magnet Motor algorithm	–	–	√
Process PID control	√	√	√
Precise Start/Stop	√	√	√
Preset references	8	8	8
Digipotmeter	√	√	√
Ramp functions: linear and S-ramps	√	√	√
Profibus, DeviceNet, CANOpen	√	√	√
ProfiSafe	–	–	√
Interface options:			
Extended input/outputs MCB 101	√	√	√
Encoders option MCB 102	√	√	√
Resolver option MCB 103	√	√	√
Relay option MCB 105	√	√	√
Safe PLC interface MCB 108	√	–	√
Motion Control Options: MCO 305	–	√	√
External 24 V back-up option MCB 107	–	√	√
Cable length – screened/unscreened	25/50 m	50/75 m	150/300 m
RFI EN55011 cl A2 (Industry)	<5 m	<5 m	<5 m
RFI EN55011 cl A1 (Industry)	<25 m	<50 m	<150 m
RFI EN55011 cl B (Domestic)	2.5 m	<10 m	<50 m
Voltage Vector Control VVC+	√	√	√
Flux Vector Control	–	–	√
Automatic Energy Optimizing (AOE)	–	–	√
Controlled ramp down	–	–	√
Flying start – catch spinning motor	–	–	√
Variable switching frequency 1 – 16 kHz <sup>2)</sup>	√	√	√
Over Voltage Control	√	√	√
Fan replaceable	√	√	√

1) Converting digital inputs

2) Power-size dependent

\* Smallest cabinet size

# VLT® AutomationDrive FC 302 offers a wide range of advanced features

## One wire safety



The VLT® AutomationDrive FC 302 comes standard with safe stop functionality suitable for category 3 installations as defined by EN 954-1. 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 3 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

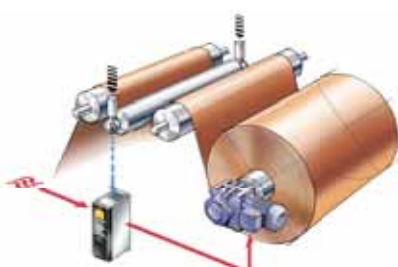
of Pilz safety relay and AutomationDrive is perfect, because AutomationDrive is approved for safety category 3 applications.

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

### When torque is the issue

In all winders the torque required to accelerate and decelerate an application varies with the load. With centre winders the required torque even varies with the dimension of the roll. Torque mode with a high-precision torque control is needed.

It's essential in winding operations to fully control the tension of the material being wound. To maintain tangential tension independently of the line speed and roll diameter, the drive is able to dynamically follow a wide range of torque references.



### 600 & 690 V

VLT® AutomationDrive FC302 comes in 600 and 690 V series specially relevant for heavy industries like chemistry, water and gas supply, mining, and forestry. 690 V versions are planned up to 1.2 MW.

### Encoder check

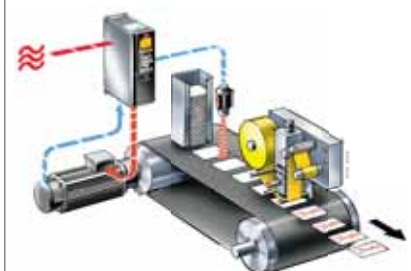
The drive will automatically check and verify if the encoder is malfunctioning.

The feedback from the encoder is compared with a calculated speed.

### VLT® AutomationDrive FC 302 runs permanent magnet motors

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

Fast processors enable it to precisely control position, acceleration and torque.





# Specifications

Mains supply (L1, L2, L3)	FC 301	FC 302
Supply voltage	200-240 V ±10%	
Supply voltage	380-480 V	380-500 V ±10%
Supply voltage		550-600 V ±10%
Supply voltage		525-690 V ±10%
Supply frequency	50/60 Hz	
Displacement power factor (cos φ) near unity	> 0.98	
Switching on input supply L1, L2, L3	2 times/min.	

