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ENGINEERING
TOMORROW

Selection Guide

VLT® High Power Drives that **fit your application**

98%

Energy efficiency

Save energy and money with >98% efficient VLT® drives.

www.danfoss.com/drives

VLT®
THE REAL DRIVE

Contents




Designed to be easy to own with specific functionality to fit the application

Part of the VLT® family

The Danfoss VLT® High Power Drives series are built on the success of the renowned VLT® name, created when Danfoss introduced the world's first mass-produced variable frequency drives in 1968.

VLT® High Power Drives feature all of the advantages you are already familiar with in the other Danfoss products, including user-friendly commissioning and operation.

In addition, the high power range offers a host of advanced yet easy-to-use features and options, built-in and factory tested to meet the unique demands of any application.

Save time

VLT® drives are designed with the installer and operator in mind to save time in installation, commissioning and maintenance.

VLT® High Power Drives are designed for full access from the front. Just open the cabinet door, and all components can be reached without removing the drive, even when mounted side by side.

- An intuitive user interface with an award-winning Local Control Panel (LCP) streamlines start-up and operating procedures
- The full power range utilises a common control platform for consistent interface and predictable operation
- Robust design and advanced controls make VLT® drives virtually maintenance free

Save space

The compact design of VLT® drives – and high power VLT® drives in particular – makes them easy to fit even in small spaces.

Integrated filters, options and accessories provide additional capabilities and protection without increasing the enclosure size.

- Built-in DC link reactors for harmonic suppression eliminate the need for higher loss external AC line reactors
- Optional, built-in RFI filters are available throughout the power range
- Optional input fuses and mains disconnect are available with standard enclosures

***Make the experts your partners**. Danfoss Drives' unequalled drives experience combined with deep application knowledge makes our sales and service staff valuable partners, available for your support in 120 countries around the clock.*

- In addition to the many valuable features that VLT® high power drives offer as standard, numerous other control, monitoring and power options are available in pre-engineered factory configurations

Save money

VLT® High Power Drives are designed for maximum efficiency with state-of-the-art power components.

- >98% efficiency reduces operating costs
- Unique back-channel cooling design reduces the need for additional cooling equipment, resulting in lower installation and recurring costs
- Lower power consumption for control room cooling equipment
- Reduced lifecycle costs and lower overall cost of ownership

The VLT® AutomationDrive

The VLT® AutomationDrive is a single drive concept that controls all operations from standard induction motors to permanent magnet 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, synchronising, programmable motion control and even servo performance are also available. All versions share an identical user interface, so once you've operated one, you can use them all.

- Built-in Smart Logic Controller
- Constant torque or variable torque operation
- Performance Level d (ISO13849-1) Safe Stop
- Loadsharing and regenerative braking capabilities

The VLT® HVAC Drive

Setting new standards, the VLT® HVAC Drive integrates seamlessly with HVAC systems. Danfoss' extensive experience in advanced variable frequency drive technology for HVAC applications has produced an unmatched product offering. The VLT® HVAC Drive is suitable for a range of needs, from simple follower operation to intelligent stand alone control. The VLT® HVAC Drive is the economical, flexible and user-friendly answer to a variety of HVAC applications.

- VLT® HVAC Intelligent Control with four auto-tuning, multi-input, multi-control PIDs
- Built-in Johnson Controls' Metasys N2, Siemens Apogee FLN and Mod- bus RTU; LonWorks® and BACnet® optional
- Real-time clock

The VLT® AQUA Drive

As the only dedicated water and wastewater variable frequency drive on the market, the VLT® AQUA Drive offers a wide range of powerful standard and optional features designed specifically for water and wastewater applications. Pump-specific features protect valuable equipment while providing unparalleled control and flexibility. And with features such as sensorless control, Automatic Energy Optimisation and Automatic Motor Adaptation, the VLT® AQUA Drive provides the lowest overall cost of ownership of any drive available.

- Dry pump detection
- Enhanced sleep mode
- Pipe fill mode
- End-of-curve detection
- Flow compensation of setpoint
- Pump deragging

Manufactured to the highest quality standards *VLT® series drives are UL listed and made in ISO 9001-2000 certified facilities.*

Features to meet even the most demanding applications in a package built for years of reliable operation

The modular VLT® technology platform

The VLT® AutomationDrive, VLT® HVAC Drive and VLT® AQUA Drive are all built on the same modular platform, allowing for highly customised drives that are still mass produced, tested, and delivered from the factory.

Upgrades and further options are a matter of plug-and-play. They share features and a common user interface, so once you know one, you know them all.

Enclosure

VLT® High Power Drives are available in three enclosure configurations for applications in different environments:

- **IP 00/Chassis**
  For installation in enclosures. Kits available to convert IP 00 to IP 20.
- **IP 20/Protected Chassis**
  For installation in enclosures.
  A touch safe option to protect against accidental contact with electrified components.
- **IP 21/NEMA Type 1**
  Enclosure is protected against small objects *(ex. fingers)* and vertically dripping water.
  For indoor use.
- **IP 54/NEMA Type 12**
  Enclosure is protected against dust and splashing water.
  For indoor use.

Ease of maintenance

All components are easily accessible from the front of the drive, simplifying maintenance and enabling side-by-side mounting of drives. The modular design of VLT® drives makes replacing sub-assemblies much easier.

Optimised motor efficiency

The Automatic Energy Optimisation (AEO) feature of VLT® Series drives utilises vector technology that ensures maximum magnetisation of the motor, minimising passive, damaging currents and flux.

This means that maximum electrical power provided through the drive is available to the application.

Efficiency is vital for high power drives

Efficiency was essential when Danfoss developers designed the high power VLT® Series variable frequency drives. Innovative design and exceptionally high quality components have resulted in unsurpassed energy efficiency.

VLT® drives pass more than 98% of the supplied electrical energy on to the motor. Only 2% or less is left in the power electronics as heat to be removed.

Energy is saved and electronics last longer because they are not exposed to high internal enclosure temperatures.

Conformal coating

VLT® High Power Drives all have conformal coated boards for use in class 3C3 harsh and aggressive environments described in IEC 60721-3-3. The coating complies with ISA (International Society of Automation) standard S71.04 1985, class G3.

Stainless steel back channel

As an option, the back channel cooling duct can be supplied in stainless steel along with heavier plated heatsinks to provide a degree of corrosion resistance against conditions such as those found in salt-air environments near the ocean.

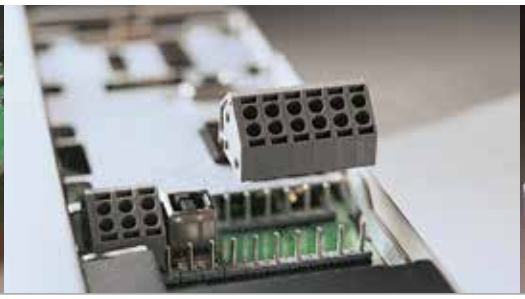
Safety

VLT® High Power Drives can be ordered with the Safe Torque Off (Safe Stop) function in compliance with EN ISO 13849-1 Category 3 PL d and SIL 2 according to IEC 62061/IEC 61508. This feature prevents the drive from starting unintended.

1 Fieldbus and Control options

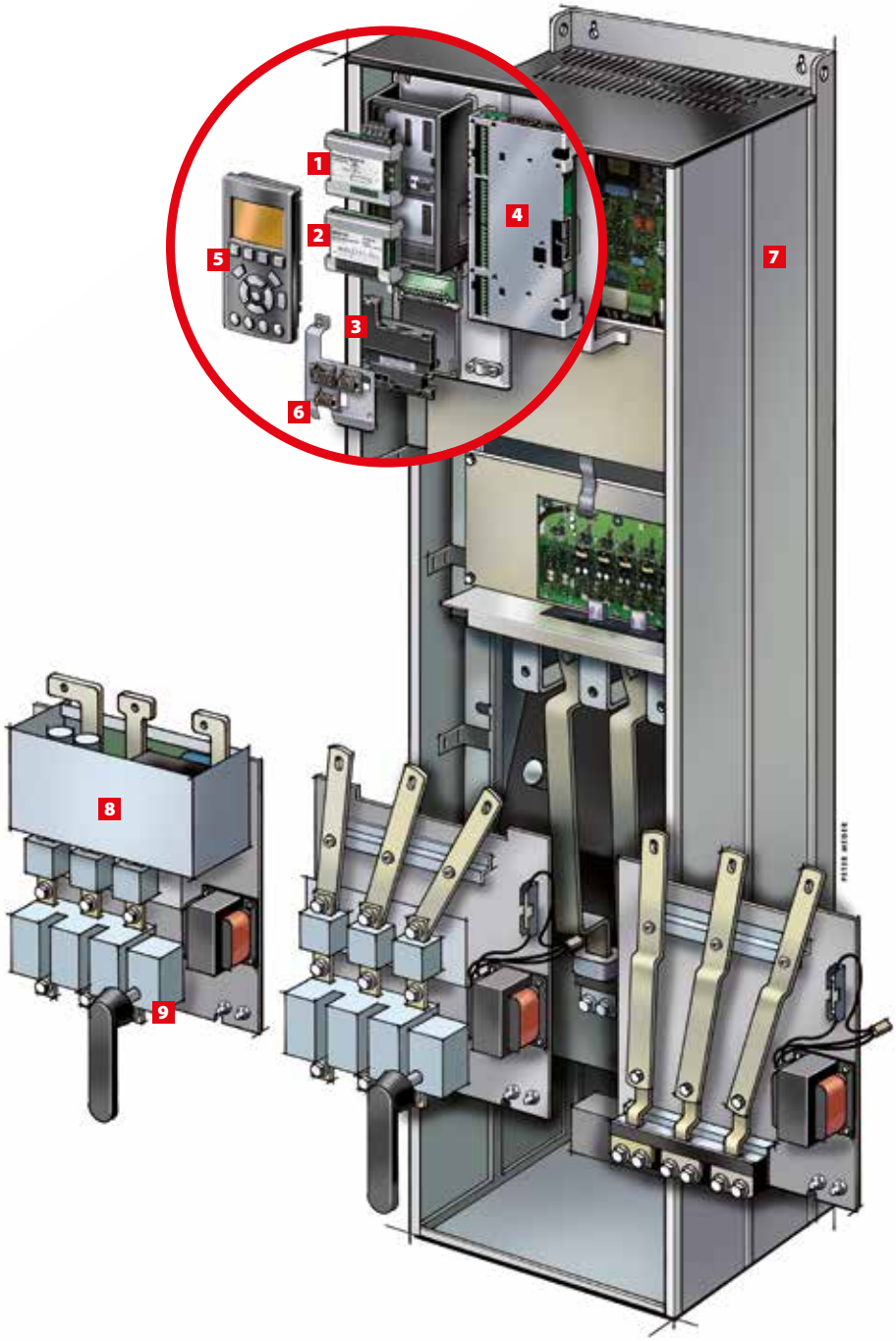
Options for bus communication (Profibus, DeviceNet, CanOpen, Ethernet, etc.), synchronisation, user programs and more are delivered ready to plug and play.

Coated control boards are available for harsh environments.



To disconnect control signal wires, simply unplug the terminal blocks.

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.



2 Feedback and I/O options

- Encoder
- Resolver
- General purpose I/O
- Relay

3 24 V supply input

Allows an externally supplied 24 V power source to keep the drive logically "alive" in situations when the AC power supply is removed.

4 Programmable options

User-programmable option MCO 305 for synchronising, positioning and motion control. Preprogrammed options for synchronising (MCO 350) or positioning (MCO 351) are also available.

5 Display and interface

Danfoss Drives' renowned, removable Local Control Panel (LCP) has an improved user interface, developed through user feedback for unmatched ease of use. The LCP can be plugged in and unplugged during operation. Settings are easily transferred via the control panel from one drive to another. The "Info" button provides direct access to onboard help, making the printed manual virtually redundant. Automatic Motor Adaptation, a Quick Setup menu, and the large graphic display make commissioning and operation a breeze.

6 Control signals

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

7 DC-link reactor

The built-in DC-link reactor ensures low harmonic disturbance of the power supply in accordance with IEC-1000-3-2. The result is a compact overall design with no need for high loss external input reactors.

8 RFI

All high power drives come standard with A2/C3 RFI filtering according to the IEC 61000 and EN 61800 standards. All 380-500 V high power drives and 525-690V D frame high power drives have A1/C2 RFI filters according to the IEC 61000 and EN 61800 standards as integrated options.

9 Input mains option

Various input plate configurations are available, including fuses, mains disconnect switch, or RFI filter. Input plates are field adaptable if options need to be added after the installation.

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

The VLT® series 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.

Intelligent heat management

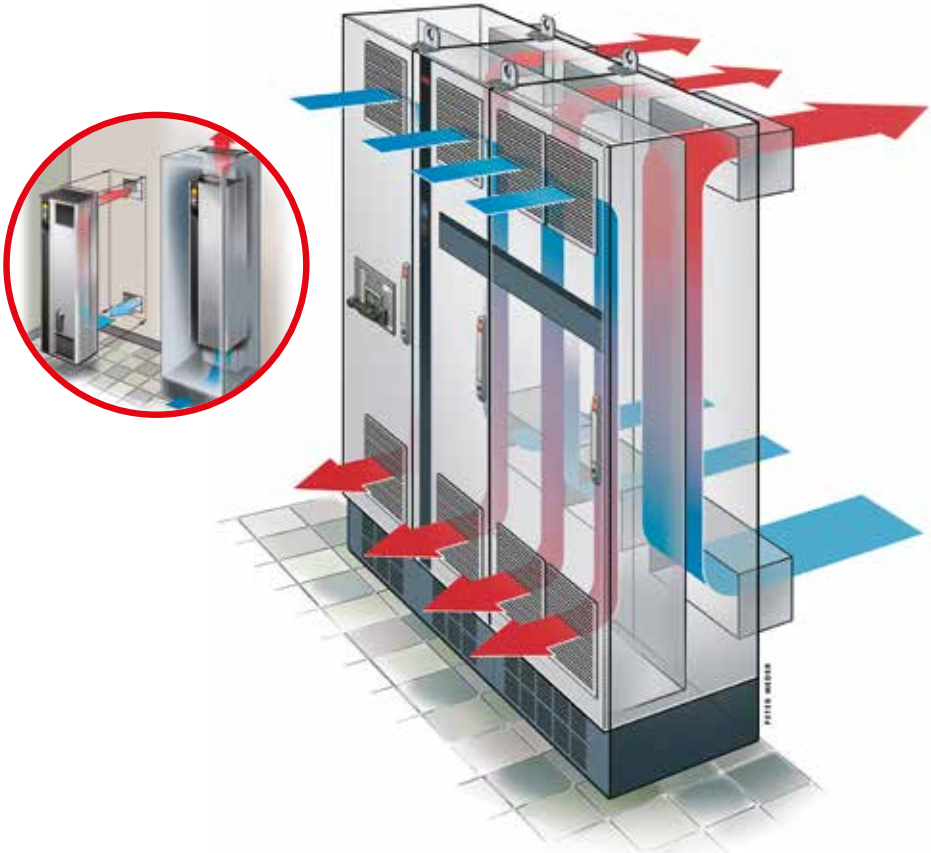
Back-channel cooling

The intelligent heat management of VLT® drives removes up to 90% of the heat losses via finned heat sinks, which transfer the heat to the back channel cooling air. This back-channel is separated from the electronics area by an IP 54 seal. This method of cooling greatly reduces contamination of the control electronics area, resulting in longer life and higher reliability.

The remaining heat losses are removed from the control electronics area using door fans.

The heat from the back-channel can be dispersed into the control room or entirely removed from the area.

An optional back-channel cooling duct kit is available to aid in the installation of IP 00/IP 20/Chassis drives into Rittal TS8 enclosures.



- Separate cooling path for power and control components
- Up to 90% of heat losses are removed through the back channel
- Back-channel can be ducted outside to reduce heat gain in control room and lower operational costs
- IP 54 seal between power and control areas
- Reduced airflow through the controls side of the enclosure results in the control electronics being exposed to fewer contaminants
- Two back-channel airflow possibilities: back inlet/back exhaust or bottom inlet/top exhaust

up to 10

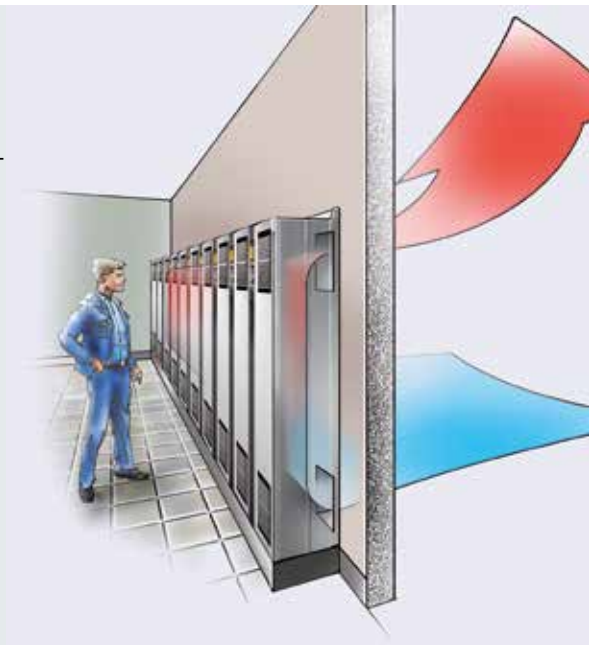
drives side-by-side

Technical Support.
The Danfoss service organisation is present in more than 100 countries – ready to respond whenever and wherever you need, around the clock, 7 days a week.

Zero clearance, side-by-side mounting

Up to 10 drives can be placed on a 20-foot (6-meter) wall, providing 6.3 MW (at 690 V) or 4.5 MW (at 400 V).

The process heat from these drives is less than 95 kW. If the drives are mounted on an outside wall and the back channel cooling air is vented directly outside, approximately 10 kW of heat loss is dispersed inside the room.



Easy start-up, operation and servicing

Smallest in their class

Even the F-frames (the largest of the VLT® High Power Drives) are among the smallest in their power range. Internal components are housed in an inverter cabinet, a rectifier cabinet, and – if required – an options cabinet for easy access during commissioning and servicing.

Unparalleled support and service

The Danfoss service organisation is present in 120 countries, ready to respond whenever and wherever you need, around the clock, seven days a week.

Additionally, Danfoss offers service plans that provide complete service solutions, freeing you to focus on your core business activities. DrivePro™ service plans provide affordable solutions that let you take advantage of Danfoss' unmatched reputation for service quality and responsiveness around the world:

- Hands-on, factory management of service support activities. Local field service organisations trained and authorised by the factory
- Technical support available 24/7 from a single point of contact
- Parts designed and specified by the factory for quick response
- Flexible coverage plans with fixed prices that reduce overall service costs

24/7

Technical Support. The Danfoss service organisation is present in more than 100 countries – ready to respond whenever and wherever you need, around the clock, 7 days a week.

The VLT® High Power Drives series carry a number of certifications for maritime use, including those listed below. Contact Danfoss for specific model coverage:

Established in 1864, DNV is an independent foundation with the objective of safeguarding life, property and the environment.

A classification society, the Russian Register, was established on 31 December 1913. Now its name is the Russian Maritime Register of Shipping (RS). Since 1969 RS has been a member of International Association of Classification Societies (IACS).

The Lloyd's Register Group is an organisation that works to enhance safety and to approve assets and systems at sea, on land and in the air.

Founded in 1828, Bureau Veritas was one of the first classification societies and a founding member of IACS (International Association of Classification societies in the world).

ABS Consulting is a leading independent global provider of Risk Management Services that combines industry experts, risk modeling, practical engineering and technology-based solutions.

Founded in 1956, China Classification Society (CCS) is the only specialised organisation of China to provide classification services. CCS aims to provide services for the shipping, shipbuilding, offshore exploitation and related manufacturing industries and marine insurance.

The user interface – developed with user participation

1 Graphical display
- International letters and signs
- Graphical display with bar-charts
- Easy overview
- 27 languages selection
- 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 set-ups simultaneously

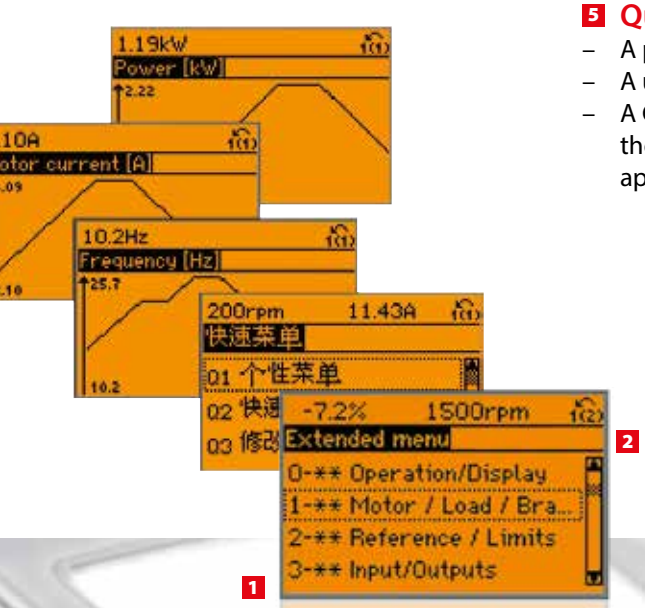
3 Other benefits
- Removable during operation
- Up- and download functionality
- IP 65 rating when mounted in a panel door
- Up to 5 different variables visible at a time
- Manual speed/torque setting
- 100% user defined information

4 Illumination
- Relevant buttons are illuminated when active
- Other LEDs indicate the status of the drive

5 Quick Menus
- A pre-defined Quick Menu
- A user-defined Quick Menu
- A Changes Made menu lists the parameters unique to your application
- A Function Setup menu provides quick and easy set-up for specific applications
- A Logging menu provides access to operation history

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

The user interface may be mounted remotely on a control panel fascia. This enables the user to take full advantage of the LCP, eliminating the need for additional switches and instrumentation.



The VLT® AutomationDrive

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

Danfoss offers solutions tailored to the specific needs of many industries, combining all the necessary components in an integrated package solution.

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, synchronising, programmable motion control and even servo performance are also available. All versions share an identical user interface, so once you've operated one, you can use them all.

Power Range

- **380-480/500 V**
  Normal overload:
  400 V .....110-1000 kW, 212-1720 A
  460 V ..... 150-1350 hp, 190-1530 A

  High overload:
  400 V .....90-800 kW, 177-1460 A
  460 V .....125-1200 hp, 160-1380 A

- **525-690 V**
  Normal overload:
  575 V.....75-1550 hp, 86-1415 A
  690 V.....75-1400 kW, 86-1415 A

  High overload:
  575 V..... 60-1350 hp, 73-1260 A
  690 V.....55-1200 kW, 73-1260 A

Enclosure Ratings

- IP 00, IP 20, IP 21 and IP 54.

Options

See page 53.

For more detailed information please see the FC 300 Design guide, MG.34.xx.yy available at www.danfoss.com/products/literature/technical+documentation.htm.

Industry specific applications:

Application	Mining and cement	Chemical	Food & Beverage	Material handling	Textile
Auger conveyor	■		■		
Ball mill	■				
Beater type mixer	■		■		
Belt conveyor	■		■	■	
Center driven winder					■
Centrifugal fan	■	■	■	■	■
Centriful pump	■	■	■	■	■
Centrifuge		■	■		
Compressor		■			
Cone crusher	■				
Cooling/baking conveyor			■	■	
Crane				■	
Decanter		■			
Diverter			■	■	
Dosing		■			
Dryer		■			
Extruder		■	■		
Grinder/roller mill		■			
Hoist				■	
Impact crusher	■				
Induced draft fan	■		■		
Jaw crusher	■				
Kneader		■			
Mixer		■			
Palletizer			■	■	■
Positive displacement pump	■		■	■	■
Rotary kiln	■				
Screw compressor			■		■



VLT® AutomationDrive (FC 302) 380-500 VAC – High overload

	High overload*												Type code	Frame size by enclosure rating				
	Typical shaft output	Output current		Output power		Rated input current	Estimated power loss at max load**	Output Frequency**	Max. external input line fuses (mains)	Weights kg (lbs)**			Beginning with***	VLT® 6-Pulse			VLT® 12-Pulse	VLT® Low Harmonic Drive
	[kW]	[A]		[kVA]		[A]	[W]											
		Con. $I_{,N}$	Inter. $I_{,Max}$ (60 sec) ****	Con.	Inter. (60 sec)			Hz		IP 00	IP 20	IP 21/IP 54		IP 00	IP 20	IP 21/IP 54		
400 V motor nominal voltage (380-440 V)	90	177	266	123	185	171	2031	0-590	315		62 (135)	62 (135)	FC-302N90KT5		D3h	D1h/D5h/D6h		
	110	212	318	147	221	204	2289		350		62 (135)	62 (135)	FC-302N110T5		D3h	D1h/D5h/D6h		
	132	260	390	180	270	251	2923		400		62 (135)	62 (135)	FC-302N132T5		D3h	D1h/D5h/D6h		D13
	160	315	473	218	327	304	3093		550		125 (275)	125 (275)	FC-302N160T5		D4h	D2h/D7h/D8h		D13
	200	395	593	274	411	381	4039		630		125 (275)	125 (275)	FC-302N200T5		D4h	D2h/D7h/D8h		D13
	250	480	720	333	500	463	5005		800		125 (275)	125 (275)	FC-302N250T5		D4h	D2h/D7h/D8h		
	250	480	720	333	499	472	5059		700	221 (487)		263 (580)	FC-302P250T5	E2		E1	F8/F9	E9
	315	600	900	416	624	590	6794			234 (516)		270 (595)	FC-302P315T5	E2		E1	F8/F9	E9
	355	658	987	456	684	647	7498		900	236 (520)		272 (600)	FC-302P355T5	E2		E1	F8/F9	E9
	400	695	1043	482	722	684	7976			277 (611)		313 (690)	FC-302P400T5	E2		E1	F8/F9	E9
	450	800	1200	554	831	779	9031					1004 (2214)	FC-302P450T5			F1/F3	F10/F11	F18
	500	880	1320	610	915	857	10146		2000			1004 (2214)	FC-302P500T5			F1/F3	F10/F11	F18
	560	990	1485	686	1029	964	10649					1004 (2214)	FC-302P560T5			F1/F3	F10/F11	F18
	630	1120	1680	776	1164	1090	12490					1004 (2214)	FC-302P630T5			F1/F3	F10/F11	F18
	710	1260	1890	873	1309	1227	14244		2500			1246 (2748)	FC-302P710T5			F2/F4	F12/F13	
	800	1460	2190	1012	1517	1422	15466					1246 (2748)	FC-302P800T5			F2/F4	F12/F13	
460 V motor nominal voltage (441-500 V)	125 hp	160	240	127	191	154	1828	0-590	315		62 (135)	62 (135)	FC-302N90KT5		D3h	D1h/D5h/D6h		
	150 hp	190	285	151	227	183	2051		350		62 (135)	62 (135)	FC-302N110T5		D3h	D1h/D5h/D6h		
	200 hp	240	360	191	287	231	2089		400		62 (135)	62 (135)	FC-302N132T5		D3h	D1h/D5h/D6h		D13
	250 hp	302	453	241	362	291	2872		550		125 (275)	125 (275)	FC-302N160T5		D4h	D2h/D7h/D8h		D13
	300 hp	361	542	288	432	348	3575		630		125 (275)	125 (275)	FC-302N200T5		D4h	D2h/D7h/D8h		D13
	350 hp	443	665	353	530	427	4458		800		125 (275)	125 (275)	FC-302N250T5		D4h	D2h/D7h/D8h		
	350 hp	443	665	353	529	436	4647		700	221 (487)		263 (580)	FC-302P250T5	E2		E1	F8/F9	E9
	450 hp	540	810	430	645	531	6118			234 (516)		270 (595)	FC-302P315T5	E2		E1	F8/F9	E9
	500 hp	590	885	470	705	580	6672		900	236 (520)		272 (600)	FC-302P355T5	E2		E1	F8/F9	E9
	550 hp	678	1017	540	810	667	7814			277 (611)		313 (690)	FC-302P400T5	E2		E1	F8/F9	E9
	600 hp	730	1095	582	872	711	8212					1004 (2214)	FC-302P450T5			F1/F3	F10/F11	F18
	650 hp	780	1170	621	932	759	8860		2000			1004 (2214)	FC-302P500T5			F1/F3	F10/F11	F18
	750 hp	890	1335	709	1064	867	9414					1004 (2214)	FC-302P560T5			F1/F3	F10/F11	F18
	900 hp	1050	1575	837	1255	1022	11581					1004 (2214)	FC-302P630T5			F1/F3	F10/F11	F18
	1000 hp	1160	1740	924	1386	1129	13005		2500			1246 (2748)	FC-302P710T5			F2/F4	F12/F13	
	1200 hp	1380	2070	1100	1649	1344	14556					1246 (2748)	FC-302P800T5			F2/F4	F12/F13	
500 V Motor nominal voltage (441-500 V)	110	160	240	139	209	154	1828	0-590	315		62 (135)	62 (135)	FC-302N90KT5		D3h	D1h/D5h/D6h		
	132	190	285	165	248	183	2051		350		62 (135)	62 (135)	FC-302N110T5		D3h	D1h/D5h/D6h		
	160	240	360	208	312	231	2089		400		62 (135)	62 (135)	FC-302N132T5		D3h	D1h/D5h/D6h		D13
	200	302	453	262	393	291	2872		550		125 (275)	125 (275)	FC-302N160T5		D4h	D2h/D7h/D8h		D13
	250	361	542	313	470	348	3575		630		125 (275)	125 (275)	FC-302N200T5		D4h	D2h/D7h/D8h		D13
	315	443	665	384	576	427	4458		800		125 (275)	125 (275)	FC-302N250T5		D4h	D2h/D7h/D8h		
	315	443	665	384	575	436	4647		700	221 (487)		263 (580)	FC-302P250T5	E2		E1	F8/F9	E9
	355	540	810	468	701	531	6118			234 (516)		270 (595)	FC-302P315T5	E2		E1	F8/F9	E9
	400	590	885	511	766	580	6672		900	236 (520)		272 (600)	FC-302P355T5	E2		E1	F8/F9	E9
	500	678	1017	587	881	667	7814			277 (611)		313 (690)	FC-302P400T5	E2		E1	F8/F9	E9
	530	730	1095	632	948	711	8212					1004 (2214)	FC-302P450T5			F1/F3	F10/F11	F18
	560	780	1170	675	1013	759	8860		2000			1004 (2214)	FC-302P500T5			F1/F3	F10/F11	F18
	630	890	1335	771	1156	867	9414					1004 (2214)	FC-302P560T5			F1/F3	F10/F11	F18
	710	1050	1575	909	1364	1022	11581					1004 (2214)	FC-302P630T5			F1/F3	F10/F11	F18
	800	1160	1740	1005	1507	1129	13005		2500			1246 (2748)	FC-302P710T5			F2/F4	F12/F13	
	1000	1380	2070	1195	1793	1344	14556					1246 (2748)	FC-302P800T5			F2/F4	F12/F13	

Consult factory for higher output drives

* *Drive defaults to high overload. Normal overload is an optional software setting.*
** *VLT® 6-Pulse and 12-Pulse Drives only. Please see VLT® Low Harmonic Drives dimension tables.*
*** *See pages 68 to 71 for the complete type code.*
**** *Intermittent duty rated for 150% of continuous current for high overload.*

VLT® AutomationDrive (FC 302) 380-500 VAC – Normal overload*

	Normal overload												Type code	Frame size by enclosure rating				
	Typical shaft output	Output current		Output power		Rated input current	Estimated power loss at max load**	Output Frequency**	Max. external input line fuses (mains)	Weights kg (lbs)**			Beginning with***	VLT® 6-Pulse			VLT® 12-Pulse	VLT® Low Harmonic Drive
	[kW]	[A]		[kVA]		[A]	[W]											
		Con. I_{VN}	Inter. I_{VMax} (60 sec) ****	Con.	Inter. (60 sec)			Hz		IP 00	IP 20	IP 21/IP 54		IP 00	IP 20	IP 21/IP 54		
400 V motor nominal voltage (380-440 V)	110	212	233	147	162	204	2559	0-590	315		62 (135)	62 (135)	FC-302N90KT5		D3h	D1h/D5h/D6h		
	132	260	286	180	198	251	2954		350		62 (135)	62 (135)	FC-302N110T5		D3h	D1h/D5h/D6h		
	160	315	347	218	240	304	3770		400		62 (135)	62 (135)	FC-302N132T5		D3h	D1h/D5h/D6h		D13
	200	395	435	274	301	381	4116		550		125 (275)	125 (275)	FC-302N160T5		D4h	D2h/D7h/D8h		D13
	250	480	528	333	366	463	5137		630		125 (275)	125 (275)	FC-302N200T5		D4h	D2h/D7h/D8h		D13
	315	588	647	407	448	567	6674		800		125 (275)	125 (275)	FC-302N250T5		D4h	D2h/D7h/D8h		
	315	600	660	416	457	590	6705		700	221 (487)		263 (580)	FC-302P250T5	E2		E1	F8/F9	E9
	355	658	724	456	501	647	7532		900	234 (516)		270 (595)	FC-302P315T5	E2		E1	F8/F9	E9
	400	745	820	516	568	733	8677			236 (520)		272 (600)	FC-302P355T5	E2		E1	F8/F9	E9
	450	800	880	554	610	787	9473			277 (611)		313 (690)	FC-302P400T5	E2		E1	F8/F9	E9
	500	880	968	610	671	857	10162		2000			1004 (2214)	FC-302P450T5			F1/F3	F10/F11	F18
	560	990	1089	686	754	964	11822					1004 (2214)	FC-302P500T5			F1/F3	F10/F11	F18
	630	1120	1232	776	854	1090	12512					1004 (2214)	FC-302P560T5			F1/F3	F10/F11	F18
	710	1260	1386	873	960	1227	14674					1004 (2214)	FC-302P630T5			F1/F3	F10/F11	F18
	800	1460	1606	1012	1113	1422	17293		2500			1246 (2748)	FC-302P710T5			F2/F4	F12/F13	
	1000	1720	1892	1192	1311	1675	19278					1246 (2748)	FC-302P800T5			F2/F4	F12/F13	
460 V motor nominal voltage (441-500 V)	150 hp	190	209	151	166	183	2261	0-590	315		62 (135)	62 (135)	FC-302N90KT5		D3h	D1h/D5h/D6h		
	200 hp	240	264	191	210	231	2724		350		62 (135)	62 (135)	FC-302N110T5		D3h	D1h/D5h/D6h		
	250 hp	302	332	241	265	291	3628		400		62 (135)	62 (135)	FC-302N132T5		D3h	D1h/D5h/D6h		D13
	300 hp	361	397	288	317	348	3569		550		125 (275)	125 (275)	FC-302N160T5		D4h	D2h/D7h/D8h		D13
	350 hp	443	487	353	388	427	4566		630		125 (275)	125 (275)	FC-302N200T5		D4h	D2h/D7h/D8h		D13
	450 hp	535	588	426	469	516	5714		800		125 (275)	125 (275)	FC-302N250T5		D4h	D2h/D7h/D8h		
	450 hp	540	594	430	473	531	5930		700	221 (487)		263 (580)	FC-302P250T5	E2		E1	F8/F9	E9
	500 hp	590	649	470	517	580	6724		900	234 (516)		270 (595)	FC-302P315T5	E2		E1	F8/F9	E9
	600 hp	678	746	540	594	667	7819			236 (520)		272 (600)	FC-302P355T5	E2		E1	F8/F9	E9
	600 hp	730	803	582	640	718	8527			277 (611)		313 (690)	FC-302P400T5	E2		E1	F8/F9	E9
	650 hp	780	858	621	684	759	8876		2000			1004 (2214)	FC-302P450T5			F1/F3	F10/F11	F18
	750 hp	890	979	709	780	867	10424					1004 (2214)	FC-302P500T5			F1/F3	F10/F11	F18
	900 hp	1050	1155	837	920	1022	11595					1004 (2214)	FC-302P560T5			F1/F3	F10/F11	F18
	1000 hp	1160	1276	924	1017	1129	13213					1004 (2214)	FC-302P630T5			F1/F3	F10/F11	F18
	1200 hp	1380	1518	1100	1209	1344	16229		2500			1246 (2748)	FC-302P710T5			F2/F4	F12/F13	
	1350 hp	1530	1683	1219	1341	1490	16624					1246 (2748)	FC-302P800T5			F2/F4	F12/F13	
500 V motor nominal voltage (441-500 V)	132	190	209	165	182	183	2261	0-590	315		62 (135)	62 (135)	FC-302N90KT5		D3h	D1h/D5h/D6h		
	160	240	264	208	229	231	2724		350		62 (135)	62 (135)	FC-302N110T5		D3h	D1h/D5h/D6h		
	200	302	332	262	288	291	3628		400		62 (135)	62 (135)	FC-302N132T5		D3h	D1h/D5h/D6h		D13
	250	361	397	313	344	348	3569		550		125 (275)	125 (275)	FC-302N160T5		D4h	D2h/D7h/D8h		D13
	315	443	487	384	422	427	4566		630		125 (275)	125 (275)	FC-302N200T5		D4h	D2h/D7h/D8h		D13
	355	535	588	463	509	516	5714		800		125 (275)	125 (275)	FC-302N250T5		D4h	D2h/D7h/D8h		
	355	540	594	468	514	531	5930		700	221 (487)		263 (580)	FC-302P250T5	E2		E1	F8/F9	E9
	400	590	649	511	562	580	6724		900	234 (516)		270 (595)	FC-302P315T5	E2		E1	F8/F9	E9
	500	678	746	587	646	667	7819			236 (520)		272 (600)	FC-302P355T5	E2		E1	F8/F9	E9
	530	730	803	632	695	718	8527			277 (611)		313 (690)	FC-302P400T5	E2		E1	F8/F9	E9
	560	780	858	675	743	759	8876		2000			1004 (2214)	FC-302P450T5			F1/F3	F10/F11	F18
	630	890	979	771	848	867	10424					1004 (2214)	FC-302P500T5			F1/F3	F10/F11	F18
	710	1050	1155	909	1000	1022	11595					1004 (2214)	FC-302P560T5			F1/F3	F10/F11	F18
	800	1160	1276	1005	1105	1129	13213					1004 (2214)	FC-302P630T5			F1/F3	F10/F11	F18
	1000	1380	1518	1195	1315	1344	16229		2500			1246 (2748)	FC-302P710T5			F2/F4	F12/F13	
	1100	1530	1683	1325	1458	1490	16624					1246 (2748)	FC-302P800T5			F2/F4	F12/F13	

Consult factory for higher output drives

* *Drive defaults to high overload. Normal overload is an optional software setting.*
** *VLT® 6-Pulse and 12-Pulse Drives only. Please see VLT® Low Harmonic Drives dimension tables.*
*** *See pages 68 to 71 for the complete type code.*
**** *Intermittent duty rated for 110% of continuous current for normal overload.*

