Contents

■ Why choose Danfoss?

Danfoss manufactured the world's first mass-produced frequency converter back in 1968. We have set the standard for quality drives ever since. That is why our VLT frequency converters are today sold and serviced in more than 100 countries covering six continents.

With the new VLT 5000 Series, we are introducing VVC^{plus}. This is our new Sensorless Vector Drive System for torque and speed control of induction motors.

If compared with a standard voltage/frequency ratio control, VVC^{plus} offers improved dynamics and stability, both when the speed reference and the load torque are changed. In addition, we have implemented a fully digitalised protection concept, which ensures reliable operation, even under the worst possible operating conditions. Naturally, the VLT 5000 Series also offers full protection against short-circuiting, earthing fault and overload.

Danfoss drives with the VVC^{plus} control system tolerate shock loads throughout their speed range and react swiftly to changes in reference.

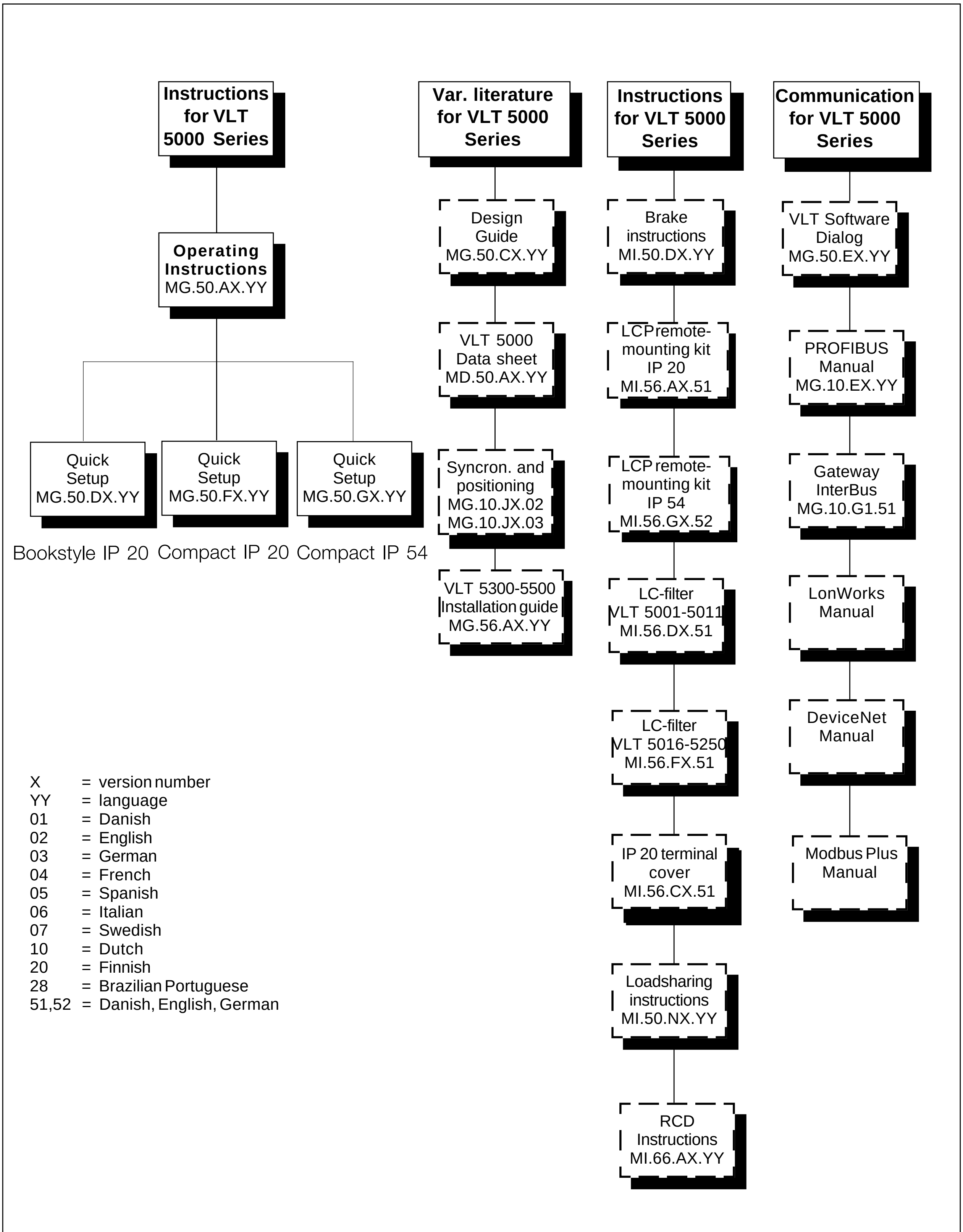
However, it must also be easy to reach this performance. Danfoss is convinced that high-technology drives can be made user-friendly. The VLT 5000 Series proves us right. In order to make programming simple and easy-to-grasp, we have divided the parameters into different groups. The Quick menu guides users quickly through the programming of the few parameters that must be set to get started. The control panel is detachable. It features a four-line alpha numeric display, enabling four measurements to be displayed at the same time. Via the detachable control panel, the programmed settings can be copied from one VLT to the next. This means that there is no time to be spent on programming when changing drives or integrating an extra drive in the installation.

