MAKING MODERN LIVING POSSIBLE

VLT® High Power Drives
Selection Guide

VLT®
THE REAL DRIVE

Designed to be easy to own...

Part of the VLT® family

Danfoss VLT® Series high power drives build 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 lower power drives, 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 demounting 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
- The modular VLT® design enables fast installation of options
- Automatic Motor Adaptation (AMA) simplifies start-up and operation
- Robust design and efficient monitoring 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 installation 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 external AC line reactors
- Optional, built-in RFI filters are available throughout the power range in most series
- Optional input fuses and mains disconnect are available with standard enclosures
- 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.

An innovative heat removal design reduces cooling power consumption by exhausting the cooling air to outside of the control room.

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

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.

...with specific functionality to fit the application

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
- Category 3 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. From "drive only" to complete package solutions, 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 Modbus 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

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...

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. And they share features and a common user interface, so once you know one, you know them all.

Enclosure
Depending on the installation environment, VLT® High Power Drives are available in three enclosure configurations:

- IP00/Chassis
- IP21/NEMA Type 1
- IP54/NEMA Type 12

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 98% of the supplied electrical energy on to the motor. Only approximately 2% 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
380-500 V D-frames meet IEC 60721-3-3, Class 3C2 as standard. For harsh and aggressive environments, coating as per IEC 60721-3-3, Class 3C3 is an option. 380-500 V E- and F-frames as well as all 525-690 V drives have coating as per IEC 60721-3-3, Class 3C3 is as standard.

Stainless steel back channel
As an option, the back channel cooling duct can be supplied in stainless steel along with heavier plated heatsinks for an even greater level of protection in harsh conditions, such as those found in salt-air environments near the ocean.

Safety
VLT® High Power Drives can be ordered with safe stop functionality suitable for category 3 installations according to EN 954-1. This feature prevents the drive from starting unintentionally.

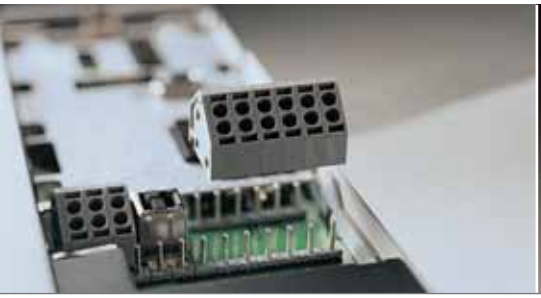
Fieldbus options
Options for bus communication (Profibus, DeviceNet, CanOpen, Ethernet, etc.), synchronisation, user programs and more are delivered ready to plug and play.

Feedback and I/O options
- Encoder
- Resolver
- General purpose I/O
- Relay

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.

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.

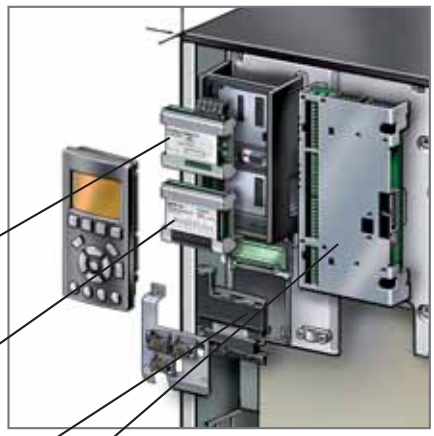
To disconnect control signal wires, simply unplug the terminal blocks.

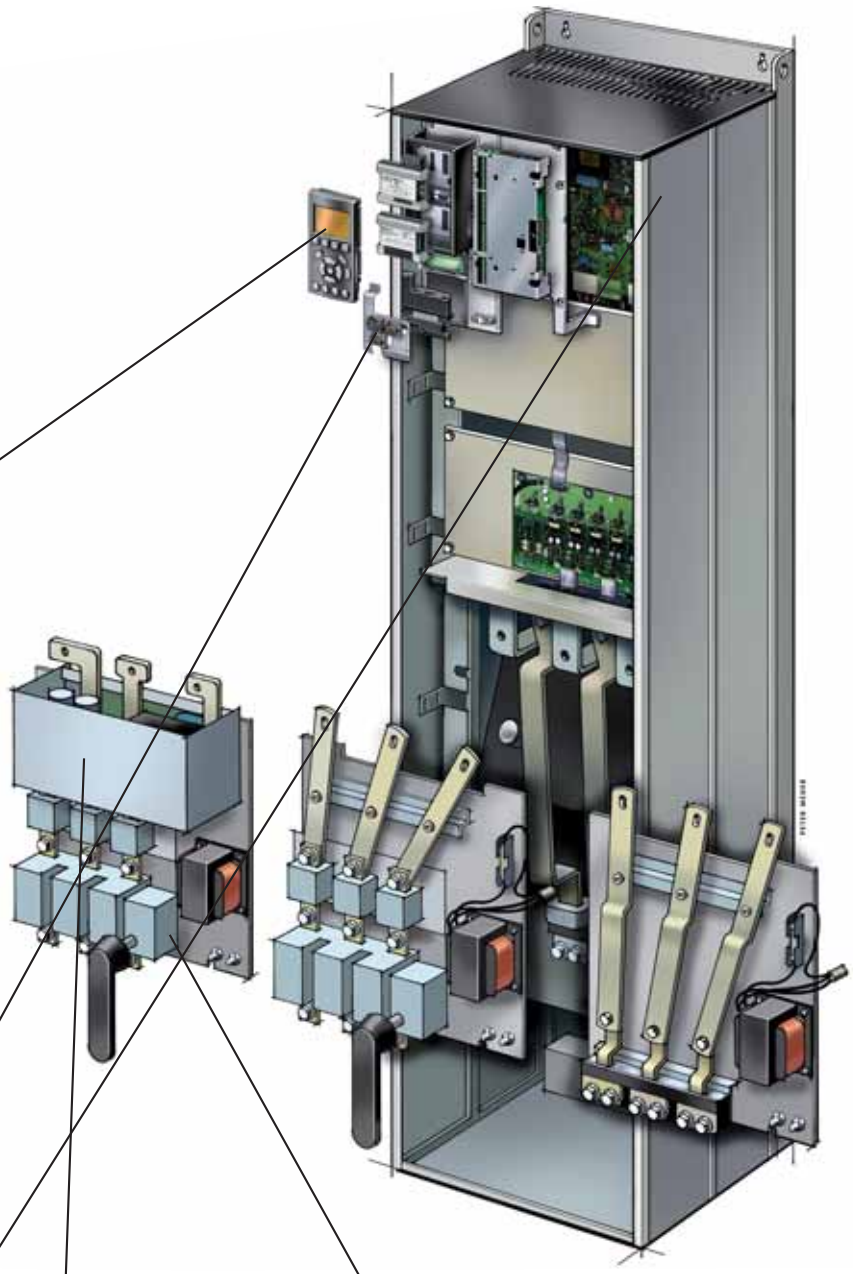


The fieldbus option ready to plug in beneath the front panel. It can be turned upside down if you'd rather have the cable on top.

Coated control boards are avilable for harsh environments.

...in a package built for years of reliable operation





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.

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

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 external input reactors.

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.

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.

2006 FROST & SULLIVAN Product Innovation Award

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

design award winner 2004

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

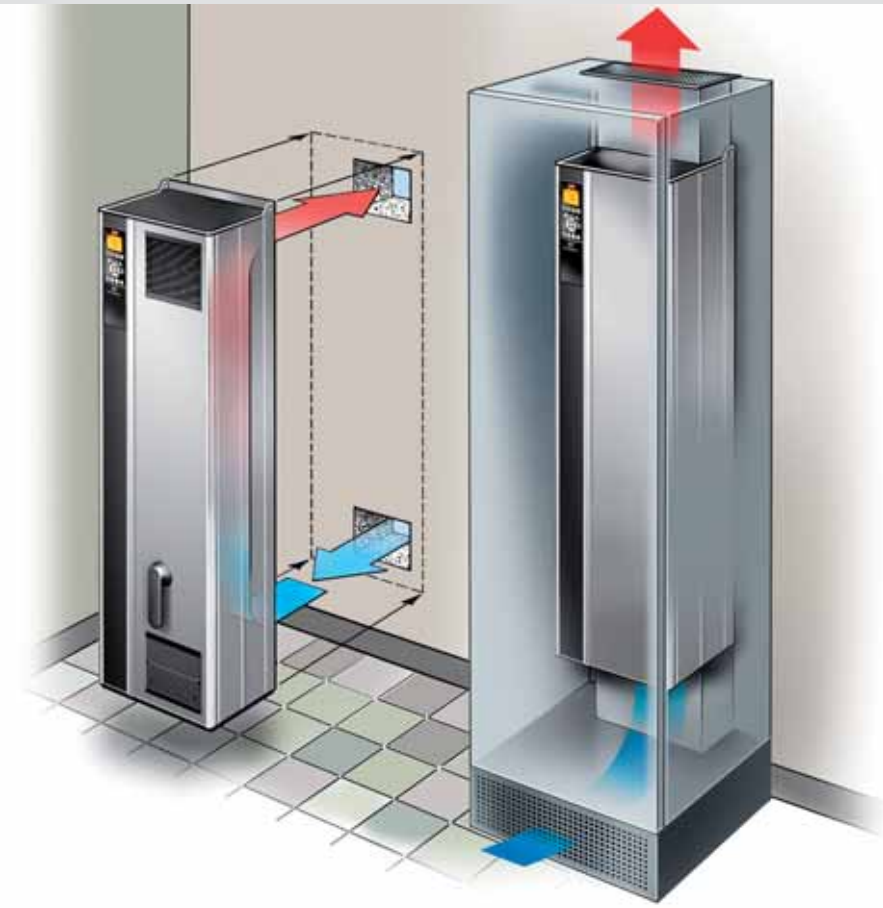
Intelligent heat management

Back-Channel Cooling
The intelligent heat management of VLT® drives removes 85% 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 15% of heat losses are removed from the control electronics area using lower-volume door fans.

The excess heat from the back channel is either dispersed into the control room or it can be directly removed from the area.

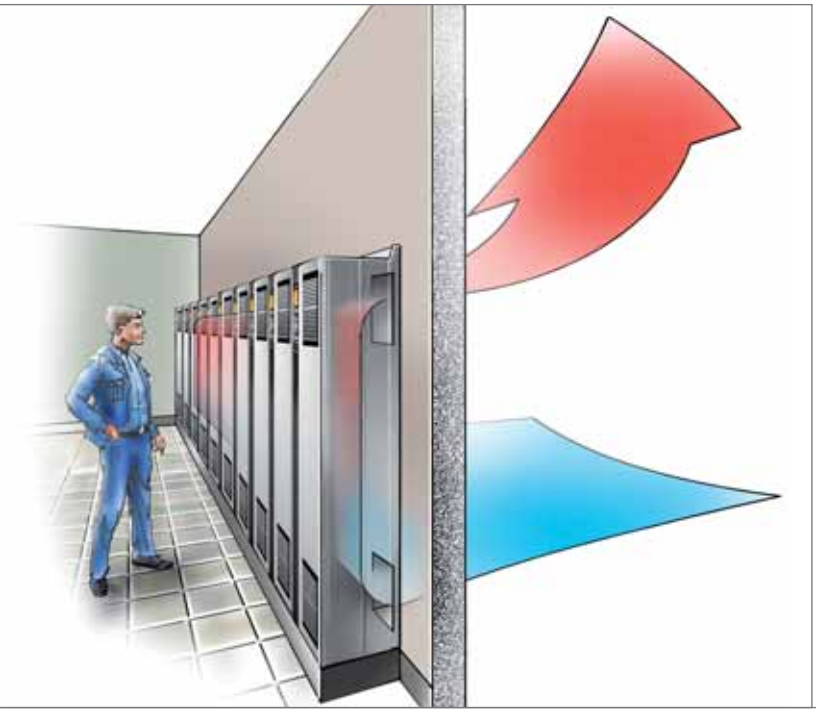
An optional back-channel cooling duct kit is available to aid in the installation of IP 00/Chassis drives into Rittal TS8 enclosures.



- Separate cooling path for power and control components
- 85% 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 fewer contaminants being exposed to control electronics
- Two back-channel airflow possibilities: back inlet/back exhaust or bottom inlet/top exhaust

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 97 kW. If the drives are mounted on an outside wall and the back channel cooling air is vented directly outside, less than 15 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. Drive-Pro™ 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

VLT® Series high power drives 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 safe-guarding life, property and the environment.

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.

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

380 – 500 VAC
D frames

			Frame	D1/D3		D1/D3		D2/D4		D2/D4		D2/D4	
VLT® Type			VLT® HVAC Drive		P110 T4		P132 T4		P160 T4		P200 T4		P250 T4
			VLT® AQUA Drive		P110 T4		P132 T4		P160 T4		P200 T4		P250 T4
			VLT® AutomationDrive	P90K T5	P90K T5	P110 T5	P110 T5	P132 T5	P132 T5	P160 T5	P160 T5	P200 T5	P200 T5
			Overload	High	Normal	High	Normal	High	Normal	High	Normal	High	Normal
Nominal Voltage	400 V	**Output Current**											
		Continuous (380-440 V)	$I_{VLT,N}$ [A]	177	212	212	260	260	315	315	395	395	480
		Intermittent (60 sec)*	$I_{VLT,MAX}$ [A]	266	233	318	286	390	347	473	435	593	528
		Output Power											
		Continuous	$S_{VLT,N}$ [kVA]	123	147	147	180	180	218	218	274	274	333
		Intermittent	$S_{VLT,MAX}$ [kVA]	184	162	220	198	270	240	327	301	410	366
		Typical Shaft Output	[kW]	90	110	110	132	132	160	160	200	200	250
		Rated Input Current	$I_{L,N}$ [A]	174	208	204	251	251	304	304	381	381	463
	460 V	**Output Current**											
		Continuous (441-500 V)	$I_{VLT,N}$ [A]	160	190	190	240	240	302	302	361	361	443
		Intermittent (60 sec)*	$I_{VLT,MAX}$ [A]	240	209	285	264	360	332	453	397	542	487
		Output Power											
		Continuous	$S_{VLT,N}$ [kVA]	127	151	151	191	191	241	241	288	288	353
		Intermittent	$S_{VLT,MAX}$ [kVA]	191	167	227	210	287	265	361	316	431	388
		Typical Shaft Output	[HP]	125	150	150	200	200	250	250	300	300	350
		Rated Input Current	$I_{L,N}$ [A]	158	185	183	231	231	291	291	348	348	427
	500 V	**Output Current**											
		Continuous (441-500 V)	$I_{VLT,N}$ [A]	160	190	190	240	240	302	302	361	361	443
		Intermittent (60 sec)*	$I_{VLT,MAX}$ [A]	240	209	285	264	360	332	453	397	542	487
		Output Power											
		Continuous	$S_{VLT,N}$ [kVA]	139	165	165	208	208	262	262	313	313	384
		Intermittent	$S_{VLT,MAX}$ [kVA]	208	181	247	229	312	288	392	344	469	422
		Typical Shaft Output	[kW]	110	132	132	160	160	200	200	250	250	315
		Rated Input Current	$I_{L,N}$ [A]	158	185	183	231	231	291	291	348	348	427