VLT® AutomationDrive (FC 302) 525-690 VAC – High overload

	High overload*												Type code	Frame size by enclosure rating			
	Typical shaft output	Output current		Output power		Rated input current	Estimated power loss at max load**	Output Frequency**	Max. external input line fuses (mains)	Weights kg (lbs)**			Beginning with***	VLT® 6-Pulse			VLT® 12-Pulse
	[kW]	[A]		[kVA]		[A]	[W]										
		Cont. I_{VN}	Inter. I_{VMax} (60 sec) ****	Con.	Inter. (60 sec)			Hz		IP 00	IP 20	IP 21/IP 54		IP 00	IP 20	IP 21/IP 54	
525V motor nominal voltage (525-550 V)	45	76	122	72	108	77	1098	0-590	160		62 (135)	62 (135)	FC-302N55KT7		D3h	D1h/D5h/D6h	
	55	90	135	86	129	89	1162		200		62 (135)	62 (135)	FC-302N75KT7		D3h	D1h/D5h/D6h	
	75	113	170	108	161	110	1430				62 (135)	62 (135)	FC-302N90KT7		D3h	D1h/D5h/D6h	
	90	137	206	131	196	130	1742		315		62 (135)	62 (135)	FC-302N110T7		D3h	D1h/D5h/D6h	
	110	162	243	154	231	158	2080				62 (135)	62 (135)	FC-302N132T7		D3h	D1h/D5h/D6h	
	132	201	302	191	287	198	2361		550		125 (275)	125 (275)	FC-302N160T7		D4h	D2h/D7h/D8h	
	160	253	380	241	362	245	3012				125 (275)	125 (275)	FC-302N200T7		D4h	D2h/D7h/D8h	
	200	303	455	289	433	299	3642				125 (275)	125 (275)	FC-302N250T7		D4h	D2h/D7h/D8h	
	250	360	540	343	516	355	4146	0-500			125 (275)	125 (275)	FC-302N315T7		D4h	D2h/D7h/D8h	
	300	395	593	376	564	381	4424		700	221 (487)		263 (580)	FC-302P355T7	E2		E1	F8/F9
	315	429	644	409	613	413	4795						FC-302P400T7	E2		E1	F8/F9
	400	523	785	498	747	504	6483		900	236 (520)		272 (600)	FC-302P500T7	E2		E1	F8/F9
	450	596	894	568	852	574	7383			277 (611)		313 (690)	FC-302P560T7	E2		E1	F8/F9
	500	659	989	628	942	642	8075		2000				FC-302P630T7			F1/F3	F10/F11
	560	763	1145	727	1090	743	9165					1004 (2214)	FC-302P710T7			F1/F3	F10/F11
	670	889	1334	847	1270	866	10860						FC-302P800T7			F1/F3	F10/F11
	750	988	1482	941	1412	962	12062					1246 (2748)	FC-302P900T7			F2/F4	F12/F13
	850	1108	1662	1056	1583	1079	13269						FC-302P1M0T7			F2/F4	F12/F13
	1000	1317	1976	1255	1380	1282	18536						FC-302P1M2T7			F2/F4	F12/F13
575 V motor nominal voltage (551-690 V)	60 hp	73	117	73	110	74	1098	0-590	160		62 (135)	62 (135)	FC-302N55KT7		D3h	D1h/D5h/D6h	
	75 hp	86	129	86	129	85	1162		200		62 (135)	62 (135)	FC-302N75KT7		D3h	D1h/D5h/D6h	
	100 hp	108	162	108	161	106	1480				62 (135)	62 (135)	FC-302N90KT7		D3h	D1h/D5h/D6h	
	125 hp	131	197	130	196	124	1800		315		62 (135)	62 (135)	FC-302N110T7		D3h	D1h/D5h/D6h	
	150 hp	155	233	154	232	151	2159				62 (135)	62 (135)	FC-302N132T7		D3h	D1h/D5h/D6h	
	200 hp	192	288	191	287	189	2446		550		125 (275)	125 (275)	FC-302N160T7		D4h	D2h/D7h/D8h	
	250 hp	242	363	241	362	234	3123				125 (275)	125 (275)	FC-302N200T7		D4h	D2h/D7h/D8h	
	300 hp	290	435	289	433	286	3771				125 (275)	125 (275)	FC-302N250T7		D4h	D2h/D7h/D8h	
	350 hp	344	516	343	516	339	4258				125 (275)	125 (275)	FC-302N315T7		D4h	D2h/D7h/D8h	
	400 hp	380	570	378	568	366	4424	0-500	700	221 (487)		263 (580)	FC-302P355T7	E2		E1	F8/F9
	400 hp	410	615	408	612	395	4795						FC-302P400T7	E2		E1	F8/F9
	500 hp	500	750	498	747	482	6483		900	236 (520)		272 (600)	FC-302P500T7	E2		E1	F8/F9
	600 hp	570	855	568	852	549	7383			277 (611)		313 (690)	FC-302P560T7	E2		E1	F8/F9
	650 hp	630	945	627	941	613	8075		2000				FC-302P630T7			F1/F3	F10/F11
	750 hp	730	1095	727	1091	711	9165					1004 (2214)	FC-302P710T7			F1/F3	F10/F11
	950 hp	850	1275	847	1270	828	10860						FC-302P800T7			F1/F3	F10/F11
	1050 hp	945	1418	941	1412	920	12062						FC-302P900T7			F2/F4	F12/F13
	1150 hp	1060	1590	1056	1584	1032	13269					1246 (2748)	FC-302P1M0T7			F2/F4	F12/F13
	1350 hp	1260	1890	1255	1381	1227	18536						FC-302P1M2T7			F2/F4	F12/F13
690 V motor nominal voltage (551-690 V)	55	73	110	87	131	77	1057	0-590	160		62 (135)	62 (135)	FC-302N55KT7		D3h	D1h/D5h/D6h	
	75	86	129	103	155	87	1205		200		62 (135)	62 (135)	FC-302N75KT7		D3h	D1h/D5h/D6h	
	90	108	162	129	194	109	1480				62 (135)	62 (135)	FC-302N90KT7		D3h	D1h/D5h/D6h	
	110	131	197	157	235	128	1800		315		62 (135)	62 (135)	FC-302N110T7		D3h	D1h/D5h/D6h	
	132	155	233	185	278	155	2159				62 (135)	62 (135)	FC-302N132T7		D3h	D1h/D5h/D6h	
	160	192	288	229	344	197	2446		550		125 (275)	125 (275)	FC-302N160T7		D4h	D2h/D7h/D8h	
	200	242	363	289	434	240	3123				125 (275)	125 (275)	FC-302N200T7		D4h	D2h/D7h/D8h	
	250	290	435	347	520	296	3771				125 (275)	125 (275)	FC-302N250T7		D4h	D2h/D7h/D8h	
	315	344	516	411	617	352	4258				125 (275)	125 (275)	FC-302N315T7		D4h	D2h/D7h/D8h	
	355	380	570	454	681	366	4589	0-500	700	221 (487)		263 (580)	FC-302P355T7	E2		E1	F8/F9
	400	410	615	490	735	395	4970						FC-302P400T7	E2		E1	F8/F9
	500	500	750	598	896	482	6707		900	236 (520)		272 (600)	FC-302P500T7	E2		E1	F8/F9
	560	570	855	681	1022	549	7633			277 (611)		313 (690)	FC-302P560T7	E2		E1	F8/F9
	630	630	945	753	1129	613	8388		2000				FC-302P630T7			F1/F3	F10/F11
	710	730	1095	872	1309	711	9537					1004 (2214)	FC-302P710T7			F1/F3	F10/F11
	800	850	1275	1016	1524	828	11291						FC-302P800T7			F1/F3	F12/F11
	900	945	1418	1129	1694	920	12524						FC-302P900T7			F2/F4	F12/F13
	1000	1060	1590	1267	1900	1032	13801					1246 (2748)	FC-302P1M0T7			F2/F4	F12/F13
	1200	1260	1890	1506	2259	1227	16719						FC-302P1M2T7			F2/F4	F12/F13

* *Drive defaults to high overload. Normal overload is an optional software setting.*
** *VLT® 6-Pulse and 12-Pulse Drives only. Please see VLT® Low Harmonic Drives dimension tables.*
*** *See pages 68 to 71 for the complete type code.*
**** *Intermittent duty rated for 150% of continuous current for high overload.*

VLT® AutomationDrive (FC 302) 525-690 VAC – Normal overload

	Normal overload												Type code	Frame size by enclosure rating			
	Typical shaft output	Output current		Output power		Rated input current	Estimated power loss at max load**	Output Frequency**	Max. external input line fuses (mains)	Weights kg (lbs)**			Beginning with***	VLT® 6-Pulse			VLT® 12-Pulse
	[kW]	[A]		[kVA]		[A]	[W]										
		Cont. I_{VN}	Inter. I_{VMax} (60 sec) ****	Con.	Inter. (60 sec)			Hz		IP 00	IP 20	IP 21/IP 54		IP 00	IP 20	IP 21/IP 54	
525V motor nominal voltage (525-550 V)	55	90	99	86	95	89	1162	0-590	200		62 (135)	62 (135)	FC-302N55KT7		D3h	D1h/D5h/D6h	
	75	113	124	108	119	110	1428				62 (135)	62 (135)	FC-302N75KT7		D3h	D1h/D5h/D6h	
	90	137	151	131	144	130	1740		250		62 (135)	62 (135)	FC-302N90KT7		D3h	D1h/D5h/D6h	
	110	162	178	154	170	158	2101		315		62 (135)	62 (135)	FC-302N110T7		D3h	D1h/D5h/D6h	
	132	201	221	191	211	198	2649				62 (135)	62 (135)	FC-302N132T7		D3h	D1h/D5h/D6h	
	160	253	278	241	265	245	3074		550		125 (275)	125 (275)	FC-302N160T7		D4h	D2h/D7h/D8h	
	200	303	333	289	318	299	3723				125 (275)	125 (275)	FC-302N200T7		D4h	D2h/D7h/D8h	
	250	360	396	343	377	355	4465				125 (275)	125 (275)	FC-302N250T7		D4h	D2h/D7h/D8h	
	315	418	460	398	438	408	5028	0-500			125 (275)	125 (275)	FC-302N315T7		D4h	D2h/D7h/D8h	
	355	470	517	448	493	453	5323		700	221 (487)		263 (580)	FC-302P355T7	E2		E1	F8/F9
	400	523	575	498	548	504	6010						FC-302P400T7	E2		E1	F8/F9
	450	596	656	568	625	574	7395		900	236 (520)		272 (600)	FC-302P500T7	E2		E1	F8/F9
	500	630	693	600	660	607	8209			277 (611)		313 (690)	FC-302P560T7	E2		E1	F8/F9
	560	763	839	727	800	743	9500		2000				FC-302P630T7			F1/F3	F10/F11
	670	889	978	847	932	866	10860					1004 (2214)	FC-302P710T7			F1/F3	F10/F11
	750	988	1087	941	1035	962	12316						FC-302P800T7			F1/F3	F10/F11
	850	1108	1219	1056	1161	1079	13731					1246 (2748)	FC-302P900T7			F2/F4	F12/F13
	1000	1317	1449	1255	1380	1282	16190						FC-302P1M0T7			F2/F4	F12/F13
	1100	1479	1627	1409	1550	1440	18536						FC-302P1M2T7			F2/F4	F12/F13
575 V motor nominal voltage (551-690 V)	75 hp	86	95	86	95	85	1162	0-590	200		62 (135)	62 (135)	FC-302N55KT7		D3h	D1h/D5h/D6h	
	100 hp	108	119	108	119	106	1428				62 (135)	62 (135)	FC-302N75KT7		D3h	D1h/D5h/D6h	
	125 hp	131	144	130	144	124	1740		250		62 (135)	62 (135)	FC-302N90KT7		D3h	D1h/D5h/D6h	
	150 hp	155	171	154	170	151	2101		315		62 (135)	62 (135)	FC-302N110T7		D3h	D1h/D5h/D6h	
	200 hp	192	211	191	210	189	2649				62 (135)	62 (135)	FC-302N132T7		D3h	D1h/D5h/D6h	
	250 hp	242	266	241	265	234	3074		550		125 (275)	125 (275)	FC-302N160T7		D4h	D2h/D7h/D8h	
	300 hp	290	319	289	318	286	3723				125 (275)	125 (275)	FC-302N200T7		D4h	D2h/D7h/D8h	
	350 hp	344	378	343	377	339	4465				125 (275)	125 (275)	FC-302N250T7		D4h	D2h/D7h/D8h	
	400 hp	400	440	398	438	390	5155				125 (275)	125 (275)	FC-302N315T7		D4h	D2h/D7h/D8h	
	450 hp	450	495	448	493	434	5323	0-500	700	221 (487)		263 (580)	FC-302P355T7	E2		E1	F8/F9
	500 hp	500	550	498	548	482	6010						FC-302P400T7	E2		E1	F8/F9
	600 hp	570	627	568	624	549	7395		900	236 (520)		272 (600)	FC-302P500T7	E2		E1	F8/F9
	650 hp	630	693	627	690	607	8209			277 (611)		313 (690)	FC-302P560T7	E2		E1	F8/F9
	750 hp	730	803	727	800	711	9500		2000				FC-302P630T7			F1/F3	F10/F11
	950 hp	850	935	847	931	828	10860					1004 (2214)	FC-302P710T7			F1/F3	F10/F11
	1050 hp	945	1040	941	1035	920	12316						FC-302P800T7			F1/F3	F10/F11
	1150 hp	1060	1166	1056	1161	1032	13731						FC-302P900T7			F2/F4	F12/F13
	1350 hp	1260	1386	1255	1380	1227	16190					1246 (2748)	FC-302P1M0T7			F2/F4	F12/F13
	1550 hp	1415	1557	1409	1550	1378	18536						FC-302P1M2T7			F2/F4	F12/F13
690 V motor nominal voltage (551-690 V)	75	86	95	103	113	87	1204	0-590	200		62 (135)	62 (135)	FC-302N55KT7		D3h	D1h/D5h/D6h	
	90	108	119	129	142	109	1477		200		62 (135)	62 (135)	FC-302N75KT7		D3h	D1h/D5h/D6h	
	110	131	144	157	172	128	1798		250		62 (135)	62 (135)	FC-302N90KT7		D3h	D1h/D5h/D6h	
	132	155	171	185	204	155	2167		315		62 (135)	62 (135)	FC-302N110T7		D3h	D1h/D5h/D6h	
	160	192	211	229	252	197	2740		315		62 (135)	62 (135)	FC-302N132T7		D3h	D1h/D5h/D6h	
	200	242	266	289	318	240	3175		550		125 (275)	125 (275)	FC-302N160T7		D4h	D2h/D7h/D8h	
	250	290	319	347	381	296	3851		550		125 (275)	125 (275)	FC-302N200T7		D4h	D2h/D7h/D8h	
	315	344	378	411	452	352	4616		550		125 (275)	125 (275)	FC-302N250T7		D4h	D2h/D7h/D8h	
	400	400	440	478	526	400	5155		550		125 (275)	125 (275)	FC-302N315T7		D4h	D2h/D7h/D8h	
	450	450	495	538	592	434	5529	0-500	700	221 (487)		263 (580)	FC-302P355T7	E2		E1	F8/F9
	500	500	550	598	657	482	6239						FC-302P400T7	E2		E1	F8/F9
	560	570	627	681	749	549	7653		900	236 (520)		272 (600)	FC-302P500T7	E2		E1	F8/F9
	630	630	693	753	828	607	8495			277 (611)		313 (690)	FC-302P560T7	E2		E1	F8/F9
	710	730	803	872	960	711	9863		2000				FC-302P630T7			F1/F3	F10/F11
	800	850	935	1016	1117	828	11304					1004 (2214)	FC-302P710T7			F1/F3	F10/F11
	900	945	1040	1129	1242	920	12798						FC-302P800T7			F1/F3	F10/F11
	1000	1060	1166	1267	1394	1032	14250						FC-302P900T7			F2/F4	F12/F13
	1200	1260	1386	1506	1656	1227	16821					1246 (2748)	FC-302P1M0T7			F2/F4	F12/F13
	1400	1415	1557	1691	1860	1378	19247						FC-302P1M2T7			F2/F4	F12/F13

Consult factory for higher output drives

* *Drive defaults to high overload. Normal overload is an optional software setting.*
** *VLT® 6-Pulse and 12-Pulse Drives only. Please see VLT® Low Harmonic Drives dimension tables.*
*** *See pages 68 to 71 for the complete type code.*
**** *Intermittent duty rated for 110% of continuous current for normal overload.*

The VLT® AQUA Drive

The growing need for clean water and energy conservation is rapidly increasing the pressure on global fresh water resources, wastewater treatment, recycling and power generation.

VLT® AQUA Drive is designed to enhance system operation, protect equipment, reduce chemical consumption in related processes and water loss, while providing significant energy savings.

VLT® AQUA Drive is the ultimate solution for all water, wastewater and recycling processes.

Power range

- **380-480/500 V**
  Normal overload:
  400 V .....110-1000 kW, 212-1720 A
  460 V ..... 150-1350 hp, 190-1530 A
- **525-690 V**
  Normal overload:
  575 V.....75-1550 hp, 86-1415 A
  690 V.....75-1400 kW, 86-1415 A

Enclosure ratings

- IP 00, IP 20, IP 21 and IP 54.

Options

See page 53.

Save cost and protect your system

VLT® AQUA Drive optional features specific to the Water/Wastewater Industries:

1 Auto tuning of the PI controllers

The advanced process control of the VLT® AQUA Drive allows the use of up to 4 internal PI controller: 1 controller for the drive and 3 controllers for other process equipment. Auto tuning of the PI controllers enables the drive to monitor how the system reacts on corrections made by the drive and learns from it. This allows the drive to quickly achieve precise and stable operation. Gain factors for PI are continuously adjusted to compensate for changing characteristics of the loads. This applies individually to each PI controller in the 4-menu sets. Exact P and I settings at start-up will not be necessary – which lowers the commissioning costs.

2 Pipe fill mode

Useful in all applications where controlled pipe filling is essential, such as irrigation and water supply systems. Contolled (closed loop) filling of pipes prevents water hammering, bursting water pipes or blowing off sprinkler heads.

New Pipe fill mode can be used in both vertical and horizontal pipe systems.

3 End of pump curve detects breaks and leakage

The feature detects breaks and leakage by identifying when a pump is running at full speed without creating the desired pressure. This will then trigger an alarm, shuts off the pump or performs another programmed action.

4 Check valve ramp

The Check Valve Ramp prevents water hammering as the pump stops and the check valve closes. This feature will slowly ramp down the pump speed around the value where the check valve ball is almost shut.

5 Dry run detection

The VLT® AQUA Drive constantly evaluates the condition of the pump, based on internal frequency/power measurements. In the case of a a no or low flow situation, the drive will stop.

6 Flow compensation

This feature exploits the fact that flow resistance decreases with reduced flow. The pressure set point is reduced accordingly, which saves energy.

7 Initial/final ramp

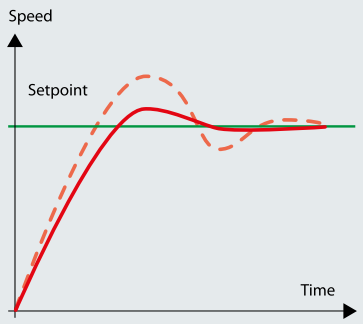
The initial ramp provides fast acceleration of pumps to minimum speed, from where the normal ramp takes over. This prevents damage to the thrust bearings on the pump. The final ramp decelerates pumps from the minimum speed to stop.

8 New! Deragging feature

This new VLT® AQUA Drive software feature offers proactive pump protection. The deragging can be configured as either a preventative or reactive action. It optimises the efficiency of the pump by constantly monitoring the motor shaft power consumption relative to flow. In the reactive mode, the drive senses the beginning of a pump clog and will reverse spin the pump to ensure a clear path for the water. As a preventative action, the drive will periodically reverse the pump to ensure a clean pump, or screen.

For more detailed information please see the FC 200 Design guide, MG20.xx.yy available at www.danfoss.com/products/literature/technical+documentation.htm.

1



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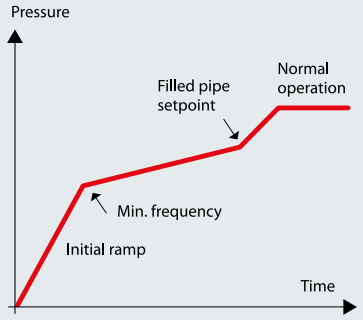

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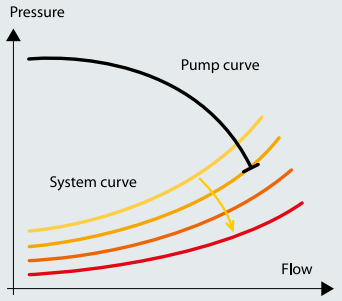

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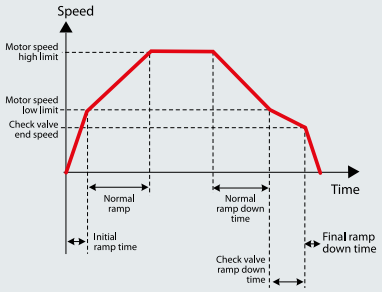

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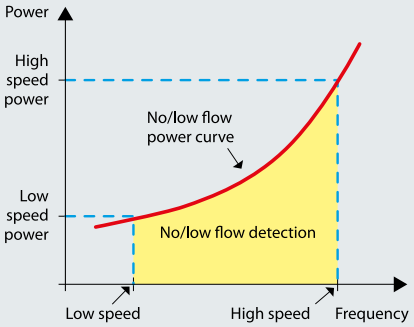

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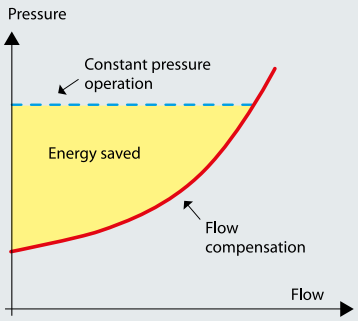

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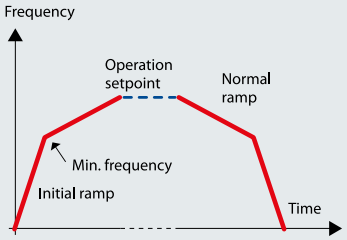

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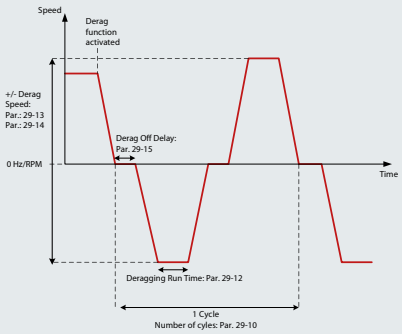
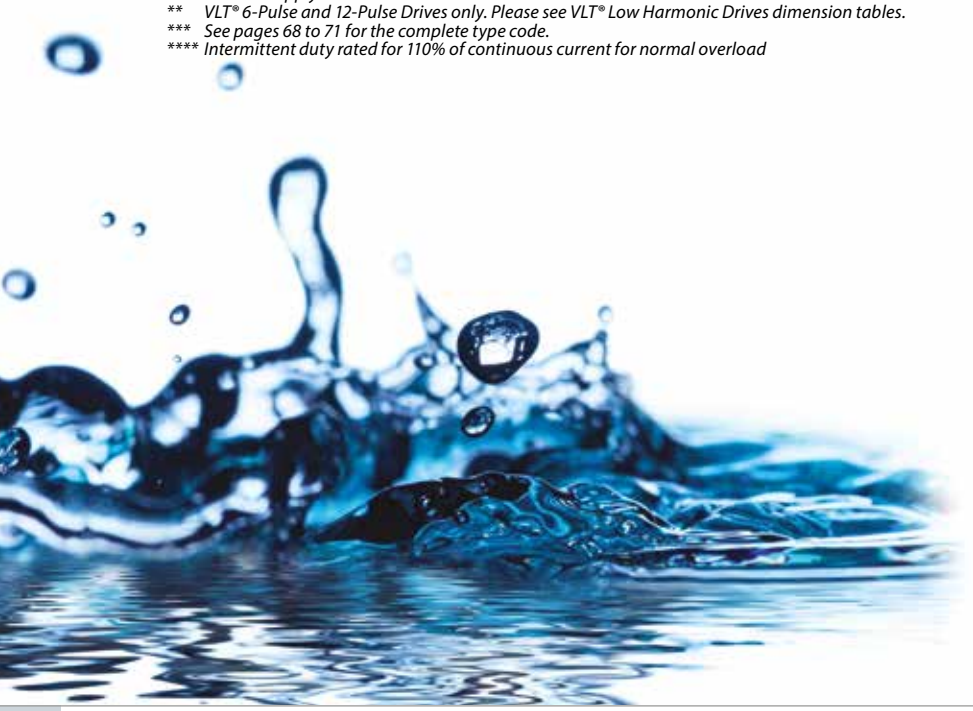


VLT® AQUA Drive (FC 202) 380-480 VAC– Normal overload

	Normal overload												Type code	Frame size by enclosure rating				
	Typical shaft output	Output current		Output power		Rated input current	Estimated power loss at max load*	Output Frequency**	Max. external input mains fuses [A] **	Weights kg (lbs)**			Beginning with***	VLT® 6-Pulse			VLT® 12-Pulse	VLT® Low Harmonic Drive
	[kW]	[A]		[kVA]		[A]	[W]											
		Con. I_{VN}	Inter. I_{VMax} (60 sec) ****	Con.	Inter. (60 sec)			Hz		IP 00	IP 20	IP 21/IP 54		IP 00	IP 20	IP 21/IP 54		
400 V motor nominal voltage (380-440 V)	110	212	233	147	162	204	2555	0-590	315		62 (135)	62 (135)	FC-202N110T4		D3h	D1h/D5h/D6h		
	132	260	286	180	198	251	2949		350		62 (135)	62 (135)	FC-202N132T4		D3h	D1h/D5h/D6h		
	160	315	347	218	240	304	3764		400		62 (135)	62 (135)	FC-202N160T4		D3h	D1h/D5h/D6h		D13
	200	395	435	274	301	381	4109		550		125 (275)	125 (275)	FC-202N200T4		D4h	D2h/D7h/D8h		D13
	250	480	528	333	366	463	5129		630		125 (275)	125 (275)	FC-202N250T4		D4h	D2h/D7h/D8h		D13
	315	588	647	407	448	567	6663		800		125 (275)	125 (275)	FC-202N315T4		D4h	D2h/D7h/D8h		
	315	600	660	416	457	590	6705		700	221 (487)		263 (580)	FC-202P315T4	E2		E1	F8/F9	E9
	355	658	724	456	501	647	7532		900	234 (516)		270 (595)	FC-202P355T4	E2		E1	F8/F9	E9
	400	745	820	516	568	733	8677			236 (520)		272 (600)	FC-202P400T4	E2		E1	F8/F9	E9
	450	800	880	554	610	787	9473			277 (611)		313 (690)	FC-202P450T4	E2		E1	F8/F9	E9
	500	880	968	610	671	857	10162		2000			1004 (2214)	FC-202P500T4			F1/F3	F10/F11	F18
	560	990	1089	686	754	964	11822						FC-202P560T4			F1/F3	F10/F11	F18
	630	1120	1232	776	854	1090	12512						FC-202P630T4			F1/F3	F10/F11	F18
	710	1260	1386	873	960	1227	14674						FC-202P710T4			F1/F3	F10/F11	F18
	800	1460	1606	1012	1113	1422	17293					1246 (2748)	FC-202P800T4			F2/F4	F12/F13	
	1000	1720	1892	1192	1311	1675	19278		2500				FC-202P1M0T4			F2/F4	F12/F13	
460 V motor nominal voltage (441-480 V)	150 hp	190	209	151	167	185	2257	0-590	315		62 (135)	62 (135)	FC-202N110T4		D3h	D1h/D5h/D6h		
	200 hp	240	264	191	210	231	2719		350		62 (135)	62 (135)	FC-202N132T4		D3h	D1h/D5h/D6h		
	250 hp	302	332	241	265	291	3622		400		62 (135)	62 (135)	FC-202N160T4		D3h	D1h/D5h/D6h		D13
	300 hp	361	397	288	316	348	3561		550		125 (275)	125 (275)	FC-202N200T4		D4h	D2h/D7h/D8h		D13
	350 hp	443	487	353	388	427	4558		630		125 (275)	125 (275)	FC-202N250T4		D4h	D2h/D7h/D8h		D13
	450 hp	535	588	426	469	516	5703		800		125 (275)	125 (275)	FC-202N315T4		D4h	D2h/D7h/D8h		
	450 hp	540	594	430	473	531	6705		700	221 (487)		263 (580)	FC-202P315T4	E2		E1	F8/F9	E9
	500 hp	590	649	470	517	580	6724		900	234 (516)		270 (595)	FC-202P355T4	E2		E1	F8/F9	E9
	550/ 600 hp	678	746	540	594	667	7819			236 (520)		272 (600)	FC-202P400T4	E2		E1	F8/F9	E9
	600 hp	730	803	582	640	718	8527			277 (611)		313 (690)	FC-202P450T4	E2		E1	F8/F9	E9
	650 hp	780	858	621	684	759	8876		2000			1004 (2214)	FC-202P500T4			F1/F3	F10/F11	F18
	750 hp	890	979	709	780	867	10424						FC-202P560T4			F1/F3	F10/F11	F18
	900 hp	1050	1155	837	920	1022	11595						FC-202P630T4			F1/F3	F10/F11	F18
	1000 hp	1160	1276	924	1017	1129	13213						FC-202P710T4			F1/F3	F10/F11	F18
	1200 hp	1380	1518	1100	1209	1344	16229					1246 (2748)	FC-202P800T4			F2/F4	F12/F13	
	1350 hp	1530	1683	1219	1341	1490	16624		2500				FC-202P1M0T4			F2/F4	F12/F13	

Consult factory for higher output drives

* *Does not apply to VLT® Low Harmonic Drive.*
** *VLT® 6-Pulse and 12-Pulse Drives only. Please see VLT® Low Harmonic Drives dimension tables.*
*** *See pages 68 to 71 for the complete type code.*
**** *Intermittent duty rated for 110% of continuous current for normal overload*



VLT® AQUA Drive (FC 202) 525-690 VAC – Normal overload

	Normal overload												Type code	Frame size by enclosure rating			
	Typical shaft output	Output current		Output power		Rated input current	Estimated power loss at max load*	Output Frequency * 6-Pulse only	Max. external input mains fuses [A] *	Weights kg (lbs)*			Beginning with**	VLT® 6-Pulse			VLT® 12-Pulse
	[kW]	[A]		[kVA]		[A]	[W]										
		Cont. I_{VN}	Inter. I_{VMax} (60 sec) ****	Con.	Inter. (60 sec)			Hz		IP 00	IP 20	IP 21/IP 54		IP 00	IP 20	IP 21/IP 54	
525 V motor nominal voltage (525-550 V)	55	90	99	86	95	89	1162	0-590	200		62 (135)	62 (135)	FC-202N75KT7		D3h	D1h/D5h/D6h	
	75	113	124	108	119	110	1428		200		62 (135)	62 (135)	FC-202N90KT7		D3h	D1h/D5h/D6h	
	90	137	151	131	144	130	1739		250		62 (135)	62 (135)	FC-202N110T7		D3h	D1h/D5h/D6h	
	110	162	178	154	170	158	2099		315		62 (135)	62 (135)	FC-202N132T7		D3h	D1h/D5h/D6h	
	132	201	221	191	211	198	2646		350		62 (135)	62 (135)	FC-202N160T7		D3h	D1h/D5h/D6h	
	160	253	278	241	265	245	3071		350		125 (275)	125 (275)	FC-202N200T7		D4h	D2h/D7h/D8h	
	200	303	333	289	318	299	3719		400		125 (275)	125 (275)	FC-202N250T7		D4h	D2h/D7h/D8h	
	250	360	396	343	377	355	4460		500		125 (275)	125 (275)	FC-202N315T7		D4h	D2h/D7h/D8h	
	315	418	460	398	438	408	5023	0-500	550		125 (275)	125 (275)	FC-202N400T7		D4h	D2h/D7h/D8h	
	355	470	517	448	493	453	5323		550	221 (487)		263 (580)	FC-202P450T7	E2		E1	F8/F9
	400	523	575	498	548	504	6010		700				FC-202P500T7	E2		E1	F8/F9
	450	596	656	568	625	574	7395			236 (520)		272 (600)	FC-202P560T7	E2		E1	F8/F9
	500	630	693	600	660	607	8209		900	277 (611)		313 (690)	FC-202P630T7	E2		E1	F8/F9
	560	763	839	727	800	743	9500						FC-202P710T7			F1/F3	F10/F11
	670	889	978	847	932	866	10872					1004 (2214)	FC-202P800T7			F1/F3	F10/F11
	750	988	1087	941	1035	962	12316						FC-202P900T7			F1/F3	F10/F11
	850	1108	1219	1056	1161	1079	13731		2000			1246 (2748)	FC-202P1M0T7			F2/F4	F12/F13
	1000	1317	1449	1255	1380	1282	16190						FC-202P1M2T7			F2/F4	F12/F13
	1100	1479	1627	1409	1550	1440	18536						FC-202P1M4T7			F2/F4	F12/F13
575 V motor nominal voltage (551-690 V)	75 hp	86	95	86	95	85	1162	0-590	200		62 (135)	62 (135)	FC-202N75KT7		D3h	D1h/D5h/D6h	
	100 hp	108	119	108	119	106	1428		200		62 (135)	62 (135)	FC-202N90KT7		D3h	D1h/D5h/D6h	
	125 hp	131	144	130	144	124	1739		250		62 (135)	62 (135)	FC-202N110T7		D3h	D1h/D5h/D6h	
	150 hp	155	171	154	170	151	2099		315		62 (135)	62 (135)	FC-202N132T7		D3h	D1h/D5h/D6h	
	200 hp	192	211	191	210	189	2646		350		62 (135)	62 (135)	FC-202N160T7		D3h	D1h/D5h/D6h	
	250 hp	242	266	241	265	234	3071		350		125 (275)	125 (275)	FC-202N200T7		D4h	D2h/D7h/D8h	
	300 hp	290	319	289	318	286	3719		400		125 (275)	125 (275)	FC-202N250T7		D4h	D2h/D7h/D8h	
	350 hp	344	378	343	377	339	4460		500		125 (275)	125 (275)	FC-202N315T7		D4h	D2h/D7h/D8h	
	400 hp	400	440	398	438	390	5023	0-500	550		125 (275)	125 (275)	FC-202N400T7		D4h	D2h/D7h/D8h	
	450 hp	450	495	448	493	434	5323		550	221 (487)		263 (580)	FC-202P450T7	E2		E1	F8/F9
	500 hp	500	550	498	548	482	6010		700				FC-202P500T7	E2		E1	F8/F9
	600 hp	570	627	568	624	549	7395			236 (520)		272 (600)	FC-202P560T7	E2		E1	F8/F9
	650 hp	630	693	627	690	607	8209		900	277 (611)		313 (690)	FC-202P630T7	E2		E1	F8/F9
	750 hp	730	803	727	800	711	9500						FC-202P710T7			F1/F3	F10/F11
	950 hp	850	935	847	931	828	10872					1004 (2214)	FC-202P800T7			F1/F3	F10/F11
	1050 hp	945	1040	941	1035	920	12316						FC-202P900T7			F1/F3	F10/F11
	1150 hp	1060	1166	1056	1161	1032	13731		2000			1246 (2748)	FC-202P1M0T7			F2/F4	F12/F13
	1350 hp	1260	1386	1255	1380	1227	16190						FC-202P1M2T7			F2/F4	F12/F13
	1550 hp	1415	1557	1409	1550	1378	18536						FC-202P1M4T7			F2/F4	F12/F13
690 V motor nominal voltage (551-690 V)	75	86	95	103	113	87	1204	0-590	200		62 (135)	62 (135)	FC-202N75KT7		D3h	D1h/D5h/D6h	
	90	108	119	129	142	109	1477		200		62 (135)	62 (135)	FC-202N90KT7		D3h	D1h/D5h/D6h	
	110	131	144	157	172	128	1796		250		62 (135)	62 (135)	FC-202N110T7		D3h	D1h/D5h/D6h	
	132	155	171	185	204	155	2165		315		62 (135)	62 (135)	FC-202N132T7		D3h	D1h/D5h/D6h	
	160	192	211	229	252	197	2738		350		62 (135)	62 (135)	FC-202N160T7		D3h	D1h/D5h/D6h	
	200	242	266	289	318	240	3172		350		125 (275)	125 (275)	FC-202N200T7		D4h	D2h/D7h/D8h	
	250	290	319	347	381	296	3848		400		125 (275)	125 (275)	FC-202N250T7		D4h	D2h/D7h/D8h	
	315	344	378	411	452	352	4610		500		125 (275)	125 (275)	FC-202N315T7		D4h	D2h/D7h/D8h	
	400	400	440	478	526	400	5150		550		125 (275)	125 (275)	FC-202N400T7		D4h	D2h/D7h/D8h	
	450	450	495	538	592	434	5529	0-500	550	221 (487)		263 (580)	FC-202P450T7	E2		E1	F8/F9
	500	500	550	598	657	482	6239		700				FC-202P500T7	E2		E1	F8/F9
	560	570	627	681	749	549	7653			236 (520)		272 (600)	FC-202P560T7	E2		E1	F8/F9
	630	630	693	753	828	607	8495		900	277 (611)		313 (690)	FC-202P630T7	E2		E1	F8/F9
	710	730	803	872	960	711	9863						FC-202P710T7			F1/F3	F10/F11
	800	850	935	1016	1117	828	11304					1004 (2214)	FC-202P800T7			F1/F3	F10/F11
	900	945	1040	1129	1242	920	12798						FC-202P900T7			F1/F3	F10/F11
	1000	1060	1166	1267	1394	1032	14250		2000			1246 (2748)	FC-202P1M0T7			F2/F4	F12/F13
	1200	1260	1386	1506	1656	1227	16821						FC-202P1M2T7			F2/F4	F12/F13
	1400	1415	1557	1691	1860	1378	19247						FC-202P1M4T7			F2/F4	F12/F13

Consult factory for higher output drives

* *VLT® 6-Pulse and 12-Pulse Drives only. Please see VLT® Low Harmonic Drives dimension tables.*
** *See pages 68 to 71 for the complete type code.*
**** *Intermittent duty rated for 110% of continuous current for normal overload*

The VLT® HVAC Drive

Danfoss was the first drives provider to develop drives specifically for HVAC applications. Our dedicated HVAC organisation is commited to seamlessly integrating drive technology to save energy and reduce $C0_2$ emissions in HVAC applications.

VLT® drives meet the ever increasing demands for intelligent solutions, comfort and energy savings within the HVAC market sector.

Danfoss' extensive experience in advanced variable frequency drive technology for HVAC applications has produced an unmatched product offering.

Power Range

- **380-480/500 V**
  Normal overload:
  400 V .....110-1000 kW, 212-1720 A
  460 V ..... 150-1350 hp, 190-1530 A
- **525-690 V**
  Normal overload:
  575 V.....75-1550 hp, 86-1415 A
  690 V.....75-1400 kW, 86-1415 A

Enclosure Ratings

- IP 00, IP 20, IP 21 and IP 54.

Options

See page 53.

Dedicated Pump Features

The VLT® HVAC Drive offers a vast number of pump-specific features developed in cooperation with OEMs, contracros and manufacturers around the world.

- Embedded Pump Cascade Controller
- Dry Pump Protection and End of Curve
- Auto tuning of the PI Controllers
- Flow compensation
- No/low Flow
- Sleep mode

Dedicated Fan Features

"User-friendly, distributed intelligence and reduced power consumption are beneficial for fan applications."

Intelligent AHU functions

- Weekend/working-day operations
- Cascaded P-PI for temperature control
- Multi-zone '3' control
- Flow balancing
- Belt monitoring
- Fire Override Mode
- Extends BMS Capacity
- Resonance Monitoring
- Stairwell Pressurisation
- Lower AHU Costs

Dedicated Compressor Features

The VLT® HVAC Drive has been designed to offer flexible, intelligent control of compressors, making it even easier to optimise cooling capacity with constant temperature and pressure levels for water chillers and other typical compressor applications in HVAC.

- Replace a cascade with a single compressor
- Set point in temperature
- Quick start-up without being under load

Makes the building perform

Today the prime focus is on the overall performance of buildings including design, construction, efficiency, sustainability and the environmental impact of these buildings in the future.

Energy efficient products form part of this overall plan. In most countries around the world this is now realized in the evaluation of high performance buildings under the banner LEED.

Fire Override Mode

Activating the function "Fire-mode" within the VLT® drive ensures secure and continued operation within applications such as stair-well pressurization, car park exhaust fans, smoke exhaust and essential service functions.

Clearly indicated

Fire mode is clearly indicated on the VLT® display to prevent any confusion. When set, the drive will override self protection and will continue operation despite the possibility of permanent damage in case of overheating or overload. The vital goal is to keep the motor running even if it means self-destruction.

Stairwell Pressurisation

In the event of fire, the VLT® HVAC Drive can maintain a higher level of air pressure in stairwells than in other parts of the building and ensure that fire escapes remain free of smoke.