The entire programming process is easier than ever before. The VLT 5000 Series makes most adjustments automatically.

If you have any questions concerning VLT frequency converters, please call us. We have drive specialists all over the world ready to advise you on applications, programming, training and service.

■ Available literature

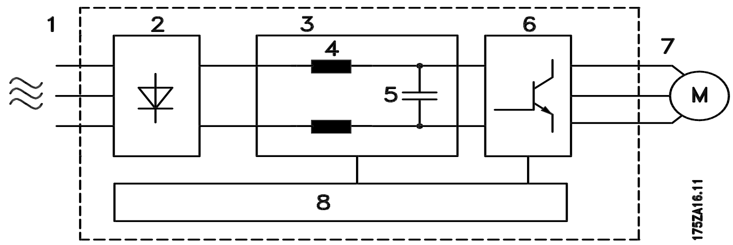
The chart below gives an overview of the literature available for the VLT 5000 Series.
Please note that variations may occur from one country to the next.



■ Control principle

A frequency converter rectifies AC voltage from mains into DC voltage, after which this DC voltage is converted into a AC current with a variable amplitude and frequency.

The motor is thus supplied with variable voltage and frequency, which enables infinitely variable speed control of three-phased, standard AC motors.



1. Mains voltage
   3 × 200 - 240 V AC, 50 / 60 Hz
   3 × 380 - 500 V AC, 50 / 60 Hz.

2. Rectifier
   A three-phase rectifier bridge that rectifies AC current into DC current.

3. Intermediate circuit
   DC voltage = $\sqrt{2}$ x mains voltage [V].

4. Intermediate circuit coils
   Smooth the intermediate circuit current and limit the load on mains and components (mains transformer, wires, fuses and contactors).

5. Intermediate circuit capacitors
   Smooth the intermediate circuit voltage.

6. Inverter
   Converts DC voltage into variable AC voltage with a variable frequency.

7. Motor voltage
   Variable AC voltage, 0-100% of mains supply voltage.
   Variable frequency: 0.5-132/0.5-1000 Hz.

8. Control card
   This is where to find the computer that controls the inverter which generates the pulse pattern by which the DC voltage is converted into variable AC voltage with a variable frequency.

VVC^{plus} control principle

VLT 5000 Series features an inverter control system called VVC^{plus}, which is a further development of the Voltage Vector Control (VVC) known i.e. from Danfoss VLT 3000 Series.

VVC^{plus} controls an induction motor by energizing it with a variable frequency and a voltage that matches it. If the motor load is changed, the magnetisation of the motor changes too, and so does its speed. Consequently, the motor current is measured continuously and the actual voltage requirement and slip of the motor are calculated from a motor model. Motor frequency and voltage are adjusted to ensure that the motor operating point remains optimum under varying conditions.

The development of the VVC^{plus} principle is the result of a wish to maintain robust, sensorless regulation that is tolerant to different motor characteristics without motor derating being required.

First and foremost, the current measurement and the motor model have been improved. The current is split into magnetising and torque-generating parts and provides for much better and quicker estimation of the actual motor loads. It is now possible to compensate for rapid load changes. Full torque as well as extremely accurate speed control can now be obtained even at low speeds or even at standstill.

In a "special motor mode", permanent magnet synchronous motors and/or parallel motors can be used.

Good torque control properties, smooth transitions to and from current limit operation and robust pull-out torque protection are ensured.

After automatic motor adaptation, VVC^{plus} will help to ensure extremely accurate motor control.

Advantages of the VVC^{plus} control system:
- Accurate speed control, now even at low speed
- Quick response from received signal to full motor shaft torque
- Good compensation for step loads
- Controlled transition from normal operation to current limit operation (and vice versa)
- Reliable pull-out torgue protection throughout the speed range, also in the case of field weakening.
- Great tolerance towards varying motor data
- Torque control, comprising control of both the torque-generating and the magnetising component of the current
- Full holding torque (closed loop)

As standard, VLT 5000 Series comes with a number of integral components that would normally have to be acquired separately. These integral components (RFI filter, DC coils, screen clamps and serial communication port) are space-savers that simplify installation, since VLT 5000 Series fulfills most requirements without any supplementary components.

Programmable control inputs and signal outputs in four Setups

VLT 5000 Series uses a digital technique which makes it possible to program the different control inputs and signal outputs and to select four different user-defined Setups for all parameters.

For the user, it is easy to program the desired functions by means of the control panel on VLT 5000 Series or the RS 485 user interface.

Protection against mains interference

VLT 5000 Series is protected against the transients that occur in the mains supply, e.g. when switching power factor correction or when fuses blow.

The rated motor voltage and full torque can be maintained all the way down to 10% undervoltage in the mains supply.

Minor interference on mains

Since as standard the VLT 5000 Series features intermediate circuit coils, there is only a small amount of harmonic mains supply interference. This ensures a good power factor and lower peak current, which reduces the load on the mains installation.