Estimated power loss at rated maximum load	[W]	2641	3234	2995	3782	3425	4213	3910	5119	4625	5893		
Efficiency		0.98		0.98		0.98		0.98		0.98			
Output Frequency	[Hz]	0-800		0-800		0-800		0-800		0-800			
Max. cable cross-section to motor output terminals (per phase)	[mm²]	2 x 70		2 x 70		2 x 185		2 x 185		2 x 185			
	[AWG]	2 x 2/0		2 x 2/0		2 x 350 mcm		2 x 350 mcm		2 x 350 mcm			
Max. cable cross-section to loadsharing terminals (per -DC/+DC)	[mm²]	2 x 70		2 x 70		2 x 185		2 x 185		2 x 185			
	[AWG]	2 x 2/0		2 x 2/0		2 x 350 mcm		2 x 350 mcm		2 x 350 mcm			
Max. cable cross-section to brake resistor terminals (per -R/+R)	[mm²]	2 x 70		2 x 70		2 x 185		2 x 185		2 x 185			
	[AWG]	2 x 2/0		2 x 2/0		2 x 350 mcm		2 x 350 mcm		2 x 350 mcm			
Max. cable cross-section to input mains terminals (per phase)	[mm²]	2 x 70		2 x 70		2 x 185		2 x 185		2 x 185			
	[AWG]	2 x 2/0		2 x 2/0		2 x 350 mcm		2 x 350 mcm		2 x 350 mcm			
Max. external input line fuses (mains)	[A]	300		350		400		500		600			
Enclosure Ratings and Weight													
IP00/Chassis (D3, D4)	[kg]/(lbs)	82	(181)	91	(201)	112	(247)	123	(271)	138	(304)		
IP21/NEMA 1 (D1, D2)	[kg]/(lbs)	96	(212)	104	(230)	125	(276)	136	(300)	151	(333)		
IP54/NEMA 12 (D1, D2)	[kg]/(lbs)	96	(212)	104	(230)	125	(276)	136	(300)	151	(333)		

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 with 40° C 24-hour avarage maximum Maximum 55° C with current derating *(see derating curves on page 16)*
Power Factor	Greater than 0.90
Supply Voltage	3-phase, 380-500 V ± 10% (3-phase x 380/400/415/440/460/480/500 V)
Output Voltage	0-100% of the AC line voltage
Rated Motor Voltage	3-phase x 380/400/415/440/460/480/500 VAC
Rated Motor Frequency	50/60 Hz
Thermal protection during operation	ETR for motor (class 20)

** Intermittent Duty rated for 110% of continuous current for Normal Overload; 150% of continuous current for High Overload.*

380 – 500 VAC
E frames

			Frame	E1/E2		E1/E2		E1/E2		E1/E2		
VLT® Type			VLT® HVAC Drive		P315 T4		P355 T4		P400 T4		P450 T4	
			VLT® AQUA Drive		P315 T4		P355 T4		P400 T4		P450 T4	
			VLT® AutomationDrive	P250 T5	P250 T5	P315 T5	P315 T5	P355 T5	P355 T5	P400 T5	P400 T5	
			Overload	High	Normal	High	Normal	High	Normal	High	Normal	
Nominal Voltage	400 V	**Output Current**										
		Continuous (380-440 V)	$I_{VLT,N}$	[A]	480	600	600	658	658	745	695	800
		Intermittent (60 sec)*	$I_{VLT,MAX}$	[A]	720	660	900	724	987	820	1043	880
		Output Power										
		Continuous	$S_{VLT,N}$	[kVA]	333	416	416	456	456	516	482	554
		Intermittent	$S_{VLT,MAX}$	[kVA]	499	457	624	501	684	568	722	610
		Typical Shaft Output		[kW]	250	315	315	355	355	400	400	450
		Rated Input Current	$I_{L,N}$	[A]	472	590	590	647	647	733	684	787
	460 V	**Output Current**										
		Continuous (441-500 V)	$I_{VLT,N}$	[A]	443	540	540	590	590	678	678	730
		Intermittent (60 sec)*	$I_{VLT,MAX}$	[A]	665	594	810	649	885	746	1017	803
		Output Power										
		Continuous	$S_{VLT,N}$	[kVA]	353	430	430	470	470	540	540	582
		Intermittent	$S_{VLT,MAX}$	[kVA]	529	473	645	517	705	594	810	640
		Typical Shaft Output		[HP]	350	450	450	500	500	550/600	550	600
		Rated Input Current	$I_{L,N}$	[A]	436	531	531	580	580	667	667	718
	500 V	**Output Current**										
		Continuous (441-500 V)	$I_{VLT,N}$	[A]	443	540	540	590	590	678	678	730
		Intermittent (60 sec)*	$I_{VLT,MAX}$	[A]	665	594	810	649	885	746	1017	803
		Output Power										
		Continuous	$S_{VLT,N}$	[kVA]	384	468	468	511	511	587	587	632
		Intermittent	$S_{VLT,MAX}$	[kVA]	575	514	701	562	766	646	881	695
		Typical Shaft Output		[kW]	315	355	355	400	400	500	500	530
		Rated Input Current	$I_{L,N}$	[A]	436	531	531	580	580	667	667	718

Estimated power loss at rated maximum load	[W]	5165	6790	6960	7701	7691	8879	8636	9670			
Efficiency		0.98		0.98		0.98		0.98				
Output Frequency	[Hz]	0-600		0-600		0-600		0-600				
Max. cable cross-section to motor output terminals (per phase)	[mm²]	4 x 240		4 x 240		4 x 240		4 x 240				
	[AWG]	4 x 500 mcm		4 x 500 mcm		4 x 500 mcm		4 x 500 mcm				
Max. cable cross-section to loadsharing terminals (per -DC/+DC)	[mm²]	4 x 240		4 x 240		4 x 240		4 x 240				
	[AWG]	4 x 500 mcm		4 x 500 mcm		4 x 500 mcm		4 x 500 mcm				
Max. cable cross-section to regeneration terminals (per -DC/+DC)	[mm²]	4 x 240		4 x 240		4 x 240		4 x 240				
	[AWG]	4 x 500 mcm		4 x 500 mcm		4 x 500 mcm		4 x 500 mcm				
Max. cable cross-section to brake resistor terminals (per -R/+R)	[mm²]	2 x 185		2 x 185		2 x 185		2 x 185				
	[AWG]	2 x 350 mcm		2 x 350 mcm		2 x 350 mcm		2 x 350 mcm				
Max. cable cross-section to input mains terminals (per phase)	[mm²]	4 x 240		4 x 240		4 x 240		4 x 240				
	[AWG]	4 x 500 mcm		4 x 500 mcm		4 x 500 mcm		4 x 500 mcm				
Max. external input line fuses (mains)	[A]	700		900		900		900				
Enclosure Ratings and Weight												
IP00/Chassis (E2)	[kg]/(lbs)	221	(487)	234	(516)	236	(520)	277	(611)			
IP21/NEMA 1 (E1)	[kg]/(lbs)	263	(580)	270	(595)	272	(600)	313	(690)			
IP54/NEMA 12 (E1)	[kg]/(lbs)	263	(580)	270	(595)	272	(600)	313	(690)			

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 with 40° C 24-hour avarage maximum Maximum 55° C with current derating *(see derating curves on page 16)*
Power Factor	Greater than 0.90
Supply Voltage	3 Phase, 380-500 V ± 10% (3-phase x 380/400/415/440/460/480/500 V)
Output Voltage	0-100% of the AC line voltage
Rated Motor Voltage	3-phase x 380/400/415/440/460/480/500 VAC
Rated Motor Frequency	50/60 Hz
Thermal protection during operation	ETR for motor (class 20)

** Intermittent Duty rated for 110% of continuous current for Normal Overload; 150% of continuous current for High Overload.*

380 – 500 VAC
F frames

				Frame	F1/F3		F1/F3		F1/F3		F1/F3		F2/F4		F2/F4	
	VLT® Type			VLT® HVAC Drive		P500 T4		P560 T4		P630 T4		P710 T4		P800 T4		P1M0 T4
				VLT® AQUA Drive		P500 T4		P560 T4		P630 T4		P710 T4		P800 T4		P1M0 T4
				VLT® AutomationDrive	P450 T5	P450 T5	P500 T5	P500 T5	P560 T5	P560 T5	P630 T5	P630 T5	P710 T5	P710 T5	P800 T5	P800 T5
				Overload	High	Normal	High	Normal	High	Normal	High	Normal	High	Normal	High	Normal
Nominal Voltage	400 V	**Output Current**														
		Continuous (380-440 V)	$I_{VLT,N}$	[A]	800	880	880	990	990	1120	1120	1260	1260	1460	1460	1720
		Intermittent (60 sec)*	$I_{VLT,MAX}$	[A]	1200	968	1320	1089	1485	1232	1680	1386	1890	1606	2190	1892
		Output Power														
		Continuous	$S_{VLT,N}$	[kVA]	554	610	610	686	686	776	776	873	873	1012	1012	1192
		Intermittent	$S_{VLT,MAX}$	[kVA]	831	671	915	754	1029	854	1164	960	1309	1113	1517	1311
		Typical Shaft Output		[kW]	450	500	500	560	560	630	630	710	710	800	800	1000
		Rated Input Current	$I_{L,N}$	[A]	779	857	857	964	964	1090	1090	1227	1227	1422	1422	1675
	460 V	**Output Current**														
		Continuous (441-500 V)	$I_{VLT,N}$	[A]	730	780	780	890	890	1050	1050	1160	1160	1380	1380	1530
		Intermittent (60 sec)*	$I_{VLT,MAX}$	[A]	1095	858	1170	979	1335	1155	1575	1276	1740	1518	2070	1683
		Output Power														
		Continuous	$S_{VLT,N}$	[kVA]	582	621	621	709	709	837	837	924	924	1100	1100	1219
		Intermittent	$S_{VLT,MAX}$	[kVA]	872	684	932	780	1064	920	1255	1017	1386	1209	1649	1341
		Typical Shaft Output		[HP]	600	650	650	750	750	900	900	1000	1000	1200	1200	1350
		Rated Input Current	$I_{L,N}$	[A]	711	759	759	867	867	1022	1022	1129	1129	1344	1344	1490
	500 V	**Output Current**														
		Continuous (441-500 V)	$I_{VLT,N}$	[A]	730	780	780	890	890	1050	1050	1160	1160	1380	1380	1530
		Intermittent (60 sec)*	$I_{VLT,MAX}$	[A]	1095	858	1170	979	1335	1155	1575	1276	1740	1518	2070	1683
		Output Power														
		Continuous	$S_{VLT,N}$	[kVA]	632	675	675	771	771	909	909	1005	1005	1195	1195	1325
		Intermittent	$S_{VLT,MAX}$	[kVA]	948	743	1013	848	1156	1000	1364	1105	1507	1315	1793	1458
		Typical Shaft Output		[kW]	530	560	560	630	630	710	710	800	800	1000	1000	1100
		Rated Input Current	$I_{L,N}$	[A]	711	759	759	867	867	1022	1022	1129	1129	1344	1344	1490
		Estimated power loss at rated maximum load**		[W]	9492	10647	10631	12338	11263	13201	13172	15436	14967	18084	16392	20358
		Efficiency			0.98		0.98		0.98		0.98		0.98		0.98	
		Output Frequency		[Hz]	0-600		0-600		0-600		0-600		0-600		0-600	
		Max. cable cross-section to motor output terminals (per phase)		[mm²]	8 x 150		8 x 150		8 x 150		8 x 150		12 x 150		12 x 150	
				[AWG]	8 x 300 mcm		8 x 300 mcm		8 x 300 mcm		8 x 300 mcm		12 x 300 mcm		12 x 300 mcm	
		Max. cable cross-section to load-sharing terminals (per -DC/+DC)		[mm²]	4 x 120		4 x 120		4 x 120		4 x 120		4 x 120		4 x 120	
				[AWG]	4 x 250 mcm		4 x 250 mcm		4 x 250 mcm		4 x 250 mcm		4 x 250 mcm		4 x 250 mcm	
		Max. cable cross-section to regen-eration terminals (per -DC/+DC)		[mm²]	2 x 150		2 x 150		2 x 150		2 x 150		2 x 150		2 x 150	
				[AWG]	2 x 300 mcm		2 x 300 mcm		2 x 300 mcm		2 x 300 mcm		2 x 300 mcm		2 x 300 mcm	
		Max. cable cross-section to brake resistor terminals (per -R/+R)		[mm²]	4 x 185		4 x 185		4 x 185		4 x 185		6 x 185		6 x 185	
				[AWG]	4 x 350 mcm		4 x 350 mcm		4 x 350 mcm		4 x 350 mcm		6 x 350 mcm		6 x 350 mcm	
		Max. cable cross-section to input mains terminals (per phase)		[mm²]	8 x 240		8 x 240		8 x 240		8 x 240		8 x 240		8 x 240	
				[AWG]	8 x 500 mcm		8 x 500 mcm		8 x 500 mcm		8 x 500 mcm		8 x 500 mcm		8 x 500 mcm	
		Max. external input line fuses (mains)		[A]	2000		2000		2000		2000		2500		2500	
		Enclosure Ratings and Weight														
		IP21/NEMA 1		[kg]/(lbs)	1004	(2214)†	1004	(2214)†	1004	(2214)†	1004	(2214)†	1246	(2748)†	1246	(2748)†
		IP54/NEMA 12		[kg]/(lbs)	1004	(2214)†	1004	(2214)†	1004	(2214)†	1004	(2214)†	1246	(2748)†	1246	(2748)†

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 with 40° C 24-hour avarage maximum Maximum 55° C with current derating *(see derating curves on page 16)*
Power Factor	Greater than 0.90
Supply Voltage	3 Phase, 380-500 V ± 10% (3-phase x 380/400/415/440/460/480/500 V)
Output Voltage	0-100% of the AC line voltage
Rated Motor Voltage	3-phase x 380/400/415/440/460/480/500 VAC
Rated Motor Frequency	50/60 Hz
Thermal protection during operation	ETR for motor (class 20)

* *Intermittent Duty rated for 110% of continuous current for Normal Overload; 150% of continuous current for High Overload.*
** *Value listed is the maximum estimated power loss without the options cabinet. Estimated options cabinet maximum losses are as follows: A) Disconnect/Circuit Breaker: 78 W – B) Contactor: 562 W – C) RFI Filter: 1326 W – D) Panel Options and Miscellaneous: 759 W*
† *Adding the F-frame option cabinet (resulting in the F3 or F4 frame) adds 295 kg (650 lbs) to estimated weight.*

525 – 690 VAC
D frames 40-100 HP (30-75 kW)

				Frame	D1/D3		D1/D3		D1/D3		D1/D3	
VLT® Type				VLT® HVAC Drive		P45K T6		P55K T6		P75K T6		P90K T6
				VLT® AQUA Drive		P45K T7		P55K T7		P75K T7		P90K T7
				VLT® AutomationDrive	P37K T7	P37K T7	P45K T7	P45K T7	P55K T7	P55K T7	P75K T7	P75K T7
				Overload	High	Normal	High	Normal	High	Normal	High	Normal
Nominal Voltage	550 V	**Output Current**										
		Continuous (525-550 V)	$I_{VLT,N}$	[A]	48	56	56	76	76	90	90	113
		Intermittent (60 sec)*	$I_{VLT,MAX}$	[A]	77	62	90	84	122	99	135	124
		Output Power										
		Continuous	$S_{VLT,N}$	[kVA]	46	53	53	72	72	86	86	108
		Intermittent	$S_{VLT,MAX}$	[kVA]	73	59	85	80	116	94	129	118
		Typical Shaft Output		[kW]	30	37	37	45	45	55	55	75
		Rated Input Current	$I_{L,N}$	[A]	53	60	60	77	77	89	89	110
	575 V	**Output Current**										
		Continuous (551-690 V)	$I_{VLT,N}$	[A]	46	54	54	73	73	86	86	108
		Intermittent (60 sec)*	$I_{VLT,MAX}$	[A]	74	59	86	80	117	95	129	119
		Output Power										
		Continuous	$S_{VLT,N}$	[kVA]	46	54	54	73	73	86	86	108
		Intermittent	$S_{VLT,MAX}$	[kVA]	73	59	86	80	116	94	128	118
		Typical Shaft Output		[HP]	40	50	50	60	60	75	75	100
		Rated Input Current	$I_{L,N}$	[A]	51	58	58	74	74	85	85	106
	690 V	**Output Current**										
		Continuous (551-690 V)	$I_{VLT,N}$	[A]	46	54	54	73	73	86	86	108
		Intermittent (60 sec)*	$I_{VLT,MAX}$	[A]	74	59	86	80	117	95	129	119
		Output Power										
		Continuous	$S_{VLT,N}$	[kVA]	55	65	65	87	87	103	103	129
		Intermittent	$S_{VLT,MAX}$	[kVA]	88	71	103	96	140	113	154	142
		Typical Shaft Output		[kW]	37	45	45	55	55	75	75	90
		Rated Input Current	$I_{L,N}$	[A]	50	58	58	77	77	87	87	109