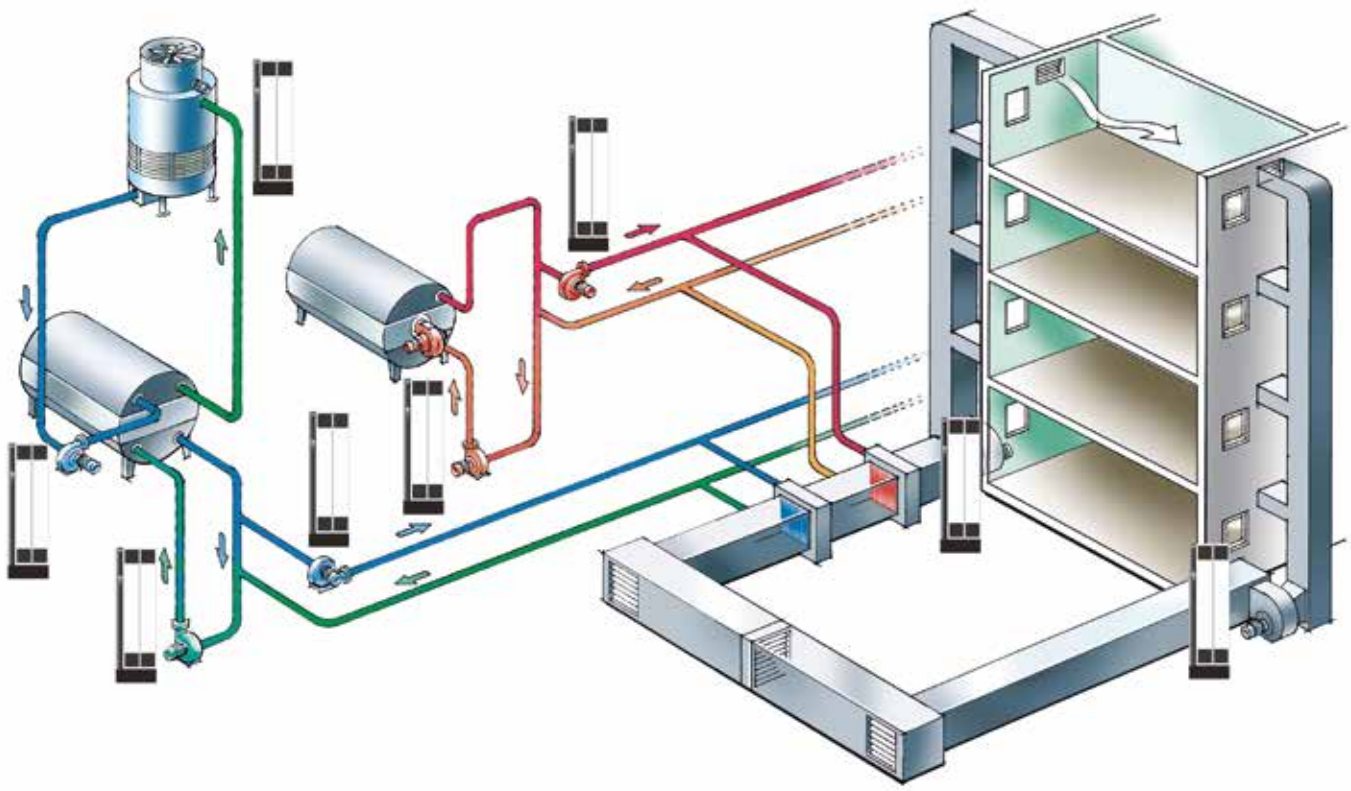
Drive bypass

If a drive bypass is available, the VLT® HVAC Drive will not only sacrifice itself in case of an extreme condition, but is able to bypass itself and connect the motor directly to mains. This will maintain operation as long as power is provided and the motor is functioning.

Resonance Monitoring

By pressing a few buttons on the Local Control Panel the drive can be set to avoid frequency bands at which connected fans create resonances in the ventilation system. This reduses vibration noise and wear on equipment.

For more detailed information please see the FC 100 Design guide, MG.16.xx.yy available at www.danfoss.com/products/literature/technical+documentation.htm.



VLT® HVAC Drive (FC 102) 380-480 VAC – Normal overload

	Normal overload												Type code	Frame size by enclosure rating				
	Typical shaft output	Output current		Output power		Rated input current	Estimated power loss at max load*	Output Frequency**	Max. external input mains fuses [A] **	Weights kg (lbs)**			Beginning with***	VLT® 6-Pulse			VLT® 12-Pulse	VLT® Low Harmonic Drive
	[kW]	[A]		[kVA]		[A]	[W]											
		Con. I_{VN}	Inter. I_{VMax} (60 sec) ****	Con.	Inter. (60 sec)			Hz		IP 00	IP 20	IP 21/IP 54		IP 00	IP 20	IP 21/IP 54		
400 V motor nominal voltage (380-440 V)	110	212	233	147	162	208	2555	0-590	315		62 (135)	62 (135)	FC-102N110T4		D3h	D1h/D5h/D6h		
	132	260	286	180	198	251	2949		350		62 (135)	62 (135)	FC-102N132T4		D3h	D1h/D5h/D6h		
	160	315	347	218	240	304	3764		400		62 (135)	62 (135)	FC-102N160T4		D3h	D1h/D5h/D6h		D13
	200	395	435	274	301	381	4109		550		125 (275)	125 (275)	FC-102N200T4		D4h	D2h/D7h/D8h		D13
	250	480	528	333	366	463	5129		630		125 (275)	125 (275)	FC-102N250T4		D4h	D2h/D7h/D8h		D13
	315	588	647	407	448	567	6663		800		125 (275)	125 (275)	FC-202N315T4		D4h	D2h/D7h/D8h		
	315	600	660	416	457	590	6705		700	221 (487)		263 (580)	FC-102P315T4	E2		E1	F8/F9	E9
	355	658	724	456	501	647	7532		900	234 (516)		270 (595)	FC-102P355T4	E2		E1	F8/F9	E9
	400	745	820	516	568	733	8677			236 (520)		272 (600)	FC-102P400T4	E2		E1	F8/F9	E9
	450	800	880	554	610	787	9473			277 (611)		313 (690)	FC-102P450T4	E2		E1	F8/F9	E9
	500	880	968	610	671	857	10162		2000			1004 (2214)	FC-102P500T4			F1/F3	F10/F11	F18
	560	990	1089	686	754	964	11822						FC-102P560T4			F1/F3	F10/F11	F18
	630	1120	1232	776	854	1090	12512						FC-102P630T4			F1/F3	F10/F11	F18
	710	1260	1386	873	960	1227	14674						FC-102P710T4			F1/F3	F10/F11	F18
	800	1460	1606	1012	1113	1422	17293					1246 (2748)	FC-102P800T4			F2/F4	F12/F13	
	1000	1720	1892	1192	1311	1675	19278		2500				FC-102P1M0T4			F2/F4	F12/F13	
460 V motor nominal voltage (441-480 V)	150 hp	190	209	151	167	185	2257	0-590	315		62 (135)	62 (135)	FC-102N110T4		D3h	D1h/D5h/D6h		
	200 hp	240	264	191	210	231	2719		350		62 (135)	62 (135)	FC-102N132T4		D3h	D1h/D5h/D6h		
	250 hp	302	332	241	265	291	3622		400		62 (135)	62 (135)	FC-102N160T4		D3h	D1h/D5h/D6h		D13
	300 hp	361	397	288	316	348	3561		550		125 (275)	125 (275)	FC-102N200T4		D4h	D2h/D7h/D8h		D13
	350 hp	443	487	353	388	427	4558		630		125 (275)	125 (275)	FC-102N250T4		D4h	D2h/D7h/D8h		D13
	450 hp	535	588	426	469	516	5703		800		125 (275)	125 (275)	FC-102N315T4		D4h	D2h/D7h/D8h		
	450 hp	540	594	430	473	531	6705		700	221 (487)		263 (580)	FC-102P315T4	E2		E1	F8/F9	E9
	500 hp	590	649	470	517	580	6724		900	234 (516)		270 (595)	FC-102P355T4	E2		E1	F8/F9	E9
	550/ 600 hp	678	746	540	594	667	7819			236 (520)		272 (600)	FC-102P400T4	E2		E1	F8/F9	E9
	600 hp	730	803	582	640	718	8527			277 (611)		313 (690)	FC-102P450T4	E2		E1	F8/F9	E9
	650 hp	780	858	621	684	759	8876		2000			1004 (2214)	FC-102P500T4			F1/F3	F10/F11	F18
	750 hp	890	979	709	780	867	10424						FC-102P560T4			F1/F3	F10/F11	F18
	900 hp	1050	1155	837	920	1022	11595						FC-102P630T4			F1/F3	F10/F11	F18
	1000 hp	1160	1276	924	1017	1129	13213						FC-102P710T4			F1/F3	F10/F11	F18
	1200 hp	1380	1518	1100	1209	1344	16229					1246 (2748)	FC-102P800T4			F2/F4	F12/F13	
	1350 hp	1530	1683	1219	1341	1490	16624		2500				FC-102P1M0T4			F2/F4	F12/F13	

Consult factory for higher output drives

* *Does not apply to VLT® Low Harmonic Drive.*
** *VLT® 6-Pulse and 12-Pulse Drives only. Please see VLT® Low Harmonic Drives dimension tables.*
*** *See pages 68 to 71 for the complete type code.*
**** *Intermittent duty rated for 110% of continuous current for normal overload*

VLT® HVAC Drive (FC 102) 525-690 VAC – Normal overload

	Normal overload												Type code	Frame size by enclosure rating			
	Typical shaft output	Output current		Output power		Rated input current	Estimated power loss at max load*	Output Frequency*	Max. external input mains fuses [A] *	Weights kg (lbs) *			Beginning with**	VLT® 6-Pulse			VLT® 12-Pulse
	[kW]	[A]		[kVA]		[A]	[W]										
		Cont. I_{VN}	Inter. I_{VMax} (60 sec) ****	Con.	Inter. (60 sec)			Hz		IP 00	IP 20	IP 21/IP 54		IP 00	IP 20	IP 21/IP 54	
525 V motor nominal voltage (525-550 V)	55	90	99	86	95	89	1162	0-590	200		62 (135)	62 (135)	FC-102N75KT7		D3h	D1h/D5h/D6h	
	75	113	124	108	119	110	1428		200		62 (135)	62 (135)	FC-102N90KT7		D3h	D1h/D5h/D6h	
	90	137	151	131	144	130	1739		250		62 (135)	62 (135)	FC-102N110T7		D3h	D1h/D5h/D6h	
	110	162	178	154	170	158	2099		315		62 (135)	62 (135)	FC-102N132T7		D3h	D1h/D5h/D6h	
	132	201	221	191	211	198	2646		350		62 (135)	62 (135)	FC-102N160T7		D3h	D1h/D5h/D6h	
	160	253	278	241	265	245	3071		350		125 (275)	125 (275)	FC-102N200T7		D4h	D2h/D7h/D8h	
	200	303	333	289	318	299	3719		400		125 (275)	125 (275)	FC-102N250T7		D4h	D2h/D7h/D8h	
	250	360	396	343	377	355	4460		500		125 (275)	125 (275)	FC-102N315T7		D4h	D2h/D7h/D8h	
	315	418	460	398	438	408	5023	0-500	550		125 (275)	125 (275)	FC-102N400T7		D4h	D2h/D7h/D8h	
	355	470	517	448	493	453	5323		550	221 (487)		263 (580)	FC-102P450T7	E2		E1	F8/F9
	400	523	575	498	548	504	6010		700				FC-102P500T7	E2		E1	F8/F9
	450	596	656	568	625	574	7395			236 (520)		272 (600)	FC-102P560T7	E2		E1	F8/F9
	500	630	693	600	660	607	8209		900	277 (611)		313 (690)	FC-102P630T7	E2		E1	F8/F9
	560	763	839	727	800	743	9500						FC-102P710T7			F1/F3	F10/F11
	670	889	978	847	932	866	10872					1004 (2214)	FC-102P800T7			F1/F3	F10/F11
	750	988	1087	941	1035	962	12316						FC-102P900T7			F1/F3	F10/F11
	850	1108	1219	1056	1161	1079	13731		2000			1246 (2748)	FC-102P1M0T7			F2/F4	F12/13
	1000	1317	1449	1255	1380	1282	16190						FC-102P1M2T7			F2/F4	F12/13
	1100	1479	1627	1409	1550	1440	18536						FC-102P1M4T7			F2/F4	F12/13
575 V motor nominal voltage (551-690 V)	75 hp	86	95	86	95	85	1162	0-590	200		62 (135)	62 (135)	FC-102N75KT7		D3h	D1h/D5h/D6h	
	100 hp	108	119	108	119	106	1428		200		62 (135)	62 (135)	FC-102N90KT7		D3h	D1h/D5h/D6h	
	125 hp	131	144	130	144	124	1739		250		62 (135)	62 (135)	FC-102N110T7		D3h	D1h/D5h/D6h	
	150 hp	155	171	154	170	151	2099		315		62 (135)	62 (135)	FC-102N132T7		D3h	D1h/D5h/D6h	
	200 hp	192	211	191	210	189	2646		350		62 (135)	62 (135)	FC-102N160T7		D3h	D1h/D5h/D6h	
	250 hp	242	266	241	265	234	3071		350		125 (275)	125 (275)	FC-102N200T7		D4h	D2h/D7h/D8h	
	300 hp	290	319	289	318	286	3719		400		125 (275)	125 (275)	FC-102N250T7		D4h	D2h/D7h/D8h	
	350 hp	344	378	343	377	339	4460		500		125 (275)	125 (275)	FC-102N315T7		D4h	D2h/D7h/D8h	
	400 hp	400	440	398	438	390	5023	0-500	550		125 (275)	125 (275)	FC-102N400T7		D4h	D2h/D7h/D8h	
	450 hp	450	495	448	493	434	5323		550	221 (487)		263 (580)	FC-102P450T7	E2		E1	F8/F9
	500 hp	500	550	498	548	482	6010		700				FC-102P500T7	E2		E1	F8/F9
	600 hp	570	627	568	624	549	7395			236 (520)		272 (600)	FC-102P560T7	E2		E1	F8/F9
	650 hp	630	693	627	690	607	8209		900	277 (611)		313 (690)	FC-102P630T7	E2		E1	F8/F9
	750 hp	730	803	727	800	711	9500						FC-102P710T7			F1/F3	F10/F11
	950 hp	850	935	847	931	828	10872					1004 (2214)	FC-102P800T7			F1/F3	F10/F11
	1050 hp	945	1040	941	1035	920	12316						FC-102P900T7			F1/F3	F10/F11
	1150 hp	1060	1166	1056	1161	1032	13731		2000			1246 (2748)	FC-102P1M0T7			F2/F4	F12/F13
	1350 hp	1260	1386	1255	1380	1227	16190						FC-102P1M2T7			F2/F4	F12/F13
	1550 hp	1415	1557	1409	1550	1378	18536						FC-102P1M4T7			F2/F4	F12/F13
690 V motor nominal voltage (551-690 V)	75	86	95	103	113	87	1204	0-590	200		62 (135)	62 (135)	FC-102N75KT7		D3h	D1h/D5h/D6h	
	90	108	119	129	142	109	1477		200		62 (135)	62 (135)	FC-102N90KT7		D3h	D1h/D5h/D6h	
	110	131	144	157	172	128	1796		250		62 (135)	62 (135)	FC-102N110T7		D3h	D1h/D5h/D6h	
	132	155	171	185	204	155	2165		315		62 (135)	62 (135)	FC-102N132T7		D3h	D1h/D5h/D6h	
	160	192	211	229	252	197	2738		350		62 (135)	62 (135)	FC-102N160T7		D3h	D1h/D5h/D6h	
	200	242	266	289	318	240	3172		350		125 (275)	125 (275)	FC-102N200T7		D4h	D2h/D7h/D8h	
	250	290	319	347	381	296	3848		400		125 (275)	125 (275)	FC-102N250T7		D4h	D2h/D7h/D8h	
	315	344	378	411	452	352	4610		500		125 (275)	125 (275)	FC-102N315T7		D4h	D2h/D7h/D8h	
	400	400	440	478	526	400	5150		550		125 (275)	125 (275)	FC-102N400T7		D4h	D2h/D7h/D8h	
	450	450	495	538	592	434	5529	0-500	550	221 (487)		263 (580)	FC-102P450T7	E2		E1	F8/F9
	500	500	550	598	657	482	6239		700				FC-102P500T7	E2		E1	F8/F9
	560	570	627	681	749	549	7653			236 (520)		272 (600)	FC-102P560T7	E2		E1	F8/F9
	630	630	693	753	828	607	8495		900	277 (611)		313 (690)	FC-102P630T7	E2		E1	F8/F9
	710	730	803	872	960	711	9863						FC-102P710T7			F1/F3	F10/F11
	800	850	935	1016	1117	828	11304					1004 (2214)	FC-102P800T7			F1/F3	F10/F11
	900	945	1040	1129	1242	920	12798						FC-102P900T7			F1/F3	F10/F11
	1000	1060	1166	1267	1394	1032	14250		2000			1246 (2748)	FC-102P1M0T7			F2/F4	F12/13
	1200	1260	1386	1506	1656	1227	16821						FC-102P1M2T7			F2/F4	F12/F13
	1400	1415	1557	1691	1860	1378	19247						FC-102P1M4T7			F2/F4	F12/F13

Consult factory for higher output drives

* *VLT® 6-Pulse and 12-Pulse Drives only. Please see VLT® Low Harmonic Drives dimension tables.*
** *See pages 68 to 71 for the complete type code.*
**** *Intermittent duty rated for 110% of continuous current for normal overload.*

VLT® 6-Pulse Drives

Optimised
for:

- VLT® HVAC Drive FC 102
- VLT® AQUA Drive FC 202
- VLT® Automation Drive FC 302

The VLT® High Power 6-Pulse Drives were designed to expand the lower power drive offering. Built exclusively in the USA, the drives maintain the same Danfoss look and LCP of the lower power VLT® drives.

VLT® 6-Pulse Drive advantages

- Higher efficiency – > 98% efficiency reduces operating costs
- Unique back-channel cooling design reduces the need for additional cooling equipment, resulting in lower installation costs
- Higher than industry standard operating temperatures without derating
- Standard LCP and programming make commissioning easy
- Modular design allows for ease of component accessibility and service
- Built-in DC link reactors for harmonic suppression eliminate the need for external AC line reactors
- Optional, built-in RFI filtes are available throughout the power range

Enclosure

- IP 00/Chassis
- IP 20/Protected Chassis
- IP 21/NEMA Type 1
- IP 54/NEMA Type 12

Voltage range

- 380-690 V

Power range

- **380-480/500**

Normal overload:
400 V.....110-1000 kW
460 V.....150-1350 hp

High overload:
400 V.....90-800 kW
460 V.....125-1200 hp

525-690 V
Normal overload:
575 V.....125-1550 hp
690 V.....90-1200 kW

High overload:
575 V.....100-1350 hp
690 V.....75-1000 kW

Specifications

Supply frequency	50/60 Hz (48-62 Hz ± 1%)
Max. motor cable length	150 metres (500 feet) shielded, 300 metres (1000 feet) unshielded
Ambient temperature (with default drive settings)	-10° C to 45° C without derating Maximum 55° C with current derating *(see derating curves on page 38)*
Power factor	Greater than 0.90 at full load
Supply voltage	3 phase, 380-500 V ± 10% (3-phase x 380/400/415/440/460/480/500) or 525-690 V ±10% (3-phase x 525/550/575/600/690)
Output voltage	0-100% of the AC line voltage
Rated motor voltage	3-phase x 380/400/415/440/460/500 or 3-phase x 525/575/690
Rated motor frequency	50/60 Hz
Thermal protection during operation	ETR for motor (class 20)
THDi worst case at full load	< 48%
THDi typical at full load	< 35%
Cooling	Back-channel air cooling

Norms and recommendations	Compliance
IEC61000-3-2 (up to 16 A)	Out of scope
IEC61000-3-12 (between 16 and 75 A)	Out of scope
IEC61000-3-4 (above 75 A)	Always

The new D-frame VLT® Drive

Note:
The new D1h Frame VLT® drive takes up significantly less space than the older version.

Up to 68%

smaller footprint provides ease of installation and lower material costs. New features increase efficiency and reduce operation costs.

Improved performance in applications between 55-315 kW

Customers today increasingly demand high efficiency in drive technology. Investments in improved efficiency quickly pay off, especially at higher power levels.
Now, one of the most efficient drives in the industry has been made even more efficient.

The size of the new D-frame has been reduced by up to 68 % to take up less space in control rooms and panels. The new IP 20 version is optimized for panel building, while providing a higher degree of safety for operators. All of the new D-frame drives will continue to use the proven back-channel cooling concept. Back-channel cooling now directs 90 % (increased from 85 %) of cooling air away from the drive interior and removes 90 % of the heat generated by the drive.

The compact, efficient design is the result of innovative thermal management. The new D-frame VLT® requires less panel or wall space than previous models which are already some of the smallest in their class, adding flexibility while reducing installation costs. The new D-frame is available in the same platforms as Danfoss' renowned VLT® drives.

- FC 302 AutomationDrive for demanding industrial applications
- FC 202 AQUA Drive for use in water and wastewater applications (and other pump applications)
- FC 102 HVAC Drive for application in the HVAC and refrigeration industries

Available in IP 20, IP 21 and IP 54 enclosures, the new drives maintain the same award winning control platform and LCP as existing Danfoss VLT®s.

Feature	Benefit
Reduced size	Reduced in size by up to 68%. The smaller new D-Frame drive uses less panel space or wall space, saving valuable space and money.
Higher Efficiency	Higher efficiency results in lower operating cost, over the life of the frequency converter.
Basic input options – Fuses – Mains disconnect – Contactor (new) – Circuit breaker (new) – Mains disconnect + contactor (new)	Eliminates the need for a panel when only the basic input options are required, for further cost savings and reduced space requirements.
Standard VLT® control platform and LCP	There are no new controls to learn. The transition from the old drive to the new drive can be made easily.
IP 20 enclosure rating for drives being installed into panels	IP 20 design enhances safety
Optional heat sink access panel	Enables the heat-sink to be cleaned when installed in harsh environments
Back-channel cooling permits up to 90% of cooling air to be removed from room	Reduces the needed air conditioning for the room, reducing up-front cost and operating expenses
230 V Anti-condensation Heater *(new option in a D-frame)*	Preventing condensation in the drive reduces the need to heat the control room.

Harmonic Solutions

Harmonics are a by-product of modern power electronic control equipment. An ideal AC supply is a pure sine-wave of the fundamental frequency.

All electrical equipment is designed for optimal performance on this supply. Equipment can then deviate from its intened behaviour causing reduced reliability, increased downtime and operating cost, lower productivity and premature product wear.

The choice of the best solution depends on several factors:

- The grid (background distortion, mains unbalance, resonance and type of supply – transformer/generator)
- Application (load profile, number of loads and load size)
- Local/national requirements/regulations (IEEE519, IEC, G5/4, etc.)
- Total cost of ownership (initial cost, efficiency, maintenance, etc.)

Passive Solutions

VLT® 12-pulse drives
VLT® AHF filters

Passive solutions offer a lower level of harmonic mitigation than the active filter options, but can offer effective mitigation for the application requirements.

- Robust
- Filters can be used to retrofit existing applications
- Energy Efficient
- Based on proven and tested concepts

Active Solutions

VLT® Advanced Active Filter (AAF)
VLT® Low Harmonic Drives

Danfoss VLT® Active Filters measure harmonic distortion from non-linear loads and determines the optimal compensation. The active filter creates a low impedance path and harmonics flow through the filter instead of back into the power supply. The VLT® filters offer the same characteristics as the VLT® high power family, including high energy efficiency, user-friendly operation, back-channel cooling and high enclosure grades. Danfoss active filters can compensate individual VLT® drives as a compact integrated solution or be installed as a stand-alone solution at a common point of coupling, compensating several loads simultaneously.

- Offers great mitigation
- Independent on load and grid imbalance
- Best cost of owner ship
- Retrofit able
- PCC installation possible (group compensation, power factor correction and load balance)
- Compact and light

To read more about the Danfoss active solutions, please see the product design guides: VLT® Low Harmonic Drive (LHD) MG.34.OX.YY and VLT® Active Filters (AAF) MG.90.VX.YY.

Typical applications where harmonic stress needs evaluation

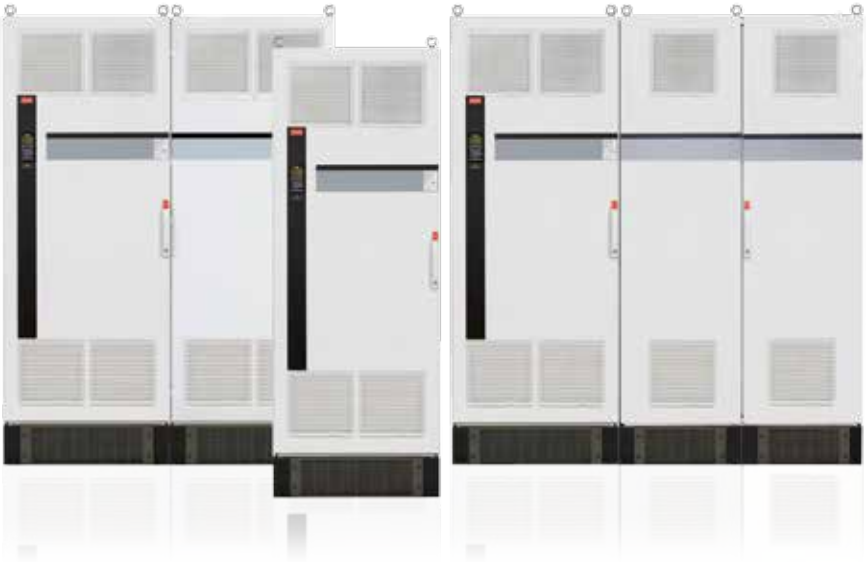
Meeting harmonic standard

Area	Application	Benefits
Contractor specified green field projects:	– Water and waste water – Fans and compressors – Food and beverage	– Meet harmonic standards – Reduce harmonic impact on grid
Process critical production/sensitive environments:	– Building services – Oil and Gas – Clean rooms – Airports – Power plants – Water treatment	– Meet harmonic standards – Reduce lighting flickering – Secure uptime – Resonance damping

Special exposed areas

Area	Application	Benefits
Isolated power grids or generator supplied sites:	– Offshore installations – Marine sector – Hospitals	– Reassure voltage quality on primary and backup supply – Reduce lighting flickering – Prevent trips
Insufficient power grid capacity:	– High Growth areas – Developing countries	– Increase transformer loading capability – Improve power-factor
Soft power grids: (Remote areas)	– Remote areas – Mining – Oil and Gas	– Reduce system loading by improving true power factor – Prevent trips and secure uptime

VLT® 12-Pulse Drives



Optimised
for:

- **VLT® HVAC Drive FC 102**
- **VLT® AQUA Drive FC 202**
- **VLT® Automation Drive FC 302**

The VLT® 12-Pulse Drive is a high efficiency variable frequency converter that passively filters harmonic distortion – built with the same modular design as the popular 6-pulse VLT® drives.

Harmonic cancellation reduces system resonance risk, erractic operation of installed equipment and equipment malfunctions. Natural harmonic cancellation occurs when two standard 6-pulse rectifiers are connected in parallel to a three-phase system, through a 30°-phase shifting transformer. Harmonic currents are limited to approximately 12-15% at full load. The Danfoss VLT® 12-Pulse Drive provides harmonic reduction without adding capacitive or inductive components which often require network analysis to avoid potential system resonance problems.

VLT® 12-Pulse Drive advantages

- Robust and highly stable in all network and operating conditions
- Low losses for high system efficiency due to the DC link reactors
- Excellent input transient immunity
- No special controls required
- Standard LCP and programming make commissioning easy
- Back-channel cooling reduces cooling loads and improves the efficiency
- Modular design allows for ease of component accessibility and service
- The compact design with zero clearance mounting minimizes the use of floor space
- Ideal for applications where stepping down from medium voltage is required or where isolation from the grid is needed

Enclosure

- IP 21/NEMA Type 1
- IP 54/NEMA Type 12

Voltage range

- 380-500 V
- 525-690 V

Power range

- **380-480/500 V**
  Normal overload:
  400 V.....315-1000 kW
  460 V.....450-1350 hp
  High overload:
  400 V.....250-800 kW
  460 V.....350-1200 hp

- **525-690 V**
  Normal overload:
  575 V.....450-1550 hp
  690 V.....450-1400 kW
  High overload:
  575 V.....400-1350 hp
  690 V.....355-1200 kW

Specifications

THiD* at: – 40% load – 70% load – 100% load	 20% 14% 12%
Efficiency* at: – 40% load – 70% load – 100% load	 95% 97% 98%
True power factor* at: – 40% load – 70% load – 100% load	 91% 95% 97%
Transformer output voltage imbalance	0.5% or less
Transformer output impedance imbalance	5% or less
Ambient temperature	-10° C to 45° C without derating Maximum 55° C with current derating *(see derating curves on page 38)*
Cooling	Back-channel air cooling

** Typical situation, measured at balanced grid without pre-distortion*

Norms and recommendations	Compliance
IEEE519	Depends on grid and load conditions
IEC61000-3-2 (up to 16 A)	Out of scope
IEC61000-3-12 (between 16 and 75 A)	Out of scope
IEC61000-3-4 (above 75 A)	Always

VLT® Advanced Active Filters

Specifications

E-frame

Nominal voltage

Frame size		D	E	E	E
Type		**A190**	**A250**	**A310**	**A400**
400 V – Corrected current					
Continuous	[A]	190	250	310	400
Intermittent*	[A]	209	275	341	440
460 V – Corrected current					
Continuous	[A]	190	250	310	400
Intermittent*	[A]	209	275	341	440
480 V – Corrected current					
Continuous	[A]	150	200	250	320
Intermittent*	[A]	165	220	275	352
500 V – Corrected current					
Continuous	[A]	95	125	155	200
Intermittent*	[A]	105	138	171	220
Estimated maximum power loss	[kW]	5	7	9	11.1
Efficiency	[%]	96	96	96	96
Recommended fuse and disconnect**	[A]	350	630	630	900
Copper cable data:					
Maximum cross-section	[mm²]	2 x 150	4 x 240	4 x 240	4 x 240
	[AWG]	2 x 300 mcm	4 x 500 mcm	4 x 500 mcm	4 x 500 mcm
Minimum cross-section	[mm²]	70	120	240	2 x 95
	[AWG]	2/0	4/0	2 x 3/0	2 x 3/0

** 1 minute every 10 minutes (automatically regulated)*
*** Built-in options are recommended*

Filter type	3P/3W, Active Shunt Filter (TN, TT, IT)
Frequency	50 to 60 Hz, ± 5%
Enclosures	IP 21 – NEMA 1, IP 54 – NEMA 12
Max. voltage pre-distortion	10% 20% with reduced performance
Operating temperature	0-40° C +5° C with reduced performance -10° C with reduced performance
Altitude	1000 m without derating 3000 m with reduced performance (5%/1000 m)
EMC standards	IEC61000-6-2 IEC61000-6-4
Circuitry coating	Conformal coated – per ISA S71.04-1985, class G3
Languages	18 different
Harmonic compensation modes	Selective or overall (90% RMS for harmonic reduction)
Harmonic compensation spectrum	2nd to 40th in overall mode, including triplens 5th, 7th, 11th, 13th, 17th, 19th, 23rd, 25th in selective mode

Individual harmonic current allocation in selective mode	I5: 63%, I7: 45%, I11: 29%, I13: 25%, I17: 18%, I19: 16%, I23: 14%, I25: 13%
Reactive current compensation	Yes, leading (capacitive) or lagging (inductive) to target power factor
Flicker reduction	Yes
Compensation priority	Programmable to harmonics or displacement power factor
Paralleling option	Up to 4 units of same power rating in master follower
Current Transformer Support (Customer supply and field mounting)	1 A and 5 A secondary with auto tuning Class 0.5 or better
Digital inputs /outputs	4 (2 programmable) Programmable PNP or NPN logic
Communication interface	RS485, USB1.1
Control type	Direct harmonic control (for faster response)
Response time	< 15 ms (including HW)
Harmonic settling time (5-95%)	< 15 ms
Reactive settling time (5-95%)	< 15 ms
Maximum overshoot	5%
Switching frequency	Progressive control in the range of 3 – 18 kHz
Average switching frequency	3 – 4.5 kHz

Type code

The different VLT® Active Filters can easily be configured acccording to customer request at www.danfoss.com

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	..	39
A	A	F	0	0	6	A	x	x	x	T	4	E	x	x	H	x	x	G	C	x	x	x	S	.	X

8-10:
190: 190 A correction current
250: 250 A correction current
310: 310 A correction current
400: 400 A correction current

13-15:
E21: IP 21/NEMA 1
E2M: IP 21/NEMA 1 w. mains shield
C2M: IP 21/NEMA 1 w. stainless steel back-channel and mains shield

E54: IP 54/NEMA 12
E5M: IP 54/NEMA 12 w. mains shield
C5M: IP 54/NEMA 12 w. stainless steel back-channel and mains shield

16-17:
HX: No RFI Filter
H4: RFI class A1

21:
X: No mains options
3: Disconnect & Fuse
7: Fuse

VLT® Low Harmonic Drive

The Danfoss VLT® Low Harmonic Drive is the first solution combining an active filter and a drive in one package.

The VLT® Low Harmonic Drive continuously regulates harmonic mitigation according to the load and grid conditions without affecting the connected motor.

The Total Harmonic Current Distortion is reduced to less than 3% on grids with balanced mains and minimum pre-distortion and to less than 5% on grids with high harmonic distortion and 2% phase imbalance. As individual harmonics also fulfil toughest harmonic requirements, the VLT® Low Harmonic Drive meets all present harmonic standards and recommendations.

Unique features such as sleep mode and back channel cooling offers unmatched energy efficiency for Low Harmonic Drives.

The VLT® Low Harmonic Drive requires the same set-up and installation as a standard VLT® drive and out of the box it ensures optimum harmonic performance.

The VLT® Low Harmonic Drive features the same modular construction as our standard high power drives and shares similar features: Built-in RFI filters, coated PCB and user-friendly programming.

Enclosure

- IP 21/NEMA 1
- IP 54/NEMA 12

Voltage range

- 380 – 480 V AC 50 – 60 Hz

Optimised

for:

- **VLT® HVAC Drive FC 102**
- **VLT® AQUA Drive FC 202**
- **VLT® Automation Drive FC 302**

Power range

- **High overload:**
  132-630 kW
  200-900 hp
- **Normal overload:**
  160-710 kW
  250-1000 hp

Specifications

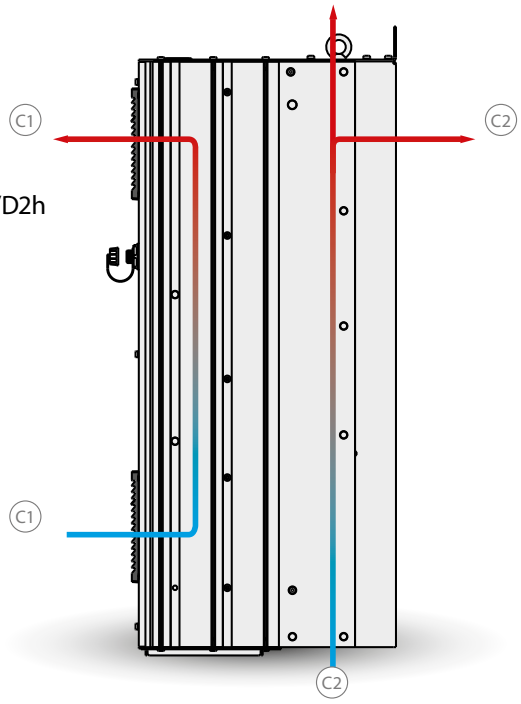
THiD* at: – 40% load – 70% load – 100% load	 < 5.5% < 3.5% < 3%
Efficiency* at: – 40% load – 70% load – 100% load	 > 93% > 95% > 96%
True power factor* at: – 40% load – 70% load – 100% load	 > 98% > 98% > 98%
Ambient temperature	40° C without derating
Cooling	Back-channel air cooling

** Measured at balanced grid without pre-distortion*

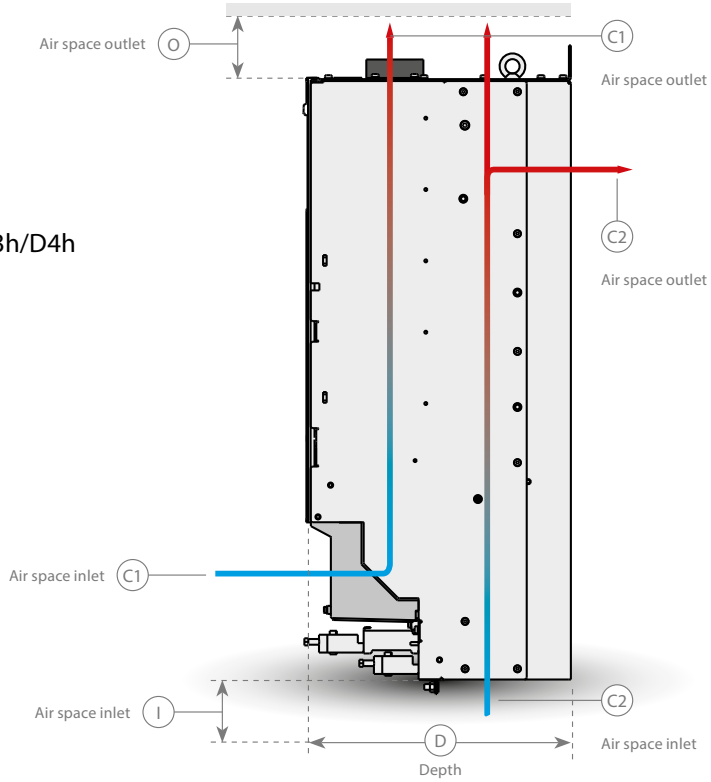
Norms and recommendations	Compliance
IEEE519 for Isc/IL>20	Always
IEC61000-3-2 (up to 16 A)	Out of scope
IEC61000-3-12 (between 16 and 75 A)	Out of scope
IEC61000-3-4 (above 75 A)	Always

VLT® High Power Drive dimensions mm (inch)

D1h/D2h



D3h/D4h



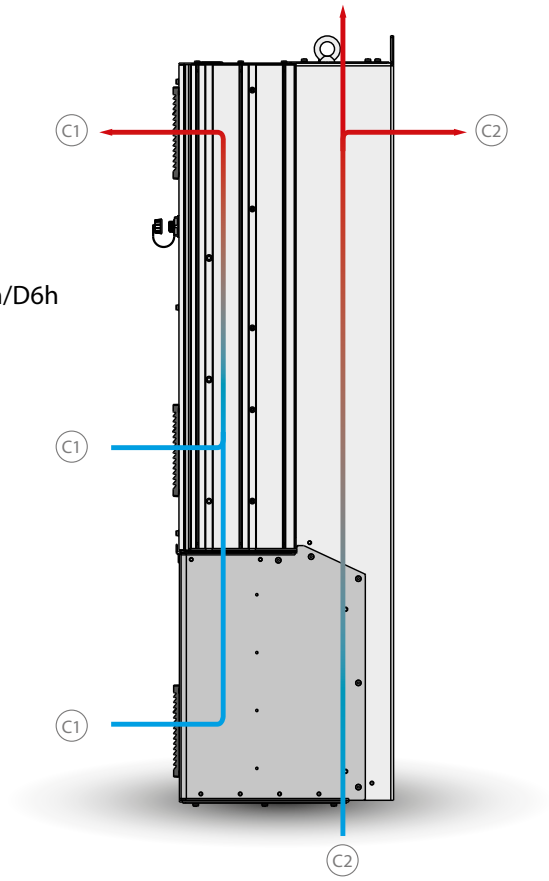
Please see the VLT® High Power Design Guide for other frames, available at www.danfoss.com/products/literature/technical+documentation.htm.