Advanced VLT protection

Current measurement on all three motor phases provides perfect protection of VLT 5000 Series against earthing and short-circuiting faults on the motor connection.

Constant monitoring of all three motor phases enables switching on the motor output, e.g. by means of a contactor.

Efficient monitoring of the three mains supply phases ensures that the unit stops in the case of phase failure. This avoids overloading the inverter and the capacitors in the intermediate circuit, which would dramatically reduce the service life of the frequency converter.

As standard, VLT 5000 Series features integral thermal protection. If a situation of thermal overload occurs, this function cuts out the inverter.

Reliable galvanic isolation

In the VLT 5000 Series, all control terminals as well as terminals 1-5 (AUX relays) are supplied by or connected to circuits that comply with PELV requirements in relation to the mains potential.

■ Advanced motor protection

VLT 5000 Series features integrated electronic, thermal motor protection.

The frequency converter calculates the motor temperature on the basis of current, frequency and time.

As opposed to the traditional bimetallic protection, electronic protection takes account of the reduction in cooling at low frequencies that comes from reduced fan speed (motors with internal ventilation).

Thermal motor protection is comparable to a normal motor thermistor.

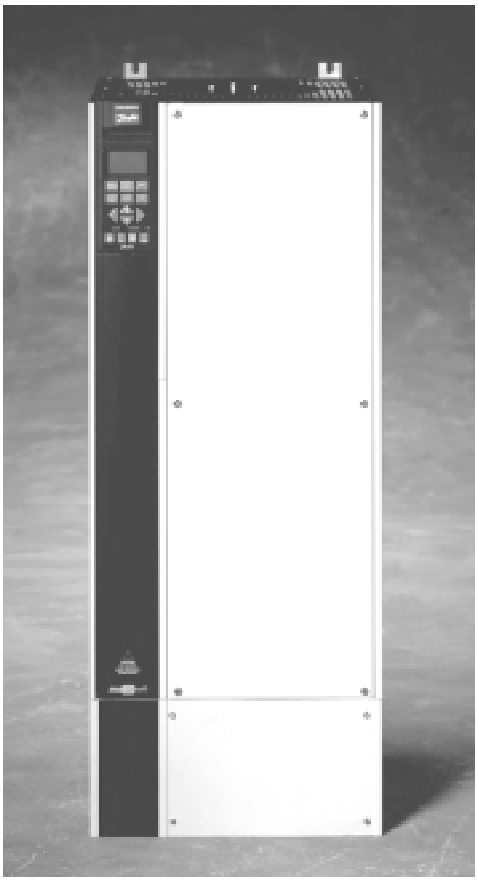
To obtain maximum protection against overheating of the motor if the motor is covered or blocked, or if the fan fails, a thermistor can be integrated and connected to the thermistor input of the frequency converter (terminals 53/54), see parameter 128 of the Operating Instructions.

■ Product range

VLT Series 5000

VLT 5001-5006 200-240V
VLT 5001-5011 380-500V

VLT 5008-5027 200-240V
VLT 5016-5052 380-500V



VLT 5032-5052 200-240V
VLT 5060-5250 380-500V

■ How to select your VLT?

A frequency converter must be selected on the basis of the given motor current at maximum load on the unit. The rated output current $I_{VLT,N}$ must be equal to or higher than the required motor current.

VLT 5000 Series is supplied for two mains frequency ranges: 200-240 V and 380-500 V.

■ Normal/high overload torque mode

This function enables the VLT frequency converter to perform a constant 100% torque, using an oversize motor.
The choice between a normal or a high overload torque characteristic is made in parameter 101.

This is also where to choose between a high/normal constant torque characteristic (CT) or a high/normal VT torque characteristic.

If a *high torque characteristic* is chosen, a rated motor with the VLT frequency converter obtains up to 160% torque for 1 min. in both CT and VT.

If a *rated torque characteristic* is chosen, an oversize motor allows up to 110% torque performance for up to 1 min. in both CT and VT. This function is used mainly for pumps and fans, since these applications do not require an overload torque.

The advantage of choosing a normal torque characteristic for an oversize motor is that the VLT frequency converter will be able constantly to yield 100% torque, without derating as a result of a bigger motor.

NB!
This function cannot be chosen for VLT 5001-5006, 200-240 Volts, and VLT 5001-5011, 380-500 Volts.

Mains voltage 200-240 V

VLT type	Typical shaft output $P_{VLT,N}$ High overl. torque (160 %) [kW]	Typical shaft output $P_{VLT,N}$ Normal overl. torque (110 %) [kW]	Max. constant output current $I_{VLT,N}$ High overl. torque (160 %) [A]	Max. constant output current $I_{VLT,N}$ Normal overl. torque (110 %) [A]	Max. constant output at at 240 V $S_{VLT,N}$ High overl. torque (160 %) [kVA]	Max. constant output at at 240 V $S_{VLT,N}$ Normal overl. torque (110 %) [kVA]
5001	0.75	-	3.7	-	1.5	-
5002	1.1	-	5.4	-	2.2	-
5003	1.5	-	7.8	-	3.2	-
5004	2.2	-	10.6	-	4.4	-
5005	3.0	-	12.5	-	5.2	-
5006	3.7	-	15.2	-	6.3	-
5008	5.5	7.5	25	32	10	13
5011	7.5	11	32	46	13	19
5016	11	15	46	61.2	19	25
5022	15	18.5	61.2	73	25	30
5027	18.5	22	73	88	30	36
5032	22	30	80	104	32	41
5042	30	37	104	130	41	52
5052	37	45	130	154	52	61

-: not possible

Note: With VLT 5032-5052, *High overload torque* is limited to 150%.