Estimated power loss at rated maximum load	[W]	1355	1458	1459	1717	1721	1913	1913	2262
Efficiency		0.97		0.97		0.97		0.97	
Output Frequency	[Hz]	0-600		0-600		0-600		0-600	
Max. cable cross-section to motor output terminals (per phase)	[mm²]	2 x 70		2 x 70		2 x 70		2 x 70	
	[AWG]	2 x 2/0		2 x 2/0		2 x 2/0		2 x 2/0	
Max. cable cross-section to loadsharing terminals (per -DC/+DC)	[mm²]	2 x 70		2 x 70		2 x 70		2 x 70	
	[AWG]	2 x 2/0		2 x 2/0		2 x 2/0		2 x 2/0	
Max. cable cross-section to brake resistor terminals (per -R/+R)	[mm²]	2 x 70		2 x 70		2 x 70		2 x 70	
	[AWG]	2 x 2/0		2 x 2/0		2 x 2/0		2 x 2/0	
Max. cable cross-section to input mains terminals (per phase)	[mm²]	2 x 70		2 x 70		2 x 70		2 x 70	
	[AWG]	2 x 2/0		2 x 2/0		2 x 2/0		2 x 2/0	
Max. external input line fuses (mains)	[A]	125		160		200		200	
Enclosure Ratings and Weight									
IP00/Chassis (D3)	[kg]/(lbs)	82	(181)	82	(181)	82	(181)	82	(181)
IP21/NEMA 1 ((D1)	[kg]/(lbs)	96	(211)	96	(211)	96	(211)	96	(211)
IP54/NEMA 12 (D1)	[kg]/(lbs)	96	(211)	96	(211)	96	(211)	96	(211)

Supply Frequency	50/60 Hz (48-62Hz ± 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 with 40° C 24-hour avarage maximum Maximum 55° C with current derating *(see derating curves on page 16)*
Power Factor	Greater than 0.90
Supply Voltage	3 Phase, 525-690 V ± 10% (3-phase x 525/550/575/600/690 V)
Output Voltage	0-100% of the AC line voltage
Rated Motor Voltage	3-phase x 525/550/575/690 VAC
Rated Motor Frequency	50/60 Hz
Thermal protection during operation	ETR for motor (class 20)

** Intermittent Duty rated for 110% of continuous current for Normal Overload; 150% of continuous current for High Overload.*

525 – 690 VAC
D frames 100-200 HP (75-132 kW)

			Frame	**D1/D3**		**D1/D3**		**D1/D3**	
VLT® Type			**VLT® HVAC Drive**		**P110 T7**		**P132 T7**		**P160 T7**
			VLT® AQUA Drive		**P110 T7**		**P132 T7**		**P160 T7**
			VLT® AutomationDrive	**P90K T7**	**P90K T7**	**P110 T7**	**P110 T7**	**P132 T7**	**P132 T7**
			Overload	**High**	**Normal**	**High**	**Normal**	**High**	**Normal**
Nominal Voltage	**550 V**	**Output Current**							
		Continuous (525-550 V)	$I_{VLT,N}$ [A]	113	137	137	162	162	201
		Intermittent (60 sec)*	$I_{VLT,MAX}$ [A]	170	151	206	178	243	221
		Output Power							
		Continuous	$S_{VLT,N}$ [kVA]	108	131	131	154	154	191
		Intermittent	$S_{VLT,MAX}$ [kVA]	161	144	196	170	231	211
		Typical Shaft Output	[kW]	75	90	90	110	110	132
		Rated Input Current	$I_{L,N}$ [A]	110	130	130	158	158	198
	575 V	**Output Current**							
		Continuous (551-690 V)	$I_{VLT,N}$ [A]	108	131	131	155	155	192
		Intermittent (60 sec)*	$I_{VLT,MAX}$ [A]	162	144	197	171	233	211
		Output Power							
		Continuous	$S_{VLT,N}$ [kVA]	108	130	130	154	154	191
		Intermittent	$S_{VLT,MAX}$ [kVA]	161	144	196	170	232	210
		Typical Shaft Output	[HP]	100	125	125	150	150	200
		Rated Input Current	$I_{L,N}$ [A]	106	124	124	151	151	189
	690 V	**Output Current**							
		Continuous (551-690 V)	$I_{VLT,N}$ [A]	108	131	131	155	155	192
		Intermittent (60 sec)*	$I_{VLT,MAX}$ [A]	162	144	197	171	233	211
		Output Power							
		Continuous	$S_{VLT,N}$ [kVA]	129	157	157	185	185	229
		Intermittent	$S_{VLT,MAX}$ [kVA]	194	172	235	204	278	252
		Typical Shaft Output	[kW]	90	110	110	132	132	160
		Rated Input Current	$I_{L,N}$ [A]	109	128	128	155	155	197

Estimated power loss at rated maximum load	[W]	2264	2662	2664	3114	2953	3612		
Efficiency		0.98		0.98		0.98			
Output Frequency	[Hz]	0-600		0-600		0-600			
Max. cable cross-section to motor output terminals (per phase)	[mm²]	2 x 70		2 x 70		2 x 70			
	[AWG]	2 x 2/0		2 x 2/0		2 x 2/0			
Max. cable cross-section to loadsharing terminals (per -DC/+DC)	[mm²]	2 x 70		2 x 70		2 x 70			
	[AWG]	2 x 2/0		2 x 2/0		2 x 2/0			
Max. cable cross-section to brake resistor terminals (per -R/+R)	[mm²]	2 x 70		2 x 70		2 x 70			
	[AWG]	2 x 2/0		2 x 2/0		2 x 2/0			
Max. cable cross-section to input mains terminals (per phase)	[mm²]	2 x 70		2 x 70		2 x 70			
	[AWG]	2 x 2/0		2 x 2/0		2 x 2/0			
Max. external input line fuses (mains)	[A]	250		315		350			
Enclosure Ratings and Weight									
IP00/Chassis (D3)	[kg]/(lbs)	82	(181)	82	(181)	91	(201)		
IP21/NEMA 1 (D1)	[kg]/(lbs)	96	(211)	96	(211)	104	(230)		
IP54/NEMA 12 (D1)	[kg]/(lbs)	96	(211)	96	(211)	104	(230)		

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 with 40° C 24-hour avarage maximum Maximum 55° C with current derating *(see derating curves on page 16)*
Power Factor	Greater than 0.90
Supply Voltage	3 Phase, 525-690 V ± 10% (3-phase x 525/550/575/600/690 V)
Output Voltage	0-100% of the AC line voltage
Rated Motor Voltage	3-phase x 525/550/575/690 VAC
Rated Motor Frequency	50/60 Hz
Thermal protection during operation	ETR for motor (class 20)

** Intermittent Duty rated for 110% of continuous current for Normal Overload; 150% of continuous current for High Overload.*

525 – 690 VAC
D frames 200-400 HP (132-315 kW)

			Frame	D2/D4		D2/D4		D2/D4		D2/D4		
VLT® Type			VLT® HVAC Drive		P200 T7		P250 T7		P315 T7		P400 T7	
			VLT® AQUA Drive		P200 T7		P250 T7		P315 T7		P400 T7	
			VLT® AutomationDrive	P160 T7	P160 T7	P200 T7	P200 T7	P250 T7	P250 T7	P315 T7	P315 T7	
			Overload	High	Normal	High	Normal	High	Normal	High	Normal	
Nominal Voltage	550 V	**Output Current**										
		Continuous (525-550 V)	$I_{VLT,N}$ [A]	201	253	253	303	303	360	360	418	
		Intermittent (60 sec)*	$I_{VLT,MAX}$ [A]	302	278	380	333	455	396	540	460	
		Output Power										
		Continuous	$S_{VLT,N}$ [kVA]	191	241	241	289	289	343	343	398	
		Intermittent	$S_{VLT,MAX}$ [kVA]	287	265	362	318	433	377	514	438	
		Typical Shaft Output	[kW]	132	160	160	200	200	250	250	315	
		Rated Input Current	$I_{L,N}$ [A]	198	245	245	299	299	355	355	408	
	575 V	**Output Current**										
		Continuous (551-690 V)	$I_{VLT,N}$ [A]	192	242	242	290	290	344	344	400	
		Intermittent (60 sec)*	$I_{VLT,MAX}$ [A]	288	266	363	319	435	378	516	440	
		Output Power										
		Continuous	$S_{VLT,N}$ [kVA]	191	241	241	289	289	343	343	398	
		Intermittent	$S_{VLT,MAX}$ [kVA]	287	265	362	318	433	377	514	438	
		Typical Shaft Output	[HP]	200	250	250	300	300	350	350	400	
		Rated Input Current	$I_{L,N}$ [A]	189	234	234	286	286	339	339	390	
	690 V	**Output Current**										
		Continuous (551-690 V)	$I_{VLT,N}$ [A]	192	242	242	290	290	344	344	400	
		Intermittent (60 sec)*	$I_{VLT,MAX}$ [A]	288	266	363	319	435	378	516	440	
		Output Power										
		Continuous	$S_{VLT,N}$ [kVA]	229	289	289	347	347	411	411	478	
		Intermittent	$S_{VLT,MAX}$ [kVA]	344	318	434	381	520	452	617	526	
		Typical Shaft Output	[kW]	160	200	200	250	250	315	315	400	
		Rated Input Current	$I_{L,N}$ [A]	197	240	240	296	296	352	352	400	

Estimated power loss at rated maximum load	[W]	3451	4292	4275	5156	4875	5821	5185	6149	
Efficiency		0.98		0.98		0.98		0.98		
Output Frequency	[Hz]	0-600		0-600		0-600		0-500		
Max. cable cross-section to motor output terminals (per phase)	[mm²]	2 x 185		2 x 185		2 x 185		2 x 185		
	[AWG]	2 x 350 mcm		2 x 350 mcm		2 x 350 mcm		2 x 350 mcm		
Max. cable cross-section to loadsharing terminals (per -DC/+DC)	[mm²]	2 x 185		2 x 185		2 x 185		2 x 185		
	[AWG]	2 x 350 mcm		2 x 350 mcm		2 x 350 mcm		2 x 350 mcm		
Max. cable cross-section to brake resistor terminals (per -R/+R)	[mm²]	2 x 185		2 x 185		2 x 185		2 x 185		
	[AWG]	2 x 350 mcm		2 x 350 mcm		2 x 350 mcm		2 x 350 mcm		
Max. cable cross-section to input mains terminals (per phase)	[mm²]	2 x 185		2 x 185		2 x 185		2 x 185		
	[AWG]	2 x 350 mcm		2 x 350 mcm		2 x 350 mcm		2 x 350 mcm		
Max. external input line fuses (mains)	[A]	350		400		500		550		
Enclosure Ratings and Weight										
IP00/Chassis (D4)	[kg]/(lbs)	112	(247)	123	(271)	138	(304)	151	(334)	
IP21/NEMA 1 (D2)	[kg]/(lbs)	125	(277)	136	(301)	151	(334)	165	(364)	
IP54/NEMA 12 (D2)	[kg]/(lbs)	125	(277)	136	(301)	151	(334)	165	(364)	

Supply Frequency	50/60 Hz (48-62Hz ± 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 with 40° C 24-hour avarage maximum Maximum 55° C with current derating *(see derating curves on page 16)*
Power Factor	Greater than 0.90
Supply Voltage	3 Phase, 525-690 V ± 10% (3-phase x 525/550/575/600/690 V)
Output Voltage	0-100% of the AC line voltage
Rated Motor Voltage	3-phase x 525/550/575/690 VAC
Rated Motor Frequency	50/60 Hz
Thermal protection during operation	ETR for motor (class 20)

** Intermittent Duty rated for 110% of continuous current for Normal Overload; 150% of continuous current for High Overload.*

525 – 690 VAC
E frames

			Frame	E1/E2		E1/E2		E1/E2		E1/E2	
VLT® Type			VLT® HVAC Drive		P450 T7		P500 T7		P560 T7		P630 T7
			VLT® AQUA Drive		P450 T7		P500 T7		P560 T7		P630 T7
			VLT® AutomationDrive	P355 T7	P355 T7	P400 T7	P400 T7	P500 T7	P500 T7	P560 T7	P560 T7
			Overload	High	Normal	High	Normal	High	Normal	High	Normal
Nominal Voltage	550 V	**Output Current**									
		Continuous (525-550 V)	$I_{VLT,N}$ [A]	395	470	429	523	523	596	596	630
		Intermittent (60 sec)*	$I_{VLT,MAX}$ [A]	593	517	644	575	785	656	894	693
		Output Power									
		Continuous	$S_{VLT,N}$ [kVA]	376	448	409	498	498	568	568	600
		Intermittent	$S_{VLT,MAX}$ [kVA]	564	493	613	548	747	625	852	660
		Typical Shaft Output	[kW]	300	355	315	400	400	450	450	500
		Rated Input Current	$I_{L,N}$ [A]	381	453	413	504	504	574	574	607
	575 V	**Output Current**									
		Continuous (551-690 V)	$I_{VLT,N}$ [A]	380	450	410	500	500	570	570	630
		Intermittent (60 sec)*	$I_{VLT,MAX}$ [A]	570	495	615	550	750	627	855	693
		Output Power									
		Continuous	$S_{VLT,N}$ [kVA]	378	448	408	498	498	568	568	627
		Intermittent	$S_{VLT,MAX}$ [kVA]	568	493	612	548	747	624	852	690
		Typical Shaft Output	[HP]	400	450	400	500	500	600	600	650
		Rated Input Current	$I_{L,N}$ [A]	366	434	395	482	482	549	549	607
	690 V	**Output Current**									
		Continuous (551-690 V)	$I_{VLT,N}$ [A]	380	450	410	500	500	570	570	630
		Intermittent (60 sec)*	$I_{VLT,MAX}$ [A]	570	495	615	550	750	627	855	693
		Output Power									
		Continuous	$S_{VLT,N}$ [kVA]	454	538	490	598	598	681	681	753
		Intermittent	$S_{VLT,MAX}$ [kVA]	681	592	735	657	896	749	1022	828
		Typical Shaft Output	[kW]	355	450	400	500	500	560	560	630
		Rated Input Current	$I_{L,N}$ [A]	366	434	395	482	482	549	549	607

Estimated power loss at rated maximum load	[W]	5383	6449	5818	7249	7671	8727	8715	9673
Efficiency		0.98		0.98		0.98		0.98	
Output Frequency	[Hz]	0-500		0-500		0-500		0-500	
Max. cable cross-section to motor output terminals (per phase)	[mm²]	4 x 240		4 x 240		4 x 240		4 x 240	
	[AWG]	4 x 500 mcm		4 x 500 mcm		4 x 500 mcm		4 x 500 mcm	
Max. cable cross-section to loadsharing terminals (per -DC/+DC)	[mm²]	4 x 240		4 x 240		4 x 240		4 x 240	
	[AWG]	4 x 500 mcm		4 x 500 mcm		4 x 500 mcm		4 x 500 mcm	
Max. cable cross-section to regeneration terminals (per -DC/+DC)	[mm²]	4 x 240		4 x 240		4 x 240		4 x 240	
	[AWG]	4 x 500 mcm		4 x 500 mcm		4 x 500 mcm		4 x 500 mcm	
Max. cable cross-section to brake resistor terminals (per -R/+R)	[mm²]	2 x 185		2 x 185		2 x 185		2 x 185	
	[AWG]	2 x 350 mcm		2 x 350 mcm		2 x 350 mcm		2 x 350 mcm	
Max. cable cross-section to input mains terminals (per phase)	[mm²]	4 x 240		4 x 240		4 x 240		4 x 240	
	[AWG]	4 x 500 mcm		4 x 500 mcm		4 x 500 mcm		4 x 500 mcm	
Max. external input line fuses (mains)	[A]	700		700		900		900	
Enclosure Ratings and Weight									
IP00/Chassis (E2)	[kg]/(lbs)	221	(487)	221	(487)	236	(520)	277	(611)
IP21/NEMA 1 (E1)	[kg]/(lbs)	263	(580)	263	(580)	272	(600)	313	(690)
IP54/NEMA 12 (E1)	[kg]/(lbs)	263	(580)	263	(580)	272	(600)	313	(690)