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.	
Closed loop	0-132 Hz	

Digital inputs	FC 301	FC 302
Programmable digital inputs	4(5) > 5	4(6) > 6
Logic	PNP or NPN	
Voltage level	0 - 24 V DC	
Voltage level, logic	'0' PNP logic < 5 V DC	
Voltage level, logic	'1' PNP logic > 10 V DC	
Voltage level, logic	'0' NPN logic > 19 V DC	
Voltage level, logic	'1' NPN logic < 14 V DC	
Maximum voltage on input	28 V DC	
Input resistance, Ri	Approx. 4 k Ω	
Scan interval	5 ms	1 ms

Analog inputs	FC 301		FC 302	
Analog inputs	2			
Modes	Voltage or current			
Voltage level	0 to +10 V	-10 to +10 V (scaleable)		
Current level	0/4 to 20 mA (scaleable)			
Accuracy of analog 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 - 110 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	32 kHz	
Accuracy on frequency output	Max. error: 0.1% of full scale	

Analog output	FC 301	FC 302
Programmable analog outputs	1	
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% of full scale	

Onboard power supply	FC 301	FC 302
Output voltage	10.5 V ±0.5 V	
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 100 mA	

Cable lengths	FC 301	FC 302
Max. motor cable length, screened (shielded)	50 m	150 m
Max. motor cable length, unscreened (unshielded)	75 m	300 m

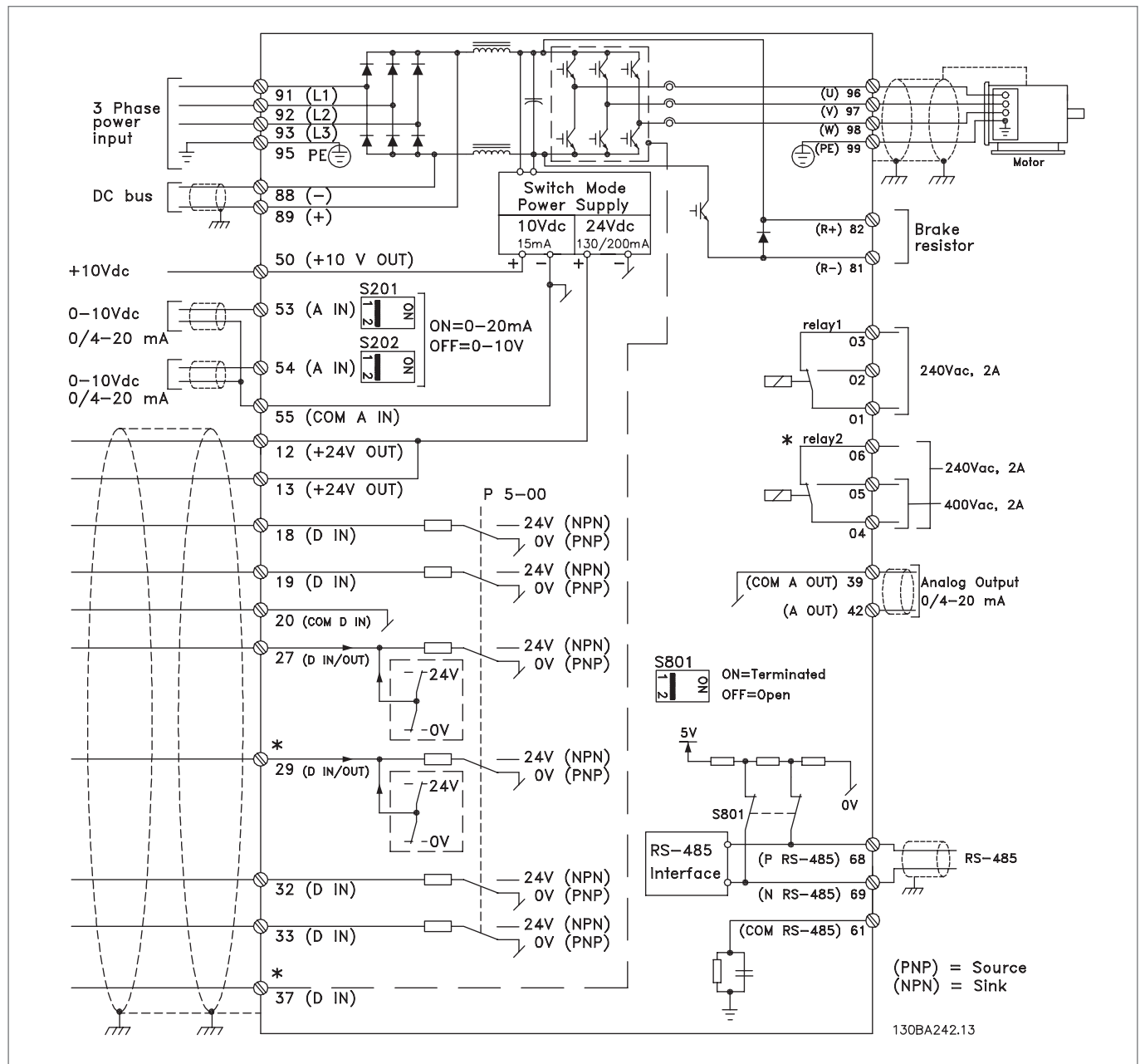
Surroundings/external	FC 301	FC 302
Enclosure	IP 20/IP 21/IP 55	
Vibration test	0.7 g	
Max. relative humidity	5% - 95% (IEC 721-3-3; Class 3K3 (non-condensing) during operation)	
Aggressive environment (IEC 721-3-3)	Uncoated class 3C2	
Aggressive environment (IEC 721-3-3),	Coated class 3C3	
Ambient temperature	Max. 50 °C	
24-hour average	Max. 45 °C	