Mains voltage 380 - 440 V

	Typical shaft output $P_{VLT,N}$		Max. constant output current $I_{VLT,N}$		Max. constant output at 415 V $S_{VLT,N}$	
VLT type	High overl. torque (160 %) [kW]	Normal overl. torque (110 %) [kW]	High overl. torque (160 %) [A]	Normal overl. torque (110 %) [A]	High overl. torque (160 %) [kVA]	Normal overl. torque (110 %) [kVA]
5001	0.75	-	2.2	-	1.6	-
5002	1.1	-	2.8	-	2.0	-
5003	1.5	-	4.1	-	2.9	-
5004	2.2	-	5.6	-	4.0	-
5005	3.0	-	7.2	-	5.2	-
5006	4.0	-	10	-	7.2	-
5008	5.5	-	13	-	9.3	-
5011	7.5	-	16	-	11.5	-
5016	11	15	24	32	17.3	23
5022	15	18.5	32	37.5	23	27
5027	18.5	22	37.5	44	27	31.6
5032	22	30	44	61	31.6	43.8
5042	30	37	61	73	43.8	52.5
5052	37	45	73	90	52.5	64.7
5060	45	55	90	106	62	73
5075	55	75	106	147	73	102
5100	75	90	147	177	102	123
5125	90	110	177	212	123	147
5150	110	132	212	260	147	180
5200	132	160	260	315	180	218
5250	160	200	315	368	218	274
5300	200	250	395	480	274	333
5350	250	315	480	600	333	416
5450	315	355	600	658	416	456
5500	355	400	658	745	456	516

-: not possible

Note: With VLT 5060-5500, *High overload torque* is limited to 150%.

Mains voltage 441 - 500 V

VLT type	Typical shaft output $P_{VLT,N}$ High overl. torque (160 %) [kW]	Typical shaft output $P_{VLT,N}$ Normal overl. torque (110 %) [kW]	Max. constant output current $I_{VLT,N}$ High overl. torque (160 %) [A]	Max. constant output current $I_{VLT,N}$ Normal overl. torque (110 %) [A]	Max. constant output at 500 V $S_{VLT,N}$ High overl. torque (160 %) [kVA]	Max. constant output at 500 V $S_{VLT,N}$ Normal overl. torque (110 %) [kVA]
5001	0.75	-	1.9	-	1.6	-
5002	1.1	-	2.6	-	2.3	-
5003	1.5	-	3.4	-	2.9	-
5004	2.2	-	4.8	-	4.2	-
5005	3.0	-	6.3	-	5.5	-
5006	4.0	-	8.2	-	7.1	-
5008	5.5	-	11	-	9.5	-
5011	7.5	-	14.5	-	12.6	-
5016	11	15	21.7	27.9	18.8	24
5022	15	18.5	27.9	34	24.2	29
5027	18.5	22	34	41.4	29.4	35.8
5032	22	30	41.4	54	35.9	47
5042	30	37	54	65	46.8	56
5052	37	45	65	78	56.3	67
5060	55	75	80	106	69	92
5075	75	90	106	130	92	113
5100	90	110	130	160	113	139
5125	110	132	160	190	139	165
5150	132	160	190	240	165	208
5200	160	200	240	302	208	262
5250	200	250	302	361	262	313
5300	250	315	361	443	313	384
5350	315	355	443	540	384	468
5450	355	400	540	590	468	511
5500	400	500	590	678	511	587

-: not possible

Note: With VLT 5060-5500, *High overload torque* is limited to 150%.

■ Selection of modules and accessories

Danfoss offers a wide range of modules and accessories for VLT 5000 Series.

NB!
To obtain satisfactory running of the frequency converter, it is extremely important to choose the necessary modules and accessories.

Modules and accessories	Bookstyle	Compact VLT 5001-5006, 200-240 V VLT 5001-5011, 380-500 V	Compact VLT 5008-5027, 200-240 V VLT 5016-5052, 380-500 V	Compact VLT 5032-5052, 200-240 V VLT 5060-5250, 380-500 V
LC filter module	+	+	+	+
Control unit LCP (as option)	+	+	+	+
Field mounting kit for LCP (not for IP 54)	+	+	+	+
IP 4x top cover [1]		+		
Terminal cover (only for IP 20 units)			+	

1) Only horizontal surfaces comply with IP 4x

■ LC filter module

The LC filter reduces the voltage rise time (dV/dt) and the ripple current (ΔI) to the motor, thereby making current and voltage almost sinusoidal. The acoustic motor noise is therefore reduced to a minimum.

See also instructions MI.56.DX.51.