Supply Frequency	50/60 Hz (48-62Hz ± 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 with 40° C 24-hour avarage maximum Maximum 55° C with current derating *(see derating curves on page 16)*
Power Factor	Greater than 0.90
Supply Voltage	3 Phase, 525-690 V ± 10% (3-phase x 525/550/575/600/690 V)
Output Voltage	0-100% of the AC line voltage
Rated Motor Voltage	3-phase x 525/550/575/690 VAC
Rated Motor Frequency	50/60 Hz
Thermal protection during operation	ETR for motor (class 20)

** Intermittent Duty rated for 110% of continuous current for Normal Overload; 150% of continuous current for High Overload.*

525 – 690 VAC
F frames

			Frame Size	F1/F3		F1/F3		F1/F3		F2/F4		F2/F4	
VLT® Type			VLT® HVAC Drive		P710 T7		P800 T7		P900 T7		P1M0 T7		P1M2 T7
			VLT® AQUA Drive		P710 T7		P800 T7		P900 T7		P1M0 T7		P1M2 T7
			VLT® AutomationDrive	P630 T7	P630 T7	P710 T7	P710 T7	P800 T7	P800 T7	P900 T7	P900 T7	P1M0 T7	P1M0 T7
			Overload	High	Normal	High	Normal	High	Normal	High	Normal	High	Normal
Nominal Voltage	550 V	**Output Current**											
		Continuous (525-550 V)	$I_{VLT,N}$ [A]	659	763	763	889	889	988	988	1108	1108	1317
		Intermittent (60 sec)*	$I_{VLT,MAX}$ [A]	989	839	1145	978	1334	1087	1482	1219	1662	1449
		Output Power											
		Continuous	$S_{VLT,N}$ [kVA]	628	727	727	847	847	941	941	1056	1056	1255
		Intermittent	$S_{VLT,MAX}$ [kVA]	942	800	1090	932	1270	1035	1412	1161	1583	1380
		Typical Shaft Output	[kW]	500	560	560	670	670	750	750	850	850	1000
		Rated Input Current	$I_{L,N}$ [A]	642	743	743	866	866	962	962	1079	1079	1282
	575 V	**Output Current**											
		Continuous (551-690 V)	$I_{VLT,N}$ [A]	630	730	730	850	850	945	945	1060	1060	1260
		Intermittent (60 sec)*	$I_{VLT,MAX}$ [A]	945	803	1095	935	1275	1040	1418	1166	1590	1386
		Output Power											
		Continuous	$S_{VLT,N}$ [kVA]	627	727	727	847	847	941	941	1056	1056	1255
		Intermittent	$S_{VLT,MAX}$ [kVA]	941	800	1091	931	1270	1035	1412	1161	1584	1380
		Typical Shaft Output	[HP]	650	750	750	950	950	1050	1050	1150	1150	1350
		Rated Input Current	$I_{L,N}$ [A]	613	711	711	828	828	920	920	1032	1032	1227
	690 V	**Output Current**											
		Continuous (551-690 V)	$I_{VLT,N}$ [A]	630	730	730	850	850	945	945	1060	1060	1260
		Intermittent (60 sec)*	$I_{VLT,MAX}$ [A]	945	803	1095	935	1275	1040	1418	1166	1590	1386
		Output Power											
		Continuous	$S_{VLT,N}$ [kVA]	753	872	872	1016	1016	1129	1129	1267	1267	1506
		Intermittent	$S_{VLT,MAX}$ [kVA]	1129	960	1309	1117	1524	1242	1694	1394	1900	1656
		Typical Shaft Output	[kW]	630	710	710	800	800	900	900	1000	1000	1200
		Rated Input Current	$I_{L,N}$ [A]	613	711	711	828	828	920	920	1032	1032	1227

Estimated power loss at rated maximum load**	[W]	9674	11315	10965	12903	12890	14533	14457	16375	15899	19207
Efficiency		0.98		0.98		0.98		0.98		0.98	
Output Frequency	[Hz]	0-500		0-500		0-500		0-500		0-500	
Max. cable cross-section to motor output terminals (per phase)	[mm²]	8 x 150		8 x 150		8 x 150		12 x 150		12 x 150	
	[AWG]	8 x 300 mcm		8 x 300 mcm		8 x 300 mcm		12 x 300 mcm		12 x 300 mcm	
Max. cable cross-section to loadsharing terminals (per -DC/+DC)	[mm²]	4 x 120		4 x 120		4 x 120		4 x 120		4 x 120	
	[AWG]	4 x 250 mcm		4 x 250 mcm		4 x 250 mcm		4 x 250 mcm		4 x 250 mcm	
Max. cable cross-section to regeneration terminals (per -DC/+DC)	[mm²]	2 x 150		2 x 150		2 x 150		2 x 150		2 x 150	
	[AWG]	2 x 300 mcm		2 x 300 mcm		2 x 300 mcm		2 x 300 mcm		2 x 300 mcm	
Max. cable cross-section to brake resistor terminals (per -R/+R)	[mm²]	4 x 185		4 x 185		4 x 185		6 x 185		6 x 185	
	[AWG]	4 x 350 mcm		4 x 350 mcm		4 x 350 mcm		6 x 350 mcm		6 x 350 mcm	
Max. cable cross-section to input mains terminals (per phase)	[mm²]	8 x 240		8 x 240		8 x 240		8 x 240		8 x 240	
	[AWG]	8 x 500 mcm		8 x 500 mcm		8 x 500 mcm		8 x 500 mcm		8 x 500 mcm	
Max. external input line fuses (mains)	[A]	2000		2000		2000		2000		2000	
Enclosure Ratings and Weight											
IP21/NEMA 1	[kg]/(lbs)	1004	(2214)†	1004	(2214)†	1004	(2214)†	1246	(2748)†	1246	(2748)†
IP54/NEMA 12	[kg]/(lbs)	1004	(2214)†	1004	(2214)†	1004	(2214)†	1246	(2748)†	1246	(2748)†

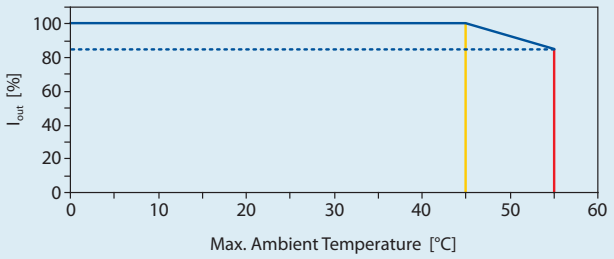
Supply Frequency	50/60 Hz (48-62 Hz ± 1%)
Max. Motor Cable Length	150 metres (500 feet) shielded, 300 metres (1000 feet) unshielded
Ambient Temperature (with default drive settings)	-10° C to 45° C with 40° C 24-hour avarage maximum Maximum 55° C with current derating *(see derating curves on page 16)*
Power Factor	Greater than 0.90
Supply Voltage	3 Phase, 525-690 V ± 10% (3-phase x 525/550/575/600/690 V)
Output Voltage	0-100% of the AC line voltage
Rated Motor Voltage	3-phase x 525/550/575/690 VAC
Rated Motor Frequency	50/60 Hz
Thermal protection during operation	ETR for motor (class 20)

* *Intermittent Duty rated for 110% of continuous current for Normal Overload; 150% of continuous current for High Overload.*
** *Value listed is the maximum estimated power loss without the options cabinet. Estimated options cabinet maximum losses are as follows: A) Disconnect/Circuit Breaker: 77 W – B) Contactor: 481 W – C) Panel Options and Miscellaneous: 837 W*
† *Adding the F-frame option cabinet (resulting in the F3 or F4 frame) adds 295 kg (650 lbs) to estimated weight.*

VLT® High Power Drive Special Conditions

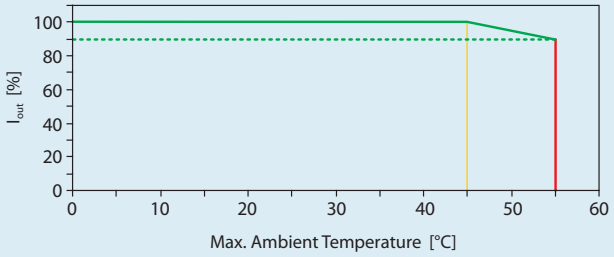
Derating in high ambient temperatures
VLT® Series drives can provide 100% of their rated output current in environments with ambient temperatures of up to 45° C with default drives settings. In environments with higher ambient temperatures, VLT® Series drives can still operate by reducing the output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

Normal Overload Drives



Derating curve based on 60° AVM IGBT switching pattern

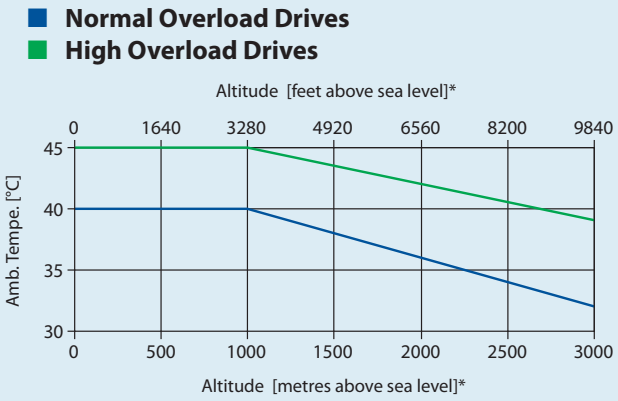
High Overload Drives



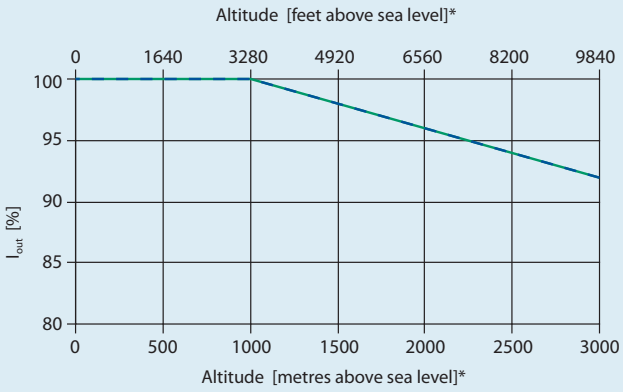
Derating curve based on SFAVM IGBT switching pattern

As shown above, 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.

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 below:



Alternatively, the output current of the drive can be reduced to achieve the same objective:



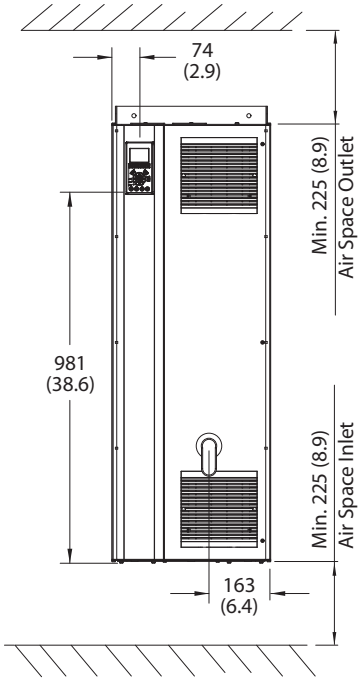
** 690 V drives are limited to 6560' (2000 m) above sea level based on PELV requirements.*

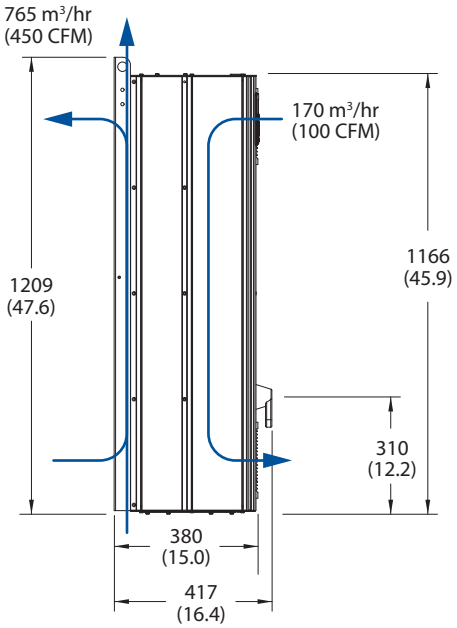
For derating options related to carrier frequency, see the VLT® HVAC Drive, VLT® AQUA Drive or VLT® AutomationDrive design guide.

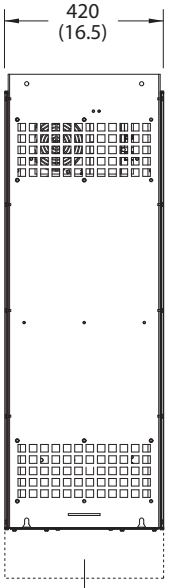
VLT® High Power Drive Dimensions

D1 frame (floor or wall mount)

mm (inches)

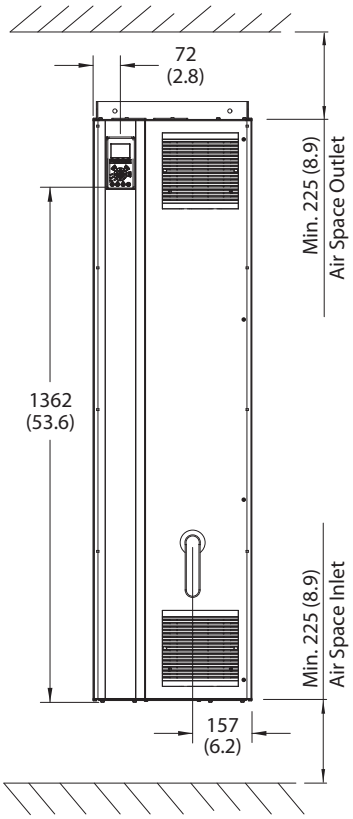


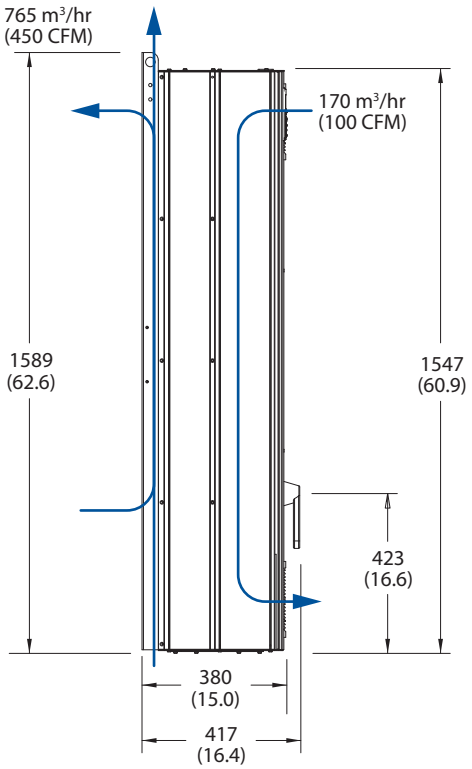


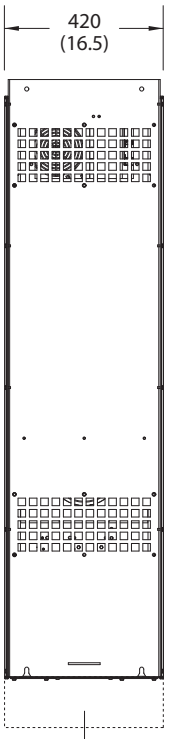


Optional pedestal 176F1827 available for stand-alone floor mount installations (adds 200 mm/7.9" to height)