D-frames

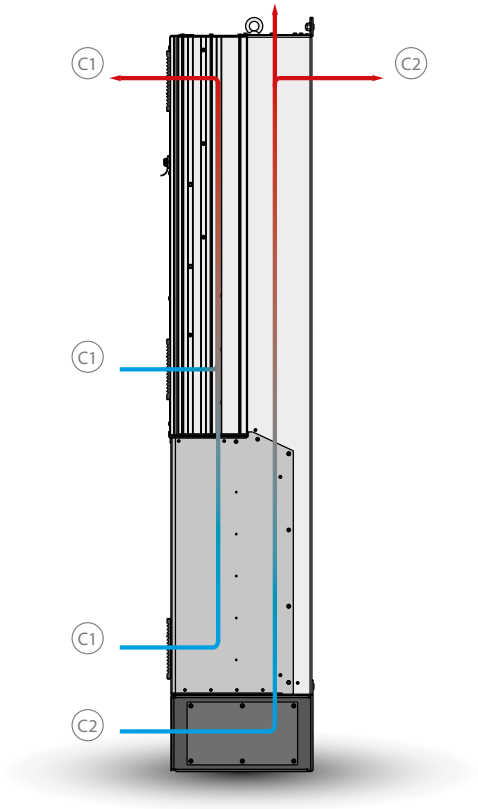
		VLT® 6-Pulse Drives							
Frame		D1h	D2h	D3h	D4h	D5h	D6h	D7h	D8h
		IP 21/IP 54		IP 20		IP 21/IP 54			
H mm (inches)		901 (36)	1107 (44)	909 (36)	1122 (44)	1324 (52)	1665 (66)	1978 (78)	2284 (90)
H1 mm (inches)		844 (33)	1050 (41)	844 (33)	1050 (41)	1277 (50)	1617 (64)	1931 (76)	2236 (88)
W mm (inches)		325 (13)	420 (17)	250 (10)	350 (14)	325 (13)	325 (13)	420 (17)	420 (17)
D mm (inches)		378 (15)	378 (15)	375 (15)	375 (15)	381 (15)	381 (15)	384 (15)	402 (16)
Door swing A mm (inches)		298 (12)	395 (15.6)	n/a	n/a	298 (12)	298 (12)	395 (16)	395 (16)
Air cooling	I (air space inlet) mm (inches)	225 (9)	225 (9)	225 (9)	225 (9)	225 (9)	225 (9)	225 (9)	225 (9)
	O (air space outlet) mm (inches)	225 (9)	225 (9)	225 (9)	225 (9)	225 (9)	225 (9)	225 (9)	225 (9)
	C1	102 m³/hr (60 cfm)	204 m³/hr (120 cfm)	102 m³/hr (60 cfm)	204 m³/hr (120 cfm)	102 m³/hr (60 cfm)		204 m³/hr (120 cfm)	
	C2	420 m³/hr (250 cfm)	840 m³/hr (500 cfm)	420 m³/hr (250 cfm)	840 m³/hr (500 cfm)	420 m³/hr (250 cfm)		840 m³/hr (500 cfm)	

Efficiency	0.98					
Max. cable cross-section to motor output terminals (per phase) – mm² (AWG)	2 x 95 (2 x 3/0)	2 x 185 (2 x 350 mcm)	2 x 95 (2 x 3/0)	2 x 185 (2 x 350 mcm)	2 x 95 (2 x 3/0)	2 x 185 (2 x 350 mcm)
Max. cable cross-section to loadsharing terminals (per -DC/+DC)						
Max. cable cross-section to regeneration terminals (per-DC/+DC)						
Max. cable cross-section to brake resistor terminals (per -R/+R)						
Max. cable cross-section to input mains terminals (per phase)						

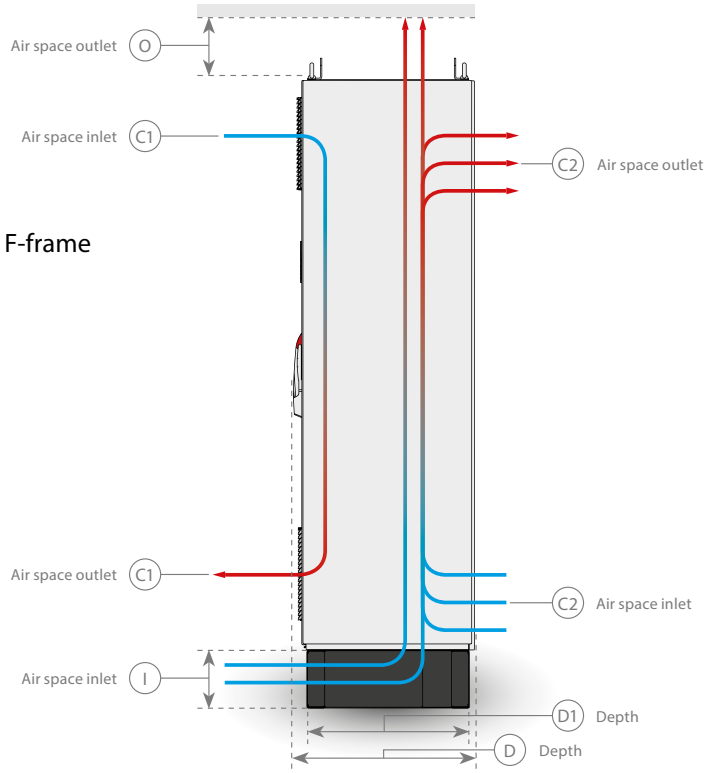
D5h/D6h

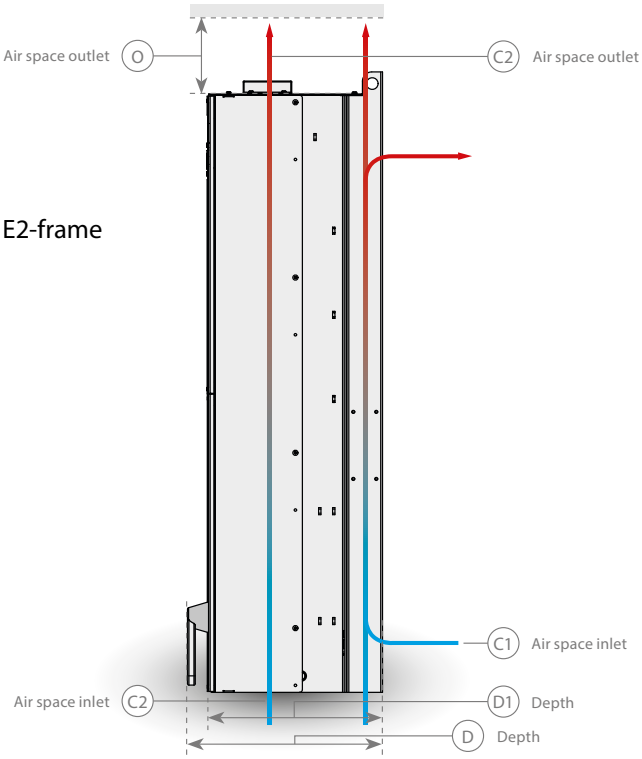


D7h/D8h



VLT® High Power Drive dimensions mm (inch)





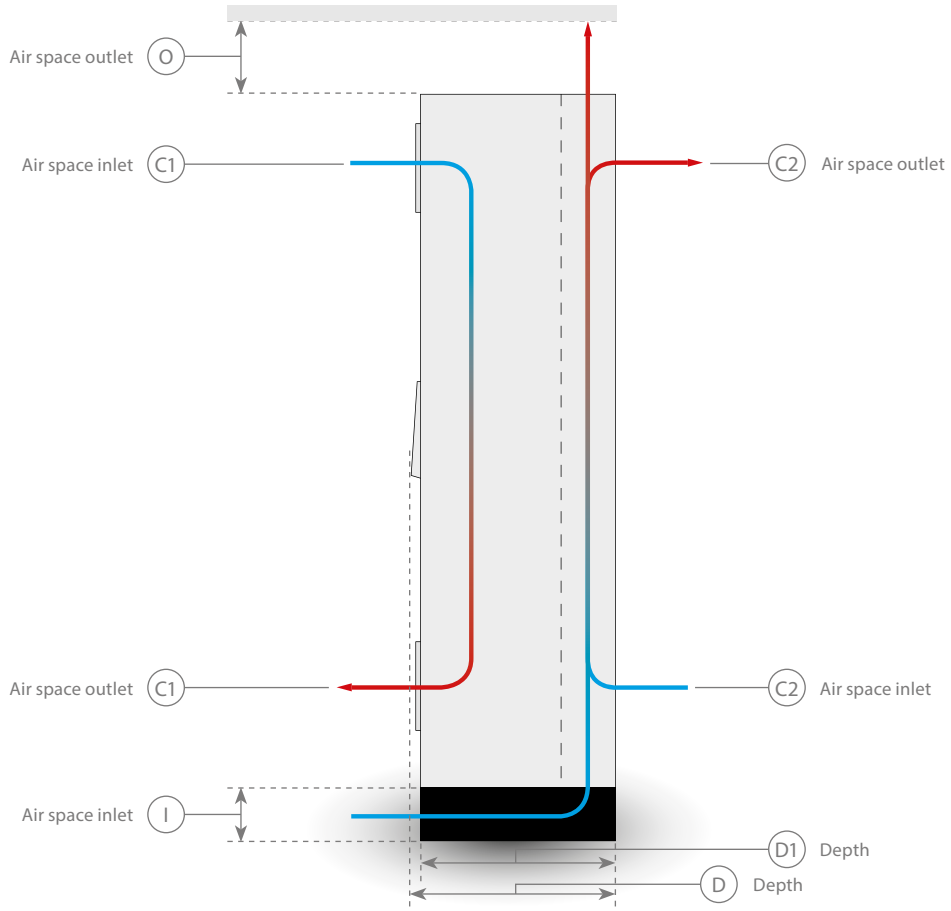
Please see the VLT® High Power Design Guide for other frames, available at www.danfoss.com/products/literature/technical+documentation.htm.

E- and F-frames

Frame		E1	E2	F1	F3	F2	F4
		IP 21/IP 54	IP 00		(F1 + options cabinet)		(F2 + options cabinet)
H mm (inches)		2000 (79)	1547 (61)	2280 (90)	2280 (90)	2280 (90)	2280 (90)
H1 mm (inches)		n/a	n/a	2205 (87)	2205 (87)	2205 (87)	2205 (87)
W mm (inches)		600 (24)	585 (23)	1400 (55)	1997 (79)	1804 (71)	2401 (94)
D mm (inches)		538 (21)	539 (21)	n/a	n/a	n/a	n/a
D1 mm (inches)		494 (19)	498 (20)	607 (24)	607 (24)	607 (24)	607 (24)
Door swing A mm (inches)		579 (23)	579 (23)	578 (23)	578 (23)	578 (23)	578 (23)
Door swing B mm (inches)		n/a	n/a	778 (31)	578 (23)	624 (25)	578 (23)
Door swing C mm (inches)		n/a	n/a	n/a	778 (31)	579 (23)	624 (25)
Door swing D mm (inches)		n/a	n/a	n/a	n/a	n/a	578 (23)
Air cooling	I (air space inlet) mm (inches)	225 (9)	225 (9)	n/a	n/a	n/a	n/a
	O (air space outlet) mm (inches)	225 (9)	225 (9)	225 (9)	225 (9)	225 (9)	225 (9)
	C1	1105 m³/hr (650 cfm) or 1444 m³/hr (850 cfm)	1105 m³/hr (650 cfm) or 1444 m³/hr (850 cfm)	985 m³/hr (580 cfm)			
	C2	340 m³/hr (200 cfm)	255 m³/hr (150 cfm)	IP 21/NEMA 1 700 m³/hr (412 cfm) IP 54/NEMA 12 525 m³/hr (309 cfm)			

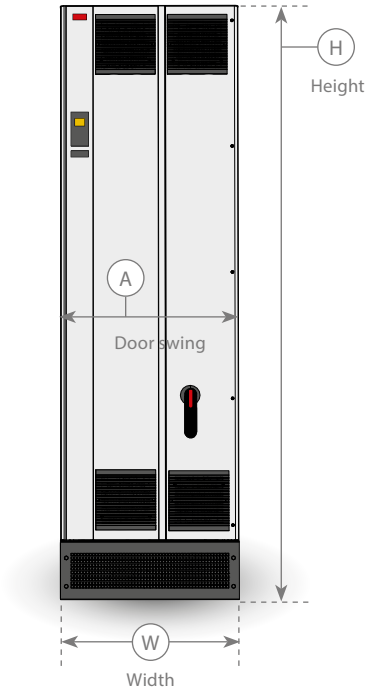
Efficiency	0.98	0.98			
Max. cable cross-section to motor output terminals (per phase) – mm² (AWG)	4 x 240 (4 x 500 mcm)	8 x 150 (8 x 300 mcm)	8 x 150 (8 x 300 mcm)	12 x 150 (12 x 300 mcm)	12 x 150 (12 x 300 mcm)
Max. cable cross-section to loadsharing terminals (per -DC/+DC)		4 x 120 (4 x 250 mcm)			
Max. cable cross-section to regeneration terminals (per-DC/+DC)		2 x 150 (2 x 300 mcm)			
Max. cable cross-section to brake resistor terminals (per -R/+R)	2 x 185 (2 x 350 mcm)	4 x 185 (4 x 350 mcm)	4 x 185 (4 x 350 mcm)	6 x 185 (6 x 350 mcm)	6 x 185 (6 x 350 mcm)
Max. cable cross-section to input mains terminals (per phase)	4 x 240 (4 x 500 mcm)	8 x 240 (8 x 500 mcm)			

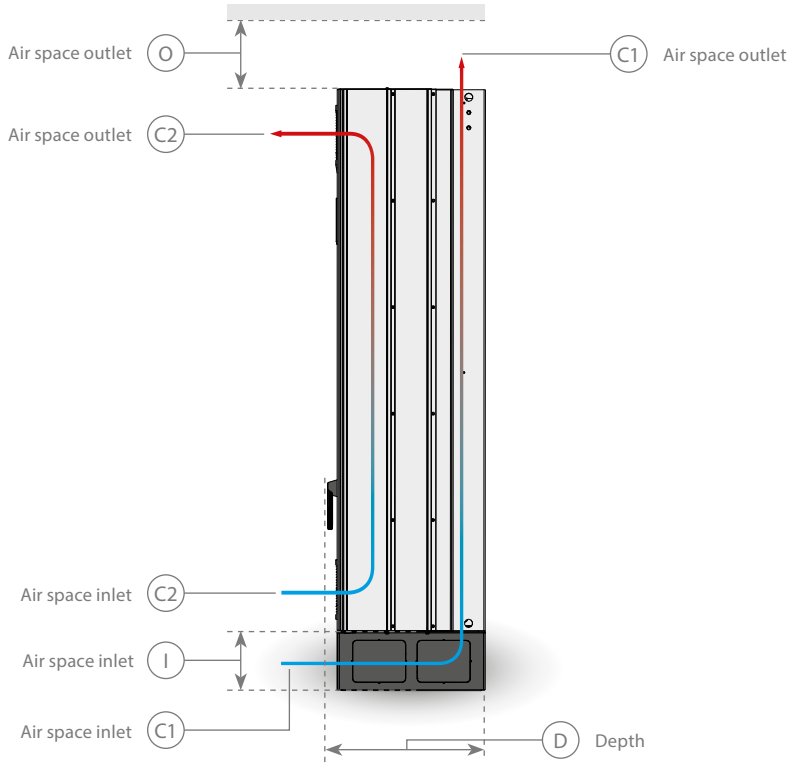
VLT® 12-pulse dimensions mm (inch)



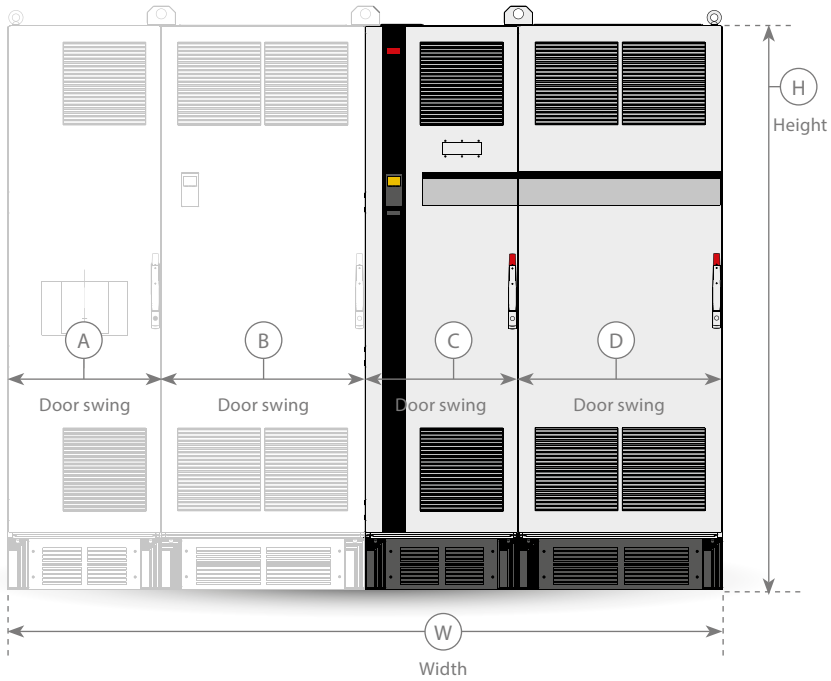
		VLT® 12-pulse					
Frame		F8	F9	F10	F11	F12	F13
			(F8 + options cabinet)		(F10 + options cabinet)		(F12 + options cabinet)
H mm (inches)		2280 (90)	2280 (90)	2280 (90)	2280 (90)	2280 (90)	2280 (90)
H1 mm (inches)		2205 (87)	2205 (87)	2205 (87)	2205 (87)	2205 (87)	2205 (87)
W mm (inches)		806 (32)	1404 (55)	1606 (32)	2401 (95)	2006 (79)	2802 (110)
D mm (inches)		607 (24)	607 (24)	607 (24)	607 (24)	607 (24)	607 (24)
Door swing A mm (inches)		776 (30)	593 (23)	776 (30)	776 (30)	776 (30)	776 (30)
Door swing B mm (inches)		n/a	776 (30)	776 (30)	776 (30)	592 (23)	776 (30)
Door swing C mm (inches)		n/a	n/a	n/a	776 (30)	592 (23)	592 (23)
Door swing D mm (inches)		n/a	n/a	n/a	n/a	n/a	592 (23)
Air cooling	O (air space outlet) mm (inches)	225 (9)	225 (9)	225 (9)	225 (9)	225 (9)	225 (9)
	C1	IP 21/NEMA 1 1400 m³/hr (824 CFM) IP 54/NEMA 12 1050 m³/hr (618 CFM)	IP 21/NEMA 1 2100 m³/hr (1236 CFM) IP 54/NEMA 12 1575 m³/hr (927 CFM)	IP 21/NEMA 1 2800 m³/hr (1648 CFM) IP 54/NEMA 12 2100 m³/hr (1236 CFM)	IP 21/NEMA 1 4200 m³/hr (2472 CFM) IP 54/NEMA 12 3150 m³/hr (1854 CFM)	IP 21/NEMA 1 2800 m³/hr (1648 CFM) IP 54/NEMA 12 3150 m³/hr (1854 CFM)	IP 21/NEMA 1 4200 m³/hr (2472 CFM) IP 54/NEMA 12 3150 m³/hr (1854 CFM)
	C2	1970 m³/hr (1160 CFM)	1970 m³/hr (1160 CFM)	3940 m³/hr (2320 CFM)	3940 m³/hr (2320 CFM)	4925 m³/hr (2900 CFM)	4925 m³/hr (2900 CFM)
Weight	IP 21 / NEMA 1 kg (lb) IP 54 / NEMA 12 kg (lb)	440 (880)	656 (1443)	880 (1936)	1096 (2411)	1022 (2248)	1238 (2724)
Efficiency		0.98					
Max. cable cross-section to motor output terminals (per phase) – mm² (AWG)		8 x 150 (8 x 300 mcm)		8 x 150 (8 x 300mcm)		12 x 150 (12 x 300 mcm)	
Max. cable cross-section to regeneration terminals (per-DC/+DC)		4 x 120 (4 x 250 mcm)					
Max. cable cross-section to brake resistor terminals (per -R/+R)		2 x 185 (2 x 350 mcm)		4 x 185 (4 x 350 mcm)			
Max. cable cross-section to input mains terminals (per phase)		8 x 250 (8 x 500 mcm)					
Max. external input mains fuses [A]		630	630	900	900	2000	2000

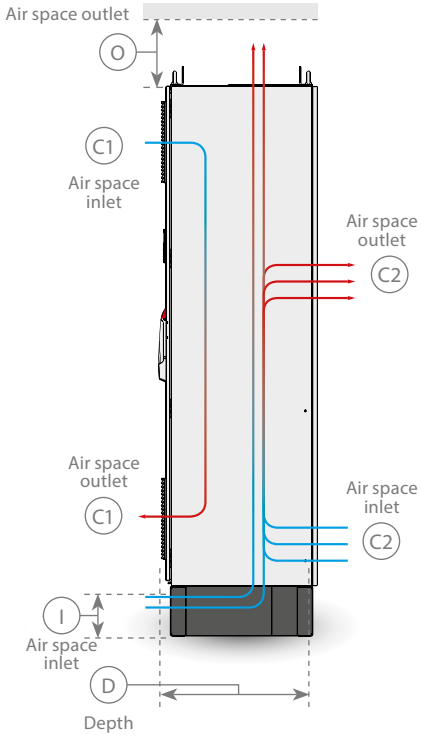
VLT® Advanced Active Filter dimensions mm (inch)





VLT® Low Harmonic Drive dimensions mm (inch)

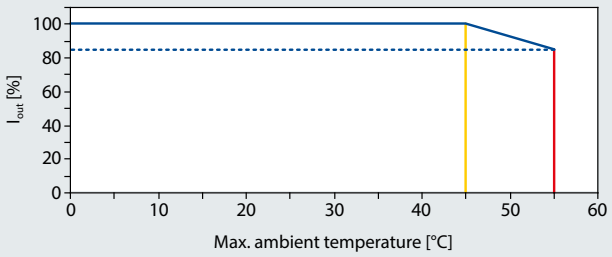




		VLT® Advanced Active filter AAF 006		VLT® Low Harmonic Drive		
Frame		D14	E1	D 13	E 9	F18
H mm (inches)		1780 (70)	2000 (79)	1780 (70)	2001 (79)	2277 (90)
W mm (inches)		600 (24)	600 (24)	1022 (40)	1200 (47)	2792 (110)
D mm (inches)		378 (15)	494 (20)	378 (15)	494 (19)	605 (24)
Door swing A mm (inches)		574 (23)	577 (23)	577 (23)	577 (23)	590 (23)
Door swing B mm (inches)		n/a	n/a	395 (16)	577 (23)	784 (31)
Door swing C mm (inches)		n/a	n/a	n/a	n/a	590 (23)
Door swing D mm (inches)		n/a	n/a	n/a	n/a	784 (31)
Air cooling	O (air space outlet) mm (inches)	225 (9)	225 (9)	225 (9)	225 (9)	225 (9)
Air cooling	C1	765 m³/hr (450 CFM)	1230 m³/hr (724 CFM)	IP 21/NEMA 1 510 m³/hr (300 CFM)	IP 21/NEMA 1 680 m³/hr (400 CFM) IP 54/NEMA 12 680 m³/hr (400 CFM)	IP 21/NEMA 1 4900 m³/hr (2884 CFM)
Air cooling	C2	340 m³/hr (200 CFM)	340 m³/hr (200 CFM)	IP 21/NEMA 1 2295 m³/hr (1350 CFM)	IP 21/NEMA 1 2635 m³/hr (1550 CFM) IP 54/NEMA 12 2975 m³/hr (1750 CFM)	IP 21/NEMA 1 6895 m³/hr (4060 CFM)
Weight	IP 21 / NEMA 1	238 (525)	AAF 250/310 429 (945)	390 (860)	676 (1491)	1899 (4187)
Weight	IP 54 / NEMA 12		AAF 400 453 (998)			
Efficiency				0.96		
Max. cable cross-section to motor output terminals (per phase) – mm² (AWG)		n/a		2 x 185 (2 x 300 mcm)	4 x 240 (4 x 500 mcm)	8 x 150 (8 x 300 mcm)
Max. cable cross-section to loadsharing terminals (per -DC/+DC)						4 x 120 (4 x 250 mcm)
Max. cable cross-section to brake resistor terminals (per -R/+R)					2 x 185 (2 x 300 mcm)	4 x 185 (4 x 350 mcm)
Max. cable cross-section to input mains terminals (per phase)		*Please see further AAF information on page 27*			4 x 240 (4 x 500 mcm)	8 x 240 (8 x 500 mcm)
Max. external input mains fuses [A] *(Typical shaft output @ high overload)*				132 kW @ 400 V: 400 160 kW @ 400 V: 500 200 kW @ 400 V: 630	250 kW @ 400 V: 700 315 kW @ 400 V: 900 355 kW @ 400 V: 900 400 kW @ 400 V: 900	450 kW @ 400 V: 1600 500 kW @ 400 V: 1600 560 kW @ 400 V: 2000 630 kW @ 400 V: 2000
Estimated power loss at max load [W] *(Typical shaft output @ high overload)*				132 kW @ 400 V: 8988 160 kW @ 400 V: 10844 200 kW @ 400 V: 11855	250 kW @ 400 V: 13311 315 kW @ 400 V: 14577 355 kW @ 400 V: 16396 400 kW @ 400 V: 17703	450 kW @ 400 V: 22401 500 kW @ 400 V: 25110 560 kW @ 400 V: 27323 630 kW @ 400 V: 31268

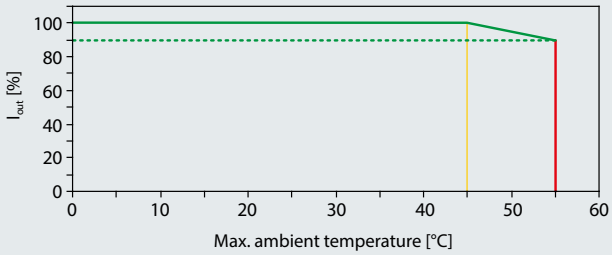
VLT® High Power Drive special conditions

Normal overload drives for VLT® HVAC Drive and VLT® AQUA Drive



Derating curve based on default switching pattern (of 60 degrees AVM).
Curve represents a derating of 1.5%/degree C.
Please see Design Guide for further information.

High overload drives for VLT® AutomationDrive



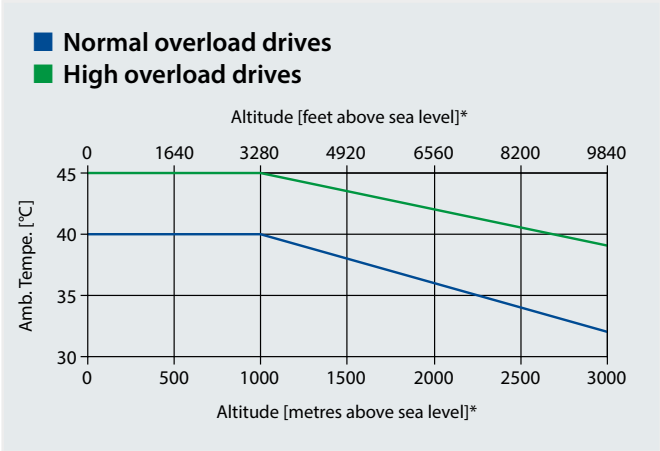
Derating curve based on default switching pattern (of SFAVM).
Curve represents 1%/ degree C.

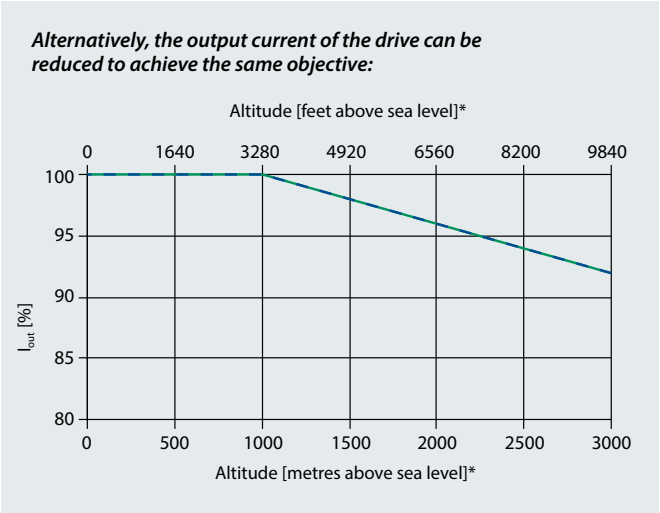
Derating in high ambient temperatures

VLT® series drives can provide 100% of their rated output current in environments with ambient temperatures of up to 45° C with default drives settings. In environments with higher ambient temperatures, VLT® series drives can still operate by reducing the output current in accordance with the following charts to the left:

As shown to the left, when the ambient temperature is 55° C, high overload drives can provide 90% of their rated output current, and normal overload drives can provide 85% of their rated output current.

For derating options related to switching frequency, see the VLT® HVAC Drive, VLT® AQUA Drive or VLT® AutomationDrive design guide.





Derating in high altitudes

The thinner air at higher altitudes reduces the effective cooling capabilities of the drive. Reliable operation in higher altitudes can still be assured as long as the ambient temperature remains within the ranges specified in the chart to the left:

** 690 V drives are limited to 6560' (2000 m) above sea level based on PELV requirements.*

VLT® Advanced Harmonic Filters

Perfect

match for:

- **Industrial automation**
- **High dynamic applications**
- **Safety installations**

Optimised harmonic performance with the VLT® FC series.

The Danfoss Advanced Harmonic Filters have been specially designed to match the Danfoss frequency converters for unmatched performance and design.

Compared to traditional harmonic trap filters they offer a smaller foot print and higher harmonic reduction.

The solution is available in two variants, AHF 005 and AHF 010. When connected in front of a Danfoss VLT® frequency converter, the harmonic current distortion generated back to the mains is reduced to 5% and 10% Total Harmonic Current Distortion at full load.

With a >98% efficiency the passive Advanced Harmonic Filters offer cost effective and very robust harmonic solutions.

As stand-alone options the advanced harmonic filters feature a compact housing that is easily integrated into existing panel space. This makes them well-suited for retrofit applications with limited adjustments of the frequency converter.

Line Voltage

- 380 – 415 V AC (50 and 60 Hz)
- 440 – 480 V AC (60 Hz)
- 500 – 525 V (50 Hz)*
- 690 V (50 Hz)

Filter current

- 380 – 415 V, 50/60 Hz ..... 130 A – 1720 A
- 440 – 480 V, 60 Hz .....118 A – 1580 A

Ratings

- 500-525 and 690 V

Enclosure degree

- IP 20/IP 00

Specifications

	AHF 010	AHF 005
THiD* at: – 40% load – 70% load – 100% load	 ~ 12% ~ 11% < 10%	 ~ 7% ~ 6% < 5%
Efficiency* at 100% load	>98.5%	
True power factor* at: – 40% load – 70% load – 100% load	 ~ 81% ~ 96% > 99%	 ~ 80% ~ 95% > 98%
Ambient temperature	45° C without derating	
Cooling	Back-channel air cooling	

** Measured at balanced grid without pre-distortion*

Norms and recommendations	Compliance
IEEE519	AHF 005 always AHF 010 depends on grid and load conditions
IEC61000-3-2 (up to 16 A)	Always
IEC61000-3-12 (between 16 and 75 A)	Always
IEC61000-3-4 (above 75 A)	Always

Ordering numbers and dimensions

VLT® Advanced Harmonic Filters

Dimensions

Dimensions in mm (inch)

Enclosure type	A Height	B Width	C Depth
X5	747 (29)	370 (15)	333 (13)
X6	778 (31)	370 (15)	400 (16)
X7	909 (36)	468 (18)	450 (18)
X8	911 (36)	468 (18)	550 (22)

	Current (Amps)	Typical motor power (kW)	AHF 005			AHF010		
			Ordering number IP 20	Ordering number IP 00	Frame size	Ordering number IP 20	Ordering number IP 00	Frame size
380-415 V, 50 Hz	133	75	130B1249	130B1444	X5	130B1207	130B1293	X5
	171	90	130B1250	130B1445	X6	130B1213	130B1294	X6
	204	110	130B1251	130B1446	X6	130B1214	130B1295	X6
	251	132	130B1258	130B1447	X7	130B1215	130B1369	X7
	304	160	130B1259	130B1448	X7	130B1216	130B1370	X7
	325	Paralleling for 355 kW	130B3152	130B3153	X8	130B3136	130B3151	X7
	381	200	130B1260	130B1449	X8	130B1217	130B1389	X7
	480	250	130B1261	130B1469	X8	130B1228	130B1391	X8
	608	315	2 x 130B1259	2 x 130B1448		2 x 130B1216	2 x 130B1370	
	650	355	2 x 130B3152	2 x 130B3153		2 x 130B3136	2 x 130B3151	
	685	400	130B1259 + 130B1260	130B1448 + 130B1449		130B1216 + 130B1217	130B1370 + 130B1389	
	762	450	2 x 130B1260	2 x 130B1449		2 x 130B1217	2 x 130B1389	
	861	500	130B1260 + 130B1261	130B1449 + 130B1469		130B1217 + 130B1228	130B1389 + 130B1391	
	960	560	2 x 130B1261	2 x 130B1469		2 x 130B1228	2 x 130B1391	
	1140	630	3 x 130B1260	3 x 130B1449		3 x 130B1217	3 x 130B1389	
	1240	710	2 x 130B1260 + 130B1261	2 x 130B1449 + 130B1469		2 x 130B1217 + 130B1228	2 x 130B1389 + 130B1391	
	1440	800	3 x 130B1261	3 x 130B1469		3 x 130B1228	3 x 130B1391	
	1720	1000	2 x 130B1260 + 2 x 130B1261	2 x 130B1449 + 2 x 130B1469		2 x 130B1217 + 2 x 130B1228	2 x 130B1389 + 2 x 130B1391	
380-415 V, 60 Hz	133	75	130B2867	130B3129	X5	130B2498	130B3088	X5
	171	90	130B2868	130B3130	X6	130B2499	130B3089	X6
	204	110	130B2869	130B3131	X6	130B2500	130B3090	X6
	251	132	130B2870	130B3132	X7	130B2700	130B3091	X7
	304	160	130B2871	130B3133	X8	130B2819	130B3092	X7
	325	Paralleling for 355 kW	130B3156	130B3157	X8	130B3154	130B3155	X7
	381	200	130B2872	130B3134	X8	130B2855	130B3093	X7
	480	250	130B2873	130B3135	X8	130B2856	130B3094	X8
	608	315	2 x 130B2871	2 x 130B3133		2 x 130B2819	2 x 130B3092	
	650	315	2 x 130b3156	2 x 130B3157		2 x 130B3154	2 x 130B3155	
	685	355	130B2871 + 130B2872	130B3133 + 130B3134		130B2819 + 130B2855	130B3092 + 130B3093	
	762	400	2 x 130B2872	2 x 130B3134		2 x 130B2855	2 x 130B3093	
	861	450	130B2872 + 130B3135	130B3134 + 130B3135		130B2855 + 130B2856	130B3093 + 130B3094	
	960	500	2 x 130B2873	2 x 130B3135		2 x 130B2856	2 x 130B3094	
	1140	560	2 x 130B2872	3 x 130B3134		2 x 130B2855	3 x 130B3093	
	1240	630	2 x 130B2872 + 130B2873	2 x 130B3134 + 130B3135		2 x 130B2855 + 130B2856	2 x 130B3093 + 130B3094	
	1440	710	3 x 130B2873	3 x 130B3135		3 x 130B2856	3 x 130B3094	
	1720	800	2 x 130B2872 + 2 x 130B2873	2 x 130B3134 + 2 x 130B3135		2 x 130B2855 + 2 x 130B2856	2 x 130B3093 + 2 x 130B3094	

Ordering numbers and dimensions

VLT® Advanced Harmonic Filters

	Current (Amps)	Typical motor power	AHF 005			AHF010		
			Ordering number IP 20	Ordering number IP 00	Frame size	Ordering number IP 20	Ordering number IP 00	Frame size
440-480 V, 60 Hz	118	100 hp	130B1762	130B1797	X5	130B1494	130B1780	X5
	154	125 hp	130B1763	130B1798	X6	130B1495	130B1781	X6
	183	150 hp	130B1764	130B1799	X6	130B1496	130B1782	X6
	231	200 hp	130B1765	130B1900	X7	130B1497	130B1783	X7
	291	250 hp	130B1766	130B2200	X8	130B1498	130B1784	X7
	355	300 hp	130B1768	130B2257	X8	130B1499	130B1785	X7
	380		130B1767	130B3168	X8	130B3165	130B3166	X7
	436	350 hp *Paralleling at 650 hp*	130B1769	130B2259	X8	130B1751	130B1786	X8
	522	450 hp	130B1765 + 130B1766	130B1900 + 130B2200		130B1497 + 130B1498	130B1783 + 130B1784	
	582	500 hp	2 X 130B1766	2 x 130B2200		2 x 130B1498	2 x 130B1784	
	671	550 hp	130B1766 +130B3167	130B2200 + 130B3166		130B1498 + 130B3165	130B1784 + 130B3166	
	710	600 hp	2 X 130B1768	2 x 130B2257		2 x 130B1499	2 x 130B1785	
	760	650 hp	2 X 130B3167	2 x 130B3168		2 x 130B3165	2 x 130B3166	
	872	750 hp	2 X 130B1769	2 x 130B2259		2 x 130B1751	2 x 130B1786	
	1065	900 hp	3 X 130B1768	3 x 130B2257		3 x 130B1499	3 x 130B1785	
	1140	1000 hp	3 X 130B3167	3 x 130B3168		3 x 130B3165	3 x 130B3166	
	1308	1200 hp	3 x 130B1769	3 x 130B2259		3 x 130B1751	3 x 130B1786	
	1582	1350 hp	2 x 130B1768 + 2 x 130B1769	2 x 130B2257 + 2 x 130B2259		2 x 130B1499 + 2 x 130B1751	2 x 130B1785 + 2 x 130B1786	
500-690 V, 50 Hz	109	75 kW	130B5172	130B5026	X6	130B5289	130B5327	X6
	128	90 kW	130B5195	130B5028	X6	130B5290	130B5328	X6
	155	110 kW	130B5196	130B5029	X7	130B5291	130B5329	X7
	197	132 kW	130B5197	130B5042	X7	130B5292	130B5330	X7
	240	160 kW	130B5198	130B5066	X8	130B5293	130B5331	X7
	296	200 kW	130B5199	130B5076	X8	130B5294	130B5332	X8
	366	250 kW	2 x 130B5197	2 x 130B5042		130B5295	130B5333	X8
	395	315 kW	2 x 130B5197	2 x 130B5042		130B5296	130B5334	X8
	437	355 kW	130B5197 + 130B5198	130B5042 + 130B5066		130B5292 + 130B5293	130B5330 + 130B5331	
	536	400 kW	130B5198 + 130B5199	130B5066 + 130B5076		130B5292 + 130B5294	130B5331 + 130B5332	
	592	450 kW	2 x 130B5199	2 x 130B5076		2 x 130B5294	2 x 130B5332	
	662	500 kW	130B5199 + 2 x 130B5197	130B5076 + 2 x 130B5042		130B5294 + 130B5295	130B5332 + 130B5333	
	732	560 kW	4 x 130B5197	4 x 130B5042		2 x 130B5295	2 x 130B5333	
	888	670 kW	3 x 130B5199	3 x 130B5076		3 x 130B5294	3 x 130B5332	
	958	750 kW	2 x 130B5199 + 2 x 130B5197	2 x 130B5076 + 2 x 130B5042		2 x 130B5294 + 130B5295	2 x 130B5332 + 130B5333	
	1098	850 kW	6 x 130B5197	6 x 130B5042		3 x 130B5295	3 x 130B5333	
600 V, 60 Hz	87	75 hp	130B5254	130B5269	X6	130B5220	130B5237	X6
	109	100 hp	130B5255	130B5270	X6	130B5221	130B5238	X6
	128	125 hp	130B5256	130B5271	X6	130B5222	130B5239	X6
	155	150 hp	130B5257	130B5272	X7	130B5223	130B5240	X7
	197	200 hp	130B5258	130B5273	X7	130B5224	130B5241	X7
	240	250 hp	130B5259	130B5274	X8	130B5225	130B5242	X7
	296	300 hp	130B5260	130B5275	X8	130B5226	130B5243	X8
	366	350 hp	2 x 130B5258	2 x 130B5273		130B5227	130B5244	X8
	395	400 hp	2 x 130B5258	2 x 130B5273		130B5228	130B5245	X8
	480	500 hp	2 x 130B5259	2 x 130B5274		2 x 130B5225	2 x 130B5242	
	592	600 hp	2 x 130B5260	2 x 130B5275		2 x 130B5226	2 x 130B5243	
	732	650 hp	3 x 130B5259	3 x 130B5274		2 x 130B5227	2 x 130B5244	
	732	750 hp	3 x 130B5259	3 x 130B5274		2 x 130B5227	2 x 130B5244	
	888	950 hp	3 x 130B5260	3 x 130B5275		3 x 130B5226	3 x 130B5243	
	960	1050 hp	4 x 130B5259	4 x 130B5274		3 x 130B5227	3 x 130B5244	
	1098	1150 hp	4 x 130B5260	4 x 130B5275		3 x 130B5227	3 x 130B5244	
	1580	1350 hp				3 x 130B5227	3 x 130B5244	

Output filters

Why use output filters?