■ LCP control unit

Control unit with display and keypad for programming VLT frequency converters. Available as an option for IP 00 and IP 20 units.
Enclosure: IP 65.

■ Remote-mounting kit for LCP

The remote kit option makes it possible to move the display from VLT 5000 Series e.g. to the front panel of an integrated cabinet.
Cannot be used for IP 54 units.

Technical data	
Enclosure:	IP 65 front
Max. cable length between VLT and unit:	3 m
Communication std:	RS 422

Reference is also made to instructions MI.56.AX.51 (IP 20) and MI.56.GX.52 (IP 54).

■ IP 4x top cover

IP 4x top cover is an optional enclosure element available for IP 20 compact units.
If an IP 4x top cover is used, an IP 20 unit is upgraded to comply with enclosure IP 4x from the top. In practice, this means that the unit complies with IP 40 on upper, horizontal surfaces.
A top cover is available for the following compact units:
VLT type 5001-5006, 200-240 V
VLT type 5001-5011, 380-500 V

■ Terminal cover

Using a terminal cover, it is possible to field mount an IP 20 unit, type VLT 5008-5052.
A terminal cover is available for the following compact units:
VLT type 5008-5027, 200-240 V
VLT type 5016-5052, 380-500 V

■ Contactors

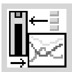
Danfoss also manufactures a complete range of contactors.

PC software and serial communication

Danfoss offers various options for serial communication. Using serial communication makes it possible to monitor, programme and control one or several VLT 5000 Series from a centrally placed computer. For example, Danfoss offers an option card for Profibus. In addition, all VLT 5000 Series have an RS 485 port as standard, which enables them to communicate e.g. with a PC. A programme entitled VLT Software Dialog is available for this purpose.

VLT Software Dialog comes in three modules and - as a minimum - contains the programmes included in the Basic module.

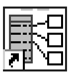
The Basic module covers:



TEST RUN
is used for controlling and commissioning of a frequency converter, including:
- setting of reference value,
- simultaneous display of selected parameters in graphs,
- option of DDE link, e.g. to a spreadsheet.

PARAMETER SETUP
is used for setting up and transferring parameter sets, including:
- setting of frequency converter parameters,
- parameter sets can be obtained from and copied to a frequency converter,
- documentation/print-out of the Setup including diagrams.

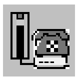
HISTORY
provides information about the different stages of development of the VLT Software dialogue.



BUS ADDRESS SETUP
is only used for addressing the VLT DriveMotor (FC motor).

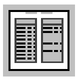
The Logging module covers:

LOGGING
is used for collecting and displaying historical or real-time operating data.
- graphical representation of selected parameters from several frequency converters,
- collection of log data to file,
- option of DDE link e.g. to a spreadsheet.



MODEM SETUP
is used for setting up the frequency converter modem.
- sets the frequency converter modem via the communication port of the PC.

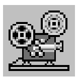
The template module covers:



TEMPLATE SETUP
is used for setting up template files for PARAMETER SETUP:
- the template file functions as a mask that limits the number of accessible parameters when a parameter file is to be made or edited in PARAMETER SETUP,
- the template file may contain preset values for the parameters of the frequency converter.

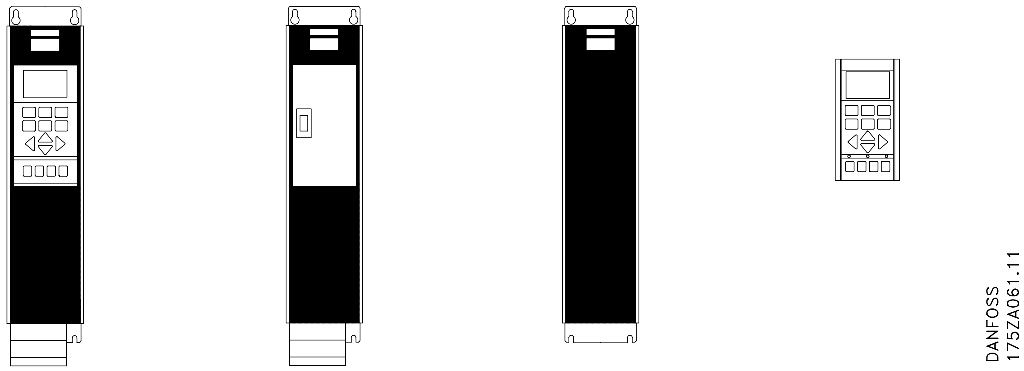
NB!
The logging and template module calls for a Basic module to be installed on the same PC.

The guided tour covers:



GUIDED TOUR
offers a demonstration of the VLT® Software Dialog programme.

■ Product range, Bookstyle



ST/SB/EB with control unit	ST/SB/EB without control unit	LC filter (IP 20)	LCP control unit

See ordering numbers of various options and LC filters for VLT 5000 Series on page 20-25.