D2 frame (floor or wall mount)







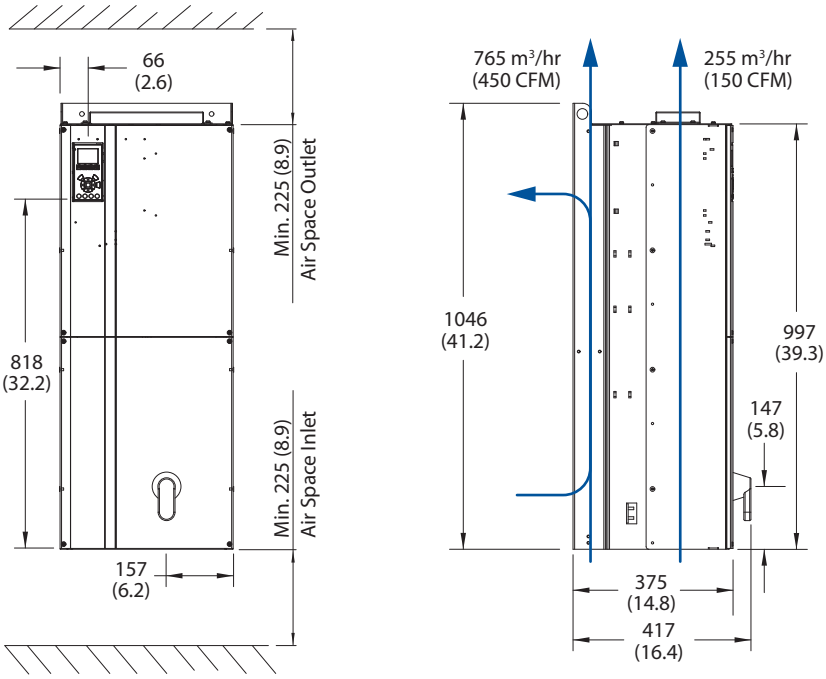
Optional pedestal 176F1827 available for stand-alone floor mount installations (adds 200 mm/7.9" to height)

Drives shown with optional disconnect switch

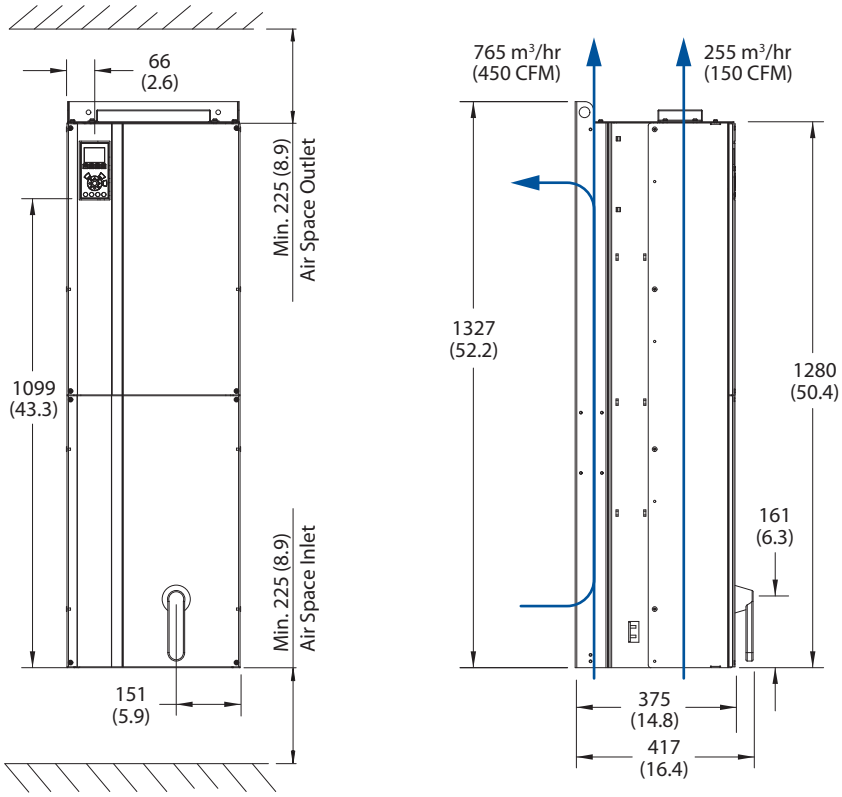
VLT® High Power Drive Dimensions

D3 frame (cabinet mount)

mm (inches)



D4 frame (cabinet mount)

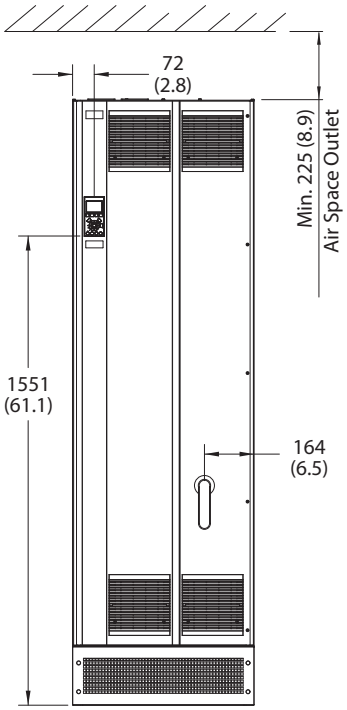


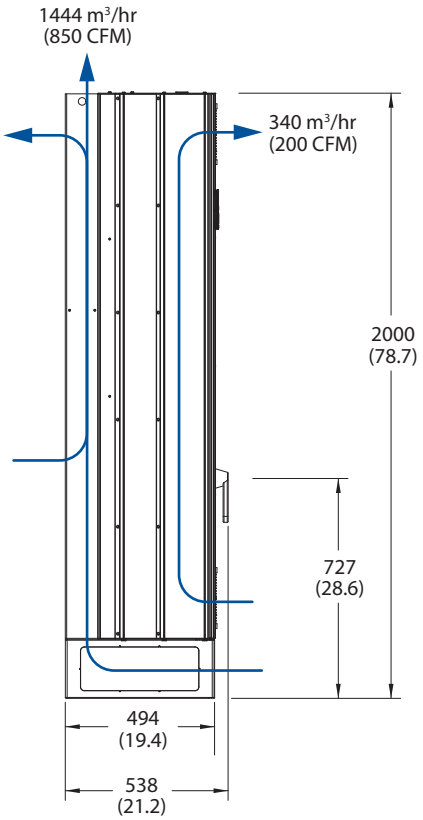
Drives shown with optional disconnect switch

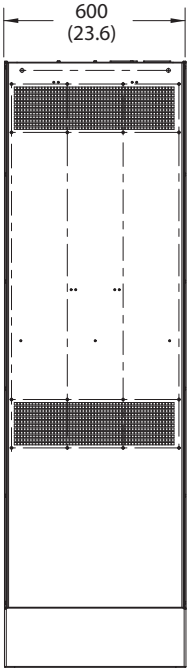
VLT® High Power Drive Dimensions

E1 frame (floor mount)

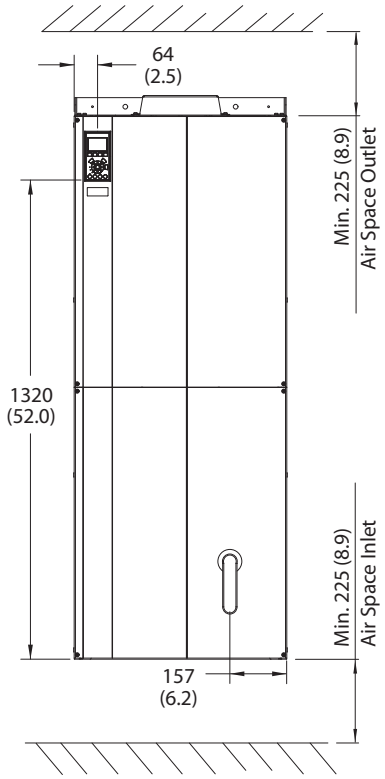
mm (inches)

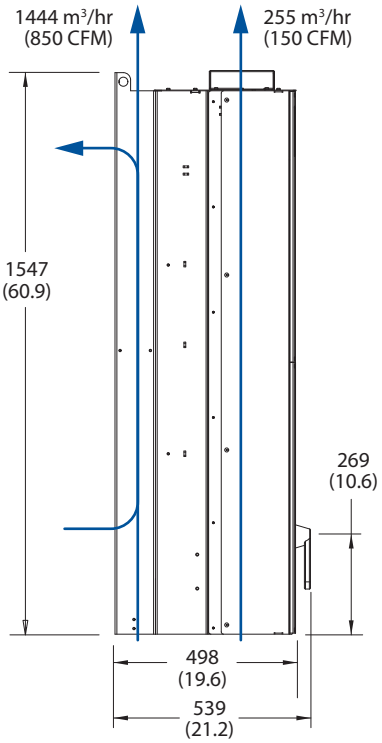


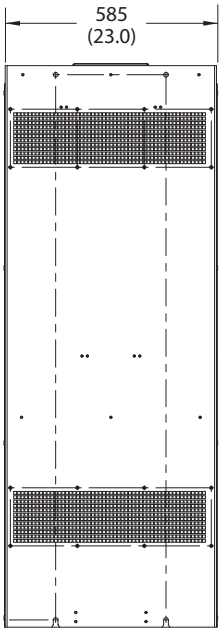




E2 frame (cabinet mount)





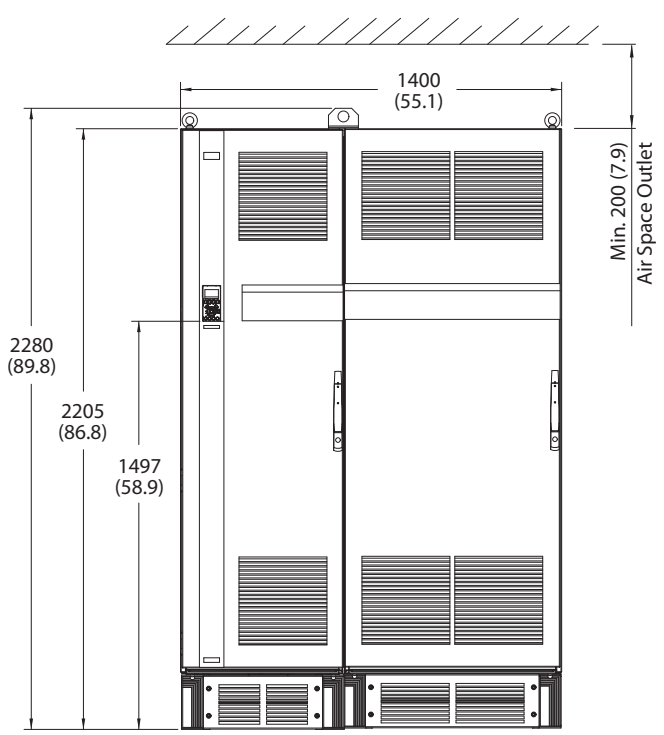


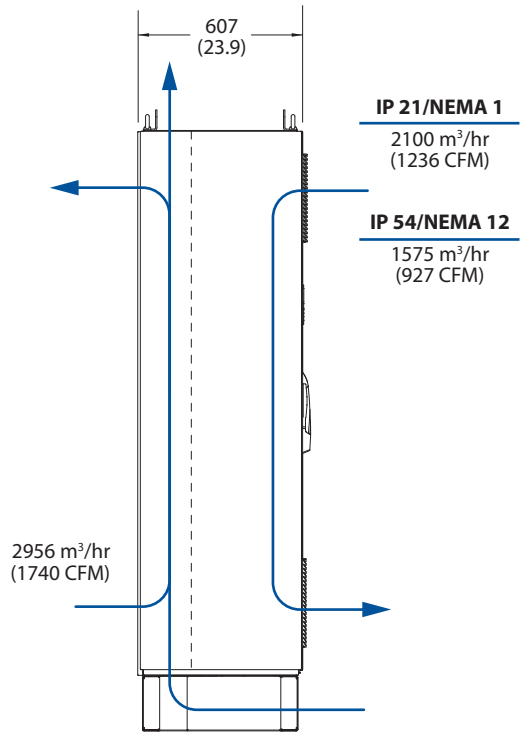
Drives shown with optional disconnect switch

VLT® High Power Drive Dimensions

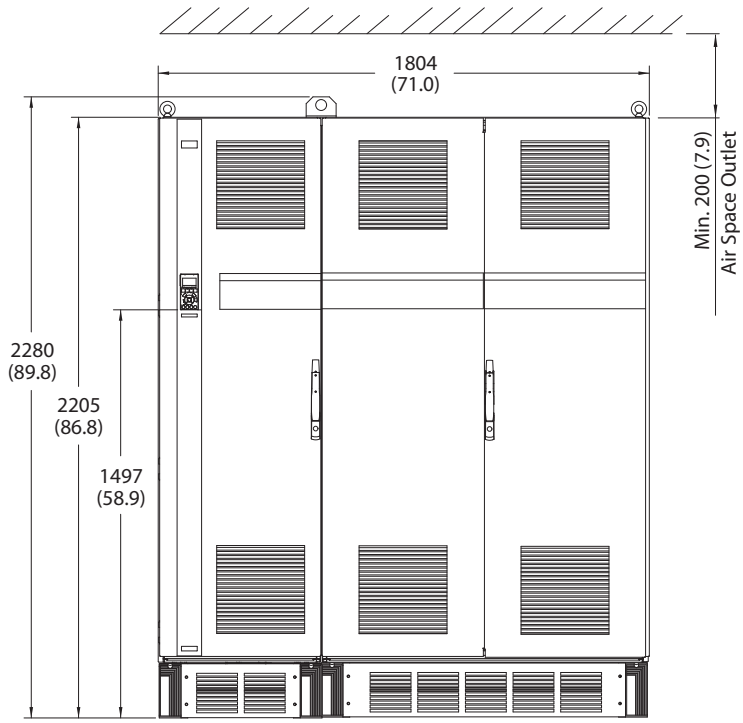
F1 frame (floor mount)

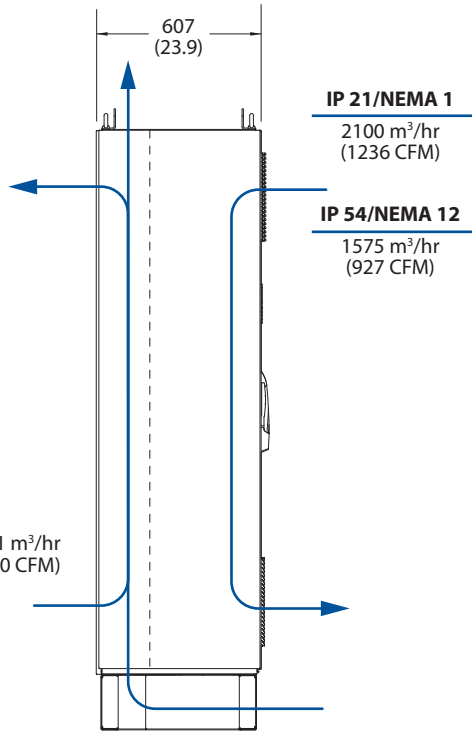
mm (inches)





F2 frame (floor mount)