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

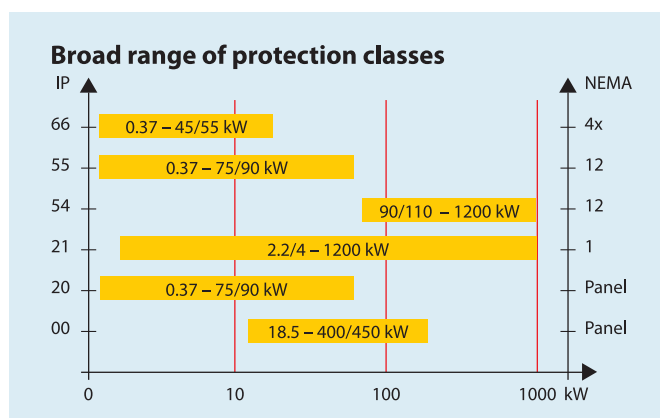


# Connection examples

This diagram shows a typical installation of the AutomationDrive FC 300. The numbers represent the terminals on the drive.



\*FC 302 only. Additional safe stop input on FC 302 and FC 301 A1 (Terminal 37)



# Typical current and power ratings

VLT® 5000 type	FC 300 type	230 V				400 V				460 V				575 V				690 V			
		Normal OL 110% torque		High OL 160% torque		Normal OL 110% torque		High OL 160% torque		Normal OL 110% torque		High OL 160% torque		Normal OL 110% torque		High OL 160% torque		Normal OL 110% torque		High OL 160% torque	
		IN Amps	PN kW	IH Amps	PH kW	IN Amps	PN kW	IH Amps	PH kW	IN Amps	PH HP	IH Amps	PH HP	IN Amps	PN HP	IH Amps	PH HP	IN Amps	PN kW	IH Amps	PH kW
5001	PK25			1.8	0.25																
5001	PK37			2.4	0.37			1.3	0.37			1.1	0.5								
5001	PK55			3.5	0.55			1.8	0.55			1.6	0.75								
5001	PK75			4.6	0.75			2.4	0.75			2.1	1.0			1.7	1.0				
5002	P1K1			6.6	1.10			3	1.10			3	1.5			2.4	1.5				
5003	P1K5			7.5	1.5			4.1	1.5			3.4	2.0			2.7	2.0				
5004	P2K2			10.6	2.2			5.6	2.2			4.8	3.0			4.1	3.0				
5005	P3K0			12.5	3			7.2	3			6.3	4.0			5.2	4.0				
5006	P3K7			16.7	3.7																
5006	P4K0							10	4			8.2	5.5			6.4	5.5				
5008	P5K5	30.8	7.5	24.2	5.5			13	5.5			11	7.5			9.5	7.5				
5011	P7K5	46.2	11	30.8	7.5			16	7.5			14.5	10			11.5	10				
5016	P11K	59.4	15	46.2	11	32	15	24	11	27	20	21	15	18	15			18	15	13	11
5022	P15K	74.8	18.5	59.4	15	37.5	18.5	32	15	34	25	27	20	22	20	18	15	22	18.5	18	15
5027	P18K	88	22	74.8	18.5	44	22	37.5	18.5	40	30	34	25	27	25	22	20	27	22	22	18.5
5032	P22K	115	30	88	22	61	30	44	22	52	40	40	30	34	30	27	25	34	30	27	22
5042	P30K	143	37	115	30	73	37	61	30	65	50	52	40	41	40	34	30	41	37	34	30
5052/5042*	P37K	170	45	143	37	90	45	73	37	77	60	65	50	52	50	41	40	52	45	41	37
5062/5052*	P45K					106	55	90	45	96	75	80	60	62	60	52	50	62	55	52	45
5072/5062*	P55K					147	75	106	55	130	100	105	75	83	75	62	60	83	75	62	55
5102/5072*	P75K					177	90	147	75	160	125	130	100	100	100	83	75	100	90	83	75
5122/5102*	P90K					212	110	177	90	190	150	160	125	125	125	100	100	125	110	100	90
5152/5122*	P110					260	132	212	110	240	200	190	150	155	150	131	125	155	132	131	110
5202/5152*	P132					315	160	260	132	302	250	240	200	192	200	155	150	192	160	155	132
5252/5202*	P160					395	200	315	160	361	300	302	250	242	250	192	200	242	200	195	160
5302/5252*	P200					480	250	395	200	443	350	361	300	290	300	242	250	290	250	242	200