■ Ordering numbers, Bookstyle

IP 20 / Chassis
200 / 208 / 220 / 230 / 240 V

VLT type	kW	Vers.	RFI	Ordering No. W/ LCP	Ordering No. W/o LCP
		ST	R3	175Z0004	175Z0001
5001	0.75	SB	R3	175Z0005	175Z0002
		EB	R3	175Z0006	175Z0003
		ST	R3	175Z0010	175Z0007
5002	1.1	SB	R3	175Z0011	175Z0008
		EB	R3	175Z0012	175Z0009
		ST	R3	175Z0016	175Z0013
5003	1.5	SB	R3	175Z0017	175Z0014
		EB	R3	175Z0018	175Z0015
		ST	R3	175Z0022	175Z0019
5004	2.2	SB	R3	175Z0023	175Z0020
		EB	R3	175Z0024	175Z0021
		ST	R3	175Z0028	175Z0025
5005	3.0	SB	R3	175Z0029	175Z0026
		EB	R3	175Z0030	175Z0027
		ST	R1	175Z0167	175Z0164
5006	3.7	SB	R1	175Z0168	175Z0165
		EB	R1	175Z0169	175Z0166

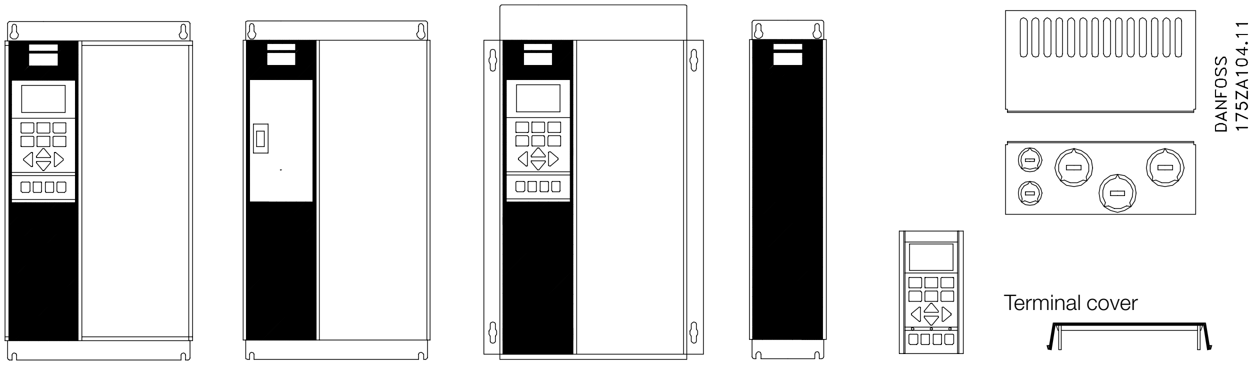
LCP: Control unit with display and keypad.
ST: Standard unit with/without control unit.
SB: Standard unit with or without display and integrated brake chopper.
EB: Extended unit with/without control unit, integrated brake chopper, connection of external 24 volt DC supply for back-up of control card, connection to DC intermediate circuit for load-sharing (load equalisation between several VLT frequency converters), as well as quick discharging of DC intermediate circuit.

IP 20 / Chassis
380 / 400 / 415 / 440 / 460 / 500 V

VLT type	kW	Vers.	RFI	Ordering No. W/ LCP	Ordering No. W/o LCP
		ST	R3	175Z0034	175Z0031
5001	0.75	SB	R3	175Z0035	175Z0032
		EB	R3	175Z0036	175Z0033
		ST	R3	175Z0040	175Z0037
5002	1.1	SB	R3	175Z0041	175Z0038
		EB	R3	175Z0042	175Z0039
		ST	R3	175Z0046	175Z0043
5003	1.5	SB	R3	175Z0047	175Z0044
		EB	R3	175Z0048	175Z0045
		ST	R3	175Z0052	175Z0049
5004	2.2	SB	R3	175Z0053	175Z0050
		EB	R3	175Z0054	175Z0051
		ST	R3	175Z0058	175Z0055
5005	3.0	SB	R3	175Z0059	175Z0056
		EB	R3	175Z0060	175Z0057
		ST	R3	175Z0064	175Z0061
5006	4.0	SB	R3	175Z0065	175Z0062
		EB	R3	175Z0066	175Z0063
		ST	R3	175Z0070	175Z0067
5008	5.5	SB	R3	175Z0071	175Z0068
		EB	R3	175Z0072	175Z0069
		ST	R1	175Z0076	175Z0073
5011	7.5	SB	R1	175Z0077	175Z0074
		EB	R1	175Z0078	175Z0075

R1: With RFI filter option, compliance of EN 55011-1A with 150 m screened motor cable.
R3: Integrated RFI filter complying with EN 55011-1B with 50 m (Bookstyle 20 m) screened motor cable and EN 55011-1A with 150 m screened motor cable.

■ Product range, Compact



IP 20 with control unit | IP 20 without control unit | IP 54 with control unit | LC-filter 200 V 5001 - 5006, 500 V 5001 - 5011 | IP 4x, top cover

See ordering numbers of options and LC filters for VLT 5000 Series on page 20-25.