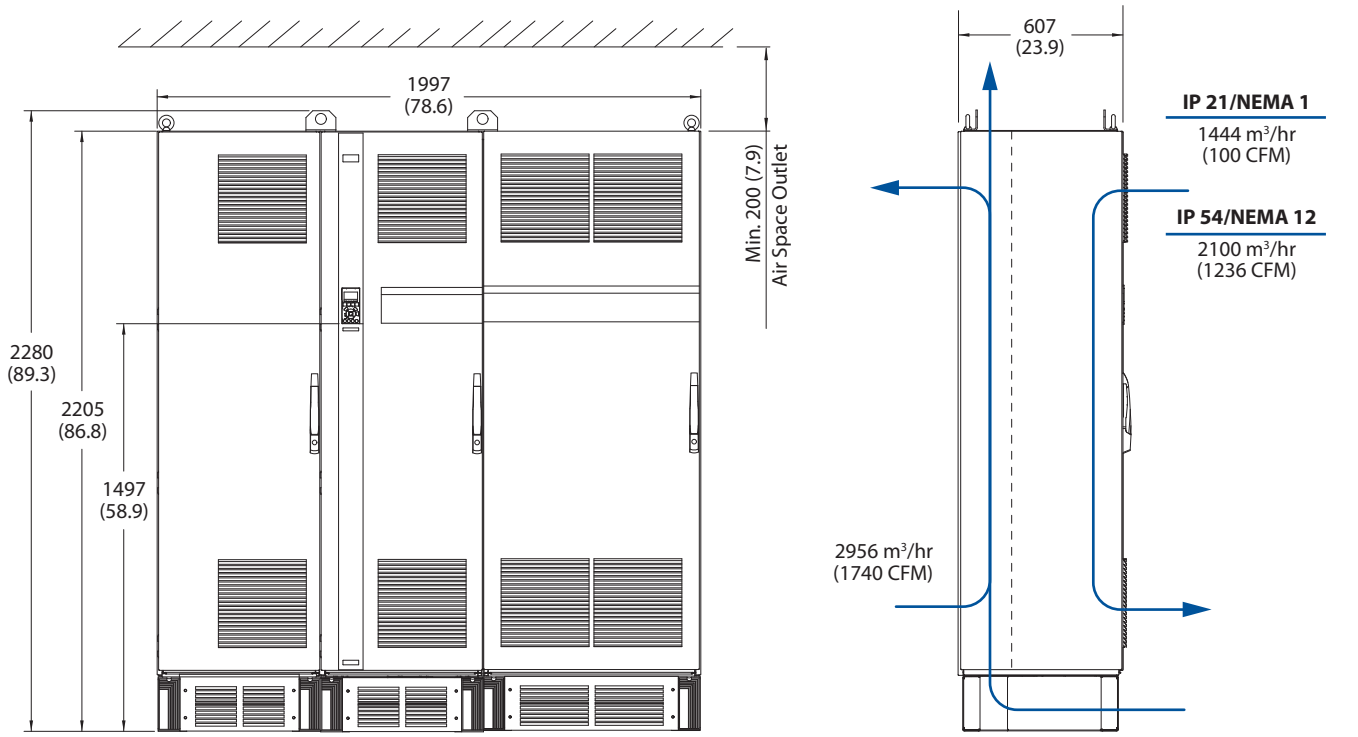




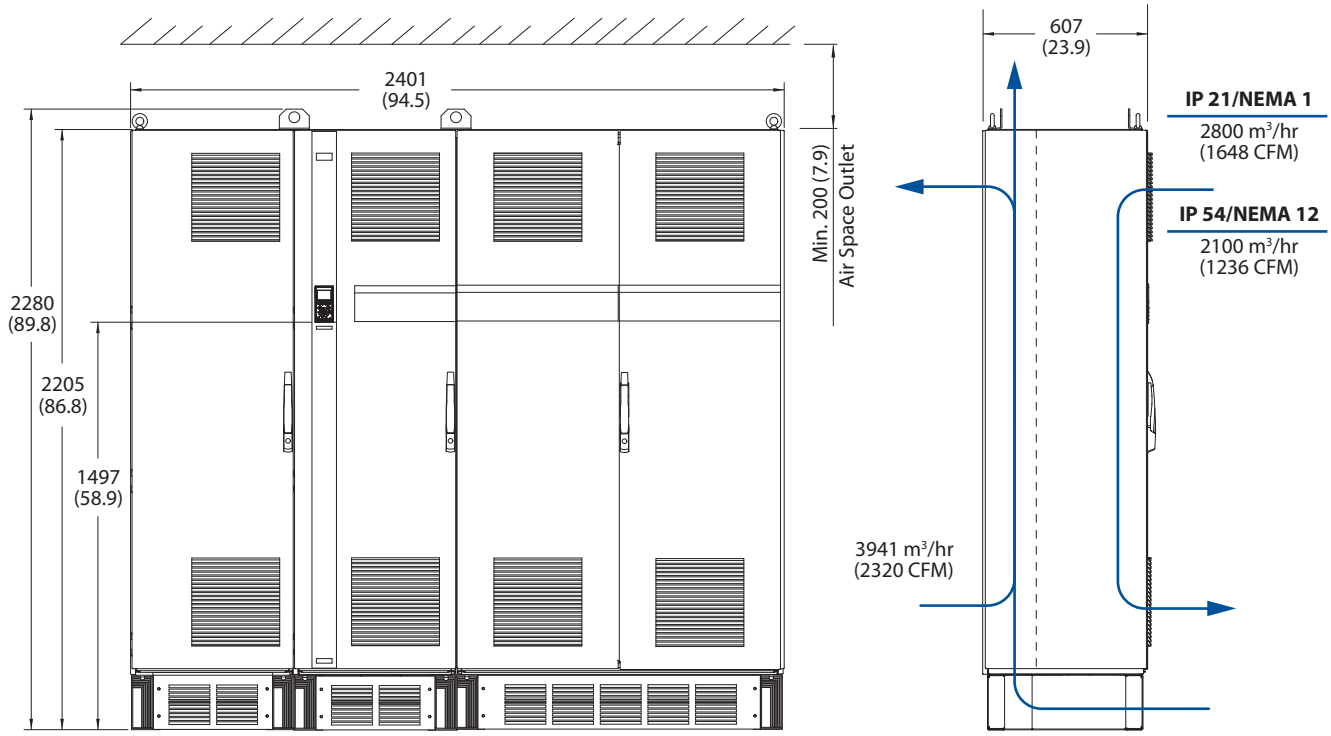
VLT® High Power Drive Dimensions

F3 frame (floor mount)

mm (inches)



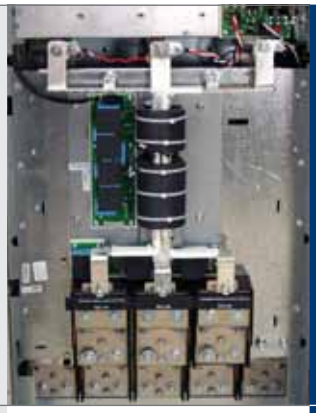
F4 frame (floor mount)



VLT® High Power Drive Options

Typecode Position		Available on Frames	
4		D3/ D4/E2	**Chassis/IP00 Enclosure with Stainless Steel Back Channel** For additional protection from corrosion in harsh environments, IP00 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.
4		D1/ D2/E1	**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.
4		F	**Space Heaters and Thermostat** Mounted on the cabinet interior of F frames, space heaters controlled via an automatic thermostat help control humidity inside the enclosure, extending the lifetime of drive components in damp environments.
4		F	**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

VLT® High Power Drive Options

	Available on Frames		Typecode Position
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**
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 in typecode block 16.	**F**	NAMUR	**5**
Residual Current Monitor (RCM) 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 setpoint) and a main alarm setpoint. Associated with each setpoint is an SPDT alarm relay for external use. Requires an exteral "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	**F3/F4**		**5**
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	**F3/F4**		**5**

VLT® High Power Drive Options

Typecode Position		Available on Frames	
6		D/E/F	**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 36.
6		E/F	**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 regeration power limits based on the specific drive size and voltage.
6		F3/F4	**IEC 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.
9		D/E/F	**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.

VLT® High Power Drive Options

	Available on Frames		Typecode Position
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.	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.	D/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.	F3/F4		9
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.	F3/F4		9

VLT® High Power Drive Options

Typecode Position		Available on Frames	
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, 120W, 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

VLT® High Power Drive Options

	Available on Frames		Typecode Position
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). ***Universal inputs (8)*** 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 dignostics • Sensor lead wire break, short-circuit, and incorrect polarity detection • Interface setup software ***Dedicated thermistor inputs (2)*** Features: • Each module capable of monitoring up to six thermistors in series • Fault diagnostics for wire breakage or short-circuits of sensor leads • ATEX/UL/CSA certification • A third thermistor input can be provided by the PTC Thermistor Option Card MCB 112, if necessary	**F**	 	**11**
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	**D/E/F**		**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	**D/E/F**		**7**

VLT® High Power Drive Options
Fieldbus

Typecode Position

13		**MCA 101 PROFIBUS** Supported by all major PLC vendors, PROFIBUS DP V1 gives you a high level of availability and compatibility with future versions. • Fast and efficient communication, transparent installation, advanced diagnosis and autoconfiguration of process data via GSD files • Acyclic parameterisation using PROFIBUS DP V1, PROFIdrive or Danfoss FC profi e state machines, PROFIBUS DP V1, Master Class 1 and 2
13		**MCA 104 DeviceNet** Based on Producer/Consumer technology, DeviceNet offers robust, efficient data handling. • Allows the user to select the nature and timing of reported information • ODVA's strong conformance testing policies ensure that products are interoperable
13		**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
13		**MCA 108 LonWorks** Allows the drive to communicate on a LonWorks Free Topology network. • Certified compliant with LonWorks 3.4 specifications • Designed to communicate with any system complying with the FTT and 78Kbps LonWorks standard • Equipped with two termination switches enabling double termination when using bus topology
13		**MCA 109 BACnet** Enables the drive to communicate with building management systems running BACnet, the open communications protocol that 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 • Easily integrated into existing control equipment networks
13		**MCA 121 Ethernet/IP** Provides the network tools to deploy standard Ethernet technology for manufacturing applications while enabling Internet and enterprise connectivity. • Built-in advanced switch with diagnostic functions and two ports for line topology • Built-in web server and e-mail client for service notification • Transparent socket channel

Typecode Position

MCB 101 General purpose I/O

Offers an extended number of control inputs and outputs:

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

14

MCB 102 Encoder

For connection of encoder feedback from either a motor or a process. Feedback for flux vector controlled asynchronous motors or brushless permanent magnet servo motors.

- Incremental encoders
- SinCos encoders with Hyperface®
- Power supply for encoders
- EIA-422 interface

14

MCB 103 Resolver

Supports resolver feedback from flux vector controlled asynchronous motors or brushless permanent magnet servo motors.

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

14

MCB 108 Safe PLC Interface

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.

14

VLT® High Power Drive Options
Applications

Typecode Position

14

MCB 105 Relay

Provides 3 extra relay outputs.

Max. terminal load:
- AC-1 Resistive load 240V AC: 2A
- AC-15 Inductive @ cos φ 0.4: 0.2A
- DC-1 Resistive load 240V AC: 1A
- DC-13 Inductive @ cos φ 0.4: 0.1A

Min. terminal load:
- DC 5 V: 10 mA
- Max. switch rate at rated load/min. load: 6 min^{-1}/20 sec^{-1}

14

MCB 109 Analogue I/O and Real-Time Clock Backup

Provides extra analog input and output capabilities and enables the connection of an external DC supply to keep the Real-Time Clock active through interruption of mains power.

- 3 analogue inputs
- 3 analogue outputs
- Back-up power for Real-Time Clock

14

MCB 112 PTC Thermistor Input

Monitors motor temperature via connected PTC thermistor(s) and protects against thermal overload of motor.

- Connection and monitoring of PTC sensors according to DIN 44081 and DIN 44082
- Capable of monitoring up to six thermistors in series
- Alarm logging, sensor leads short-circuit detection, and sensor leads break detection
- Integrated with the drive's safe-stop function in accordance with Category 3 EN 954-1
- ATEX certified

14

MCO 101 Extended Cascade Controller

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

- Provides 3 additional relays for staging of additional motors
- Provides accurate flow, pressure, and level control for optimizing 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 pumps or blowers are used equally

18

MCB 107 24 V DC Supply option

Enables connection of external DC supply to keep the control section and any option installed active through interruption of mains power.

- 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

VLT® High Power Drive Options
Applications

Typecode Position

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

15

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)

15 & 17

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)

15 & 17

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

15

MCB 113 Extended Relay

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

- 7 digital inputs
- 2 analogue outputs
- 4 SPDT relays
- Meets NAMUR recommendations
- Galvanic isolation capability

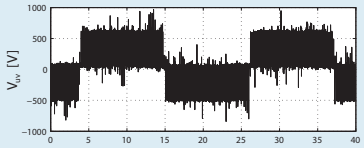
16

VLT® High Power Drive Accessories
Power Filtration

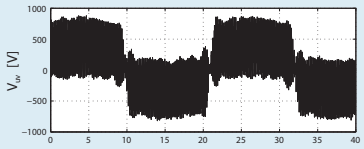
dU/dt filters
dU/dt filters provide a slower voltage rise rate on the motor terminal phase-to-phase voltage, which is particularly important when using shorter motor cables. The higher the level of inductance, the higher the voltage peaks, which can cause flashover, a condition that results in premature breakdown of the winding insulation of the connected motor.

Even in applications where motor cable length is substantial, dU/dt filters reduce the peak voltage, prolonging the life of the motor. They accomplish this by cutting off frequencies above the switching frequency. With small inductance and capacitance, dU/dt filters are a more cost-conscious solution than (but not a substitute for) sine wave filters.

- Greater motor longevity through lower dU/dt stress
- Reduced transmission of electro-magnetic interference to surrounding cables and equipment
- Trouble-free operation



Voltage and current without dU/dt filter



Voltage and current with dU/dt filter

Specifications

Voltage rating	3 x 200–500 V and 3 x 525–690 V
Nominal current I_N @ 50 Hz	11–1200 Amp (modules can be paralleled for higher power)
Motor frequency	6-60 Hz without derating, 120 Hz with derating
Ambient temperature	-25° to 40° C without derating
Minimum switching frequency	f_{min} 1.5 kHz – 4 kHz, depending on filter type
Max. switching frequency	f_{max} 8 kHz
Overload capacity	150% for 60 seconds every 10 minutes
Enclosure rating	Chassis (IP00) and NEMA Type 1 (IP20)
Approvals	CE, UL508

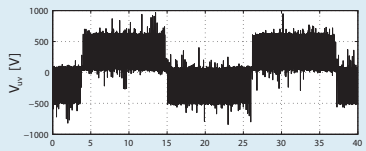
		Current		Dimensions						Mounting Type	Ordering Number
				Height		Width		Depth			
		@ 50 Hz	@ 60 Hz	inches	mm	inches	mm	inches	mm		
Chassis (IP00) Enclosure	380–500 V	182	173	10.7	270	9.7	245	13.8	350	Floor	130B2389
		280	266	11.8	298	9.5	240	15.8	400	Floor	130B2390
		400	380	15.4	390	8.9	226	18.2	460	Floor	130B2391
		500	475	16.2	410	9.7	246	16.6	420	Floor	130B2275
		750	712	17	430	11.9	300	19.3	490	Floor	130B2276
		910	864	17.4	440	11.9	300	19.3	490	Floor	130B2393
		1500	1425	30.4	770	15.4	390	19.3	490	Floor	130B2394
		2300	2185	30.5	774	15.4	390	19.3	490	Floor	130B2395
	525–690 V	28	26	10.3	260	4.8	120	10.3	260	Wall	130B2414
		45	42	10.3	260	6.7	170	10.3	260	Wall	130B2415
		75	71	10.3	260	6.7	170	10.3	260	Wall	130B2416
		115	109	10.3	260	6.7	170	10.3	260	Wall	130B2417
		165	157	12.2	308	10.5	265	16.2	410	Floor	130B2418
		260	247	15.8	400	10.5	265	15	380	Floor	130B2419
		310	294	15.8	400	10.5	265	14.6	370	Floor	130B2420
		430	408	17.3	437	10.5	265	16.6	420	Floor	130B2235
		530	503	21	533	10.6	268	16.8	425	Floor	130B2236
		630	598	17.2	436	10.5	265	16.4	415	Floor	130B2280
		765	726	28.9	734	17.6	446	20.5	520	Floor	130B2421
		1350	1282	29.6	750	18	455	19.9	503	Floor	130B2422
NEMA Type 1 (IP20) Enclosure	380–500 V	182	173	18.3	463	24.1	610	17.4	440	Floor	130B2400
		280	266	18.3	463	24.1	610	17.4	440	Floor	130B2401
		400	380	22.5	571	30.4	770	21.7	550	Floor	130B2402
		500	475	11.9	300	26.4	670	19.3	490	Floor	130B2277
		750	712	23.8	602	30.4	770	21.7	550	Floor	130B2278
		910	864	23.8	602	30.4	770	21.7	550	Floor	130B2405
		1500	1425	33.8	856	45.3	1150	33.9	860	Floor	130B2407
		2300	2185	33.8	856	45.3	1150	33.9	860	Floor	130B2410
	525–690 V	45	42	11.3	285	6.7	170	10.3	260	Wall	130B2424
		75	71	11.3	285	6.7	170	10.3	260	Wall	130B2425
		115	109	11.3	285	6.7	170	10.3	260	Wall	130B2426
		165	157	20.6	522	26.4	670	19.7	500	Floor	130B2427
		260	247	20.6	522	25.2	640	19.7	500	Floor	130B2428
		310	294	20.6	522	26.4	670	19.7	500	Floor	130B2429
		430	408	20.6	522	26.4	670	19.7	500	Floor	130B2238
		530	503	23.8	602	30.4	770	21.7	550	Floor	130B2239
		630	598	20.6	522	26.4	670	19.7	500	Floor	130B2274
		765	726	33.8	856	45.3	1150	33.9	860	Floor	130B2430
		1350	1282	33.8	856	45.3	1150	33.9	860	Floor	130B2431

VLT® High Power Drive Accessories
Power Filtration

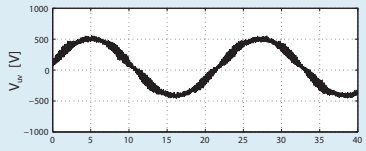
Sine wave filters
Positioned between the variable frequency drive and the motor, sine wave filters provide a sinusoidal phase-to-phase motor voltage. They reduce motor insulation stress and switching acoustic noise from the motor. Bearing currents are also reduced, especially in larger motors.