- Protection of motor insulation
- Reduction of motor acoustic noise
- Reduction of high frequency electromagnetic noise in the motor cable
- Reduction of Bearing currents and shaft voltage

Application Areas

Sine-wave Filter

- Applications where the acoustic switching noise from the motor has to be eliminated
- Retro fit instatllations with old motors using poor insulation
- Applications with frequent regenerative braking and motors that do not comply with IEC 600034-17
- Motor is in an aggressive environment or is running at high temperatures
- Applications with motor cables between 150 m – 300 m (screened or unscreened). Use of motor cables longer than 300 m is application dependant
- Applications with increased service intervals on the motor
- 690 V applications with general purpose motors
- Step-up applications or other applications where the frequency converter feeds a transformer

dU/dt Filter

- Applications with frequent regenerative braking
- Motors that are not rated for frequency converter operation and not complying with IEC 600034-25
- Motors placed in aggressive environments or running at high temperatures
- Applications with risk of flash over
- Retrofit applications or using general purpose motors not complying with IEC 600034-17
- Application with short motor cables (less than 15 m)
- 690 V applications

High-Frequency Common Mode Core Filters

- Applications with unshielded motor cables
- Should not be used as the sole mitigation measure

Reduction of Motor Acoustic Noise

1. The magnetic noise produced by themotor core, through magnetostriction
2. The noise produced by the motor bearings
3. The noise produced by the motor ventilation

When a motor is fed by a frequency converter, the pulsewidth modulated (PWM) voltage applied to the motor causes additional magnetic noise at the switching frequency and harmonics of the switching frequency (mainly the double of the switching frequency). In some applications this is not acceptable.In order to eliminate this additional switching noise, a sine-wave filter should be used. This will filter the pulse shaped voltage from the frequency converter and provide a sinusoidal phase-to-phase voltage at the motor terminals.

Performance criteria	du/dt Filters	Sine-wave Filters	High-frequency Common Mode Filters
Motor insulation stress	Up to 150 m cable (shielded/unshielded) complies with the requirements of IEC60034-17* (general purpose motors). Above this cable length the risk of "double pulsing" increases.	Provides a sinusoidal phase-to-phase motor terminal voltage. Complies with IEC-60034-17* and NEMA-MG1 requirements for general purpose motors with cables up to 500 m (1 km for frame size D and above).	Does not reduce motor insulation stress.
Motor bearing stress	Slightly reduced, mainly in high power motors.	Reduces bearing currents caused by circulating currents. Does not reduce common-mode currents (shaft currents).	Reduces bearing stress by limiting common mode high-frequency currents.
EMC performance	Eliminates motor cable ringing. Does not change the emission class. Does not allow longer motor cables as specified for the frequency converter's built-in RFI filter.	Eliminates motor cable ringing. Does not change the emission class. Does not allow longer motor cables as specified for the frequency converter's built-in RFI filter.	Reduces high-frequency emissions (above 1 MHz). Does not change the emission class of the RFI filter. Does not allow longer motor cables as specified for the frequency converter.
Max. motor cable length	100 m ... 150 m With guaranteed EMC performance: 150 m screened Without guaranteed EMC performance: 150 m unscreened	With guaranteed EMC performance: 150 m shielded and 300 m unshielded (only conducted emissions). Without guaranteed EMC performance: up to 500 m (1 km for frame size D and above).	300 m screened (frame size D, E, F), 300 m unscreened
Acoustic motor switching noise	Does not eliminate acoustic switching noise from the motor.	Eliminates acoustic switching noise from the motor caused by magnetostriction.	Does not eliminate acoustic switching noise.
Relative size	15 – 50% (depending on power size).	100%	5 – 15%
Relative price	50%	100%	None

**Not 690 V*

VLT® Common Mode Filters

Effective

In reduction of electromagnetic interference.

High-frequency common-mode core filters reduce electromagnetic interference and eliminate bearing damage by electrical discharge.

High-frequency common-mode (HF-CM) cores are special nanocrystalline magnetic cores which have superior filtering performance compared to regular ferrite cores. They act like a common-mode inductor (between phases and ground).

Installed around the three motor phases (U, V, W), they reduce high-frequency common-mode currents. As a result, high-frequency electromagnetic interference from the motor cable is reduced. However, the core kit should not be used as the sole mitigation measure. Even when the cores are used, the EMC installation rules should be followed.

Prevent motor bearing currents

The most important function is to reduce high-frequency currents associated with electrical discharges in the motor currents. These discharges contribute to the premature wear-out and failure of motor bearings. By reducing or even eliminating discharges, the bearing wear is reduced and the lifetime extended. Thus, maintenance and down-time costs are lowered.

Feature	Benefit
– High-performance nanocrystalline magnetic material	– Effective reduction of electrical discharges in the motor bearings – Reduces bearing wear-out, maintenance costs and down-time – Reduces high-frequency electromagnetic interference from the motor cable
– Oval shape – Scalable solution: longer cables handled by stacking more cores	– Easy to install in restricted places such as the VLT® enclosure or the motor terminal box
– Only 4 core sizes cover the entire VLT® power range	– Easy logistics, fast delivery and comprehensible product program – Allows the addition to a service tool-kit
– Low investment	– Cost-effective alternative to, for example, sine-wave filters if the only phenomena to be mitigated is bearing wear-out through electrical discharge

Ideal for retrofitting

Bearing current problems are most often discovered after commissioning. Therefore, the cores have an oval shape which makes them ideal for retrofitting and for installation in restricted places.

Only 4 variants cover the entire VLT® product range making it possible to carry these valuable aids in a service tool kit.

A flexible solution

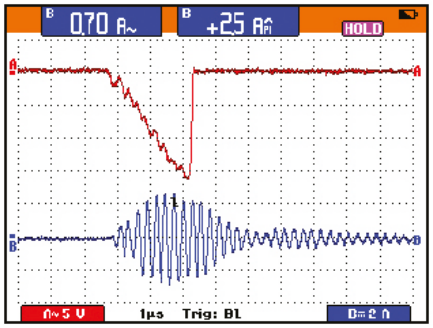
The cores can be combined with other output filters (especially in combination with dU/dt filters) they offer a low cost solution for protection of both motor bearings and insulation.

Product range

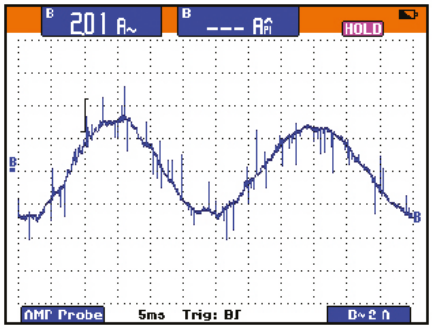
- Available for all power sizes from 0.18 kW to 1.4 MW
- 4 core sizes cover the entire VLT® power range

HF-CM selector

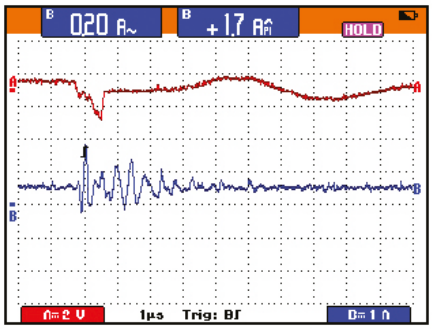
The cores can be installed at the frequency converter's output terminals (U, V, W) or in the motor terminal box. When installed at the frequency converter's terminals, the HF-CM kit reduces bearing stress and high-frequency electromagnetic interference from the motor cable. The number of cores depends on motor cable length and frequency converter voltage. A selection table is shown to the right.



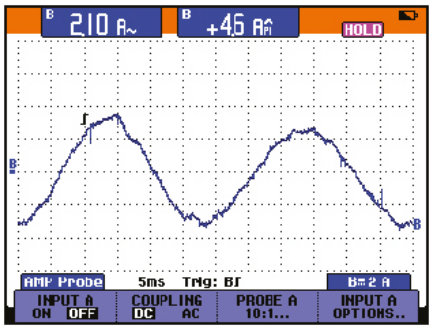
Shaft voltage and bearing current without HF-CM



Grounding current without HF-CM



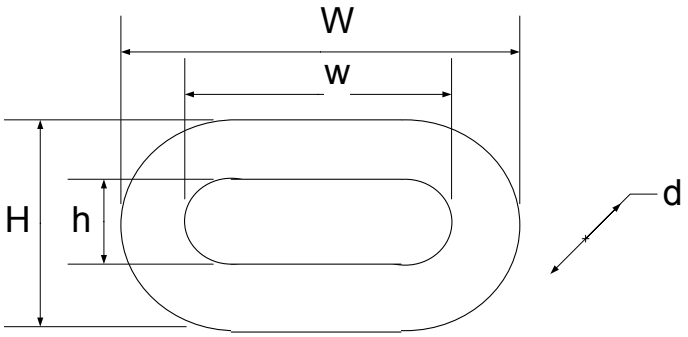
Shaft voltage and bearing current with HF-CM



Grounding current with HF-CM core

Cable length [m]	D frame		E and F frame	
	T4/T5	T7	T5	T7
50	2	4	2	2
100	4	4	2	4
150	4	4	4	4
300*	4	6	4	4

** Longer cable lengths are easily handled by stacking more HF-CM cores.*



Ordering numbers and dimensions

Ordering numbers for the core kits (2 cores per kit) are given in the table below.

VLT® Frame Size	Danfoss ordering number	Core dimension [mm]					Weight	Packaging dimension
		W	w	H	h	d	[kg]	[mm]
D	130B3259	189	143	126	80	37	2.45	235 x 190 x 140
E and F	130B3260	305	249	147	95	37	4.55	290 x 260 x 110

Installation

The HF-CM cores are easy to install: Simply pass the three motor phase leads (U, V, W) through the cores.

VLT® Power Option dU/dt Filter

dU/dt filters reduce the dU/dt values on the motor terminal phase-to-phase voltage – an issue that is important for short motor cables.

dU/dt filters are differential-mode filters which reduce motor terminal phase-to-phase peak voltage spikes and reduce the rise time to a level that lowers the stress on the insulation of motor windings.

Compared to sine-wave filters, the dU/dt filters have a cut-off frequency above the switching frequency. The voltage at the motor terminals is still PWM pulse shaped, but the rise time and Upeak are reduced. They are smaller, weigh less and have a lower price compared to sine-wave filters. Furthermore, because of the smaller inductance and capacitance, the dU/dt filters introduce a negligible reactance between inverter and motor and are therefore suitable for high dynamic applications.

Superior compared to output chokes

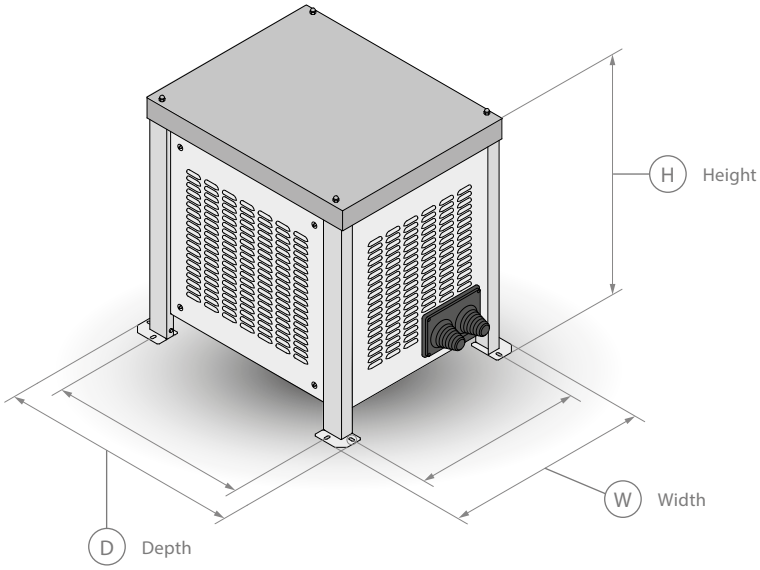
Output chokes cause undamped oscillations at the motor terminals which increase the risk of double pulsing and over-voltages higher than twice the DC link voltage. The dU/dt filters are low-pass L-C filters with a well defined cut-off frequency. Therefore the ringing oscillations at the motor terminals are damped and there is a reduced risk of double pulsing and voltage peaks.

Quality and Design

All dU/dt filters are designed and tested for operation with the VLT® AutomationDrive FC 302, VLT® AQUA Drive FC 202, and the VLT® HVAC Drive FC 102. They are designed to match the look and quality of the VLT® FC series drives.

Advantages

- Compatible with all control principles, including flux and VVC+
- Parallel filter installation is possible for applications in the high power range



Dimensions – all units are floor mounted

IP rating	Ordering number	Height		Width		Depth	
		mm	inches	mm	inches	mm	inches
IP 00	130B2847	300	12	190	7	235	9
	130B2849	300	12	250	10	235	9
	130B2851	350	14	250	10	270	11
	130B2853	400	16	290	11	283	11
IP 23	130B2848 130B2850 130B2852	425	17	700	28	620	24
	130B2854	792	31	940	37	918	36

Except as noted, selected filters are based on one filter per inverter module.
See the Output Filters Design Guide for additional information.

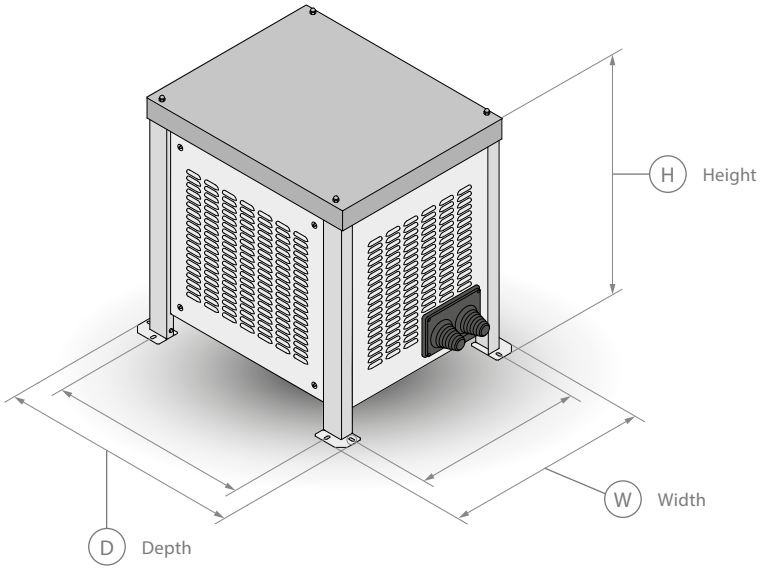
Typical application ratings

380-500 V (T5)						525-690 V (T7)						Frame	Filter ordering number	
400 V, 50 Hz		460 V, 60 Hz		500 V, 50 Hz 441-500 V		525 V, 50 Hz 525-550 V		575 V, 60 Hz		690 V, 50 Hz 525-550 V				
kW*	A	hp*	A	kW*	A	kW*	A	hp*	A	kW*	A	Size	IP 00	IP 23
90	177	125	160	110	160	90	137	125	131			D1h/D3h/D5h/D6h	130B2847	130B2848
110	212	150	190	132	190	110	162	150	155	110	131	D1h/D3h/D5h/D6h		
132	260	200	240	160	240	132	201	200	192	132	155	D1h/D3h/D5h/D6h, D2h, D4h, D7h, D8h, D13		
160	315	250	302	200	302	160	253	250	242	160	192	D2h, D4h, D7h, D8h, D13		
200	395	300	361	250	361	200	303	300	290	200	242	D2h, D4h, D7h, D8h, D13	130B2849	130B3850
250	480	350	443	315	443	250	360	350	344	250	290	D2h, D4h, D7h, D8h, D13, E1/E2, E9, F8/F9		
315	600	450	540	355	540	315	429	400	410	315	344	E1/E2, E9, F8/F9	130B2851	130B2852
355	658	500	590	400	590	355	470	450	450	355	380	E1/E2, E9, F8/F9		
										400	410	E1/E2, F8/F9		
										450	450	E1/E2, F8/F9	130B2853	130B2854
400	745	600	678	500	678	400	523	500	500	500	500	E1/E2, E9, F8/F9		
450	800	600	730	530	730	450	596	600	570	560	570	E1/E2, E9, F8/F9		
						500	630	650	630	630	630	E1/E2, F8/F9		
450	800	600	730	530	730							F1/F3, F10/F11, F18	2 x 130B2849[2) 4)]	2 x 130B2850[2) 4)]
500	880	650	780	560	780	500	659	650	630			F1/F3, F10/F11, F18		
										630[2)]	630[2)]	F1/F3, F10/F11	2 x 130B2851[4)]	2 x 130B2852[4)]
560	990	750	890	630	890	560	763	750	730	710	730	F1/F3, F10/F11, F18		
630	1120	900	1050	710	1050	670	889	950	850	800	850	F1/F3, F10/F11, F18		
710	1260	1000	1160	800	1160	750	988	1050	945			F1/F3, F10/F11, F18	2 x 130B2851[4)]	2 x 130B2852[4)]
										900	945	F1/F3, F10/F11	2 x 130B2853[4)]	2 x 130B2854[4)]
710	1260	1000	1160	800	1160	750	988	1050	945			F2/F4, F12/F13	3 x 130B2849[5)]	3 x 130B2850[5)]
										900	945	F2/F4, F12/F13	3 x 130B2851[5)]	3 x 130B2852[5)]
800	1460	1200	1380	1000	1380	850	1108	1150	1060	1000	1060	F2/F4, F12/F13		
1000	1720	1350	1530	1100	1530	1000	1317	1350	1260	1200	1260	F2/F4, F12/F13		
						1100	1479	1550	1415	1400	1415	F2/F4, F12/F13	3 x 130B2853[5)]	3 x 130B2854[5)]

[1)] For derating with motor frequency consider 60 Hz rating = 0.94 x 50 Hz rating and 100 Hz rating = 0.75 x 50 Hz rating
[2)] Alternatively, these ratings could use a single filter 130B2853 or 130B2854, with an optional L terminal bracket to accept cables from two inverters.
[3)] 525 V ratings require a T7 (525-690 V) drive
[4)] Drive includes two inverters. Install one filter per inverter.
[5)] Drive includes three inverter. Install one filter per inverter.
* Actual power rating, not the part of the drive type code.

VLT® Power Option Sine-Wave Filter

Sine-wave output filters are low-pass filters that suppress the switching frequency component from the drive and smooth out the phase-to-phase output voltage of the drive to become sinusoidal. This reduces the motor insulation stress and bearing currents.



Dimensions – all units are floor mounted

IP rating	Ordering number	Height		Width		Depth	
		mm	inches	mm	inches	mm	inches
IP 00	130B3182	580	23	470	19	311	12
	130B3184	520	20	500	20	350	14
	130B3186 130B3188	520	20	500	20	400	16
	130B3191 130B3193	620	24	620	24	583	23
	130B4118	520	20	470	19	332	13
	130B4121	470	19	500	20	400	16
	130B4125	535	21	660	26	460	18
	130B4129 130B4152	660	26	800	32	610	24
	130B4154	660	26	800	32	684	27
	130B4156	490	19	800	32	713	28
IP 23	130B3183 130B3185 130B3187	918	36	904	36	792	31
	130B3189 130B3192 130B3194	1161	46	1260	50	991	39
	130B4119	715	28	798	31	620	24
	130B4124	918	36	940	37	792	31
	130B4126 130B4151 130B4153 130B4155 130B4157	1161	46	1260	49.61	991	39

Except as noted, selected filters are based on one filter per inverter module.
See the Output Filters Design Guide for additional information.

By supplying the motor with a sinusoidal voltage waveform, the switching acoustic noise from the motor is also eliminated.

Thermal losses and bearing currents

The sinusoidal voltage supply to the motor reduces hysteresis thermal losses in the motor. Since the motor insulation lifetime is dependent on the motor temperature, the sine-wave filter prolongs the lifetime of the motor.

The sinusoidal motor terminal voltage from the sine-wave filter furthermore has the advantage of suppressing any bearing currents in the motor. This reduces the risk of flashover in the motor bearings and thereby also contributes to extended motor lifetime and increased service intervals.

Quality and Design

All filters are designed and tested for operation with the VLT® Automation-Drive FC 302, VLT® AQUA Drive FC 202, and the VLT® HVAC Drive FC 102. They are rated for the nominal switching frequency of the VLT® FC series and therefore no derating of the drive is needed.

The enclosure is designed to match the look and quality of the VLT® FC series drives.

Advantages

- Compatible with all control principles including flux and VVC+
- Parallel filter installation is possible for applications in the high power range

Typical application ratings for drives rated 380-500 V

	400 V, 50 Hz		460 V, 60 Hz		500 V, 50 Hz		Frame	Filter ordering number	
	kW	A	hp	A	kW	A	Size	IP 00	IP 23
380-500 VAC	90	177	125	160	110	160	D1h/D3h/D5h/D6h	130B3182	130B3183
	110	212	150	190	132	190	D1h/D3h/D5h/D6h	130B3184	130B3185
	132	260	200	240	160	240	D1h/D3h/D5h/D6h, D2h, D4h, D7h, D8h, D13		
	160	315	250	302	200	302	D2h, D4h, D7h, D8h, D13	130B3186	130B3187
	200	395	300	361	250	361	D2h, D4h, D7h, D8h, D13		
	250	480	350	443	315	443	D2h, D4h, D7h, D8h, D13, E1/E2, E9, F8/F9	130B3188	130B3189
	315	600	450	540	355	540	E1/E2, E9, F8/F9	130B3191	130B3192
	355	658	500	590	400	590	E1/E2, E9, F8/F9		
	400	745	600	678	500	678	E1/E2, E9, F8/F9	130B3193	130B3194
	450	800	600	730	530	730	E1/E2, E9, F8/F9		
	450	800	600	730	530	730	F1/F3, F10/F11, F18	2 x 130B3186[1]	2 x 130B3187[1]
	500	880	650	780	560	780	F1/F3, F10/F11, F18	2 x 130B3188[1]	2 x 130B3189[1]
	560	990	750	890	630	890	F1/F3, F10/F11, F18		
	630	1120	900	1050	710	1050	F1/F3, F10/F11, F18	2 x 130B3191[1]	2 x 130B3192[1]
	710	1260	1000	1160	800	1160	F1/F3, F10/F11, F18		
	710	1260	1000	1160	800	1160	F2/F4, F12/F13	3 x 130B3188[2]	3 x 130B3189[2]
	800	1460					F2/F4, F12/F13		
			1200	1380	1000	1380	F2/F4, F12/F13	3 x 130B3191[2]	3 x 130B3192[2]
	1000	1720	1350	1530	1100	1530	F2/F4, F12/F13		

[1] Drive includes two inverters. Install one filter per inverter.
[2] Drive includes three inverters. Install one filter per inverter.

Typical application ratings for drives rated 525-690 V

	525 V, 50 Hz		575 V, 60 Hz		690 V, 50 Hz		Frame	Filter ordering number	
	kW	A	hp	A	kW	A	Size	IP 00	IP 23
525-690 VAC	75	113	100	108	90	108	D1h/D3h/D5h/D6h	130B4118	130B4119
	90	137	125	131	110	131	D1h/D3h/D5h/D6h	130B4121	130B4124
	110	162	150	155	132	155	D1h/D3h/D5h/D6h		
	132	201	200	192	160	192	D1h/D3h/D5h/D6h, D2h, D4h, D7h, D8h	130B4125	130B4126
	160	253	250	242	200	242	D2h, D4h, D7h, D8h		
	200	303	300	290	250	290	D2h, D4h, D7h, D8h	130B4129	130B4151
	250	360			315	344	D2h, D4h, D7h, D8h, F8/F9		
			350	344	355	380	D2h, D4h, D7h, D8h, F8/F9	130B4152	130B4153
	315	429	400	400	400	410	D2h, D4h, D7h, D8h, E1/E2, F8/F9		
			400	410			E1/E2, F8/F9	130B4154	130B4155
	355	470	450	450	450	450	E1/E2, F8/F9		
	400	523	500	500	500	500	E1/E2, F8/F9		
	450	596	600	570	560	570	E1/E2, F8/F9	130B4156	130B4157
	500	630	650	630	630	630	E1/E2, F8/F9		
	500	659			630	630	F1/F3, F10/F11	2 x 130B4129[1]	2 x 130B4151[1]
			650	630			F1/F3, F10/F11	2 x 130B4152[1]	2 x 130B4153[1]
	560	763	750	730	710	730	F1/F3, F10/F11		
	670	889	950	850	800	850	F1/F3, F10/F11	2 x 130B4154[1]	2 x 130B4155[1]
	750	988	1050	945	900	945	F1/F3, F10/F11		
	750	988	1050	945	900	945	F2/F4, F12/F13	3 x 130B4152[2]	3 x 130B4153[2]
	850	1108	1150	1060	1000	1060	F2/F4, F12/F13		
	1000	1317	1350	1260	1200	1260	F2/F4, F12/F13	3 x 130B4154[2]	3 x 130B4155[2]

[1] Drive includes two inverters. Install one filter per inverter.
[2] Drive includes three inverters. Install one filter per inverter.

VLT® Brake Resistors

Used to dissipate energy generated during braking.

When the speed reference of a frequency converter is reduced, the motor acts as a generator and brakes. When a motor acts as a generator, it supplies energy to the frequency converter which is collected in the intermediate circuit.

The function of the brake resistor is to provide a load on the intermediate circuit during braking, thereby ensuring that the braking power is absorbed by the brake resistor.

If a brake resistor was not used, the intermediate circuit voltage of the frequency converter would continue to increase, until it cuts out for protection.

The advantage of using a brake resistor is it enables braking of a heavy load quickly, e.g. on a conveyor belt.

Danfoss has chosen a solution in which the brake resistor does not form an integral part of the frequency converter.

This offers the user the following advantages:

- The resistor time cycle can be selected as required
- The heat developed during braking can be conveyed beyond the panel cabinet to allow the energy to be used
- There is no overheating of the electronic components, even if the brake resistor is overloaded

Danfoss offers a range of brake resistors for frequency converters. Please see the tables below to determine the brake resistor required. For further information, consult the brake resistor design guide – MG.90.0x.yy.

The requirements for Brake Resistors vary in different applications. Always consult the Brake Resistor Design Guide, before selecting brake resistors.

Critical data includes:
- Brake duty cycle, resistance and brake resistor power capability
- Drive minimum resistance

The following table provides critical information on minimum and nominal brake resistors.
- R_{min} is the minimum resistance that can be attached to the drive. Larger drives include multiple brake choppers. Equal resistors should be attached to each brake chopper. R_{min} is calculated by using the combined resistance of all resistors if connected in parellel.
- R_{nom} is the nominal resistance needed to achieve the maximum overload braking torque

D-frame drive ratings:
- Capable of 100% torque 4 minutes out of 10 minutes
- Capable of 150% torque 1 minute out of 10 minutes

E and F-frame drive ratings:
- Capable of 100% torque 4 minutes out of 10 minutes
- Capable of 150% torque 0.5 min out of 5 min

- η_{motor} is typically at 0.95
- η_{VLT} is typically at 0.98

- $P_{peak} = P_{motor} \times \%\ \text{Braking torque} \times \eta_{motor} \times \eta_{VLT}$ [W]

- $R_{br} = \frac{Udc^2}{P_{peak}}$ [Ω]

380-500 V .....Udc = 810 Vdc
525-690 V .....Udc = 1099 Vdc

380-500 VAC				
Drive data				
AutomationDrive FC 302	$P_{m\ (HO)}$	Number of brake terminals[1]	R_{min}	$R_{br,\ nom}$
T5	[kW]			
N90K	90	1	3.8	5.1
N110	110	1	3.2	4.2
N132	132	1	2.6	3.5
N160	160	1	2.1	2.9
N200	200	1	1.6	2.3
N250	250	1	1.2	1.8
P250	250	1	1.2	1.8
P315	315	1	1.2	1.5
P355	355	1	1.2	1.3
P400	400	1	1.1	1.1
P450	450	2	0.9	1.0
P500	500	2	0.9	0.91
P560	560	2	0.8	0.82
P630	630	2	0.7	0.72
P710	710	3	0.6	0.64
P800	800	3	0.5	0.57

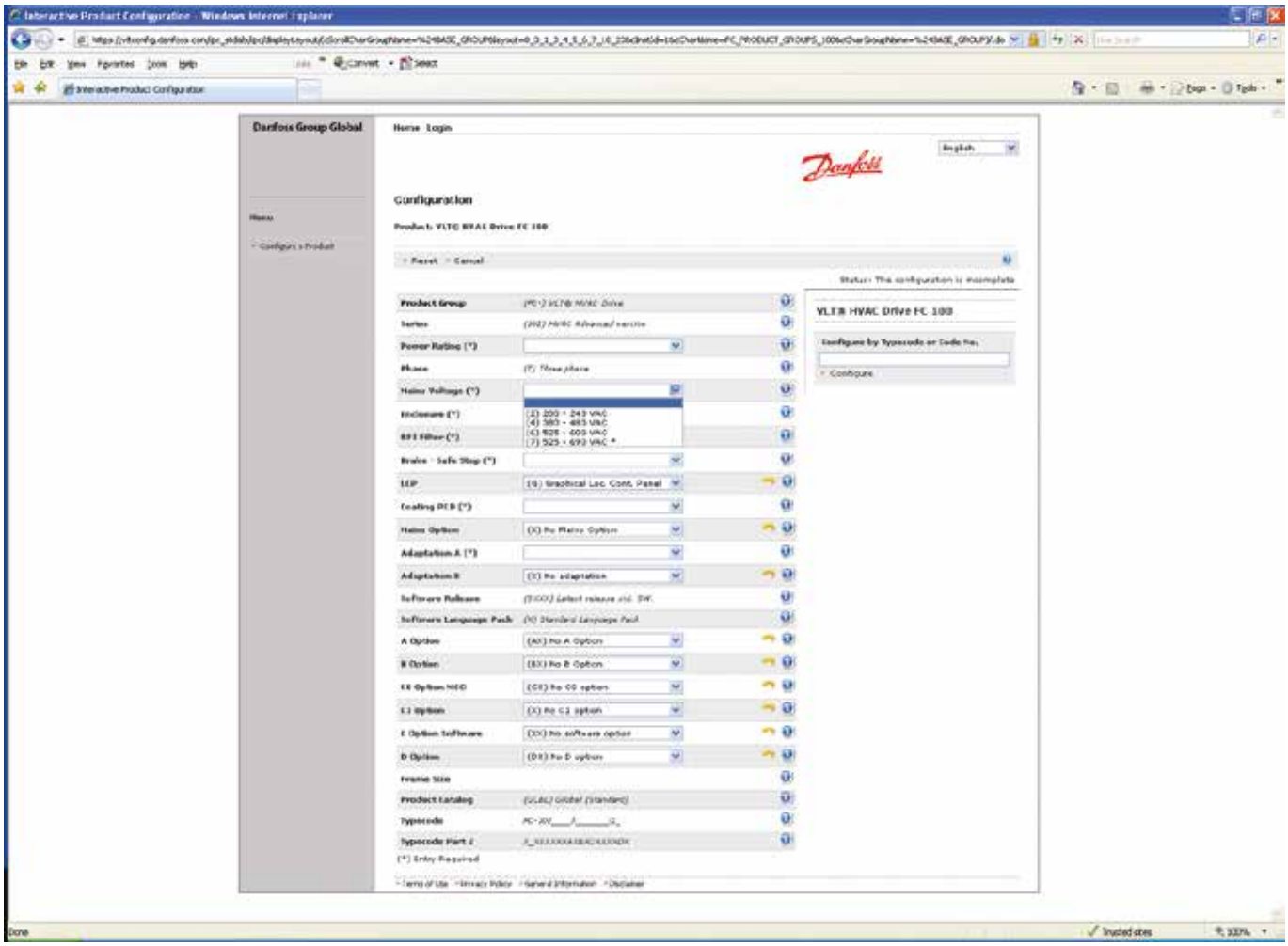
525-690 VAC				
Drive data				
AutomationDrive FC 302 (normal overload)	$P_{m\ (HO)}$	Number of brake terminals[1]	R_{min}	$R_{br,\ nom}$
T7	[kW]			
N90K	90	1	8.8	9.5
N110	110	1	6.6	7.8
N132	132	1	4.2	6.4
N160	160	1	4.2	5.3
N200	200	1	3.4	4.2
N250	250	1	2.3	3.4
N315	315	1	2.3	2.7
P315	315	1	2.3	2.7
P355	355	1	2.3	2.4
P400	400	1	2.1	2.1
P500	500	1	2.0	2.0
P560	560	1	2.0	2.0
P630	630	2	1.3	1.3
P710	710	2	1.1	1.2
P800	800	2	1.1	1.1
P900	900	3	1.0	1.0
P1M0	1000	3	0.8	0.84
P1M2	1200	3	0.7	0.70
P1M4	1400	4	0.55	0.60

R_{min} = Minimum brake resistance that can be used with this drive. If the drive includes multiple brake choppers, the resistance value is the sum of all resisters in parallel
$R_{br,\ nom}$ = Nominal resistance required to achieve 150% braking torque
R_{rec} = Resistance value of the recommended Danfoss brake resistor

[1] Larger drives include multiple inverter modules with a brake terminals in each inverter. Equal resistors should be connected to each brake terminals

Configure your VLT® drive to fit your needs on http://driveconfig.danfoss.com

The Drive Configurator gives you the possibility to configure (select) the right drive for your purpose.
You don't have to consider if the combinations are valid, while the configurator only gives you valid selections.



Drive Configurator

The Danfoss Drive Configurator is an advanced but easy-to-use tool to configure the Danfoss VLT® frequency converter that exactly matches your requirements.

The Drive Configurator generates the unique article number for the drive you need, preventing errors during order entry.

"Decoding" is also available: Enter a Typecode and the Drive Configurator will decode the configuration and show configuration for your drive. "Reverse engineering" is also supported: Enter an article number and the Drive Configurator will display the exact configuration for the drive in question, including all options and special features. A further advantage of using the Drive Configurator is that it tells you exactly which options and features are avaible and so prevents you selecting conflicting or nonsensical combinations.

If you need to replace an obsolete product, just enter the article number of the older VLT® and the Drive Configurator will provide details of the appropriate newer generation replacement.

Last but by no means least, the Drive Configurator provides quick access to the available spare parts and accessories for both current and obsolete products.

Options and typecode position overview

Frame size	Position	D1h/ D2h	D3h/ D4h	D5h/ D7h	D6h/ D8h	D13	E1	E2	E9	F1 and F2	F3 and F4 (w/ options cabinet)	F8	F9 (w/options cabinet)	F10, F12	F11, F13 (w/ options cabinet)	F18
Enclosure with stainless steel back-channel	4	■	■	■	■			■		■	■					
Mains shielding	4	■	■	■	■	■	■		■							■
Space heaters and thermostat	4	■	■	■	■					■	■			■	■	■
Cabinet light with power outlet	4									■	■			■	■	■
Class A1 RFI Filters	5*	■	■	■	■	■	■	■			■		■		■	■
NAMUR terminals	5**									■	■	■	■	■	■	■
Residual Current Monitor (RCD)	5*										■		■		■	■
Brake chopper (IGBTs)	6		■	■	■	■	■	■	■	■	■	■	■	■	■	■
Safe Stop / 6***	6	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
Regeneration terminals	6		■				■	■	■	■	■					■
Emergency Stop with Pilz Safety Relay	6*										■					■
Safe Stop + Pilz Safety Relay	6									■	■	■	■	■	■	■
No LCP	7	■	■	■	■											
LCP 101 numerical local control panel	7	■	■	■	■		■	■								
LCP 102 graphical local control panel	7	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
Fuses	9	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
Loadsharing terminals	9		■	■	■	■	■	■	■	■	■					■
Fuses + loadsharing terminals	9		■			■	■	■	■	■	■					■
Disconnect	9****			■	■	■	■	■	■		■		■		■	■
Circuit breakers	9****				■						■					■
Contactors	9****				■						■					■
Manual motor starters	10									■	■			■	■	■
30 Amp, fuse-protected terminals	10									■	■			■	■	■
24 VDC power supply	11									■	■			■	■	■
External temperature monitoring	11									■	■			■	■	■
Heat sink access panel	11	■	■	■	■											

* *Requires an options cabinet*
** *Available only on the VLT® AutomationDrive FC 302*
*** *Standard on VLT® Automation Drive FC 302, optional on VLT® HVAC Drive FC 102 and VLT® AQUA Drive FC 202*
**** *Options supplied with fuses on D-Frame*

VLT® High Power Drive Kits

Kits to fit your application

Available on frames

D1h D2h D3h D4h D5h D6h D7h D8h E1 F

USB in the door kit

Available on all frame sizes, this USB extension cord kit allows access to the drive controls via laptop computer without opening the drive. The kits can only be applied to drives manufactured after a certain date. Drives built prior to these dates do not have the provisions to accommodate the kits. Reference the following table to determine which drives the kits can be applied to.

IP 20/IP 21/IP 54	IP 21/IP 54	IP 21/IP 54
D1h, D2h, D3h, D4h, D5h, D6h, D7h, D8h	E1	F *(All frames)*

F

F-frame top entry kit motor cables

To use this kit, the drive must be ordered with the common motor terminal option. The kit includes everything to install a top entry cabinet on the motor side (right side) of the F-frame VLT® drive.

Cables	Frame	Cabinet width	Kit number
Motor	F1/F3	400 mm	176F1838
Motor	F1/F3	600 mm	176F1839
Motor	F2/F4	400 mm	176F1840
Motor	F2/F4	600 mm	176F1841
Motor	F8, F9, F10, F11, F12, F13	*Contact factory*	

F

F-frame top entry kit mains cables

The kits include everything required to install a top entry section onto the mains side (left side) of a Danfoss F-frame VLT® frequency converter.

Cables	Frame	Cabinet width	Kit number
Mains	F1/F2	400 mm	176F1832
Mains	F1/F2	600 mm	176F1833
Mains	F3/F4 with disconnect	400 mm	176F1834
Mains	F3/F4 with disconnect	600 mm	176F1835
Mains	F3/F4 without disconnect	400 mm	176F1836
Mains	F3/F4 without disconnect	600 mm	176F1837
Mains	F8, F9, F10, F11, F12, F13	*Contact factory*	

F1/F3 F2/F4

Common motor terminal kits

The common motor terminal kits provide the bus bars and hardware required to connect the motor terminals from the paralleled inverters to a single terminal (per phase) to accommodate the installation of the motor-side top entry kit. This kit is equivalent to the common motor terminal option of a drive. This kit is not required to install the motor-side top entry kit if the common motor terminal option was specified when the drive was ordered.
This kit is also recommended to connect the output of a drive to an output filter or output contactor. The common motor terminals eliminate the need for equal cable lengths from each inverter to the common point of the output filter (or motor).

Frame	Kit number
F1/F3	176F1845
F2/F4	176F1846

D1h/ D3h and D2h/ D4h

Adaptor plate

The adaptor plate is used to replace an old D-frame drive with the new D-frame drive using the same mounting.

Kit number	Description
176F3409	**D1h/D3h adaptor plate to replace D1/D3 drive**
176F3410	D2h/D4h adaptor plate to replace D2/D4 drive

Available on frames

Back-channel duct kit

Back-channel duct kits are offered for conversion of the D and E frames. They are offered in two configurations – top and bottom venting and top only venting. Available for the D3h, D4h and E2 frames.

Top and bottom			
Kit number	**Description**	**Instruction number**	**Additional documents/drawings**
176F3627	D3h Kit 1800 mm	177R0456	
176F3628	D4h Kit 1800 mm	177R0457	
176F3629	D3h Kit 2000 mm	177R0456	
176F3630	D4h Kit 2000 mm	177R0457	
176F1850	E2 2000 mm		
176F0299	E2 2200 mm		
Top only			
176F1776	E2 Frame		175R1037

D3h D4h E2

NEMA-3R Rittal and welded enclosures

The kits are designed to be used with the IP 00/IP 20/Chassis drives to achieve an enclosure rating of NEMA-3R or NEMA-4. These enclosures are intended for outdoor use to provide a degree of protection against inclement weather.