■ Ordering numbers, Compact

200 / 208 / 220 / 230 / 240 V

					Ordering No.	
VLT	kW	Enclosure	Vers.	RFI	W/ LCP	W/o LCP
			ST	R3	175Z0083	175Z0080
5001	0.75	IP 20	SB	R3	175Z0084	175Z0081
			EB	R3	175Z0085	175Z0082
			ST	R3	175Z0173	
5001	0.75	IP 54	SB	R3	175Z0174	
			EB	R3	175Z0175	
			ST	R3	175Z0089	175Z0086
5002	1.1	IP 20	SB	R3	175Z0090	175Z0087
			EB	R3	175Z0091	175Z0088
			ST	R3	175Z0185	
5002	1.1	IP 54	SB	R3	175Z0186	
			EB	R3	175Z0187	
			ST	R3	175Z0095	175Z0092
5003	1.5	IP 20	SB	R3	175Z0096	175Z0093
			EB	R3	175Z0097	175Z0094
			ST	R3	175Z0197	
5003	1.5	IP 54	SB	R3	175Z0198	
			EB	R3	175Z0199	
			ST	R3	175Z0107	175Z0104
5004	2.2	IP 20	SB	R3	175Z0108	175Z0105
			EB	R3	175Z0109	175Z0106
			ST	R3	175Z0209	
5004	2.2	IP 54	SB	R3	175Z0210	
			EB	R3	175Z0211	
			ST	R3	175Z0113	175Z0110
5005	3.0	IP 20	SB	R3	175Z0114	175Z0111
			EB	R3	175Z0115	175Z0112
			ST	R3	175Z0221	
5005	3.0	IP 54	SB	R3	175Z0222	
			EB	R3	175Z0223	

					Ordering No.	
VLT	kW	Enclosure	Vers.	RFI	W/ LCP	W/o LCP
			ST	R1	175Z0916	175Z0910
5006	3.7	IP 20	SB	R1	175Z0917	175Z0911
			EB	R1	175Z0918	175Z0912
			ST	R1	175Z0922	
5006	3.7	IP 54	SB	R1	175Z0923	
			EB	R1	175Z0924	

LCP: Control unit with display and keypad.
ST: Standard unit with/without control unit.
SB: Standard unit with/without control unit and integral brake chopper.
EB: Extended unit with/without control unit, integral brake chopper, connection of external 24 volt DC supply for back-up of control card, connection to DC intermediate circuit for load-sharing (load equalisation between several VLT frequency converters), and quick discharging of DC intermediate circuit.
R1: With RFI filter option, compliance of EN 55011-1A with 150 m screened motor cable.
R3: Integrated RFI filter complying with EN 55011-1B with 50 m (Bookstyle 20 m) screened motor cable and EN 55011-1A with 150 m screened motor cable.

Ordering numbers, Compact

200/ 208 / 220 / 230 / 240 V

VLT	kW	Enclosure	Vers.	RFI[1)]	Ordering No. W/ LCP	Ordering No. W/o LCP
5008	5.5	IP 20	ST	R0	175Z4006	175Z4000
			SB	R0	175Z4007	175Z4001
			EB	R0	175Z4008	175Z4002
			ST	R3	175Z4009	175Z4003
			SB	R3	175Z4010	175Z4004
			EB	R3	175Z4011	175Z4005
5008	5.5	IP 54	ST	R0	175Z4012	
			SB	R0	175Z4013	
			EB	R0	175Z4014	
			ST	R3	175Z4015	
			SB	R3	175Z4016	
			EB	R3	175Z4017	
5011	7.5	IP 20	ST	R0	175Z4024	175Z4018
			SB	R0	175Z4025	175Z4019
			EB	R0	175Z4026	175Z4020
			ST	R3	175Z4027	175Z4021
			SB	R3	175Z4028	175Z4022
			EB	R3	175Z4029	175Z4023
5011	7.5	IP 54	ST	R0	175Z4030	
			SB	R0	175Z4031	
			EB	R0	175Z4032	
			ST	R3	175Z4033	
			SB	R3	175Z4034	
			EB	R3	175Z4035	
5016	11	IP 20	ST	R0	175Z4042	175Z4036
			SB	R0	175Z4043	175Z4037
			EB	R0	175Z4044	175Z4038
			ST	R3	175Z4045	175Z4039
			SB	R3	175Z4046	175Z4040
			EB	R3	175Z4047	175Z4041
5016	11	IP 54	ST	R0	175Z4048	
			SB	R0	175Z4049	
			EB	R0	175Z4050	
			ST	R3	175Z4051	
			SB	R3	175Z4052	
			EB	R3	175Z4053	
5022	15	IP 20	ST	R0	175Z4060	175Z4054
			SB	R0	175Z4061	175Z4055
			EB	R0	175Z4062	175Z4056
			ST	R3	175Z4063	175Z4057
			SB	R3	175Z4064	175Z4058
			EB	R3	175Z4065	175Z4059
5022	15	IP 54	ST	R0	175Z4066	
			SB	R0	175Z4067	
			EB	R0	175Z4068	
			ST	R3	175Z4069	
			SB	R3	175Z4070	
			EB	R3	175Z4071	
5027	18,5	IP 20	ST	R0	175Z4078	175Z4072
			SB	R0	175Z4079	175Z4073
			EB	R0	175Z4080	175Z4074
			ST	R3	175Z4081	175Z4075
			SB	R3	175Z4082	175Z4076
			EB	R3	175Z4083	175Z4077
5027	18,5	IP 54	ST	R0	175Z4084	
			SB	R0	175Z4085	
			EB	R0	175Z4086	
			ST	R3	175Z4087	
			SB	R3	175Z4088	
			EB	R3	175Z4089	