In addition to protecting the motor, sine wave filters also provide protection for the drive, because the lower pulse load is reflected in lower semiconductor losses.

- Greater motor longevity through lower dU/dt stress
- Lower frequency-dependent losses in the motor, eddy current losses and stray flux losses
- Lower acoustic switching noise on the motor
- Reduced semiconductor losses in the drive when using longer motor cables
- Less EMI on unshielded motor cables
- Reduced voltage peaks
- Reduced electrical discharges in the motor, prolonging bearing life
- Prevent flashover in motor windings



Voltage and current without sine wave filter



Voltage and current with sine wave filter

Specifications

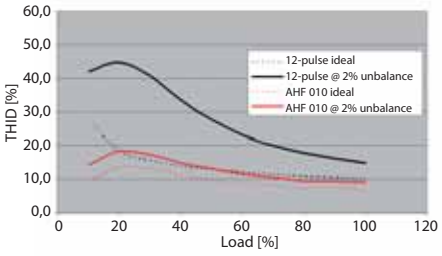
Voltage rating	380–500, 525–690 VAC
Nominal current IN @ 50 Hz	2.5–1200 amp (modules can be paralleled for higher power)
Motor frequency	6–60 Hz without derating, 120 Hz with derating
Ambient temperature	-25° to 40°C without derating
Min. switching frequency	f_{min} 1.5 kHz–5 kHz, depending on filter type
Max. switching frequency	f_{max} 8 kHz
Overload capacity	150% for 60 seconds every 10 minutes
Enclosure rating	Chassis (IP00) and NEMA Type 1 (IP20)
Approvals	CE, UL508

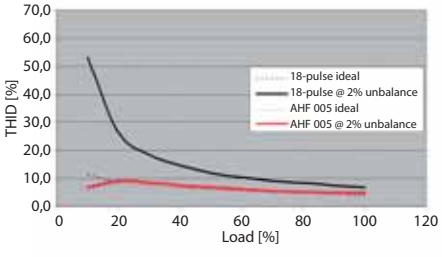
		Current		Dimensions						Mounting Type	Ordering Number
				Height		Width		Depth			
		@ 50Hz	@ 60Hz	inches	mm	inches	mm	inches	mm		
Chassis (IP00) Enclosure	380–500 V	180	171	15.9	402	17.8	450	20.7	524	Floor	130B2285
		260	247	20	506	17.8	450	21.2	536	Floor	130B2286
		410	390	26.6	675	18.9	480	22.1	560	Floor	130B2287
		480	456	25.6	650	23.7	600	24.9	630	Floor	130B2288
		660	627	29.3	742	24.5	620	24.7	626	Floor	130B2289
		750	712	27	684	34.7	880	26.2	664	Floor	130B2290
		880	836	35.2	893	30	760	28.4	720	Floor	130B2291
		1200	1140	36.3	920	29.2	740	26.1	661	Floor	130B2292
	525–690 V	45	42.5	14.9	378	12.3	310	14.6	370	Floor	130B2323
		76	72	17.4	440	14.2	360	16.2	410	Floor	130B2324
		115	109	18.9	480	17	430	17	430	Floor	130B2325
		165	157	21.4	542	18.9	480	19.3	490	Floor	130B2326
		260	247	19.5	493	21.7	550	21.3	540	Floor	130B2327
		303	287	25.3	641	21.3	540	26	660	Floor	130B2329
		430	408	25.4	643	23.3	590	26.8	680	Floor	130B2241
		530	503	31.3	794	26.8	680	24.5	620	Floor	130B2242
		660	627	31.3	794	27.2	690	22.7	576	Floor	130B2337
		765	726	35	888	35.5	900	27	684	Floor	130B2338
		940	893	36.6	928	44.9	1140	22.1	560	Floor	130B2339
		1320	1250	38.2	968	33.5	850	29.2	740	Floor	130B2340
NEMA Type 1 (IP20) Enclosure	380–500 V	180	171	30.8	782	37.1	940	25.6	650	Floor	130B2311
		260	247	30.8	782	37.1	940	25.6	650	Floor	130B2312
		410	390	30.8	782	37.1	940	25.6	650	Floor	130B2313
		480	456	29.3	742	41.4	1050	30	760	Floor	130B2314
		660	627	45.4	1152	50.8	1290	31.5	800	Floor	130B2315
		750	712	43.9	1115	50.8	1290	31.5	800	Floor	130B2316
		880	836	45.4	1152	50.8	1290	31.5	800	Floor	130B2317
		1200	1140	45.4	1152	50.8	1290	31.5	800	Floor	130B2318
	525–690 V	45	42.5	20.6	522	26.4	670	19.7	500	Floor	130B2343
		76	72	20.6	522	26.4	670	19.7	500	Floor	130B2344
		115	109	20.6	522	25.2	640	19.7	500	Floor	130B2345
		165	157	30.8	782	35.9	910	25.6	650	Floor	130B2346
		260	247	30.8	782	37.1	940	25.6	650	Floor	130B2347
		303	287	45.4	1152	50.8	1290	31.5	800	Floor	130B2348
		430	408	45.4	1152	50.8	1290	31.5	800	Floor	130B2270
		530	503	45.4	1152	50.8	1290	31.5	800	Floor	130B2271
		660	627	45.4	1152	50.8	1290	31.2	790	Floor	130B2381
		765	726	45.4	1152	50.8	1290	31.5	800	Floor	130B2382
		940	893	45.4	1152	50.8	1290	31.5	800	Floor	130B2383
		1320	1250	51.6	1310	51.3	1302	33.9	860	Floor	130B2384

VLT® High Power Drive Accessories
Harmonic Filtration

Advanced Harmonic Filters (AHF)
As a cost-effective total solution, Danfoss Advanced Harmonic Solutions (AHS) packages combine the reliability and performance of VLT® Series drives with the innovative technology of AHF Series Filters.

AHF Advantages
- Designed for matched performance with Danfoss VLT® Series drives
- User-friendly start-up; no adjustment necessary
- Requires no routine maintenance
- Protects multiple drives with one filter
- Designed to address the current distortion limit guidelines of IEEE 519-1992
- AHF 010 has THiD < 10%; equal or superior performance and cost competitive compared to 12-pulse rectifiers
- AHF 005 has THiD < 5%; equal or superior performance and cost competitive compared to 18-pulse rectifiers





Specifications

Line Voltage	• 380–415 VAC ±10%, 50 Hz ±5% • 380–415 VAC ±10%, 60 Hz ±5% • 440–480 VAC ±10%, 60 Hz ±5% • 500–525 VAC ±10%, 50 Hz ±5% • 690 VAC ±10%, 50 Hz ±5%
THiD	AHF 005 < 5% AHF 010 < 10%
Overload Current	160% for 60 seconds
Ambient Temperature	5°–40° C (41°–104° F) without derating
Enclosure Rating	IP 20 (NEMA Type 1)
Efficiency	>0.98
Approvals	CE: Low-Voltage Directive; UL

Frame	Dimensions *mm (inches)*		
	H	W	D
D	938 (37,0)	351 (13,9)	230 (9,1)
E	1046 (41,2)	394 (15,6)	400 (15,8)
F	1152 (45,4)	454 (17,9)	419 (16,5)
G	1322 (52,1)	454 (17,9)	419 (16,5)
H	1352 (53,3)	528 (20,8)	409 (16,2)

Ordering Numbers

	Current (amps)	Typical Motor Power	AHF 005		AHF 010	
			Ordering Number	Frame Size	Ordering Number	Frame Size
380 – 415 V, 50 Hz	144	75 kW	175G6607	E	175G6629	D
	180	90 kW	175G6608	F	175G6630	E
	217	110 kW	175G6609	F	175G6631	E
	289	132 kW	175G6610	G	175G6632	F
	324	160 kW	175G6611	G	175G6633	F
	370	200 kW	175G6688	H	175G6691	G
	506	250 kW	175G6609 + 175G6610	F & G	175G6631 + 175G6632	E & F
	578	315 kW	2 x 175G6610	2 x G	2 x 175G6632	2 x F
	648	355 kW	2 x 175G6611	2 x G	2 x 175G6633	2 x F
380 – 415 V, 60 Hz	144	100 HP	130B2466	E	130B2478	D
	180	125 HP	130B2467	F	130B2479	E
	217	150 HP	130B2468	F	130B2480	E
	289	200 HP	130B2469	G	130B2481	F
	324	250 HP	130B2470	G	130B2482	F
	370	300 HP	130B2471	H	130B2483	G
	506	350 HP	130B2468 + 130B2469	F & G	130B2480 + 130B2481	E & F
	578	450 HP	2 x 130B2469	2 x G	2 x 130B2481	2 x F
	648	500 HP	2 x 130B2470	2 x G	2 x 130B2482	2 x F
440 – 480 V, 60 Hz	144	100/125 HP	175G6618	E	175G6640	D
	180	150 HP	175G6619	F	175G6641	E
	217	200 HP	175G6620	F	175G6642	E
	289	250 HP	175G6621	G	175G6643	F
	324	300 HP	175G6689	G	175G6692	F
	370		175G6690	H	175G6693	G
	434	350 HP	2 x 175G6620	2 x F	2 x 175G6642	2 x E
	578	450/500 HP	2 x 175G6621	2 x G	2 x 175G6643	2 x F
	659	550/600 HP	175G6690 + 175G6621	H & G	175G6693 + 175G6643	G & F
500 – 525 V, 50 Hz	43	30 kW	175G6648	D	174G6660	D
	72	37/45 kW	175G6649	E	174G6661	D
	101	55/75 kW	175G6650	E	174G6662	D
	144	90/110 kW	175G6651	E	174G6663	E
	180	132 kW	175G6652	F	174G6664	E
	217	160 kW	175G6653	F	174G6665	F
	289	200 kW	175G6654	G	174G6666	F
	324	250 kW	175G6655	G	174G6667	G
	370	315 kW	2 x 175G6653	2 x F	2 x 175G6665	2 x F
	506	355 kW	175G6652 x 175G6654	F & G	175G6664 + 175G6666	E & F
	578	400 kW	2 x 175G6654	2 x G	2 x 175G6666	2 x F
690 V, 50 Hz	43	37/45 kW	130B2328	D	130B2293	D
	72	55/75 kW	130B2330	E	130B2295	D
	101	90 kW	130B2331	F	130B2296	E
	144	110/132 kW	130B2333	G	130B2298	E
	180	160 kW	130B2334	G	130B2299	F
	217	200 kW	130B2335	H	130B2300	G
	289	250 kW	130B2331 + 130B2333	F & G	130B2301	G
	324	315 kW	130B2333 + 130B2334	2 x G	130B2302	H
	370	400 kW	130B2334 + 130B2335	G & H	130B2304	H

VLT® High Power Drive Accessories
Harmonic Filtration

Advanced Active Filters (AAF)
The perfect solution for:
- Restoring weak networks
- Increasing network capacity
- Increasing generator power
- Meeting compact retrofit demands
- Securing sensitive environments

VLT® Active Filters identify harmonic distortion from non-linear loads and inject counter-phased harmonic and reactive currents into the AC line to cancel out the distortion. The optimal sinusoidal waveform of the AC power is restored and the power factor of the system is re-established at 1.

The modular design offers the same benefits as our High Power VLT® family, including high energy efficiency, user-friendly operation, back-channel cooling and high enclosure grades.

VLT® Active Filters can compensate individual VLT® drives as a compact integrated solution or be installed as a compact, stand-alone solution at a common point of coupling to address several loads simultaneously.

With a step-down transformer, Danfoss Advanced Active Filters can also operate at medium voltage levels.

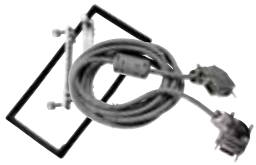
Specifications

Line Voltage	380–480 VAC, 50–60 Hz; 500–690 VAC 50–60 Hz
Enclosure Rating	Chassis (IP00), NEMA Type 1 (IP21), and NEMA Type 12 (IP54)
Power Range	190 A, 310 A, 500 A *Up to four units can be paralleled for higher power*
Current transformer (CT) requirements	Three standard CTs connected during installation at phases L1, L2 and L3
Operation modes	Mode 1: Harmonic mitigation Mode 2: Harmonic mitigation and power factor correction with options to programme the task priorities
Harmonic mitigation performance	< 5% THD of the rated non-linear load current at the point of common coupling
Harmonics Control	Individual harmonic control of 1st harmonic of the reactive current and the 2nd through at least the 25th harmonic (excluding the 3rd)
Compatibility	Compatible for field installation with existing active filters
Ambient temperature	-10°C to +45° C, up to 1000 metres above sea level, with relative humidity of 5%–85% RH, class 3K3 (functions to be maintained up to 95% RH, non-condensing)
Power fuses	Optional
RFI filtering	Class A2 RFI required; Class A1 RFI optional
Cooling	Air-cooled, with primary cooling through back channel
Standard current transducer	Rated secondary current 1 A and 5 A Rated apparent power 0.5 VA Accuracy class 0.5 or better

Nominal current [A]	@ 400 V	190	310	500
	@ 690 V	140	230	365
Peak Current [A]	@ 400 V	475	775	1250
	@ 690 V	375	625	1000
Enclosure size mm (inches)	Height	1540 (60.6)	2000 (78.7)	2000 (78.7) 220 (86.6) with base
	Width	840 (33.1)	840 (33.1)	1400 (55.1)
	Depth	373 (14.7)	494 (19.4)	600 (23.6)
RMS overload [%]	120%, 60 seconds in 10 min.			

** Above 460V, derating of the active filter power for the harmonic mitigation will occur*

VLT® High Power Drive Accessories



LCP Panel Mounting Kit

- IP65 enclosure rating
- 10 ft. (3 metre) cable
- Finger screws for easy fitting
- Can be used with LCP101 or LCP 102
- Ordering number: 130B1117

Coiled Brake Resistors

Used to dissipate energy generated during braking.