NEMA-3R (welded enclosures)			
Kit number	**Description**	**Instruction number**	**Additional documents/drawings**
176F3521	D3h back-channel cooling kit (in back out back)	177R0460	
176F3526	D4h back-channel cooling kit (in back out back)	177R0461	
176F0298	E2 Kit	175R1068	175R1069
NEMA-3R (Rittal enclosures)			
176F3633	D3h back-channel cooling kit (in back out back)	177R0460	
176F3634	D4h Back-channel cooling kit (in back out back)	177R0461	
176F1852	E2 Kit	175R5922	175R5921

D3h D4h E2

Back-channel cooling kits for non-Rittal enclosures

The kits are designed to be used with the IP 20/Chassis drives in non-Rittal enclosures for in and out the back cooling. Kits do not include plates for mounting in the enclosures.

Kit number	Applicable to frame	Drawing/ Instruction
176F3519	D3h	177R0454
176F3524	D4h	177R0455

Stainless Steel

Kit number	Applicable to frame	Drawing/ Instruction
176F3520	D3h	177R0454
176F3525	D4h	177R0455

D3h D4h

Back-channel cooling kit – in the bottom and out the back of the drive

Kit for directing the back-channel air flow in the bottom of the drive and out the back.

Kit number	Applicable to frame	Drawing/ Instruction
176F3522	D1h/D3h	177R0506
176F3527	D2h/D4h	177R0507

Stainless Steel

Kit number	Applicable to frame	Drawing/ Instruction
176F3523	D1h/D3h	177R0506
176f3528	D2h/D4h	177R0507

D1h/ D3h and D2h/ D4h

VLT® High Power Drive Kits

Kits to fit your application

Available on frames

Back-channel cooling kit – in and out the back of the drive

D1h D2h D3h D4h D5h D6h D7h D8h E

These kits are designed to be used for redirecting the back-channel air flow. Factory back-channel cooling directs air in the bottom of the drive and out the top. The kit allows the air to be directed in and out the back of the drive.

Back-channel cooling kit – in and out the back of the drive

Kit number	Applicable to frame	Drawing/ Instruction
176F3648	Kit, cooling, in back out back, D1h	177R0458
176F3649	Kit, cooling, in back out back, D2h	177R0459
176F3625	Kit, cooling, in back out back, D3h	177R0454
176F3626	Kit, cooling, in back out back, D4h	177R0455
176F3530	D5h/D6h	177R0505
176F3531	D7h/D8h	177R0504

Stainless Steel

Kit number	Applicable to frame	Drawing/ Instruction
176F3656	D1h SS (wall mounted)	177R0458
176F3657	D2h SS (wall mounted)	177R0459
176F3654	D3h SS (enclosure mounted)	117R0454
176F3655	D4h SS (enclosure mounted)	117R0455

Top and bottom covers

Top and bottom covers	Kit number	Applicable to frame	Drawing/ Instruction
IP 00 (welded enclosures)	176F1861	E2	175R1106
IP 21/54	176F1946	E1	175R1106
IP 00 (Rittal Enclosures)	176F1783	E1	177R0076

Pedestal kit with in and out the back back-channel cooling

D1h D2h

Kit number	Description	Additional documents/drawings
176F3532	D1h 400 mm kit	177R0508
176F3533	D2h 400 mm kit	177R0509

Pedestal kit

D1h D2h D5h D6h D7h D8h E1 E2

The pedestal kit is a 400 mm high pedestal for the D1h and D2h and 200 mm high for the D5h and D6h frames that allow the drives to be floor mounted. The front of the pedestal has openings for input air to the power components.

Kit number	Description	Additional documents/ drawings
176F3631	D1h 400 mm kit	177R0452
176F3632	D2h 400 mm kit	177R0453
176F3452	D5h/D6h 200 mm kit	177R0500
176F3539	D7h/D8h 200 mm kit	
176F6739	E-frame pedestal kit	

Input-plate option kit

Input-plate option kits are available for D and E frames. The kits can be ordered to add fuses, disconnect/fuses, RFI, RFI/Fuses, and RFI/Disconnect/Fuses. Please consult the factory for kit ordering numbers.

IP 20 conversion kit

E2

This kit is for use with the E2 (IP 00) frames. After installation, the drive will have an enclosure rating of IP 20.

Frame	Kit number	Terminal cover height
E2	176F1884	254 mm (10 inch.)

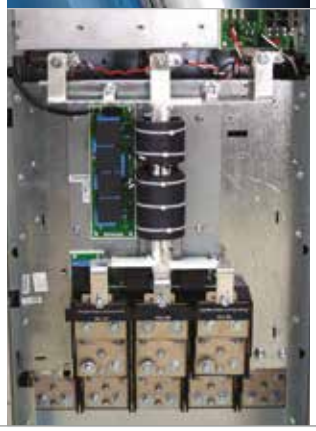
Top entry of fieldbus cables

The top entry kit provides the ability to install fieldbus cables through the top of the drive. The kit is IP 20 when installed. If an increased rating is desired, a different mating connector can be used.

Kit number
176F1742

VLT® High Power Drive Options

Dedicated options, fieldbusses and applications

	Available on frames	Typecode Position
Enclosure with 304 Stainless Steel back-channel For additional protection from corrosion in harsh environments, units can be ordered in an enclosure that includes a stainless steel back-channel, heavier plated heatsinks and an upgraded fan. This option is recommended in salt-air environments near the ocean.	D E2 F1-F4 F8-F13	4
 **Mains shielding** Lexan® shielding mounted in front of incoming power terminals and input plate to protect from accidental contact when the enclosure door is open.	D1h D2h D5h D6h D7h D8h E1	4
 **Space heaters and thermostat** Mounted on the cabinet interior of F frames, space heaters controlled via automatic thermostat prevents condensation inside the enclosure. The thermostat default settings turn on the heaters at 10° C (50° F) and turn them off at 15.6° C (60° F).	D1h D2h D5h D6h D7h D8h F	4
 **Cabinet light with power outlet** A light can be mounted on the cabinet interior of F frames to increase visibility during servicing and maintenance. The light housing includes a power outlet for temporarily powering laptop computers or other devices. Available in two voltages: ■ 230 V, 50 Hz, 2.5 A, CE/ENEC ■ 120 V, 60 Hz, 5 A, UL/cUL	F	4
 **RFI filters** VLT® Series drives feature integrated Class A2 RFI filters as standard. If additional levels of RFI/EMC protection are required, they can be obtained using optional Class A1 RFI filters, which provide suppression of radio frequency interference and electromagnetic radiation in accordance with EN 55011. On F-frame drives, the Class A1 RFI filter requires the addition of the options cabinet. Marine use RFI filters are also available.	D E F3 F4	5

VLT® High Power Drive Options

Dedicated options, fieldbusses and applications

Typecode Position	Available on frames		
5	F		**NAMUR terminals** NAMUR is an international association of automation technology users in the process industries, primarily chemical and pharmaceutical industries in Germany. Selection of this option provides standardised terminal connection and associated functionality as defined by NAMUR NE37. Requires the selection of the MCB 113 Extended Relay option and the MCB 112 PTC Thermistor Card. *Available only on FC 302 – VLT® AutomationDrive.*
5	F		**Residual Current Device (RCD)** Uses the core balance method to monitor ground fault currents in grounded and high-resistance grounded systems (TN and TT systems in IEC terminology). There is a pre-warning (50% of main alarm set-point) and a main alarm set-point. Associated with each setpoint is an SPDT alarm relay for external use. Requires an external "window-type" current transformer(supplied and installed by customer). ■ Integrated into the drive's safe-stop circuit ■ IEC 60755 Type B device monitors, pulsed DC, and pure DC ground fault currents ■ LED bar graph indicator of the ground fault current level from 10-100% of the setpoint ■ Fault memory ■ TEST / RESET button
5	F3 F4		**Insulation Resistance Monitor (IRM)** Monitors the insulation resistance in ungrounded systems (IT systems in IEC terminology) between the system phase conductors and ground. There is an ohmic pre-warning and a main alarm setpoint for the insulation level. Associated with each setpoint is an SPDT alarm relay for external use. Note: only one insulation resistance monitor can be connected to each ungrounded (IT) system. ■ Integrated into the drive's safe-stop circuit ■ LCD display of insulation resistance ■ Fault memory ■ INFO, TEST, and RESET buttons
6	F		**Safe Stop with Pilz Safety Relay** Available on F frame. Enables the Pilz Relay to fit in the F frames without requiring an option cabinet. The Relay is used in the external temperature monitoring option. If PTC monitoring is required, the MCB 112 PTC thermistor option must be ordered.
6	F1-F4		**Emergency Stop with Pilz Safety Relay** Includes a redundant 4-wire emergency-stop pushbutton mounted on the front of the enclosure and a Pilz relay that monitors it in conjunction with the drive's safe-stop circuit and contactor position. Requires a contactor and the F frame options cabinet.

		Available on frames	Typecode Position
	**Brake Chopper (IGBTs)** Brake terminals with an IGBT brake chopper circuit allow for the connection of external brake resistors. For detailed data on brake resistors, see page 46-47.	D E F	6
	Regeneration terminals Allow connection of regeneration units to the DC bus on the capacitor bank side of the DC-link reactors for regenerative braking. The F-frame regeneration terminals are sized for approximately ½ the power rating of the drive. Consult the factory for regeneration power limits based on the specific drive size and voltage.	D3h D4h E F	6
	Loadsharing terminals These terminals connect to the DC-bus on the rectifier side of the DC-link reactor and allow for the sharing of DC bus power between multiple drives. The F-frame loadsharing terminals are sized for approximately 1/3 the power rating of the drive. Consult the factory for loadsharing limits based on the specific drive size and voltage.	D E F	9
	**Fuses** Fuses are highly recommended for fast-acting current overload protection of the variable frequency drive. Fuse protection will limit drive damage and minimize service time in the event of a failure. Fuses are required to meet Marine certification.	D E F	9
	**Disconnect** A door-mounted handle allows for the manual operation of a power disconnect switch to enable and disable power to the drive, increasing safety during servicing. The disconnect is interlocked with the cabinet doors to prevent them from being opened while power is still applied.	D5h/ D7h E F3 F4	9
	**Circuit Breakers** A circuit breaker can be remotely tripped but must be manually reset. Circuit breakers are interlocked with the cabinet doors to prevent them from being opened while power is still applied. When a circuit breaker is ordered as an option, fuses are also included for fast-acting current overload protection of the variable frequency drive.	D6h D8h F	9

VLT® High Power Drive Options

Dedicated options, fieldbusses and applications

Typecode Position	Available on frames	
9	D6h D8h F3 F4	**Contactors** An electrically controlled contactor switch allows for the remote enabling and disabling of power to the drive. An auxiliary contact on the contactor is monitored by the Pilz Safety if the IEC Emergency Stop option is ordered.
10	F	**Manual motor starters** Provide 3-phase power for electric cooling blowers often required for larger motors. Power for the starters is provided from the load side of any supplied contactor, circuit breaker, or disconnect switch and from the input side of the Class 1 RFI filter (if an RFI filter option is ordered). Power is fused before each motor starter, and is off when the incoming power to the drive is off. Up to two starters are allowed (one if a 30-amp, fuse-protected circuit is ordered). Integrated into the drive's safe-stop circuit. Unit features include: ■ Operation switch (on/off) ■ Short-circuit and overload protection with test function ■ Manual reset function
10	F	**30 Amp, fuse-protected terminals** ■ 3-phase power matching incoming mains voltage for powering auxiliary customer equipment ■ Not available if two manual motor starters are selected ■ Terminals are off when the incoming power to the drive is off ■ Power for the fused protected terminals will be provided from the load side of any supplied contactor, circuit breaker, or disconnect switch and from the input side of the Class 1 RFI filter (if a RFI filter is ordered as an option).
11	F	**24 VDC power supply** ■ 5 Amp, 120 W, 24 VDC ■ Protected against output overcurrent, overload, short circuits, and overtemperature ■ For powering customer-supplied accessory devices such as sensors, PLC I/O, contactors, temperature probes, indicator lights, and/or other electronic hardware ■ Diagnostics include a dry DC-ok contact, a green DC-ok LED, and a red overload LED
11	F	**External temperature monitoring** Designed for monitoring temperatures of external system components, such as the motor windings and/or bearings. Includes eight universal input modules plus two dedicated thermistor input modules. All ten modules are integrated into the drive's safe-stop circuit and can be monitored via a fieldbus network (requires the purchase of a separate module/bus coupler). A Safe Stop brake option must be ordered to choose External temperature monitoring. ***Universal inputs (5)*** Signal types: ■ RTD inputs (including Pt100), 3-wire or 4-wire ■ Thermocouple ■ Analogue current or analog voltage Additional features: ■ One universal output, configurable for analog voltage or analogue current ■ Two output relays (N.O.) ■ Dual-line LC display and LED diagnostics ■ Sensor lead wire break, short-circuit, and incorrect polarity detection ■ Interface setup software ■ If 3 PTC are required, MCB112 control card option must be added. Additional external temperature monitors: ■ This option is provided in case you need more than the MCB114 and MCB 112 provides.

	Available on frames	Typecode Position

LCP 102 Graphical Local Control Panel

- Multi-language display
- Quick menu for easy commissioning
- Full parameter backup and copy function
- Alarm logging
- Info button explains the function of the selected item on display
- Hand-operated start/stop or selection of Automatic mode
- Reset function
- Trend graphing

Available on frames: D E F — Typecode Position: 7

LCP 101 Numerical Local Control Panel

- Status messages
- Quick menu for easy commissioning
- Parameter setting and adjusting
- Hand-operated start/stop function or selection of Automatic mode
- Reset function

Available on frames: D E F — Typecode Position: 7

LCP Panel Mounting Kit

- IP 65 enclosure rating
- 10 ft. (3 metre) cable
- Finger screws for easy fitting
- Can be used with LCP101 or LCP 102
- Ordering number: 130B1117

Available on frames: Accessory

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, PROFIdrive or Danfoss FC profile state machines, PROFIBUS DP V1, Master Class 1 and 2

Ordering number 130B1100 uncoated – 130B1200 coated (Class G3/ISA S71.04-1985)

Available on frames: Fieldbus — Typecode Position: 14

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 G3/ISA S71.04-1985)

Available on frames: Fieldbus — Typecode Position: 14

VLT® MCA 105 CAN Open

The CAN Open fieldbus interface incorporates the CAN fieldbus system and DeviceNet.

- CAN Open Application layer according to DS301
- Support of Device Profile DSP402 for Drives and Motion Control
- Baud rate of 10–1000 Kbaud and addressing range of 0–127

Available on frames: Fieldbus — Typecode Position: 14

VLT® High Power Drive Options

Dedicated options, fieldbusses and applications

Typecode Position

14 Fieldbus

VLT® LonWorks MCA 108

LonWorks is a fieldbus system developed for building automation. It enables communication between individual units in the same system (peer-to-peer) and thus supports decentralising of control.

- No need for big main station (master-follower)
- Units receive signals directly
- Supports Echelon free-topology interface (flexible cabling and installation)
- Supports embedded I/Os and I/O options (easy implementation of de-central I/Os)
- Sensor signals can quickly be moved to another controller via bus cables
- Certified as compliant with LonMark ver. 3.4 specifications

Ordering number 130B1106 uncoated – 130B1206 coated (Class G3/ISA S71.04-1985)

14 Fieldbus

VLT® BACnet MCA 109

The open communications protocol for worldwide building automation use. The BACnet protocol is an international protocol that efficiently integrates all parts of building automation equipment from the actuator level to the building management system.

- BACnet is the world standard for building automation
- International standard ISO 16484-5
- With no license fees, the protocol can be used in building automation systems of all sizes
- The BACnet option lets the drive communicate with building management systems running the BACnet protocol
- Typical areas where BACnet is used include heating, ventilation, cooling and climate equipment control
- The BACnet protocol is easily integrated into existing control equipment networks

Ordering number 130B11446 uncoated – 130B1244 coated (Class G3/ISA S71.04-1985)

14 Fieldbus

VLT® MCA 113 Profibus Converter VLT® 3000

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 G3/ISA S71.04-1985)

14 Fieldbus

VLT® MCA 114 Profibus Converter VLT® 5000

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 G3/ISA S71.04-1985)

VLT® PROFINET RT MCA 120

The VLT® PROFINET Option offers connectivity to PROFINET based networks via the PROFINET Protocol. The option is able to handle a single connection with an Actual Packet Interval down to 1 ms in both directions, positioning it among the fastest performing PROFINET devices in the market.

- Built-in web server for remote diag-nosis and reading out of basic drive parameters
- An e-mail notificator can be configured for sending an e-mail message to one or several receivers, if certain warnings or alarms occur, or have cleared again
- TCP/IP for easy access to Drive configuration data from MCT 10
- FTP (File Transfer Protocol) file up- and download
- Support of DCP (discovery and configuration protocol)

Fieldbus 14

VLT® EtherNet IP MCA 121

EtherNet will become the future standard for communication at the factory floor.
The EtherNet Option is based on the newest technology available for the 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

Fieldbus 14

VLT® Modbus TCP MCA 122

The VLT® Modbus Option offers connectivity to Modbus TCP based networks, such as Groupe Schneider PLC system via the Modbus TCP Protocol. The option is able to handle a single connection with an Actual Packet Interval down to 5 ms in both directions, positioning it among the fastest performing Modbus TCP devices in the market.

- Built-in web-server for remote diagnosis and reading out basic drive parameters
- An e-mail notificator can be configured for sending an e-mail message to one or several receivers, if certain warnings or alarms occur, or have cleared again
- Two Ethernet ports with built-in switch
- FTP (File Transfer Protocol) file up- and download
- Protocol – automatic – IP address configuration

Fieldbus 14

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' > 10 V
- 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 G3/ISA S71.04-1985)

Application 15

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 G3/ISA S71.04-1985)

Application 15

VLT® High Power Drive Options

Dedicated options, fieldbusses and applications

Typecode Position

15 Application

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 G3/ISA S71.04-1985)

15 Application

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 G3/ISA S71.04-1985)

15 Application

VLT® Safe PLC Interface MCB 108

A cost-effective method of ensuring safety, the Safe PLC interface enables the connection of a dual-wire safety link between a Safe PLC and a single-pole 24 VDC input on the drive.
The Safe PLC Interface allows the Safe PLC to interrupt operation on the plus or minus link without interfering with the sense signal of the Safe PLC.

15 Application

VLT® Analog I/O Option MCB 109

This analogue input/output option is easily fitted in the frequency converter for upgrading to advanced performance and control using the additional in/outputs.This option also upgrades the frequency converter with a battery back-up supply for the clock built into the frequency converter. This provides stable use of all frequency converter clock functions as timed actions etc.

- 3 analogue inputs, each configurable as both voltage and temperature input
- Connection of 0-10 V analogue signals as well as PT1000 and NI1000 temperature inputs
- 3 analogue outputs each configurable as 0-10 V outputs
- Incl. back-up supply for the standard clock function in the frequency converter

The back-up battery typically lasts for 10 years, depending on environment.

Ordering number 130B1143 uncoated – 130B1243 coated (Class G3/ISA S71.04-1985)

15 Application

VLT® PTC Thermistor Card MCB 112

With the MCB 112 PTC Thermistor Card all Danfoss VLT® frequency converters with STO can be used to supervise motors in potentially explosive atmospheres. MCB 112 offers superior performance compared to the bult-in ETR function and thermistor terminal.

- Protects the motor from overheating
- ATEX approved for use with EX d and EX e motors
- Uses the safe stop function of Danfosss VLT® frequency converters to stop the motor in case of over temperature
- Certified for use to protect motors in zones 1, 2, 21 and 22
- Certified Up to SIL2

VLT® Sensor Input Card MCB 114

The option protects the motor from being overheated by monitoring the bearings and windings temperature in the motor. The limits as well as the action are adjustable and the individual sensor temperature is visible as a read out in the display or by field bus.

- Protects the motor from overheating
- Three self-detecting sensor inputs for 2 or 3 wire PT100/PT1000 sensors
- One additional analogue input 4-20mA

Application 15

VLT® Extended Cascade Controller MCO 101

Easily fitted and upgrades the built-in cascade controller to operate more pumps and more advanced pump control in master/follower mode.

- Up to 6 pumps in standard cascade setup
- Up to 6 pumps in master/follower setup
- Technical specification: See MCB 105 Relay Option

Application 15

VLT® MCO 305 Programmable Motion Controller

Provides synchronization (electronic shaft) capabilities, 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
- Communication via fieldbus interface (requires fieldbus option)
- PC software tools for programming and commissioning

Motion control 16

VLT® MCO 350 Synchronizing Controller

Factory-programmed for synchronizing applications.

- 2 inputs supporting both incremental and absolute encoders
- 1 encoder output (virtual master function)
- 10 digital inputs
- 8 digital outputs
- Communication via fieldbus interface (requires fieldbus option)

Motion control 16 and 18

VLT® MCO 351 Positioning Controller

Factory-programmed for positioning applications.

- 2 inputs supporting both incremental and absolute encoders
- 1 encoder output (virtual master function)
- 10 digital inputs
- 8 digital outputs
- Communication via fieldbus interface (requires fieldbus option)

Motion control 16 and 18

VLT® High Power Drive Options

Dedicated options, fieldbusses and applications

Typecode Position

16 and 18 — Motion control

VLT® Center Winder MCO 352

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

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

Ordering number 130B1165 uncoated – 130B1265 coated (Class G3/ISA S71.04-1985)

17 — Extended relay

VLT® Extended Relay Card MCB 113

The Extended Relay Card MCB 113 adds inputs/outputs to VLT® AutomationDrive for increased flexibility.

- 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 capabilit

Ordering number 130B1164 uncoated – 130B1264 coated (Class G3/ISA S71.04-1985)

17 — Extended relay

VLT® MCO 102 Advanced Cascade Controller

Extends the capabilities of the standard Cascade Controller built into VLT® Series drives.

- Provides 8 additional relays for staging of additional motors
- Provides accurate flow, pressure, and level control for optimising the efficiency of systems that use multiple pumps or blowers
- Master/Follower mode runs all blowers/pumps at the same speed, potentially reducing the energy consumption to less than half that of valve throttling or traditional, across-the-line on/off cycling
- Lead pump alternation assures that multiple pumps or blowers are used equally

19 — Application

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 capitance 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 G3/ISA S71.04-1985)

Accessories

VLT® A/B in C Option Adapter MCF 106

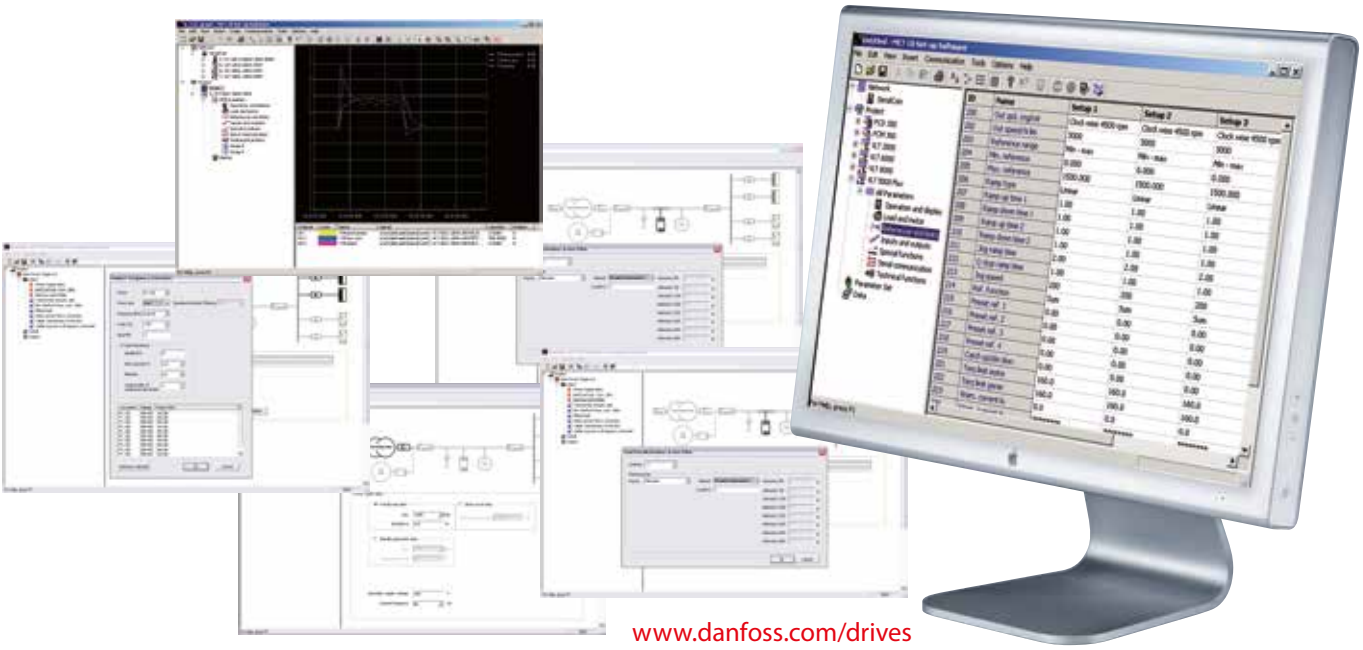
The A/B in C Option Adapter allows mounting of further A and B options in the C slot.

- 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.
- 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.

Ordering number 130B1130 uncoated – 130B1230 coated (Class G3/ISA S71.04-1985).

Depending on the cabinet, the retrofitting of a C-option might require appropriate mounting accessories. Please contact Danfoss.

VLT® High Power Drive accessories
PC Software



www.danfoss.com/drives

Perfect

tool for:

- Commissioning
- Servicing
- Programming
- Application specific simulations
- Various power supply sources
- Norm compliance indication
- Project documentation

VLT® MCT 10 Setup Software

VLT® MCT 10 offers advanced programming functionality for all Danfoss drive products, greatly reducing programming and set-up time. Drives are managed in a standard folder-based user interface that's familiar and easy to understand.

Parameter settings for each drive are contained in a single file, allowing easy duplication of parameter sets between drives. Project folders can also store user-defined files such as PDFs, CAD drawings, or Word documents. It's the one PC tool for all your drive programming tasks.

VLT® MCT-10 Basic (available free of charge from the Danfoss web site) allows access to a finite number of drives with limited functionality. The Advanced edition, offering a higher level of functionality, is available from your Danfoss sales partner.

VLT® MCT 10 features include:

- On-line and off-line commissioning
- On-board help files for each drive parameter
- Logging of alarms and warnings
- Graphical tools for simplified programming of the Smart Logic Controller
- Scope function for real-time data collection
- Configuration and access to the VLT® AutomationDrive's internal data buffer, providing up to four channels of high speed (down to 1 millisec) data collection
- MCO programming

VLT® MCT 31 Harmonics Calculation Software

VLT® MCT 31 calculates system harmonic distortion for both Danfoss and non-Danfoss drives. It is also able to calculate the effects of using various additional harmonic reduction measures, including Danfoss harmonic filters.

With VLT® MCT 31, you can determine whether harmonics will be an issue in your installation, and if so, what strategies will be most cost-effective in addessing the problem.

VLT® MCT 31 features include:

- Short circuit current ratings can be used instead of transformer size and impedance when transformer data is unknown
- Project oriented for simplified calculations on several transformers
- Easy to compare different harmonic solutions within the same project
- Supports current Danfoss product line as well as legacy drive models

Ordering typecode for D and E frames

	[1]	[2]	[3]	[4]	[5]	[6]	[7]	[8]	[9]	[10]	[11]	[12]	[13]	[14]	[15]	[16]	[17]	[18]	[19]	[20]
FC																				

[1] Application *(character 1-3)*	
102	VLT® HVAC Drive
202	VLT® AQUA Drive
302	VLT® AutomationDrive

[2] Power size *(character 4-7)*	
N90K	90 kW / 125 hp
N110	110 kW / 150 hp
N132	132 kW / 200 hp
N160	160 kW / 250 hp
N200	200 kW / 300 hp
N250	250 kW / 350 hp
P250	250 kW / 350 hp
N315	315 kW / 450 hp
P315	315 kW / 450 hp
P355	355 kW / 500 hp
P400	400 kW / 550 hp
P450	450 kW / 600 hp
P500	500 kW / 650 hp
P560	560 kW / 750 hp
P630	630 kW / 900 hp

D/E Frame kW ratings at 400 V, 690 V
D/E Frame hp ratings at 460 V, 575 V

[3] AC Line Voltage *(character 8-9)*	
T4	Three phase 380-480 VAC
T5	Three phase 380-500 VAC
T7	Three phase 525-690 VAC – 690 V kW rating, see manual for 575 V hp

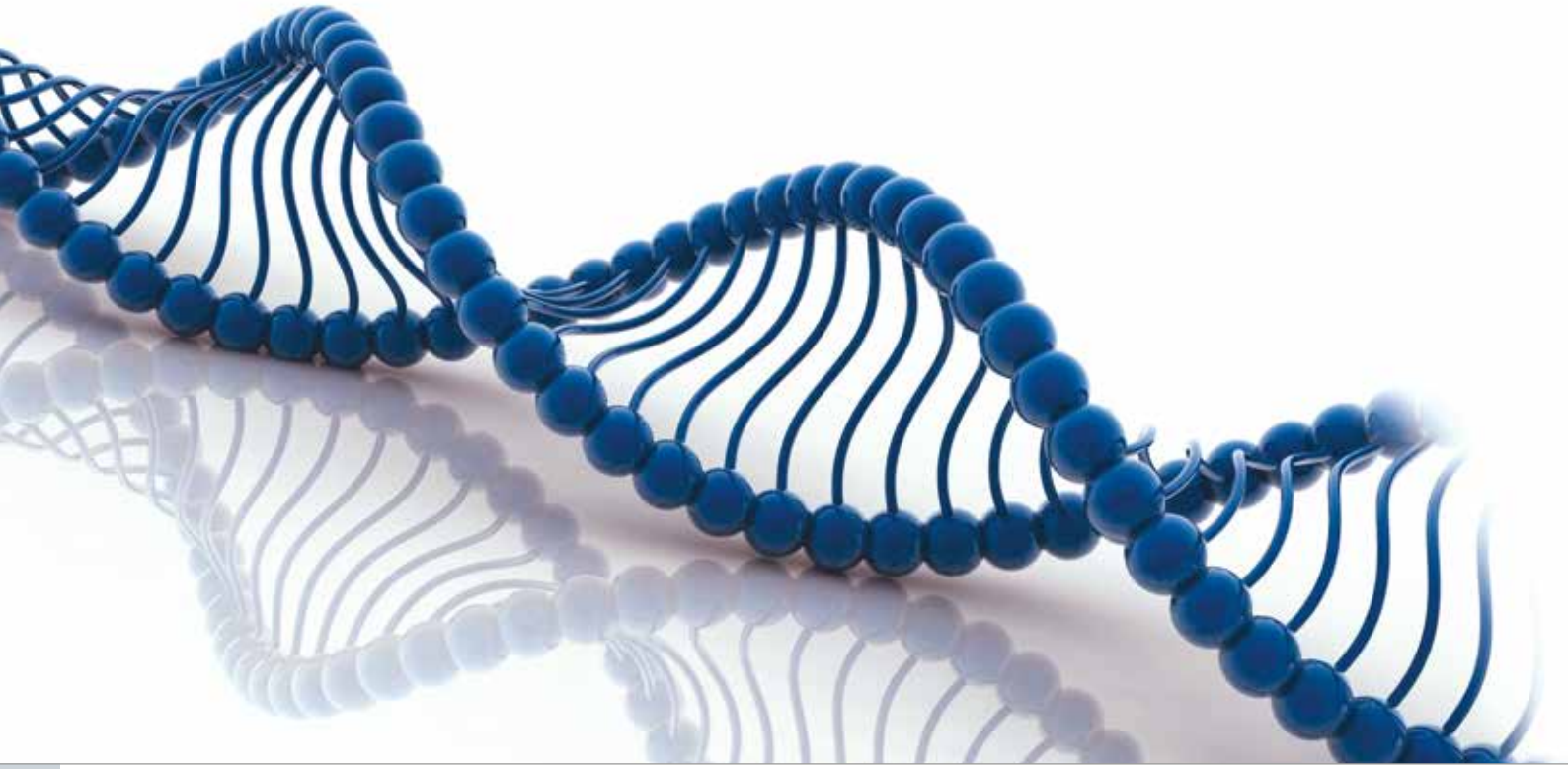
[4] Enclosure *(character 10-12)*	
D frames:	
E20	IP 20 / Chassis
E21	IP 21 / Type 1
E54	IP 54 / Type 12
E2M	IP 21 / Type 1 with mains shield
E5M	IP 54 / Type 12 with mains shield
H21	IP 21 / Type 1 with heater
H54	IP 54 / Type 12 with heater
C20	IP 20 / 304 Stainless Steel back-channel *(only for D3h and D4h)*
E1 frames:	
E21	IP 21 / Type 1
E54	IP 54 / Type 12
E2M	IP 21 / Type 1 with mains shield
E5M	IP 54 / Type 12 with mains shield
E2 frames:	
E00	IP 00 / Chassis
C00	IP 00 / Chassis with stainless steel back-channel
VLT® Low Harmonic Drive (LHD) D13 & E9 frames:	
E21	IP 21 / Type 1
E54	IP 54 / Type 12
E2M	IP 21 / Type 1 with mains shield
E5M	IP 54 / Type 12 with mains shield

[5] RFI filter, terminal and monitoring options *(character 13-14)*	
D frames:	
H2	RFI Class A2
H4	RFI class A1
N2	LHD, active filter based with Class A2 RFI
N4	LHD, active filter based with Class A1 RFI
E frames:	
H2	RFI Class A2
N2	LHD, active filter based with Class A2 RFI
N4	LHD, active filter based with Class A1 RFI
380-480/500 V only (T4 or T5 in position [3]):	
H4	RFI class A1

[6] Braking and safety *(character 15)*	
X	No brake IGBT
B	Brake IGBT
T	Safe Stop *(FC102/202 only; Safe Stop standard on 302)*
R	Regeneration terminals
U	Brake IGBT plus Safe Stop *(FC102/202 only; Safe Stop standard on 302)*
S	Regen terminals + brake chopper *(D-frame IP 20 only)*

[7] LCP Display *(character 16)*	
X	Blank faceplate, no LCP installed
N	Numerical Local Control Panel (LCP-101)
G	Graphical Local Control Panel (LCP-102)

[8] PCB Coating *(character 17)*	
C	Coated PCB
R	Coated PCB + ruggedised *(available on D-Frame only)*



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FC																				

[9] Mains input *(character 18)*	
X	No mains option
7	Fuses
A*	Fuses and loadsharing terminals
D*	Loadsharing terminals
3	Mains disconnect and fuses
4	Mains contactor and fuse ** *(Available on D-frame only)*
5	Mains disconnect, fuses and loadsharing terminals *(Available on E-Frame and LHD)*
E	Mains disconnect, contactor and fuse
J	Circuit breaker and fuse

* *Not available on IP21/IP54 D-frames*
** *Available on D-frame only*
*** *Available on E-Frame and LHD*

[10] Power terminals and motor starters *(character 19)*	
X	Standard cable entries
Q	Heat-sink access panel *(D-Frame only)*

[11] Auxiliary 24 V supply and external temperature monitoring *(character 20)*	
X	No adaptation

[12] Special version *(character 21-24)*	
SXXX	No option

[13] LCP language *(character 25)*	
X	Standard language package including English, German, French, Spanish, Danish, Italian and Finnish

[14] Fieldbus *(character 26-27)*		FC 302	FC 202	FC 102
AX	No option	■	■	■
A0	MCA 101 Profibus DP V1	■	■	■
A4	MCA 104 DeviceNet	■	■	■
A6	MCA 105 CAN Open	■		
AG	MCA 108 LonWorks			■
AJ	MCA 109 BACNet			■
AT	MCA 113 Profibus Converter VLT® 3000	■		
AU	MCA 114 Profibus Converter VLT® 5000	■		
AL	MCA 120 Profinet SRT	■	■	■
AN	MCA 121 Ethernet IP	■	■	■
AQ	MCA 122 Modbus TCP	■	■	■

[15] Application *(character 28-29)*		FC 302	FC 202	FC 102
BX	No application option	■	■	■
B0	MCB 109 analogue I/O, real-time clock backup		■	■
B2	MCB 112 PTC Thermistor Card	■	■	■
B4	MCB 114 VLT® Sensor Input	■	■	■
BK	MCB 101 General Purpose I/O	■	■	■
BP	MCB 105 Relay Expansion	■	■	■
BR	MCB 102 CL Encoder	■		
BU	MCB 103 Resolver	■		
BY	MCO 101 Extended Cascade Control		■	
BZ	MCB 108 Safety PLC Interface	■		

[16] Motion Control *(character 30-31)*		FC 302	FC 202	FC 102
CX	No motion control option	■	■	■
C4	MCO 305 Programmable Motion Control (SyncPos)	■		
C4	MCO 350 Synchronizing control	■		
C4	MCO 351 Positioning control	■		

[17] Extended Relay *(character 32)*		FC 302	FC 202	FC 102
X	No selection	■	■	■
R	MCB 113 Extended Relay Card	■		
5	MCO 102 Advanced Cascade Control		■	

[18] Motion Software *(character 33-34)*		FC 302	FC 202	FC 102
XX	No software option *Note: C4 option in [17] selected with no motion software in [19] will require programming by qualified individual*	■	■	■
10	MCO 350 Synchronizing control *(must select C4 in position [17])*	■		
11	MCO 351 Positioning control *(must select C4 in position [17])*	■		
12	MCO 352 Center Winder	■		

[19] Control Power Backup Input *(character 35-36)*		FC 302	FC 202	FC 102
DX	No DC input installed	■	■	■
D0	MCB 107 24 V DC backup	■	■	■

Ordering typecode for F frames

	[1]	[2]	[3]	[4]	[5]	[6]	[7]	[8]	[9]	[10]	[11]	[12]	[13]	[14]	[15]	[16]	[17]	[18]	[19]	[20]
FC																				

[1] Application *(character 1-3)*	
102	VLT® HVAC Drive
202	VLT® AQUA Drive
302	VLT® AutomationDrive

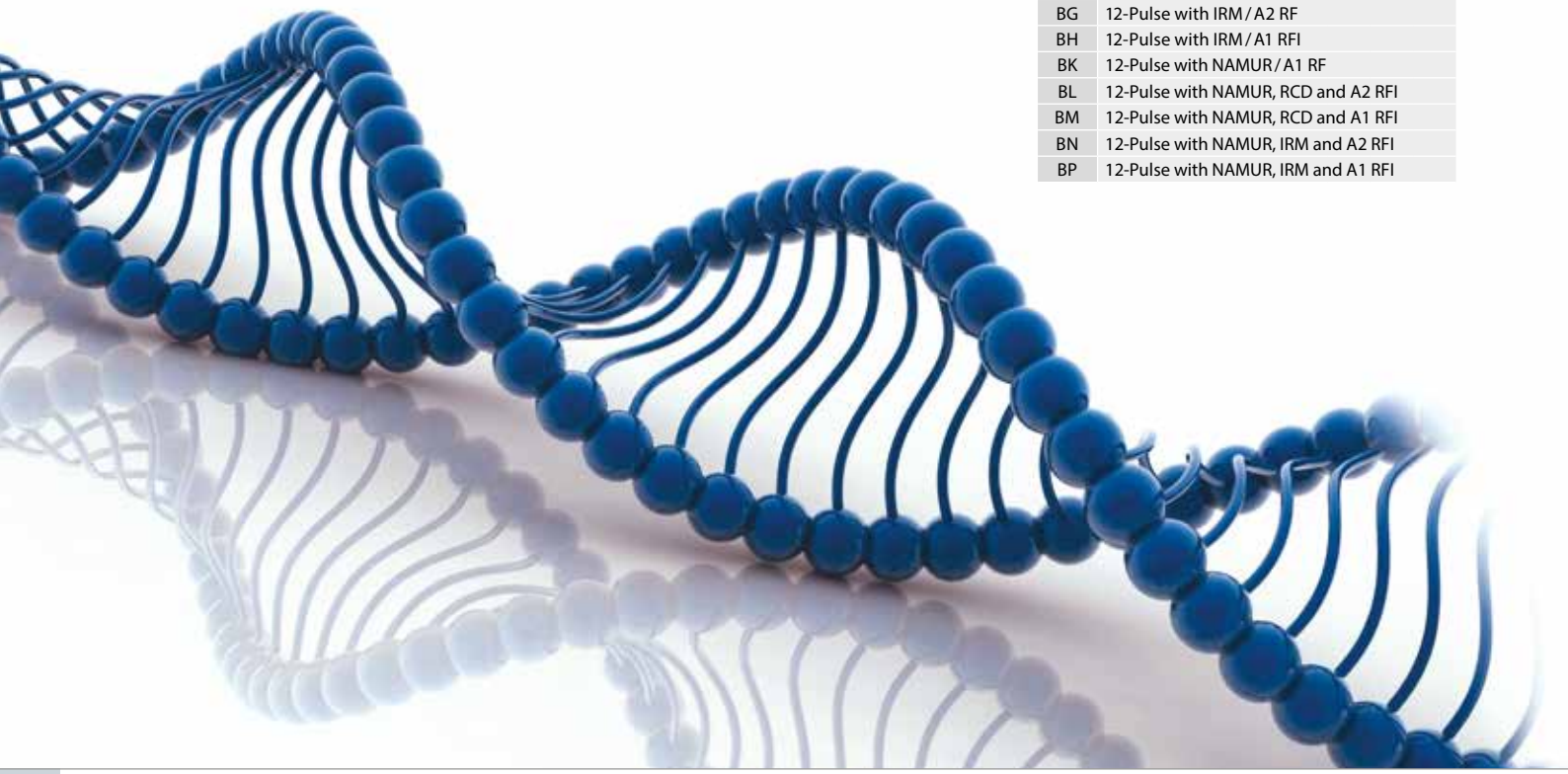
[2] Power size *(character 4-7)*	
P450	450 kW / 600 hp
P500	500 kW / 650 hp
P560	560 kW / 750 hp
P630	630 kW / 900 hp
P710	710 kW / 1000 hp
P800	800 kW / 1200 hp
P900	900 kW / 1250 hp
P1M0	1.0 MW / 1350 hp
P1M2	1.2 MW / 1600 hp
P1M4	1.4 MW / 1900 hp