5352/5302*	P250					600	315	480	250	540	450	443	350	344	350	290	300	344	315	290	250
5452/5352*	P315					658	355	600	315	590	500	540	450	400	400	344	350	400	400	344	315
5502	P355					745	400	658	355	678	550	590	500	450	450	380	400	450	450	380	355
5552/5402*	P400					800	450	695	400	730	600	678	550	500	500	410	400	500	500	410	400
	P450					880	500	800	450	780	650	730	600								
5502*	P500					990	560	880	500	890	750	780	650	570	600	500	500	570	560	500	500
5602*	P560					1120	630	990	560	1050	900	890	750	630	650	570	600	630	630	570	560
	P630					1260	710	1120	630	1160	1000	1050	900	730	750	630	650	730	710	630	630
	P710					1460	800	1260	710	1380	1200	1160	1000	850	950	730	750	850	800	730	710
	P800					1720	1000	1460	800	1530	1350	1380	1200	945	1150	850	950	945	900	850	800
	P900													1060	1150	945	1050	1060	1000	945	900
	P1M0													1260	1350	1060	1150	1260	1200	1060	1000

For 441 – 500 and 525 – 600 Volt versions the power is stated in Horse Power (North American market). \*600 V.

## Cabinet sizes [mm]

### IP 20 and IP 21/NEMA 1

Enclosure name		A1*	A2	A3	B1	B2	C1	C2	D1	D2	E1	E2	E3
Height	IP 20	200	268	268	481	651	680	770	1159	1540	2000	2000	2000
	IP 21/NEMA 1	307	370	370									
Width	Without Option C	75	90	130	242	242	308	370	420	420	600	1400	1600
	With slim Option C		130	170									
	With wide Option C		1550	190									
Depth	Without Option A or B	205	205	205	261	261	310	335	373	373	494	600	600
	With Option A or B	219	219	219									

A5 cabinet replace A1-A3 in IP 54 – IP 66 classes

\* Only FC 301

### IP 54/IP 55/IP 66/NEMA 12

Enclosure name		A5	B1	B2	C1	C2	D1	D2	E1	E2	E3
Height		420	481	651	680	770	1159	1540	2000	2000	2000
Width		242	242	242	308	370	420	420	600	1400	1600
Depth		200	261	261	310	335	373	373	494	600	600

### IP 00/Chassis

Enclosure name		D1	D2	E1
Height		997	1277	1499
	Without Option C, with slim Option C and with wide Option C	408	408	585
Depth	Without Option A or B	373	373	494
	With Option A or B			







## Protects environment

VLT® products are manufactured with respect for environment, safety and wellbeing.

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 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. 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).

### Products impact

One year's production of VLT® drives will save energy equivalent to the energy production of a 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.