	VLT® AutomationDrive	VLT® AQUA Drive	VLT® HVAC Drive	R (ohms)	10% Duty Cycle[1]			40% Duty Cycle[2]		
					Continuous Power (kW)	Ordering Number	Quantity	Continuous Power (kW)	Ordering Number	Quantity
380–500 VAC	P90K T5	P110 T4	P110 T4	3.8	22	175U1960	1	75	175U0072	2
	P110 T5	P132 T4	P132 T4	3.2	27	175U1961	1	90	175U0073	2
	P132 T5	P160 T4	P160 T4	2.6	32	175U1962	1	112	175U0074	2
	P160 T5	P200 T4	P200 T4	2.1	39	175U1963	1	135	175U0075	3
	P200 T5	P250 T4	P250 T4	3.3	56	175U1061	2			
	P250 T5	P315 T4	P315 T4	2.6	72	175U1062	2			
	P315 T5	P355 T4	P355 T4	2.6	72	175U1062	2			
	P355 T5	P400 T4	P400 T4	2.6	72	175U1062[3]	2			
	P400 T5	P450 T4	P450 T4	2.6	72	175U1062[3]	2			

	VLT® AutomationDrive	VLT® AQUA Drive	VLT® HVAC Drive	R (ohms)	10% Duty Cycle[4]			40% Duty Cycle[2]		
					Peak Power (kW)	Ordering Number	Quantity	Peak Power (kW)	Ordering Number	Quantity
525–690 VAC	P37K T7	P45K T7	P45K T7	22.0	52	130B2118	1	32	130B2118	1
	P45K T7	P55K T7	P55K T7	18.0	64	130B2119	1	39	130B2119	1
	P55K T7	P75K T7	P75K T7	15.0	76	130B2120	1	47	130B2120	1
	P75K T7	P90K T7	P90K T7	11.0	104	130B2121	1	64	130B2121	1
	P90K T7	P110 T7	P110 T7	9.1	126	130B2122	1	77	130B2122	1
	P110 T7	P132 T7	P132 T7	7.5	153	130B2123	1	93	130B2123	1
	P132 T7	P160 T7	P160 T7	6.2	185	130B2124	1	113	130B2124	1
	P160 T7	P200 T7	P200 T7	5.1	224	130B2125	1	137	130B2125	1
	P200 T7	P250 T7	P250 T7	3.9	293	130B2126	2	179	130B2126	2
	P250 T7	P315 T7	P315 T7	3.3	347	130B2127	2	212	130B2127	2
	P315 T7	P400 T7	P400 T7	2.7	424	130B2128	2	259	130B2128	2
	P355 T7	P450 T7	P450 T7	*Consult Danfoss for resistor selection*						
	P400 T7	P500 T7	P500 T7							
	P500 T7	P560 T7	P560 T7							
	P560 T7	P630 T7	P630 T7							

[1] *Based on 160% braking torque for 30 sec. during 300-sec. cycles. Consult Danfoss for duty cycles higher than 10% or lower braking torque requirements.*
[2] *Based on 100% braking torque for 240 sec. during 600-sec. cycles.*
[3] *Braking torque reduced (below 160%).*
[4] *Based on 160% braking torque for 60 sec. during 600-sec. cycles.*

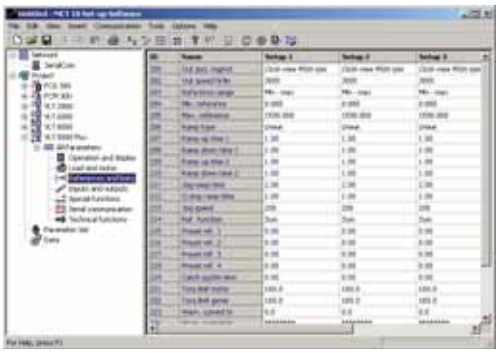
VLT® High Power Drive Accessories
PC Software

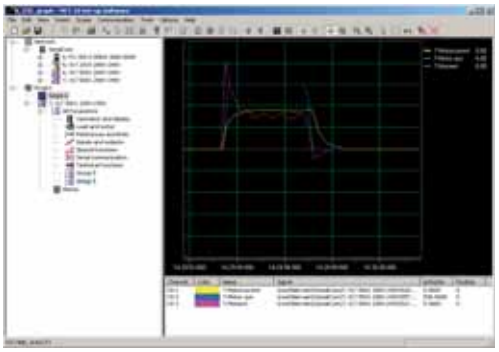
VLT® MCT 10 Setup Software

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]
FC		–		–		–		–		–		–		–		–		–		–	X	–	X	– SXX X –		–		–		–		–		–		–

[1] Application

102	VLT® HVAC Drive
202	VLT® AQUA Drive
302	VLT® AutomationDrive

[2] Power Size

P37K	*See ratings data on pages 8-15 for power ratings*
P45K	
P55K	
P75K	
P90K	
P110	
P132	
P160	
P200	
P250	
P315	
P355	
P400	
P450	
P500	
P560	
P630	

[3] AC Line Voltage

T4	3Ø 380/480 VAC *(no FC 302)*
T5	3Ø 380/500 VAC *(FC 302 only)*
T7	3Ø 525/690 VAC

[4] Enclosure

D1 frames P110 or larger for FC 102 & FC 202; P90K or larger for FC 302:	
E21	IP21/NEMA 1
E54	IP54/NEMA 12
E2M	IP21/NEMA 1 with mains shield
E5M	IP54/NEMA 12 with mains shield
D1 frames P90K size or smaller for FC 102 & FC 202; P75K size or smaller for FC 302:	
E2D	IP21/NEMA 1
E5D	IP54/NEMA 12
E2M	IP21/NEMA 1 with mains shield
E5M	IP54/NEMA 12 with mains shield
D2 frames:	
E21	IP21/NEMA 1
E54	IP54/NEMA 12
E2M	IP21/NEMA 1 with mains shield
E5M	IP54/NEMA 12 with mains shield
D3 frames P110 size or larger for FC 102 & FC 202; P90K size or larger for FC 302:	
E00	IP00/Chassis
C00	IP00/Chassis w/stainless steel back channel
D3 frames P90K size or smaller for FC 102 & FC 202; P75K size or smaller for FC 302:	
E0D	IP00/Chassis
C0D	IP00/Chassis w/stainless steel back channel
D4 frames:	
E00	IP00/Chassis
C00	IP00/Chassis w/stainless steel back channel
E1 frames:	
E21	IP21/NEMA 1
E54	IP54/NEMA 12
E2M	IP21/NEMA 1 with mains shield
E5M	IP54/NEMA 12 with mains shield
E2 frames:	
E00	IP00/Chassis
C00	IP00/Chassis w/ stainless steel back channel

[5] RFI Filter, Terminal & Monitoring Options

D frames:	
H2	RFI filter, Class A2 *(standard)*
H4	RFI filter, Class A1
H6	Maritime use RFI filter *(consult Danfoss for applications requiring maritime certification)*
E frames:	
H2	RFI filter, Class A2 *(standard)*
H6	Maritime use RFI filter *(consult Danfoss for applications requiring maritime certification)*
380-480/500 V only (T4 or T5 in position [3]):	
H4	RFI filter, Class A1

[6] Braking & Safety

D & E frames:	
X	No brake IGBT
B	Brake IGBT mounted
T	Safe Stop *(FC 102/202 only; std. on 302)*
U	Brake IGBT plus Safe Stop *(FC 102/202 only; safe stop std. on 302)*
E frames:	
R	Regeneration terminals

[7] Local Control Panel

D & E frames:	
N	Numeric LCP installed
G	Graphic LCP installed
D frames:	
IP00/Chassis or IP21/NEMA1 only (E21, E2M, E2D, E00, C00, E0D, C0D in position [4]):	
X	Blank faceplate, no LCP installed

[8] Conformal Coating

D & E frames:	
C	Conformal coating on all PCBs
D frames:	
380-480/500 V only (T4 or T5 in position [3]):	
X	No conformal coating

[9] Mains Input

X	No option
7*	Fuses
A*	Fuses & load sharing terminals
D	Load sharing terminals
3*	Mains disconnect & fuses
5*	Mains disconnect, fuses & loadsharing terminals
Not available in D frames with Class A1 RFI filter (525-690 VAC only) or maritime RFI filter	

[12] LCP Language

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

[13] Fieldbus

AX	No fieldbus option
A0	MCA 101 Profibus DP V1
A4	MCA 104 DeviceNet
A6	MCA 105 CANopen *(FC 302 only)*
AG	MCA 108 LonWorks *(FC 102 only)*
AJ	MCA 109 BACnet *(FC 102 only)*
AN	MCA 121 Ethernet I/P

[14] Application

BX	No application option
BK	MCB 101 general purpose I/O
BR	MCB 102 encoder input
BU	MCB 103 resolver input
BP	MCB 105 relay expansion
BZ	MCB 108 safety PLC interface
B0	MCB 109 analogue I/O & real-time clock backup
B2	MCB 112 PTC thermistor
BY	MCO 101 extended cascade control

[15] Motion Control

CX	No motion control option
C4	MCO 305/350/351 motion control, synchronising and/or positioning *(For FC 302 only)*
C5	MCO 102 advanced cascade control

[16] Extended Relay

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

[17] Motion Software

XX	No motion software *Note: C4 option in [15] selected with no motion software in [17] will require programming by qualified individual*
10	MCO 350 synchronising control software *(must select C4 in position [15])*
11	MCO 351 positioning control software *(must select C4 in position [15])*

[18] Control Power Backup Input

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

High power VLT® Series variable frequency drives can be configured online at www.danfoss.com

Ordering Typecode for F Frames

[1]	[2]	[3]	[4]	[5]	[6]	[7]	[8]	[9]	[10]	[11]		[12]	[13]	[14]	[15]	[16]	[17]	[18]
FC	–	–	–	–	–	–	G	–	C	–	–	–	–	– SXXX –	–	–	–	–	–	–	–	–

[1] Application	
102	VLT® HVAC Drive
202	VLT® AQUA Drive
302	VLT® AutomationDrive

[2] Power Size	
P450	*See ratings data on pages 8-15 for power ratings*
P500	
P560	
P630	
P670	
P710	
P750	
P800	
P850	
P900	
P1M0	
P1M2	

[3] AC Line Voltage	
T4	3Ø 380/480 VAC *(no FC 302)*
T5	3Ø 380/500 VAC *(FC 302 only)*
T7	3Ø 525/690 VAC

[4] Enclosure	
E21	IP21/NEMA 1
E54	IP54/NEMA 12
L2X	IP21/NEMA 1 with cabinet light & IEC 230 V power outlet
L5X	IP54/NEMA 12 with cabinet light & IEC 230 V power outlet
L2A	IP21/NEMA 1 with cabinet light & NAM 115 V power outlet
L5A	IP54/NEMA 12 with cabinet light & NAM 115 V power outlet
H21	IP21 with space heater and thermostat
H54	IP54 with space heater and thermostat
R2X	IP21/NEMA1 with space heater, thermostat, light & IEC 230 V outlet
R5X	IP54/NEMA12 with space heater, thermostat, light & IEC 230 V outlet
R2A	IP21/NEMA1 with space heater, thermostat, light, & NAM 115 V outlet
R5A	IP54/NEMA12 with space heater, thermostat, light, & NAM 115 V outlet

[5] RFI Filter, Terminal & Monitoring Options	
F1 & F2 frames:	
H2	RFI filter, Class A2 *(standard)*
HJ*	NAMUR terminals and Class A2 RFI filter
F3 & F4 frames:	
H2	RFI filter, Class A2 *(standard)*
HE	RCM with Class A2 RFI filter
HG	IRM with Class A2 RFI filter
HJ*	NAMUR terminals and Class A2 RFI filter
HL*	RCM with NAMUR terminals and Class A2 RFI filter
HN*	IRM with NAMUR terminals and Class A2 RFI filter
380-480/500V only (T4 or T5 in position [3]):	
H4	RFI filter, Class A1
HF	RCM with Class A1 RFI filter
HH	IRM with Class A1 RFI filter
HK*	NAMUR terminals with Class A1 RFI filter
HM*	RCM with NAMUR terminals and Class A1 RFI filter
HP*	IRM with NAMUR terminals with Class A1 RFI filter

[6] Braking & Safety	
X	No brake IGBT
B	Brake IGBT mounted
T	Safe Stop *(FC 102/202 only; std. on 302)*
U	Brake IGBT plus Safe Stop *(FC 102/202 only; safe stop std. on 302)*
R	Regeneration terminals
Requires contactor (E, F, G or H in typecode block [9]); includes safe stop for FC 102 and FC 202:	
M	IEC Emergency stop pushbutton *(with Pilz safety relay)*
N	IEC Emergency stop pushbutton with brake IGBT and brake terminals
P	IEC Emergency stop pushbutton with regeneration terminals

[9] Mains Input	
F1 & F2 frames:	
X	No option
7	Fuses
A	Fuses & loadsharing terminals
D	Load sharing terminals
F3 & F4 frames:	
3	Mains disconnect & fuses
5	Mains disconnect, fuses & loadsharing
E	Mains disconnect, contactor & fuses
F	Mains circuit breaker, contactor & fuses
G	Mains disconnect, contactor, load sharing terminals & fuses
H	Mains circuit breaker, contactor, load sharing terminals & fuses
J	Mains circuit breaker & fuses
K	Mains circuit breaker, load sharing terminals & fuses

[10] Power Terminals & Motor Starters	
X	No option
E	30 A, fuse-protected power terminals
F	30 A, fuse-protected power terminals & 2.5-4 A manual motor starter
G	30 A, fuse-protected power terminals & 4-6.3 A manual motor starter
H	30A, fuse-protected power terminals & 6.3-10 A manual motor starter
J	30 A, fuse-protected power terminals & 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 24V Supply & External Temperature Monitoring	
X	No option
H	5 A, 24 V power supply *(customer use)*
J	External temperature monitoring
G	5 A, 24 V power supply *(customer use)* & external temperature monitoring

[12] LCP Language	
X	Standard language package including English, German, French, Spanish, Danish, Italian and Finnish
Consult Danfoss for other language options	

[13] Fieldbus	
AX	No fieldbus option
A0	MCA 101 Profibus DP V1
A4	MCA 104 DeviceNet
A6	MCA 105 CANopen *(FC 302 only)*
AG	MCA 108 LonWorks *(FC 102 only)*
AJ	MCA 109 BACnet *(FC 102 only)*
AN	MCA 121 Ethernet I/P

[14] Application	
BX	No application option
BK	MCB 101 general purpose I/O
BR	MCB 102 encoder input
BU	MCB 103 resolver input
BP	MCB 105 relay expansion
BZ	MCB 108 safety PLC interface
B0	MCB 109 analogue I/O & real-time clock backup
B2	MCB 112 PTC thermistor
BY	MCO 101 extended cascade control

[15] Motion Control	
CX	No motion control option
C4	MCO 305/350/351 motion control, synchronising and/or positioning *(For FC 302 only)*
C5	MCO 102 advanced cascade control

[16] Extended Relay	
X	No option
R	MCB 113 extended relay *(FC 302 only)*

[17] Motion Software	
XX	No motion software *Note: C4 option in [15] selected with no motion software in [17] will require programming by qualified individual*
10	MCO 350 synchronising control software *(must select C4 in position [15])*
11	MCO 351 positioning control software *(must select C4 in position [15])*

[18] Control Power Backup Input	
DX	No DC input installed
D0	MCB107 24 VDC backup input

**MCB112 PTC Thermistor card (B2 in typecode position [14]) and MCB 113 Extended Relay Card (R in typecode position [16]) required for NAMUR terminals – FC 302 only.*

High power VLT® Series variable frequency drives can be configured online at www.danfoss.com

Environmentally responsible

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

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

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

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

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

What VLT® is all about

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

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

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

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

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

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

Local backup – globally
VLT® motor controllers are operating in applications all over the world and Danfoss Drives' experts located in more than 100 countries are ready to support our customers with application advice and service wherever they may be.

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

Danfoss AS, Årenga 2, 1340 SKUI, Tlf. 67 17 72 00 Fax, 67 13 68 50, www.danfoss.no • drives@danfoss.no

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