F Frame kW ratings at 400 V, 690 V
F Frame hp ratings at 460 V, 575 V

[3] AC Line Voltage *(character 8-9)*	
T4	Three phase 380-480 VAC
T5	Three phase 380-500 VAC
T7	Three phase 525-690 VAC – 690 V kW rating, see manual for 575 V hp

[4] Enclosure *(character 10-12)*	
E21	IP 21 / Type 1
E54	IP 54 / Type 12
H21	IP 21 / Type 1 with space heater and thermostat
H54	IP 54 / Type 12 with space heater and thermostat
L2X	IP 21 / Type 1 with cabinet light and IEC 230 V power outlet
L5X	IP 54 / Type 12 with cabinet light and IEC 230 V power outlet
L2A	IP 21 / Type 1 with cabinet light and NAM, 115 V power outlet
L5A	IP 54 / Type 12 with cabinet light and NAM, 115 V power outlet
R2X	IP 21 / Type 1 with space heater, thermostat, light and IEC 230 V power outlet
R5X	IP 54 / Type 12 with space heater, thermostat, light and IEC 230 V power outlet
R2A	IP 21 / Type 1 with space heater, thermostat, light and NAM, 115 V power outlet
R5A	IP 54 / Type 12 with space heater, thermostat, light and NAM, 115 V power outlet
VLT® Low Harmonic Drive (LHD) F18 frame:	
E21	IP 21 / Type 1
E54	IP 54 / Type 12

[5] RFI filter, terminal and monitoring options *(character 13-14)*	
F1, F2, F3 and F4 frames:	
H2	RFI Class A2
HG	IRM for IT mains with Class A2 RFI
HJ	NAMUR terminals and Class A2 RFI *(requires MCB 112 and MCB 113)* *Available only on FC 302* *– VLT® Automation Drive*
HL	RCD for TN/TT mains with NAMUR terminals and Class A2 RFI *(requires MCB 112 and MCB 113)*
HE	RCD for TN/TT mains with Class A2 RFI
HN	IRM for IT mains with NAMUR terminals and Class A2 RFI *(requires MCB 112 and MCB 113)*
380-480/500 V only (T4 or T5 in position [3]):	
H4	RFI class A1
HF	RCD for TN/TT mains and Class A1 RFI
HH	IRM for IT mains and Class A1 RFI
HK	NAMUR terminals and Class A1 RFI *(requires MCB 112 and MCB 113)*
HM	RCD for TN/TT mains with NAMUR terminals and Class A1 RFI *(requires MCB 112 and MCB 113)*
hp	IRM for IT mains with NAMUR terminals and Class A1 RFI *(requires MCB 112 and MCB 113)*
VLT® Low Harmonic Drive (LHD) F18 frame	
N2	LHD, active filter based with Class A2 RFI
N4	LHD, active filter based with Class A1 RFI
VLT® 12-Pulse F8, F9, F10, F11, F12, F13 frames	
B2	12-Pulse with Class A2 RFI
BJ	12-Pulse with NAMUR / A2 RFI
VLT® 12-Pulse F9, F11, F13 frames 380-480/500 V (T5 in position [3])	
B4	12-Pulse with Class A1 RFI
BE	12-Pulse with RCD / A2 RFI
BF	12-Pulse with RCD / A1 RF
BG	12-Pulse with IRM / A2 RF
BH	12-Pulse with IRM / A1 RFI
BK	12-Pulse with NAMUR / A1 RF
BL	12-Pulse with NAMUR, RCD and A2 RFI
BM	12-Pulse with NAMUR, RCD and A1 RFI
BN	12-Pulse with NAMUR, IRM and A2 RFI
BP	12-Pulse with NAMUR, IRM and A1 RFI



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FC																				

[6] Braking and safety *(character 15)*	
X	No brake IGBT
B	Brake IGBT mounted
R	Regeneration terminals
C	Safe Stop with Pilz Safety Relay
D	Safe Stop with Pilz Safety Relay and brake IGBT
E	Safe Stop with Pilz Safety Relay and regeneration terminals
T	Safe Stop *(FC 102/202 only; standard on 302)*
U	Brake IGBT plus Safe Stop *(FC 102/202 only; safe stop standard on 302)*
F3, F4, F18 frames	
M	IEC Emergency Stop Pushbutton *(includes Pilz Relay)*
N	IEC Emergency Stop Pushbutton with brake IGBT and brake terminals *(includes Pilz Safety Relay)*
P	IEC Emergency Stop Pushbutton with regeneration terminals *(includes Pilz Safety Relay)*

[7] LCP Display *(character 16)*	
G	Graphical Local Control Panel (LCP-102)

[8] PCB Coating *(character 17)*	
C	Coated PCB

[9] Mains input *(character 18)*	
All frames:	
X	No mains option
7	Fuses
F3, F4, F9, F11, F13, and F18 frames:	
3	Mains disconnect and fuses
5	Mains disconnect, fuses and loadsharing terminals *(Not available on F18 frame)*
A	Fuses and loadsharing terminals
D	Loadsharing terminals
E	Mains disconnect, contactor and fuses
F	Mains circuit breaker, contactor and fuses
G	Mains disconnect, contactor, loadsharing terminals and fuses
H	Mains circuit breaker, contactor, loadsharing terminals and fuses
J	Mains circuit breaker and fuses
K	Mains circuit breaker, loadshare and fuses

[10] Power terminals and motor starters *(character 19)*	
X	Standard cable entries
F1, F2, F3, F4, F10, F11, F12, F13 and F18 frames:	
E	30 A fuse protected power terminals
F	30 A fuse protected power terminals and 2.5-4 A manual motor starter
G	30 A fuse protected power terminals and 4-6.3 A manual motor starter
H	30 A fuse protected power terminals and 6.3-10 A manual motor starter
J	30 A fuse protected power terminals and 10-16 A manual motor starter
K	Two 2.5-4 A manual motor starters
L	Two 4-6.3 A manual motor starters
M	Two 6.3-10 A manual motor starters
N	Two 10-16 A manual motor starters

[11] Auxiliary 24 V supply and external temperature monitoring *(character 20)*	
X	No option
F1, F2, F3, F4, F10, F11, F12, F13 and F18 frames:	
G	5 A 24 V supply *(customer use)* and external temperature monitoring
H	5 A 24 V supply *(customer use)*
J	External temperature monitoring
K	Common motor terminals
L	5 A 24 V supply + common motor terminals
M	External temperature monitoring + common motor terminals
N	5 A 24 V supply + external temperature monitoring + common motor terminals

[12] Special version *(character 21-24)*	
SXXX	No option

[13] LCP language *(character 25)*	
X	Standard language package including English, German, French, Spanish, Danish, Italian and Finnish

[14] Fieldbus *(character 26-27)*		FC 302	FC 202	FC 102
AX	No option	■	■	■
A0	MCA 101 Profibus DP V1	■	■	■
A4	MCA 104 DeviceNet	■	■	■
A6	MCA 105 CAN Open	■		
AG	MCA 108 LonWorks			■
AJ	MCA 109 BACNet			■
AT	MCA 113 Profibus Converter VLT® 3000	■		
AU	MCA 114 Profibus Converter VLT® 5000	■		
AL	MCA 120 Profinet SRT	■	■	■
AN	MCA 121 Ethernet IP	■	■	■
AQ	MCA 122 Modbus TCP	■	■	■

[15] Application *(character 28-29)*		FC 302	FC 202	FC 102
BX	No application option	■	■	■
B0	MCB 109 analogue I/O, real-time clock backup		■	■
B2	MCB 112 PTC Thermistor Card	■	■	■
B4	MCB 114 VLT® Sensor Input	■	■	■
BK	MCB 101 General Purpose I/O	■	■	■
BP	MCB 105 Relay Expansion	■	■	■
BR	MCB 102 CL Encoder	■		
BU	MCB 103 Resolver	■		
BY	MCO 101 Extended Cascade Control		■	
BZ	MCB 108 Safety PLC Interface	■		

[16] Motion Control *(character 30-31)*		FC 302	FC 202	FC 102
CX	No motion control option	■	■	■
C4	MCO 305 Programmable Motion Control (SyncPos)	■		
C4	MCO 350 Synchronizing control	■		
C4	MCO 351 Positioning control	■		

[17] Extended Relay *(character 32)*		FC 302	FC 202	FC 102
X	No selection	■	■	■
R	MCB 113 Extended Relay Card	■		
5	MCO 102 Advanced Cascade Control		■	

[18] Motion Software *(character 33-34)*		FC 302	FC 202	FC 102
XX	No software option *Note: C4 option in [17] selected with no motion software in [19] will require programming by qualified individual*	■	■	■
10	MCO 350 Synchronizing control *(must select C4 in position [17])*	■		
11	MCO 351 Positioning control *(must select C4 in position [17])*	■		
12	MCO 352 Center Winder	■		

[19] Control Power Backup Input *(character 35-36)*		FC 302	FC 202	FC 102
DX	No DC input installed	■	■	■
D0	MCB 107 24 V DC backup	■	■	■

ENGINEERING
TOMORROW

What VLT® is all about

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

Environmentally responsible

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

All frequency converter factories are certified according to ISO 14001 and ISO 9001 standards.

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.

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.

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 VLT 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 VLT Drives' experts located in more than 100 countries are ready to support our customers with application advice and service wherever they may be.

Danfoss VLT Drives experts don't stop until the customer's drive challenges are solved.

www.danfoss.com/drives

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www.danfoss.com/drives, E-mail: info@danfoss.com

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To access the product, click on the green button.

Product	Code	Reference	Product link
VLT® HVAC Drive FC 102 110 KW / 150 HP, 380 - 480 VAC, No brake chopper, IP21 / Type 1, RFI Class A2 (C3), No A Option, No B Option, Not coated PCB, No Mains Option FC-102P110T4E21H2XGXXXXSXXXXAXBXCXXXXDX	131B6929		Buy on EAN
VLT® HVAC Drive FC 102 132 KW / 200 HP, 380 - 480 VAC, No brake chopper, IP21 / Type 1, RFI Class A2 (C3), No A Option, No B Option, Not coated PCB, No Mains Option FC-102P132T4E21H2XGXXXXSXXXXAXBXCXXXXDX	131B6935		Buy on EAN
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VLT® AQUA Drive FC 200 110 KW / 150 HP, 380 - 480 VAC, IP21 / Type 1, RFI Class A2 (C3), No brake chopper FC-202P110T4E21H2XGXXXXSXXXXAXBXCXXXXDX	131B8869		Buy on EAN
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VLT® AutomationDrive FC 300 15 KW / 20 HP, 380 - 500 VAC, IP20 / Chassis, RFI Class A1/B (C1), No brake chopper Further options according to typecode	131F0430		Buy on EAN
VLT® AQUA Drive FC 200 160 KW / 250 HP, 380 - 480 VAC, IP21 / Type 1, RFI Class A2 (C3), No brake chopper FC-202P160T4E21H2XGCXXXSXXXXAXBXCXXXXDX	131F4230		Buy on EAN
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VLT® AQUA Drive FC 200 315 KW / 450 HP, 380 - 480 VAC, IP54 / Type 12, RFI class A1 (C2), No brake chopper FC-202N315T4E54H4XGC3XXSXXXXAXBXCXXXXDX	134H1810		Buy on EAN

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VLT® HVAC Drive FC 102 160 KW / 250 HP, 380 - 480 VAC, No brake chopper, IP21 / Type 1, RFI Class A2 (C3), No A Option, MCB-101 General purp. I/O, Not coated PCB, No Mains Option FC-102P160T4E21H2XGXXXXSXXXXAXBKCXXXXDX	131F7588		Buy on EAN
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VLT® HVAC Drive FC 102 110 KW / 150 HP, 380 - 480 VAC, No brake chopper, IP21 / Type 1, RFI Class A2 (C3), No A Option, MCB-101 General purp. I/O, Not coated PCB, No Mains Option FC-102P110T4E21H2XGXXXXSXXXXAXBKCXXXXDX	131F7585		Buy on EAN
VLT® AutomationDrive FC 300 200 KW / 300 HP, 380 - 500 VAC, IP21 / Type 1, RFI class A1 (C2), No brake chopper Further options according to typecode	131H4074		Buy on EAN
VLT® HVAC Drive FC 102 315 KW / 450 HP, 380 - 480 VAC, Safe Stop, IP54 / Type 12, LHD - AAF006 filter + A2 RFI, PROFINET MCA 120, No B Option, Coated PCB, Mains Disconnect + Fuse FC-102P315T4E54N2TGC3XXSXXXXALBXCXXXXDX	134N8766		Buy on EAN
VLT® HVAC Drive FC 102 315 KW / 450 HP, 380 - 480 VAC, No brake chopper, IP54 / Type 12, RFI Class A2 (C3), No A Option, No B Option, Coated PCB, Mains Disconnect + Fuse FC-102P315T4E54H2XGC3XXSXXXXAXBXCXXXXDX	131F9516		Buy on EAN
VLT® HVAC Drive FC 102 250 KW / 350 HP, 380 - 480 VAC, No brake chopper, IP54 / Type 12, RFI class A1 (C2), No A Option, MCB-101 General purp. I/O, Coated PCB, No Mains Option FC-102N250T4E54H4XGCXXXSXXXXAXBKCXXXXDX	134L3519		Buy on EAN

VLT® AutomationDrive FC 300 355 KW / 500 HP, 380 - 500 VAC, IP00 / Chassis, RFI Class A2 (C3), Brake chopper Further options according to typecode	131F3298		Buy on EAN
VLT® HVAC Drive FC 102 315 KW / 450 HP, 380 - 480 VAC, No brake chopper, IP21/Type 1+mains shield, RFI Class A2 (C3), No A Option, No B Option, Coated PCB, No Mains Option FC-102N315T4E2MH2XGCXXXSXXXXAXBXCXXXXDX	134F6808		Buy on EAN
VLT® AQUA Drive FC 200 160 KW / 250 HP, 380 - 480 VAC, IP54 / Type 12, RFI Class A2 (C3), No brake chopper FC-202P160T4E54H2XGC3XXSXXXXAXBXCXXXXDX	131F7115		Buy on EAN
VLT® AQUA Drive FC 200 200 KW / 300 HP, 380 - 480 VAC, IP54 / Type 12, RFI Class A2 (C3), No brake chopper FC-202P200T4E54H2XGC3XXSXXXXAXBXCXXXXDX	131F7116		Buy on EAN
VLT® HVAC Drive FC 102 250 KW / 350 HP, 380 - 480 VAC, Safe Stop, IP20 / Chassis, RFI Class A2 (C3), No A Option, No B Option, Coated PCB, No Mains Option FC-102N250T4E20H2TGCXXXSXXXXAXBXCXXXXDX	134H0677		Buy on EAN
VLT® HVAC Drive FC 102 250 KW / 350 HP, 380 - 480 VAC, Safe Stop, IP54 / Type 12, RFI class A1 (C2), No A Option, No B Option, Coated PCB, No Mains Option FC-102P250T4E54H4TGCXXXSXXXXAXBXCXXXXDX	131H3173		Buy on EAN
VLT® HVAC Drive FC 102 110 KW / 150 HP, 380 - 480 VAC, No brake chopper, IP21 / Type 1, RFI class A1 (C2), No A Option, No B Option, Coated PCB, No Mains Option FC-102N110T4E21H4XGCXXXSXXXXAXBXCXXXXDX	134F4246		Buy on EAN
VLT® HVAC Drive FC 102 132 KW / 200 HP, 380 - 480 VAC, No brake chopper, IP54 / Type 12, RFI Class A2 (C3), No A Option, No B Option, Coated PCB, No Mains Option FC-102N132T4E54H2XGCXXXSXXXXAXBXCXXXXDX	134F4247		Buy on EAN
VLT® HVAC Drive FC 102 250 KW / 350 HP, 380 - 480 VAC, No brake chopper, IP54 / Type 12, RFI Class A2 (C3), PROFIBUS DP MCA 101, No B Option, Coated PCB, No Mains Option FC-102N250T4E54H2XGCXXXSXXXXA0BXCXXXXDX	134G5725		Buy on EAN
VLT® HVAC Drive FC 102 250 KW / 350 HP, 380 - 480 VAC, Brake chopper, IP20 / Chassis, RFI Class A2 (C3), No A Option, No B Option, Coated PCB, No Mains Option FC-102N250T4E20H2BGCXXXSXXXXAXBXCXXXXDX	134G5433		Buy on EAN
VLT® AutomationDrive FC 300 90 KW / 125 HP, 380 - 500 VAC, IP21 / Type 1, RFI Class A2 (C3), No brake chopper Further options according to typecode	131B6825		Buy on EAN
VLT® AutomationDrive FC 300 160 KW / 250 HP, 380 - 500 VAC, IP00 / Chassis, RFI class A1 (C2), No brake chopper Further options according to typecode	131B6820		Buy on EAN
VLT® HVAC Drive FC 102 110 KW / 150 HP, 380 - 480 VAC, Brake chopper, IP54 / Type 12, RFI Class A2 (C3), No A Option, No B Option, Coated PCB, No Mains Option FC-102N110T4E54H2BGCXXXSXXXXAXBXCXXXXD0	134U4754		Buy on EAN

VLT® HVAC Drive FC 102 250 KW / 350 HP, 380 - 480 VAC, No brake chopper, IP54 / Type 12, RFI class A1 (C2), PROFIBUS DP MCA 101, No B Option, Not coated PCB, No Mains Option FC-102P250T4E54H4XGXXXXSXXXXA0BXCXXXXDX	131H1810		Buy on EAN
VLT® HVAC Drive FC 102 110 KW / 150 HP, 380 - 480 VAC, No brake chopper, IP54 / Type 12, RFI class A1 (C2), PROFIBUS DP MCA 101, No B Option, Not coated PCB, No Mains Option FC-102P110T4E54H4XGXXXXSXXXXA0BXCXXXXDX	131H0148		Buy on EAN
VLT® HVAC Drive FC 102 132 KW / 200 HP, 380 - 480 VAC, No brake chopper, IP54 / Type 12, RFI Class A2 (C3), PROFIBUS DP MCA 101, No B Option, Not coated PCB, Mains Disconnect + Fuse FC-102P132T4E54H2XGX3XXSXXXXA0BXCXXXXDX	131N1639		Buy on EAN
VLT® HVAC Drive FC 102 200 KW / 300 HP, 380 - 480 VAC, Safe Stop, IP00 / Chassis, RFI Class A2 (C3), No A Option, No B Option, Not coated PCB, No Mains Option FC-102P200T4E00H2TGXXXXSXXXXAXBXCXXXXDX	131N0456		Buy on EAN
VLT® HVAC Drive FC 102 315 KW / 450 HP, 380 - 480 VAC, No brake chopper, IP54/Type 12+main shield, RFI Class A2 (C3), No A Option, No B Option, Coated PCB, No Mains Option FC-102P315T4E5MH2XGCXXXSXXXXAXBXCXXXXDX	131F8101		Buy on EAN
VLT® HVAC Drive FC 102 355 KW / 500 HP, 380 - 480 VAC, No brake chopper, IP00 / Chassis, RFI Class A2 (C3), No A Option, MCB-101 General purp. I/O, Coated PCB, No Mains Option FC-102P355T4E00H2XGCXXXSXXXXAXBKCXXXXDX	131F7616		Buy on EAN
VLT® HVAC Drive FC 102 315 KW / 450 HP, 380 - 480 VAC, No brake chopper, IP00 / Chassis, RFI Class A2 (C3), No A Option, MCB-101 General purp. I/O, Coated PCB, No Mains Option FC-102P315T4E00H2XGCXXXSXXXXAXBKCXXXXDX	131F7615		Buy on EAN
VLT® HVAC Drive FC 102 132 KW / 200 HP, 380 - 480 VAC, Brake chopper, IP54/Type 12+main shield, RFI class A1 (C2), No A Option, No B Option, Not coated PCB, Loadsharing FC-102P132T4E5MH4BGXDXXSXXXXAXBXCXXXXDX	131F9292		Buy on EAN
VLT® HVAC Drive FC 102 132 KW / 200 HP, 380 - 480 VAC, No brake chopper, IP54/Type 12+main shield, RFI class A1 (C2), No A Option, No B Option, Not coated PCB, No Mains Option FC-102P132T4E5MH4XGXXXXSXXXXAXBXCXXXXDX	131F8079		Buy on EAN
VLT® HVAC Drive FC 102 160 KW / 250 HP, 380 - 480 VAC, No brake chopper, IP54/Type 12+main shield, RFI Class A2 (C3), No A Option, No B Option, Not coated PCB, No Mains Option FC-102P160T4E5MH2XGXXXXSXXXXAXBXCXXXXDX	131F8076		Buy on EAN
VLT® HVAC Drive FC 102 110 KW / 150 HP, 380 - 480 VAC, No brake chopper, IP54/Type 12+main shield, RFI Class A2 (C3), No A Option, No B Option, Not coated PCB, No Mains Option FC-102P110T4E5MH2XGXXXXSXXXXAXBXCXXXXDX	131F8077		Buy on EAN
VLT® HVAC Drive FC 102 200 KW / 300 HP, 380 - 480 VAC, No brake chopper, IP54/Type 12+main shield, RFI Class A2 (C3), No A Option, No B Option, Not coated PCB, No Mains Option FC-102P200T4E5MH2XGXXXXSXXXXAXBXCXXXXDX	131F8075		Buy on EAN

VLT® HVAC Drive FC 102 315 KW / 450 HP, 380 - 480 VAC, Safe Stop, IP20 / Chassis, RFI Class A2 (C3), No A Option, No B Option, Coated PCB, No Mains Option FC-102N315T4E20H2TGCXXXSXXXXAXBXCXXXXDX	134F9232		Buy on EAN
VLT® HVAC Drive FC 102 110 KW / 150 HP, 380 - 480 VAC, No brake chopper, IP54 / Type 12, RFI class A1 (C2), No A Option, No B Option, Coated PCB, No Mains Option FC-102P110T4E54H4XGCXXXSXXXXAXBXCXXXXDX	131F9671		Buy on EAN
VLT® HVAC Drive FC 102 132 KW / 200 HP, 380 - 480 VAC, No brake chopper, IP54 / Type 12, RFI Class A2 (C3), No A Option, No B Option, Coated PCB, No Mains Option FC-102P132T4E54H2XGCXXXSXXXXAXBXCXXXXDX	131L4910		Buy on EAN
VLT® AutomationDrive FC 300 132 KW / 200 HP, 380 - 500 VAC, IP21 / Type 1, RFI class A1 (C2), No brake chopper Further options according to typecode	131B5931		Buy on EAN
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VLT® HVAC Drive FC 102 200 KW / 300 HP, 525 - 690 VAC *, Safe Stop, IP20 / Chassis, RFI Class A2 (C3), No A Option, No B Option, Coated PCB, No Mains Option FC-102N200T7E20H2TGCXXXSXXXXAXBXCXXXXDX	134L0398		Buy on EAN
VLT® AutomationDrive FC 300 11 KW / 15 HP, 380 - 500 VAC, IP20 / Chassis, RFI Class A2 (C3), Brake chopper Further options according to typecode	131F8653		Buy on EAN
VLT® AutomationDrive FC 300 15 KW / 20 HP, 380 - 500 VAC, IP20 / Chassis, RFI Class A1/B (C1), No brake chopper Further options according to typecode	131F8654		Buy on EAN
VLT® AutomationDrive FC 300 15 KW / 20 HP, 380 - 500 VAC, IP20 / Chassis, RFI Class A1/B (C1), Brake chopper Further options according to typecode	131F8655		Buy on EAN
VLT® HVAC Drive FC 102 450 KW / 600 HP, 380 - 480 VAC, Safe Stop, IP54 / Type 12, RFI Class A2 (C3), No A Option, No B Option, Coated PCB, Mains Disconnect + Fuse FC-102P450T4E54H2TGC3XXSXXXXAXBXCXXXXDX	131L2852		Buy on EAN
VLT® HVAC Drive FC 102 132 KW / 200 HP, 380 - 480 VAC, Brake chopper + Safe stop, IP20 / Chassis, RFI Class A2 (C3), PROFIBUS DP MCA 101, No B Option, Coated PCB, No Mains Option FC-102N132T4E20H2UGCXXXSXXXXA0BXCXXXXDX	134G5609		Buy on EAN
VLT® HVAC Drive FC 102 630 KW / 900 HP, 380 - 480 VAC, No brake chopper, IP54 / Type 12, RFI Class A2 (C3), No A Option, No B Option, Coated PCB, Fuse FC-102P630T4E54H2XGC7XKSXXXXAXBXCXXXXDX	134G1948		Buy on EAN
VLT® AutomationDrive FC 300 250 KW / 350 HP, 380 - 500 VAC, IP54 Hybrid LHD elect., LHD + Class A1 RFI, No brake chopper Further options according to typecode	131Z3864		Buy on EAN

VLT® AQUA Drive FC 200 110 KW / 150 HP, 380 - 480 VAC, IP21 / Type 1, RFI Class A2 (C3), No brake chopper FC-202P110T4E21H2XGXXXXSXXXXAXBYCXXXXDX	131F5966		Buy on EAN
VLT® HVAC Drive FC 102 250 KW / 350 HP, 380 - 480 VAC, Brake chopper, IP20 / Chassis, RFI class A1 (C2), PROFIBUS DP MCA 101, No B Option, Coated PCB, No Mains Option FC-102N250T4E20H4BGCXXXSXXXXA0BXCXXXXDX	134L6697		Buy on EAN
VLT® AutomationDrive FC 300 315 KW / 450 HP, 380 - 500 VAC, IP54 / Type 12, RFI class A1 (C2), Brake chopper Further options according to typecode	131F5543		Buy on EAN
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VLT® AutomationDrive FC 300 110 KW / 150 HP, 380 - 500 VAC, IP21 / Type 1, RFI Class A2 (C3), No brake chopper Further options according to typecode	131B6836		Buy on EAN
VLT® AutomationDrive FC 300 110 KW / 150 HP, 380 - 500 VAC, IP54 / Type 12, RFI Class A2 (C3), No brake chopper Further options according to typecode	131B6838		Buy on EAN
VLT® AutomationDrive FC 300 200 KW / 300 HP, 380 - 500 VAC, IP54 / Type 12, RFI Class A2 (C3), No brake chopper Further options according to typecode	131X3266		Buy on EAN
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VLT® HVAC Drive FC 102 315 KW / 450 HP, 380 - 480 VAC, No brake chopper, IP54 / Type 12, RFI class A1 (C2), PROFIBUS DP MCA 101, No B Option, Coated PCB, No Mains Option FC-102N315T4E54H4XGCXXXSXXXXA0BXCXXXXDX	134H4584		Buy on EAN
VLT® HVAC Drive FC 102 132 KW / 200 HP, 380 - 480 VAC, No brake chopper, IP54/Type 12+main shield, RFI class A1 (C2), PROFIBUS DP MCA 101, No B Option, Not coated PCB, Mains Disconnect + Fuse FC-102P132T4E5MH4XGX3XXSXXXXA0BXCXXXXDX	131F8254		Buy on EAN
VLT® HVAC Drive FC 102 200 KW / 300 HP, 380 - 480 VAC, No brake chopper, IP54 / Type 12, RFI class A1 (C2), No A Option, No B Option, Not coated PCB, Fuse FC-102P200T4E54H4XGX7XXSXXXXAXBXCXXXXDX	131F9111		Buy on EAN
VLT® HVAC Drive FC 102 200 KW / 300 HP, 380 - 480 VAC, No brake chopper, IP54/Type 12+main shield, RFI Class A2 (C3), No A Option, MCB-101 General purp. I/O, Not coated PCB, No Mains Option FC-102P200T4E5MH2XGXXXXSXXXXAXBKCXXXXDX	131F7604		Buy on EAN
VLT® HVAC Drive FC 102 250 KW / 350 HP, 380 - 480 VAC, No brake chopper, IP54/Type 12+main shield, RFI Class A2 (C3), No A Option, MCB-101 General purp. I/O, Not coated PCB, No Mains Option FC-102P250T4E5MH2XGXXXXSXXXXAXBKCXXXXDX	131F7605		Buy on EAN

VLT® HVAC Drive FC 102 110 KW / 150 HP, 380 - 480 VAC, No brake chopper, IP54/Type 12+main shield, RFI Class A2 (C3), No A Option, MCB-101 General purp. I/O, Not coated PCB, No Mains Option FC-102P110T4E5MH2XGXXXXSXXXXAXBKCXXXXDX	131F7600		Buy on EAN
VLT® HVAC Drive FC 102 132 KW / 200 HP, 380 - 480 VAC, No brake chopper, IP54/Type 12+main shield, RFI Class A2 (C3), No A Option, MCB-101 General purp. I/O, Not coated PCB, No Mains Option FC-102P132T4E5MH2XGXXXXSXXXXAXBKCXXXXDX	131F7602		Buy on EAN
VLT® HVAC Drive FC 102 160 KW / 250 HP, 380 - 480 VAC, No brake chopper, IP54/Type 12+main shield, RFI Class A2 (C3), No A Option, MCB-101 General purp. I/O, Not coated PCB, No Mains Option FC-102P160T4E5MH2XGXXXXSXXXXAXBKCXXXXDX	131F7603		Buy on EAN
VLT® HVAC Drive FC 102 315 KW / 450 HP, 380 - 480 VAC, No brake chopper, IP20 / Chassis, RFI class A1 (C2), No A Option, MCB-101 General purp. I/O, Coated PCB, No Mains Option FC-102N315T4E20H4XGCXXXSXXXXAXBKCXXXXDX	134G7240		Buy on EAN
VLT® HVAC Drive FC 102 315 KW / 450 HP, 380 - 480 VAC, No brake chopper, IP54 / Type 12, RFI Class A2 (C3), No A Option, No B Option, Coated PCB, Fuse FC-102P315T4E54H2XGC7XXSXXXXAXBXCXXXXDX	131G5448		Buy on EAN
VLT® HVAC Drive FC 102 315 KW / 450 HP, 380 - 480 VAC, No brake chopper, IP54/Type 12+main shield, RFI class A1 (C2), No A Option, No B Option, Coated PCB, Mains Disconnect + Fuse FC-102P315T4E5MH4XGC3XXSXXXXAXBXCXXXXDX	131F8006		Buy on EAN
VLT® HVAC Drive FC 102 110 KW / 150 HP, 380 - 480 VAC, No brake chopper, IP54/Type 12+main shield, RFI class A1 (C2), PROFIBUS DP MCA 101, No B Option, Not coated PCB, No Mains Option FC-102P110T4E5MH4XGXXXXSXXXXA0BXCXXXXDX	131F7736		Buy on EAN
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VLT® HVAC Drive FC 102 450 KW / 600 HP, 380 - 480 VAC, No brake chopper, IP00 / Chassis, RFI Class A2 (C3), No A Option, No B Option, Coated PCB, No Mains Option FC-102P450T4E00H2XGCXXXSXXXXAXBXCXXXXDX	131B7431		Buy on EAN
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VLT® HVAC Drive FC 102 160 KW / 250 HP, 380 - 480 VAC, No brake chopper, IP00 / Chassis, RFI class A1 (C2), No A Option, No B Option, Not coated PCB, No Mains Option FC-102P160T4E00H4XGXXXXSXXXXAXBXCXXXXD0	131F7953		Buy on EAN

VLT® HVAC Drive FC 102 160 KW / 250 HP, 380 - 480 VAC, No brake chopper, IP21 / Type 1, RFI class A1 (C2), No A Option, MCB-109 I/O, RTC Back-up, Not coated PCB, No Mains Option FC-102P160T4E21H4XGXXXXSXXXXAXB0CXXXXDX	131F7959		Buy on EAN
VLT® HVAC Drive FC 102 110 KW / 150 HP, 380 - 480 VAC, No brake chopper, IP00 / Chassis, RFI class A1 (C2), No A Option, No B Option, Not coated PCB, No Mains Option FC-102P110T4E00H4XXXXXXSXXXXAXBXCXXXXDX	131F8539		Buy on EAN
VLT® HVAC Drive FC 102 400 KW / 550 HP, 380 - 480 VAC, No brake chopper, IP21 / Type 1, LHD - AAF006 filter + A2 RFI, PROFIBUS DP MCA 101, No B Option, Coated PCB, Mains Disconnect + Fuse FC-102P400T4E21N2XGC3XXSXXXXA0BXCXXXXDX	134H4804		Buy on EAN
VLT® HVAC Drive FC 102 200 KW / 300 HP, 380 - 480 VAC, No brake chopper, IP21 / Type 1, LHD - AAF006 filter + A2 RFI, PROFIBUS DP MCA 101, No B Option, Coated PCB, Mains Disconnect + Fuse FC-102P200T4E21N2XGC3XXSXXXXA0BXCXXXXDX	134H4805		Buy on EAN
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VLT® AQUA Drive FC 200 200 KW / 300 HP, 380 - 480 VAC, IP00 / Chassis, RFI Class A2 (C3), No brake chopper FC-202P200T4E00H2XGCXXXSXXXXAXBXCXXXXDX	131F4235		Buy on EAN
VLT® AQUA Drive FC 200 250 KW / 350 HP, 380 - 480 VAC, IP54/Type 12+main shield, RFI class A1 (C2), Brake chopper + Safe stop FC-202P250T4E5MH4UGC3XXSXXXXAXBXCXXXXDX	131N0058		Buy on EAN
VLT® HVAC Drive FC 102 110 KW / 150 HP, 380 - 480 VAC, No brake chopper, IP54 / Type 12, RFI Class A2 (C3), PROFIBUS DP MCA 101, No B Option, Coated PCB, No Mains Option FC-102N110T4E54H2XGCXXXSXXXXA0BXCXXXXDX	134F9206		Buy on EAN
VLT® HVAC Drive FC 102 315 KW / 450 HP, 380 - 480 VAC, Safe Stop, IP54/Type 12+main shield, RFI class A1 (C2), No A Option, No B Option, Coated PCB, Fuse FC-102N315T4E5MH4TGC7XXSXXXXAXBXCXXXXDX	134G4270		Buy on EAN
VLT® AutomationDrive FC 300 15 KW / 20 HP, 380 - 500 VAC, IP20 / Chassis, RFI Class A1/B (C1), Brake chopper Further options according to typecode	131H1167		Buy on EAN
VLT® HVAC Drive FC 102 132 KW / 200 HP, 380 - 480 VAC, No brake chopper, IP21 / Type 1, RFI Class A2 (C3), No A Option, No B Option, Not coated PCB, Fuse FC-102P132T4E21H2XGX7XXSXXXXAXBXCXXXXDX	131H2163		Buy on EAN
VLT® AutomationDrive FC 300 11 KW / 15 HP, 380 - 500 VAC, IP20 / Chassis, RFI Class A2 (C3), No brake chopper Further options according to typecode	131G0027		Buy on EAN
VLT® HVAC Drive FC 102 132 KW / 200 HP, 380 - 480 VAC, No brake chopper, IP21 / Type 1, RFI class A1 (C2), No A Option, No B Option, Not coated PCB, No Mains Option FC-102P132T4E21H4XGXXXXSXXXXAXBXCXXXXDX	131B6934		Buy on EAN

VLT® HVAC Drive FC 102 132 KW / 200 HP, 380 - 480 VAC, No brake chopper, IP54 / Type 12, RFI Class A2 (C3), No A Option, No B Option, Not coated PCB, No Mains Option FC-102P132T4E54H2XGXXXXSXXXXAXBXCXXXXDX	131B6937		Buy on EAN
VLT® HVAC Drive FC 102 132 KW / 200 HP, 380 - 480 VAC, No brake chopper, IP54 / Type 12, RFI class A1 (C2), No A Option, No B Option, Not coated PCB, No Mains Option FC-102P132T4E54H4XGXXXXSXXXXAXBXCXXXXDX	131B6936		Buy on EAN
VLT® HVAC Drive FC 102 132 KW / 200 HP, 380 - 480 VAC, No brake chopper, IP00 / Chassis, RFI Class A2 (C3), No A Option, No B Option, Not coated PCB, No Mains Option FC-102P132T4E00H2XGXXXXSXXXXAXBXCXXXXDX	131B6933		Buy on EAN
VLT® HVAC Drive FC 102 160 KW / 250 HP, 380 - 480 VAC, No brake chopper, IP00 / Chassis, RFI Class A2 (C3), No A Option, No B Option, Not coated PCB, No Mains Option FC-102P160T4E00H2XGXXXXSXXXXAXBXCXXXXDX	131B6939		Buy on EAN
VLT® HVAC Drive FC 102 160 KW / 250 HP, 380 - 480 VAC, No brake chopper, IP00 / Chassis, RFI class A1 (C2), No A Option, No B Option, Not coated PCB, No Mains Option FC-102P160T4E00H4XGXXXXSXXXXAXBXCXXXXDX	131B6938		Buy on EAN
VLT® HVAC Drive FC 102 200 KW / 300 HP, 380 - 480 VAC, No brake chopper, IP00 / Chassis, RFI Class A2 (C3), No A Option, MCB-101 General purp. I/O, Coated PCB, No Mains Option FC-102P200T4E00H2XGCXXXSXXXXAXBKCXXXXDX	131G9303		Buy on EAN
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VLT® HVAC Drive FC 102 132 KW / 200 HP, 380 - 480 VAC, No brake chopper, IP54/Type 12+main shield, RFI class A1 (C2), No A Option, No B Option, Not coated PCB, Mains Disconnect + Fuse FC-102P132T4E5MH4XGX3XXSXXXXAXBXCXXXXDX	131F7704		Buy on EAN
VLT® HVAC Drive FC 102 200 KW / 300 HP, 380 - 480 VAC, No brake chopper, IP21 / Type 1, RFI Class A2 (C3), No A Option, No B Option, Not coated PCB, No Mains Option FC-102P200T4E21H2XXXXXXSXXXXAXBXCXXXXDX	131F8549		Buy on EAN
VLT® HVAC Drive FC 102 160 KW / 250 HP, 380 - 480 VAC, No brake chopper, IP00 / Chassis, RFI Class A2 (C3), No A Option, MCB-101 General purp. I/O, Coated PCB, No Mains Option FC-102P160T4E00H2XGCXXXSXXXXAXBKCXXXXDX	131L2509		Buy on EAN
VLT® AQUA Drive FC 200 450 KW / 600 HP, 380 - 480 VAC, IP54 / Type 12, RFI class A1 (C2), Brake chopper + Safe stop FC-202P450T4E54H4UGCXXXSXXXXAXBXCXXXXDX	131H3156		Buy on EAN
VLT® HVAC Drive FC 102 110 KW / 150 HP, 380 - 480 VAC, No brake chopper, IP20 / Chassis, RFI Class A2 (C3), No A Option, No B Option, Coated PCB, No Mains Option FC-102N110T4E20H2XGCXXXSXXXXAXBXCXXXXDX	134F0374		Buy on EAN
VLT® AutomationDrive FC 300 11 KW / 15 HP, 380 - 500 VAC, IP20 / Chassis, RFI Class A2 (C3), No brake chopper Further options according to typecode	131F7145		Buy on EAN

VLT® AQUA Drive FC 200 200 KW / 300 HP, 380 - 480 VAC, IP20 / Chassis, RFI Class A2 (C3), No brake chopper FC-202N200T4E20H2XGCXXXSXXXXAXBYCXXXXDX	134H7489		Buy on EAN
VLT® AutomationDrive FC 300 110 KW / 150 HP, 380 - 500 VAC, IP21 / Type 1, RFI Class A2 (C3), Brake chopper Further options according to typecode	131F3402		Buy on EAN
VLT® HVAC Drive FC 102 355 KW / 500 HP, 380 - 480 VAC, No brake chopper, IP54 / Type 12, RFI class A1 (C2), PROFIBUS DP MCA 101, No B Option, Coated PCB, No Mains Option FC-102P355T4E54H4XGCXXXSXXXXA0BXCXXXXDX	131F9871		Buy on EAN
VLT® HVAC Drive FC 102 160 KW / 250 HP, 380 - 480 VAC, No brake chopper, IP54/Type 12+main shield, RFI class A1 (C2), No A Option, No B Option, Not coated PCB, No Mains Option FC-102P160T4E5MH4XGXXXXSXXXXAXBXCXXXXDX	131F7961		Buy on EAN
VLT® AQUA Drive FC 200 160 KW / 250 HP, 380 - 480 VAC, IP20 / Chassis, RFI Class A2 (C3), No brake chopper FC-202N160T4E20H2XGCXXXSXXXXAXBYCXXXXDX	134U4718		Buy on EAN
VLT® AutomationDrive FC 300 90 KW / 125 HP, 380 - 500 VAC, IP54/Type 12+main shield, RFI class A1 (C2), No brake chopper Further options according to typecode	131N2423		Buy on EAN
VLT® HVAC Drive FC 102 160 KW / 250 HP, 380 - 480 VAC, Safe Stop, IP20 / Chassis, RFI Class A2 (C3), PROFINET MCA 120, No B Option, Coated PCB, No Mains Option FC-102N160T4E20H2TGCXXXSXXXXALBXCXXXXDX	134L5613		Buy on EAN
VLT® AutomationDrive FC 300 315 KW / 450 HP, 380 - 500 VAC, IP54 / Type 12, RFI class A1 (C2), No brake chopper Further options according to typecode	131B6892		Buy on EAN
VLT® AutomationDrive FC 300 315 KW / 450 HP, 380 - 500 VAC, IP54 / Type 12, RFI class A1 (C2), No brake chopper Further options according to typecode	131B6890		Buy on EAN
VLT® AQUA Drive FC 200 110 KW / 150 HP, 380 - 480 VAC, IP21 / Type 1, RFI class A1 (C2), No brake chopper FC-202N110T4E21H4XGCXXXSXXXXAXBXCXXXXDX	134F4167		Buy on EAN
VLT® HVAC Drive FC 102 160 KW / 250 HP, 380 - 480 VAC, No brake chopper, IP21 / Type 1, RFI class A1 (C2), No A Option, No B Option, Not coated PCB, Mains Disconnect + Fuse FC-102P160T4E21H4XGX3XXSXXXXAXBXCXXXXDX	131F7957		Buy on EAN
VLT® HVAC Drive FC 102 250 KW / 350 HP, 380 - 480 VAC, No brake chopper, IP54 / Type 12, RFI Class A2 (C3), No A Option, No B Option, Not coated PCB, No Mains Option FC-102P250T4E54H2XGXXXXSXXXXAXBXCXXXXDX	131B6955		Buy on EAN
VLT® HVAC Drive FC 102 250 KW / 350 HP, 380 - 480 VAC, No brake chopper, IP54 / Type 12, RFI class A1 (C2), No A Option, No B Option, Not coated PCB, No Mains Option FC-102P250T4E54H4XGXXXXSXXXXAXBXCXXXXDX	131B6954		Buy on EAN
VLT® AQUA Drive FC 200 132 KW / 200 HP, 380 - 480 VAC, IP54 / Type 12, RFI Class A2 (C3), No brake chopper FC-202N132T4E54H2XGRXXXSXXXXAXBXCXXXXDX	134G9367		Buy on EAN
VLT® AutomationDrive FC 300 110 KW / 150 HP, 380 - 500 VAC, IP54 / Type 12, RFI class A1 (C2), No brake chopper Further options according to typecode	131B8209		Buy on EAN

VLT® AutomationDrive FC 300 355 KW / 500 HP, 380 - 500 VAC, IP21 / Type 1, RFI class A1 (C2), No brake chopper Further options according to typecode	131B6898		Buy on EAN
VLT® AutomationDrive FC 300 11 KW / 15 HP, 380 - 500 VAC, IP20 / Chassis, RFI Class A1/B (C1), Brake chopper Further options according to typecode	131F6613		Buy on EAN
VLT® AQUA Drive FC 200 132 KW / 200 HP, 380 - 480 VAC, IP00 / Chassis, RFI Class A2 (C3), No brake chopper FC-202P132T4E00H2XGXXXXSXXXXAXBXCXXXXDX	131B9335		Buy on EAN
VLT® HVAC Drive FC 102 200 KW / 300 HP, 380 - 480 VAC, No brake chopper, IP54 / Type 12, RFI Class A2 (C3), No A Option, No B Option, Coated PCB, Mains Disconnect + Fuse FC-102N200T4E54H2XGC3XXSXXXXAXBXCXXXXDX	134G9095		Buy on EAN
VLT® HVAC Drive FC 102 160 KW / 250 HP, 380 - 480 VAC, No brake chopper, IP54 / Type 12, RFI Class A2 (C3), No A Option, No B Option, Coated PCB, Mains Disconnect + Fuse FC-102N160T4E54H2XGC3XXSXXXXAXBXCXXXXDX	134G9094		Buy on EAN
VLT® HVAC Drive FC 102 250 KW / 350 HP, 380 - 480 VAC, No brake chopper, IP20 / Chassis, RFI Class A2 (C3), No A Option, No B Option, Coated PCB, No Mains Option FC-102N250T4E20H2XGCXXXSXXXXAXBXCXXXXDX	134F0530		Buy on EAN
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VLT® HVAC Drive FC 102 110 KW / 150 HP, 380 - 480 VAC, No brake chopper, IP21 / Type 1, RFI class A1 (C2), No A Option, No B Option, Not coated PCB, No Mains Option FC-102P110T4E21H4XGXXXXSXXXXAXBXCXXXXDX	131B6928		Buy on EAN
VLT® HVAC Drive FC 102 110 KW / 150 HP, 380 - 480 VAC, No brake chopper, IP00 / Chassis, RFI Class A2 (C3), No A Option, No B Option, Not coated PCB, No Mains Option FC-102P110T4E00H2XGXXXXSXXXXAXBXCXXXXDX	131B6927		Buy on EAN
VLT® AutomationDrive FC 300 90 KW / 125 HP, 380 - 500 VAC, IP00 / Chassis, RFI Class A2 (C3), No brake chopper Further options according to typecode	131B6818		Buy on EAN
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VLT® HVAC Drive FC 102 800 KW / 1200 HP, 380 - 480 VAC, No brake chopper, IP54 / Type 12, RFI Class A2 (C3), No A Option, No B Option, Coated PCB, No Mains Option FC-102P800T4E54H2XGCXKXSXXXXAXBXCXXXXDX	134U5018		Buy on EAN

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VLT® HVAC Drive FC 102 110 KW / 150 HP, 380 - 480 VAC, No brake chopper, IP00 / Chassis, RFI Class A2 (C3), PROFIBUS DP MCA 101, No B Option, Not coated PCB, No Mains Option FC-102P110T4E00H2XGXXXXSXXXXA0BXCXXXXDX	131L4589		Buy on EAN
VLT® HVAC Drive FC 102 132 KW / 200 HP, 380 - 480 VAC, No brake chopper, IP20 / Chassis, RFI Class A2 (C3), LonWorks MCA 108, No B Option, Coated PCB, No Mains Option FC-102N132T4E20H2XGCXXXSXXXXAGBXCXXXXDX	134H6072		Buy on EAN
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VLT® AQUA Drive FC 200 200 KW / 300 HP, 380 - 480 VAC, IP54/Type 12 +Space Heat, RFI Class A2 (C3), No brake chopper FC-202N200T4H54H2XGCXXXSXXXXAXBXCXXXXDX	134U0613		Buy on EAN
VLT® AQUA Drive FC 200 315 KW / 450 HP, 380 - 480 VAC, IP20 / Chassis, RFI Class A2 (C3), No brake chopper FC-202N315T4E20H2XGCXXXSXXXXAXBXCXXXXDX	134F4192		Buy on EAN
VLT® HVAC Drive FC 102 160 KW / 250 HP, 380 - 480 VAC, Safe Stop, IP54 / Type 12, RFI Class A2 (C3), PROFIBUS DP MCA 101, No B Option, Coated PCB, Mains Disconnect + Fuse FC-102P160T4E54H2TGC3XXSXXXXA0BXCXXXXD0	134F3186		Buy on EAN
VLT® AutomationDrive FC 300 90 KW / 125 HP, 380 - 500 VAC, IP21 / Type 1, RFI Class A2 (C3), Brake chopper Further options according to typecode	131F2874		Buy on EAN
VLT® AQUA Drive FC 200 200 KW / 300 HP, 380 - 480 VAC, IP54 / Type 12, RFI class A1 (C2), No brake chopper FC-202P200T4E54H4XGCXXXSXXXXAXBXCXXXXDX	131F3658		Buy on EAN
VLT® HVAC Drive FC 102 110 KW / 150 HP, 380 - 480 VAC, No brake chopper, IP00 / Chassis, RFI Class A2 (C3), No A Option, MCB-101 General purp. I/O, Not coated PCB, No Mains Option FC-102P110T4E00H2XGXXXXSXXXXAXBKCXXXXDX	131F7572		Buy on EAN
VLT® HVAC Drive FC 102 132 KW / 200 HP, 380 - 480 VAC, No brake chopper, IP00 / Chassis, RFI Class A2 (C3), No A Option, MCB-101 General purp. I/O, Not coated PCB, No Mains Option FC-102P132T4E00H2XGXXXXSXXXXAXBKCXXXXDX	131F7573		Buy on EAN
VLT® HVAC Drive FC 102 200 KW / 300 HP, 380 - 480 VAC, No brake chopper, IP00 / Chassis, RFI Class A2 (C3), No A Option, MCB-101 General purp. I/O, Not coated PCB, No Mains Option FC-102P200T4E00H2XGXXXXSXXXXAXBKCXXXXDX	131F7576		Buy on EAN

VLT® HVAC Drive FC 102 200 KW / 300 HP, 380 - 480 VAC, No brake chopper, IP21 / Type 1, RFI Class A2 (C3), No A Option, No B Option, Coated PCB, No Mains Option FC-102P200T4E21H2XGCXXXSXXXXAXBXCXXXXDX	131N3743		Buy on EAN
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VLT® HVAC Drive FC 102 110 KW / 150 HP, 380 - 480 VAC, No brake chopper, IP00 / Chassis, RFI class A1 (C2), No A Option, MCB-101 General purp. I/O, Not coated PCB, No Mains Option FC-102P110T4E00H4XGXXXXSXXXXAXBKCXXXXDX	131F7579		Buy on EAN
VLT® HVAC Drive FC 102 200 KW / 300 HP, 380 - 480 VAC, No brake chopper, IP21 / Type 1, RFI class A1 (C2), No A Option, MCB-109 I/O, RTC Back-up, Not coated PCB, No Mains Option FC-102P200T4E21H4XGXXXXSXXXXAXB0CXXXXDX	131F7975		Buy on EAN
VLT® HVAC Drive FC 102 200 KW / 300 HP, 380 - 480 VAC, No brake chopper, IP21 / Type 1, RFI class A1 (C2), No A Option, No B Option, Not coated PCB, Mains Disconnect + Fuse FC-102P200T4E21H4XGX3XXSXXXXAXBXCXXXXDX	131F7973		Buy on EAN
VLT® AQUA Drive FC 200 400 KW / 550 HP, 380 - 480 VAC, IP54 / Type 12, RFI Class A2 (C3), No brake chopper FC-202P400T4E54H2XGCXXXSXXXXAXBXCXXXXDX	131B9509		Buy on EAN
VLT® HVAC Drive FC 102 200 KW / 300 HP, 380 - 480 VAC, No brake chopper, IP00 / Chassis, RFI Class A2 (C3), No A Option, MCB-114 VLT Sensor Input, Not coated PCB, No Mains Option FC-102P200T4E00H2XGXXXXSXXXXAXB4CXXXXDX	134G1193		Buy on EAN
VLT® HVAC Drive FC 102 110 KW / 150 HP, 380 - 480 VAC, Brake chopper, IP21 / Type 1, RFI class A1 (C2), No A Option, No B Option, Not coated PCB, No Mains Option FC-102P110T4E21H4BGXXXXSXXXXAXBXCXXXXDX	131H8997		Buy on EAN
VLT® AQUA Drive FC 200 355 KW / 500 HP, 380 - 480 VAC, IP54 / Type 12, RFI Class A2 (C3), No brake chopper FC-202P355T4E54H2XGCXXXSXXXXAXBXCXXXXDX	131B9500		Buy on EAN
VLT® AQUA Drive FC 200 200 KW / 300 HP, 380 - 480 VAC, IP21 / Type 1, RFI Class A2 (C3), No brake chopper FC-202N200T4E21H2XGCXXXSXXXXAXBXCXXXXDX	134F4179		Buy on EAN
VLT® AQUA Drive FC 200 160 KW / 250 HP, 380 - 480 VAC, IP54 / Type 12, RFI Class A2 (C3), No brake chopper FC-202N160T4E54H2XGCXXXSXXXXAXBXCXXXXDX	134F4175		Buy on EAN
VLT® AQUA Drive FC 200 200 KW / 300 HP, 380 - 480 VAC, IP54 / Type 12, RFI class A1 (C2), No brake chopper FC-202N200T4E54H4XGCXXXSXXXXAXBXCXXXXDX	134F4177		Buy on EAN
VLT® HVAC Drive FC 102 90 KW / 125 HP, 525 - 690 VAC *, No brake chopper, IP54/Type 12 -D1 frame, RFI Class A2 (C3), PROFIBUS DP MCA 101, No B Option, Coated PCB, No Mains Option FC-102N90KT7E5DH2XGCXXXSXXXXA0BXCXXXXD0	134L0363		Buy on EAN

VLT® HVAC Drive FC 102 110 KW / 150 HP, 380 - 480 VAC, No brake chopper, IP21 / Type 1, RFI Class A2 (C3), No A Option, No B Option, Not coated PCB, No Mains Option FC-102P110T4E21H2XXXXXXSXXXXAXBXCXXXXDX	131F8540		Buy on EAN
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VLT® HVAC Drive FC 102 250 KW / 350 HP, 380 - 480 VAC, No brake chopper, IP00 / Chassis, RFI Class A2 (C3), No A Option, No B Option, Not coated PCB, No Mains Option FC-102P250T4E00H2XGXXXXSXXXXAXBXCXXXXDX	131B6951		Buy on EAN
VLT® HVAC Drive FC 102 132 KW / 200 HP, 380 - 480 VAC, No brake chopper, IP00 / Chassis, RFI class A1 (C2), No A Option, No B Option, Not coated PCB, Fuse FC-102P132T4E00H4XGX7XXSXXXXAXBXCXXXXDX	131F8212		Buy on EAN
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VLT® HVAC Drive FC 102 200 KW / 300 HP, 380 - 480 VAC, No brake chopper, IP21 / Type 1, RFI class A1 (C2), No A Option, No B Option, Not coated PCB, Fuse FC-102P200T4E21H4XGX7XXSXXXXAXBXCXXXXDX	131F8217		Buy on EAN
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VLT® AQUA Drive FC 200 132 KW / 200 HP, 380 - 480 VAC, IP21 / Type 1, RFI class A1 (C2), No brake chopper FC-202N132T4E21H4XGCXXXSXXXXAXBXCXXXXDX	134F4171		Buy on EAN

VLT® HVAC Drive FC 102 200 KW / 300 HP, 380 - 480 VAC, No brake chopper, IP21/Type 1+mains shield, RFI class A1 (C2), No A Option, No B Option, Not coated PCB, Mains Disconnect + Fuse FC-102P200T4E2MH4XGX3XXSXXXXAXBXCXXXXDX	131F9137		Buy on EAN
VLT® AutomationDrive FC 300 160 KW / 250 HP, 380 - 500 VAC, IP54 / Type 12, RFI Class A2 (C3), Brake chopper Further options according to typecode	131H1923		Buy on EAN
VLT® AQUA Drive FC 200 160 KW / 250 HP, 380 - 480 VAC, IP20 / Chassis, RFI Class A2 (C3), No brake chopper FC-202N160T4E20H2XGCXXXSXXXXA0BXCXXXXDX	134F6435		Buy on EAN
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VLT® HVAC Drive FC 102 250 KW / 350 HP, 380 - 480 VAC, No brake chopper, IP20 / Chassis, RFI Class A2 (C3), PROFIBUS DP MCA 101, No B Option, Coated PCB, No Mains Option FC-102N250T4E20H2XGCXXXSXXXXA0BXCXXXXDX	134F5964		Buy on EAN

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VLT® HVAC Drive FC 102 110 KW / 150 HP, 380 - 480 VAC, No brake chopper, IP21 / Type 1, RFI Class A2 (C3), No A Option, MCB-105 Relay Card, Not coated PCB, No Mains Option FC-102P110T4E21H2XGXXXXSXXXXAXBPCXXXXDX	131F9403		Buy on EAN
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VLT® AQUA Drive FC 200 450 KW / 600 HP, 380 - 480 VAC, IP54 / Type 12, RFI Class A2 (C3), No brake chopper FC-202P450T4E54H2XGCXXXSXXXXA0BXCXXXXDX	131H3874		Buy on EAN
VLT® HVAC Drive FC 102 110 KW / 150 HP, 380 - 480 VAC, Safe Stop, IP20 / Chassis, RFI Class A2 (C3), No A Option, No B Option, Coated PCB, No Mains Option FC-102N110T4E20H2TGCXXXSXXXXAXBXCXXXXDX	134G3059		Buy on EAN
VLT® HVAC Drive FC 102 200 KW / 300 HP, 380 - 480 VAC, No brake chopper, IP21 / Type 1, RFI class A1 (C2), No A Option, No B Option, Not coated PCB, No Mains Option FC-102P200T4E21H4XGXXXXSXXXXAXBXCXXXXDX	131B6946		Buy on EAN
VLT® HVAC Drive FC 102 160 KW / 250 HP, 380 - 480 VAC, No brake chopper, IP21 / Type 1, RFI class A1 (C2), No A Option, No B Option, Not coated PCB, No Mains Option FC-102P160T4E21H4XGXXXXSXXXXAXBXCXXXXDX	131B6940		Buy on EAN
VLT® HVAC Drive FC 102 160 KW / 250 HP, 380 - 480 VAC, No brake chopper, IP54 / Type 12, RFI Class A2 (C3), No A Option, No B Option, Not coated PCB, No Mains Option FC-102P160T4E54H2XGXXXXSXXXXAXBXCXXXXDX	131B6943		Buy on EAN
VLT® HVAC Drive FC 102 160 KW / 250 HP, 380 - 480 VAC, Safe Stop, IP54 / Type 12, RFI Class A2 (C3), PROFIBUS DP MCA 101, No B Option, Coated PCB, Mains Disconnect + Fuse FC-102N160T4E54H2TGC3XXSXXXXA0BXCXXXXD0	134L6438		Buy on EAN
VLT® HVAC Drive FC 102 132 KW / 200 HP, 380 - 480 VAC, No brake chopper, IP21 / Type 1, RFI class A1 (C2), No A Option, No B Option, Coated PCB, No Mains Option FC-102N132T4E21H4XGCXXXSXXXXAXBXCXXXXDX	134F4249		Buy on EAN

VLT® HVAC Drive FC 102 110 KW / 150 HP, 380 - 480 VAC, No brake chopper, IP54 / Type 12, RFI class A1 (C2), No A Option, No B Option, Not coated PCB, Fuse FC-102P110T4E54H4XGX7XXSXXXXAXBXCXXXXDX	131F9108		Buy on EAN
VLT® HVAC Drive FC 102 110 KW / 150 HP, 380 - 480 VAC, No brake chopper, IP54 / Type 12, RFI class A1 (C2), No A Option, No B Option, Not coated PCB, No Mains Option FC-102P110T4E54H4XGXXXXSXXXXAXBXCXXXXDX	131B6930		Buy on EAN
VLT® HVAC Drive FC 102 800 KW / 1200 HP, 380 - 480 VAC, Safe Stop, IP54 / Type 12, RFI Class A2 (C3), No A Option, No B Option, Coated PCB, No Mains Option FC-102P800T4E54H2TGCXKXSXXXXAXBXCXXXXDX	134U5929		Buy on EAN
VLT® AQUA Drive FC 200 132 KW / 200 HP, 525 - 690 VAC *, IP20 / Chassis, RFI Class A2 (C3), No brake chopper FC-202N132T7E20H2XGCXXXSXXXXAXBXCXXXXDX	134G8764		Buy on EAN
VLT® HVAC Drive FC 102 450 KW / 600 HP, 380 - 480 VAC, No brake chopper, IP54 / Type 12, LHD - AAF006 filter + A2 RFI, PROFINET MCA 120, No B Option, Coated PCB, Mains Disconnect + Fuse FC-102P450T4E54N2XGC3XXSXXXXALBXCXXXXDX	134L2550		Buy on EAN
VLT® AutomationDrive FC 300 15 KW / 20 HP, 380 - 500 VAC, IP20 / Chassis, RFI Class A1/B (C1), Brake chopper Further options according to typecode	131F8891		Buy on EAN
VLT® HVAC Drive FC 102 110 KW / 150 HP, 380 - 480 VAC, No brake chopper, IP21 / Type 1, RFI class A1 (C2), No A Option, No B Option, Not coated PCB, No Mains Option FC-102P110T4E21H4XGXXXXSXXXXAXBXCXXXXD0	131F7779		Buy on EAN
VLT® HVAC Drive FC 102 110 KW / 150 HP, 380 - 480 VAC, No brake chopper, IP21 / Type 1, RFI class A1 (C2), No A Option, No B Option, Not coated PCB, Mains Disconnect + Fuse FC-102P110T4E21H4XGX3XXSXXXXAXBXCXXXXDX	131F7776		Buy on EAN
VLT® HVAC Drive FC 102 110 KW / 150 HP, 380 - 480 VAC, No brake chopper, IP00 / Chassis, RFI class A1 (C2), No A Option, No B Option, Not coated PCB, No Mains Option FC-102P110T4E00H4XGXXXXSXXXXAXBXCXXXXD0	131F7773		Buy on EAN
VLT® AutomationDrive FC 300 90 KW / 125 HP, 380 - 500 VAC, IP21 / Type 1, RFI Class A2 (C3), No brake chopper Further options according to typecode	131F1826		Buy on EAN
VLT® HVAC Drive FC 102 110 KW / 150 HP, 380 - 480 VAC, No brake chopper, IP00 / Chassis, RFI class A1 (C2), No A Option, No B Option, Not coated PCB, No Mains Option FC-102P110T4E00H4XGXXXXSXXXXAXBXCXXXXDX	131B6549		Buy on EAN
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VLT® HVAC Drive FC 102 132 KW / 200 HP, 380 - 480 VAC, Brake chopper + Safe stop, IP21 / Type 1, RFI Class A2 (C3), PROFIBUS DP MCA 101, No B Option, Not coated PCB, No Mains Option FC-102P132T4E21H2UGXXXXSXXXXA0BXCXXXXDX	134G6403		Buy on EAN

VLT® AutomationDrive FC 300 200 KW / 300 HP, 380 - 500 VAC, IP21 / Type 1, RFI class A1 (C2), No brake chopper Further options according to typecode	131B5940		Buy on EAN
VLT® HVAC Drive FC 102 200 KW / 300 HP, 380 - 480 VAC, No brake chopper, IP21 / Type 1, RFI Class A2 (C3), No A Option, No B Option, Coated PCB, Fuse FC-102P200T4E21H2XGC7XXSXXXXAXBXCXXXXDX	131G6379		Buy on EAN
VLT® HVAC Drive FC 102 110 KW / 150 HP, 380 - 480 VAC, No brake chopper, IP21 / Type 1, RFI class A1 (C2), No A Option, No B Option, Not coated PCB, Fuse FC-102P110T4E21H4XGX7XXSXXXXAXBXCXXXXDX	131F8211		Buy on EAN
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VLT® HVAC Drive FC 102 315 KW / 450 HP, 380 - 480 VAC, No brake chopper, IP00 / Chassis, RFI class A1 (C2), No A Option, No B Option, Coated PCB, No Mains Option FC-102P315T4E00H4XGCXXXSXXXXAXBXCXXXXD0	131F7995		Buy on EAN
VLT® HVAC Drive FC 102 132 KW / 200 HP, 380 - 480 VAC, Safe Stop, IP20 / Chassis, RFI Class A2 (C3), No A Option, MCB-101 General purp. I/O, Coated PCB, No Mains Option FC-102N132T4E20H2TGCXXXSXXXXAXBKCXXXXDX	134H8407		Buy on EAN
VLT® HVAC Drive FC 102 110 KW / 150 HP, 380 - 480 VAC, Brake chopper, IP54 / Type 12, RFI class A1 (C2), PROFIBUS DP MCA 101, No B Option, Not coated PCB, Fuse FC-102P110T4E54H4BGX7XXSXXXXA0BXCXXXXD0	131U6860		Buy on EAN
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VLT® HVAC Drive FC 102 400 KW / 550 HP, 380 - 480 VAC, No brake chopper, IP54 / Type 12, RFI Class A2 (C3), No A Option, No B Option, Coated PCB, No Mains Option FC-102P400T4E54H2XGCXXXSXXXXAXBXCXXXXDX	131B6973		Buy on EAN
VLT® HVAC Drive FC 102 200 KW / 300 HP, 380 - 480 VAC, No brake chopper, IP20 / Chassis, RFI Class A2 (C3), No A Option, No B Option, Coated PCB, No Mains Option FC-102N200T4E20H2XGCXXXSXXXXAXBXCXXXXDX	134F0389		Buy on EAN
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VLT® HVAC Drive FC 102 250 KW / 350 HP, 380 - 480 VAC, No brake chopper, IP54 / Type 12, RFI class A1 (C2), No A Option, No B Option, Not coated PCB, Fuse FC-102P250T4E54H4XGX7XXSXXXXAXBXCXXXXDX	131F9112		Buy on EAN
VLT® HVAC Drive FC 102 315 KW / 450 HP, 380 - 480 VAC, No brake chopper, IP54 / Type 12, RFI class A1 (C2), No A Option, No B Option, Coated PCB, Fuse FC-102P315T4E54H4XGC7XXSXXXXAXBXCXXXXDX	131F9113		Buy on EAN
VLT® HVAC Drive FC 102 160 KW / 250 HP, 380 - 480 VAC, No brake chopper, IP54 / Type 12, RFI class A1 (C2), No A Option, No B Option, Not coated PCB, Fuse FC-102P160T4E54H4XGX7XXSXXXXAXBXCXXXXDX	131F9110		Buy on EAN
VLT® HVAC Drive FC 102 200 KW / 300 HP, 380 - 480 VAC, No brake chopper, IP20 / Chassis, RFI Class A2 (C3), No A Option, No B Option, Coated PCB, Fuse FC-102N200T4E20H2XGC7XXSXXXXAXBXCXXXXDX	134F8458		Buy on EAN
VLT® HVAC Drive FC 102 160 KW / 250 HP, 380 - 480 VAC, No brake chopper, IP54 / Type 12, RFI class A1 (C2), PROFIBUS DP MCA 101, No B Option, Not coated PCB, No Mains Option FC-102P160T4E54H4XGXXXXSXXXXA0BXCXXXXDX	131H6048		Buy on EAN

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VLT® HVAC Drive FC 102 200 KW / 300 HP, 380 - 480 VAC, No brake chopper, IP54 / Type 12, RFI Class A2 (C3), PROFIBUS DP MCA 101, No B Option, Coated PCB, Mains Disconnect + Fuse FC-102N200T4E54H2XGC3XXSXXXXA0BXCXXXXDX	134N2910		Buy on EAN
VLT® AQUA Drive FC 200 160 KW / 250 HP, 380 - 480 VAC, IP54 / Type 12, RFI class A1 (C2), No brake chopper FC-202P160T4E54H4XGCXXXSXXXXAXBXCXXXXDX	131F3853		Buy on EAN
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VLT® HVAC Drive FC 102 160 KW / 250 HP, 380 - 480 VAC, No brake chopper, IP21 / Type 1, RFI Class A2 (C3), No A Option, No B Option, Coated PCB, Fuse FC-102P160T4E21H2XGC7XXSXXXXAXBXCXXXXDX	131Z8491		Buy on EAN
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VLT® HVAC Drive FC 102 250 KW / 350 HP, 380 - 480 VAC, No brake chopper, IP00 / Chassis, RFI class A1 (C2), No A Option, No B Option, Not coated PCB, Mains Disconnect + Fuse FC-102P250T4E00H4XGX3XXSXXXXAXBXCXXXXDX	131F7982		Buy on EAN
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VLT® HVAC Drive FC 102 132 KW / 200 HP, 380 - 480 VAC, Safe Stop, IP54 / Type 12, RFI class A1 (C2), No A Option, No B Option, Coated PCB, No Mains Option FC-102P132T4E54H4TGCXXXSXXXXAXBXCXXXXDX	131G1399		Buy on EAN
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VLT® HVAC Drive FC 102 160 KW / 250 HP, 380 - 480 VAC, No brake chopper, IP21 / Type 1, RFI class A1 (C2), PROFIBUS DP MCA 101, No B Option, Not coated PCB, No Mains Option FC-102P160T4E21H4XGXXXXSXXXXA0BXCXXXXDX	131F9908		Buy on EAN
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VLT® AQUA Drive FC 200 110 KW / 150 HP, 380 - 480 VAC, IP54 / Type 12, RFI class A1 (C2), No brake chopper FC-202P110T4E54H4XGXXXXSXXXXAXBXCXXXXDX	131B9374		Buy on EAN
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VLT® HVAC Drive FC 102 160 KW / 250 HP, 380 - 480 VAC, Safe Stop, IP00 / Chassis, RFI Class A2 (C3), No A Option, MCB-101 General purp. I/O, Not coated PCB, Mains Disconnect + Fuse FC-102P160T4E00H2TGX3XXSXXXXAXBKCXXXXDX	131G3683		Buy on EAN

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VLT® AutomationDrive FC 300 11 KW / 15 HP, 380 - 500 VAC, IP20 / Chassis, RFI Class A1/B (C1), No brake chopper Further options according to typecode	131F8792		Buy on EAN
VLT® AQUA Drive FC 200 315 KW / 450 HP, 380 - 480 VAC, IP21 / Type 1, RFI Class A2 (C3), No brake chopper FC-202P315T4E21H2XGCXXXSXXXXAXB4CXXXXDX	131Z7627		Buy on EAN
VLT® HVAC Drive FC 102 110 KW / 150 HP, 380 - 480 VAC, No brake chopper, IP54/Type 12+main shield, RFI Class A2 (C3), No A Option, No B Option, Not coated PCB, Mains Disconnect + Fuse FC-102P110T4E5MH2XGX3XXSXXXXAXBXCXXXXDX	131F7829		Buy on EAN
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VLT® HVAC Drive FC 102 450 KW / 600 HP, 380 - 480 VAC, No brake chopper, IP21 / Type 1, RFI Class A2 (C3), PROFIBUS DP MCA 101, No B Option, Coated PCB, No Mains Option FC-102P450T4E21H2XGCXXXSXXXXA0BXCXXXXDX	134F7184		Buy on EAN

VLT® AQUA Drive FC 200 160 KW / 250 HP, 380 - 480 VAC, IP00 / Chassis, RFI Class A2 (C3), No brake chopper FC-202P160T4E00H2XGXXXXSXXXXAXBXCXXXXDX	131B9381		Buy on EAN
VLT® AQUA Drive FC 200 160 KW / 250 HP, 380 - 480 VAC, IP54 / Type 12, RFI Class A2 (C3), No brake chopper FC-202P160T4E54H2XGXXXXSXXXXAXBXCXXXXDX	131B9385		Buy on EAN
VLT® AQUA Drive FC 200 200 KW / 300 HP, 380 - 480 VAC, IP21 / Type 1, RFI class A1 (C2), No brake chopper FC-202P200T4E21H4XGXXXXSXXXXAXBXCXXXXDX	131B9389		Buy on EAN
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VLT® AutomationDrive FC 300 15 KW / 20 HP, 380 - 500 VAC, IP20 / Chassis, RFI Class A2 (C3), Brake chopper Further options according to typecode	131G3651		Buy on EAN
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VLT® HVAC Drive FC 102 132 KW / 200 HP, 380 - 480 VAC, Safe Stop, IP00 / Chassis, RFI Class A2 (C3), No A Option, No B Option, Not coated PCB, No Mains Option FC-102P132T4E00H2TGXXXXSXXXXAXBXCXXXXDX	131L2592		Buy on EAN
VLT® AQUA Drive FC 200 250 KW / 350 HP, 380 - 480 VAC, IP54 / Type 12, RFI Class A2 (C3), No brake chopper FC-202N250T4E54H2XGCXXXSXXXXAXBXCXXXXDX	134F4185		Buy on EAN
VLT® AutomationDrive FC 300 450 KW / 600 HP, 380 - 500 VAC, IP54 / Type 12, RFI Class A2 (C3), No brake chopper Further options according to typecode	131H0872		Buy on EAN
VLT® HVAC Drive FC 102 200 KW / 300 HP, 380 - 480 VAC, No brake chopper, IP54 / Type 12, LHD - AAF006 filter + A2 RFI, No A Option, No B Option, Coated PCB, Mains Disconnect + Fuse FC-102P200T4E54N2XGC3XXSXXXXAXBXCXXXXDX	134F1295		Buy on EAN
VLT® HVAC Drive FC 102 315 KW / 450 HP, 380 - 480 VAC, Safe Stop, IP00 / Chassis, RFI Class A2 (C3), No A Option, No B Option, Coated PCB, No Mains Option FC-102P315T4E00H2TGCXXXSXXXXAXBXCXXXXDX	131H1874		Buy on EAN
VLT® AQUA Drive FC 200 160 KW / 250 HP, 380 - 480 VAC, IP00 / Chassis, RFI Class A2 (C3), No brake chopper FC-202P160T4E00H2XGCXXXSXXXXAXBXCXXXXDX	131F4227		Buy on EAN
VLT® AQUA Drive FC 200 160 KW / 250 HP, 380 - 480 VAC, IP21 / Type 1, RFI class A1 (C2), No brake chopper FC-202P160T4E21H4XGCXXXSXXXXAXBXCXXXXDX	131F4229		Buy on EAN
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VLT® AutomationDrive FC 300 15 KW / 20 HP, 380 - 500 VAC, IP20 / Chassis, RFI Class A2 (C3), No brake chopper Further options according to typecode	131F8886		Buy on EAN
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VLT® HVAC Drive FC 102 110 KW / 150 HP, 380 - 480 VAC, No brake chopper, IP54 / Type 12, RFI Class A2 (C3), No A Option, No B Option, Coated PCB, No Mains Option FC-102P110T4E54H2XGCXXXSXXXXAXBXCXXXXDX	131H7885		Buy on EAN
VLT® AQUA Drive FC 200 110 KW / 150 HP, 380 - 480 VAC, IP54 / Type 12, RFI Class A2 (C3), No brake chopper FC-202P110T4E54H2XGXXXXSXXXXAXBYCXXXXDX	131G1864		Buy on EAN
VLT® AutomationDrive FC 300 132 KW / 200 HP, 380 - 500 VAC, IP21 / Type 1, RFI Class A2 (C3), No brake chopper Further options according to typecode	131H7484		Buy on EAN
VLT® AQUA Drive FC 200 110 KW / 150 HP, 380 - 480 VAC, IP21 / Type 1, RFI Class A2 (C3), No brake chopper FC-202P110T4E21H2XGXXXXSXXXXA0BXCXXXXDX	131G0409		Buy on EAN
VLT® AQUA Drive FC 200 160 KW / 250 HP, 380 - 480 VAC, IP20 / Chassis, RFI Class A2 (C3), Safe Stop FC-202N160T4E20H2TGCXXXSXXXXA0BXCXXXXD0	134H5922		Buy on EAN
VLT® AQUA Drive FC 200 132 KW / 200 HP, 380 - 480 VAC, IP54 / Type 12, RFI class A1 (C2), No brake chopper FC-202P132T4E54H4XGXXXXSXXXXANBXCXXXXDX	131L4781		Buy on EAN
VLT® HVAC Drive FC 102 250 KW / 350 HP, 380 - 480 VAC, No brake chopper, IP54 / Type 12, RFI Class A2 (C3), No A Option, No B Option, Coated PCB, No Mains Option FC-102P250T4E54H2XGCXXXSXXXXAXBXCXXXXDX	131L0189		Buy on EAN
VLT® HVAC Drive FC 102 250 KW / 350 HP, 380 - 480 VAC, No brake chopper, IP20 / Chassis, RFI class A1 (C2), No A Option, MCB-109 I/O, RTC Back-up, Coated PCB, No Mains Option FC-102N250T4E20H4XGCXXXSXXXXAXB0CXXXXDX	134L3340		Buy on EAN
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VLT® AQUA Drive FC 200 250 KW / 350 HP, 380 - 480 VAC, IP20 / Chassis, RFI Class A2 (C3), No brake chopper FC-202N250T4E20H2XGCXXXSXXXXA0BXCXXXXDX	134G4027		Buy on EAN
VLT® HVAC Drive FC 102 110 KW / 150 HP, 380 - 480 VAC, No brake chopper, IP54/Type 12+main shield, RFI class A1 (C2), No A Option, No B Option, Not coated PCB, Mains Disconnect + Fuse FC-102P110T4E5MH4XGX3XXSXXXXAXBXCXXXXDX	131F7784		Buy on EAN

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VLT® HVAC Drive FC 102 200 KW / 300 HP, 380 - 480 VAC, No brake chopper, IP54 / Type 12, RFI Class A2 (C3), PROFIBUS DP MCA 101, No B Option, Coated PCB, No Mains Option FC-102N200T4E54H2XGCXXXSXXXXA0BXCXXXXDX	134H3241		Buy on EAN
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VLT® AQUA Drive FC 200 132 KW / 200 HP, 380 - 480 VAC, IP54 / Type 12, RFI Class A2 (C3), No brake chopper FC-202N132T4E54H2XGCXXXSXXXXAXBXCXXXXDX	134F4108		Buy on EAN
VLT® HVAC Drive FC 102 132 KW / 200 HP, 380 - 480 VAC, No brake chopper, IP54/Type 12+main shield, RFI Class A2 (C3), No A Option, No B Option, Not coated PCB, Mains Disconnect + Fuse FC-102P132T4E5MH2XGX3XXSXXXXAXBXCXXXXDX	131F7815		Buy on EAN
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VLT® AQUA Drive FC 200 250 KW / 350 HP, 380 - 480 VAC, IP21 / Type 1, RFI Class A2 (C3), No brake chopper FC-202P250T4E21H2XGXXXXSXXXXAXBXCXXXXDX	131B9396		Buy on EAN
VLT® AQUA Drive FC 200 250 KW / 350 HP, 380 - 480 VAC, IP54 / Type 12, RFI Class A2 (C3), No brake chopper FC-202P250T4E54H2XGXXXXSXXXXAXBXCXXXXDX	131B9398		Buy on EAN
VLT® AQUA Drive FC 200 160 KW / 250 HP, 380 - 480 VAC, IP00 / Chassis, RFI Class A2 (C3), No brake chopper FC-202P160T4E00H2XGXXXXSXXXXA0BXCXXXXDX	131H3836		Buy on EAN
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VLT® AQUA Drive FC 200 315 KW / 450 HP, 380 - 480 VAC, IP54 / Type 12, RFI Class A2 (C3), No brake chopper FC-202P315T4E54H2XGCXXXSXXXXAXBXCXXXXDX	131B9494		Buy on EAN
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