VLT	kW	Enclosure	Vers.	RFI[1)]	Ordering No. W/ LCP	Ordering No. W/o LCP
5032	22	IP 00	ST	R0	176F0337	176F0331
			SB	R0	176F0338	176F0332
			EB	R0	176F0339	176F0333
			ST	R3	176F0340	176F0334
			SB	R3	176F0341	176F0335
			EB	R3	176F0342	176F0336
5032	22	IP 20	ST	R0	176F0349	176F0343
			SB	R0	176F0350	176F0344
			EB	R0	176F0351	176F0345
			ST	R3	176F0352	176F0346
			SB	R3	176F0353	176F0347
			EB	R3	176F0354	176F0348
5032	22	IP 54	ST	R0	176F0355	
			SB	R0	176F0356	
			EB	R0	176F0357	
			ST	R3	176F0358	
			SB	R3	176F0359	
			EB	R3	176F0360	
5042	30	IP 00	ST	R0	176F0367	176F0361
			SB	R0	176F0368	176F0362
			EB	R0	176F0369	176F0363
			ST	R3	176F0370	176F0364
			SB	R3	176F0371	176F0365
			EB	R3	176F0372	176F0366
5042	30	IP 20	ST	R0	176F0379	176F0373
			SB	R0	176F0380	176F0374
			EB	R0	176F0381	176F0375
			ST	R3	176F0382	176F0376
			SB	R3	176F0383	176F0377
			EB	R3	176F0384	176F0378
5042	30	IP 54	ST	R0	176F0385	
			SB	R0	176F0386	
			EB	R0	176F0387	
			ST	R3	176F0388	
			SB	R3	176F0389	
			EB	R3	176F0390	
5052	37	IP 00	ST	R0	176F0397	176F0391
			SB	R0	176F0398	176F0392
			EB	R0	176F0399	176F0393
			ST	R3	176F0400	176F0394
			SB	R3	176F0401	176F0395
			EB	R3	176F0402	176F0396
5052	37	IP 20	ST	R0	176F0409	176F0403
			SB	R0	176F0410	176F0404
			EB	R0	176F0411	176F0405
			ST	R3	176F0412	176F0406
			SB	R3	176F0413	176F0407
			EB	R3	176F0414	176F0408
5052	37	IP 54	ST	R0	176F0415	
			SB	R0	176F0416	
			EB	R0	176F0417	
			ST	R3	176F0418	
			SB	R3	176F0419	
			EB	R3	176F0420	

380 / 400 / 415 / 440 / 460 / 500 V

					Ordering No.	
VLT	kW	Enclosure	Vers.	RFI	W/ LCP	W/o LCP
			ST	R3	175Z0119	175Z0116
5001	0.75	IP 20	SB	R3	175Z0120	175Z0117
			EB	R3	175Z0121	175Z0118
			ST	R3	175Z0233	
5001	0.75	IP 54	SB	R3	175Z0234	
			EB	R3	175Z0235	
			ST	R3	175Z0125	175Z0122
5002	1.1	IP 20	SB	R3	175Z0126	175Z0123
			EB	R3	175Z0127	175Z0124
			ST	R3	175Z0245	
5002	1.1	IP 54	SB	R3	175Z0246	
			EB	R3	175Z0247	
			ST	R3	175Z0131	175Z0128
5003	1.5	IP 20	SB	R3	175Z0132	175Z0129
			EB	R3	175Z0133	175Z0130
			ST	R3	175Z0257	
5003	1.5	IP 54	SB	R3	175Z0258	
			EB	R3	175Z0259	
			ST	R3	175Z0137	175Z0134
5004	2.2	IP 20	SB	R3	175Z0138	175Z0135
			EB	R3	175Z0139	175Z0136
			ST	R3	175Z0269	
5004	2.2	IP 54	SB	R3	175Z0270	
			EB	R3	175Z0271	
			ST	R3	175Z0143	175Z0140
5005	3.0	IP 20	SB	R3	175Z0144	175Z0141
			EB	R3	175Z0145	175Z0142
			ST	R3	175Z0281	
5005	3.0	IP 54	SB	R3	175Z0282	
			EB	R3	175Z0283	
			ST	R3	175Z0149	175Z0146
5006	4.0	IP 20	SB	R3	175Z0150	175Z0147
			EB	R3	175Z0151	175Z0148
			ST	R3	175Z0293	
5006	4.0	IP 54	SB	R3	175Z0294	
			EB	R3	175Z0295	
			ST	R3	175Z0155	175Z0152
5008	5.5	IP 20	SB	R3	175Z0156	175Z0153
			EB	R3	175Z0157	175Z0154
			ST	R3	175Z0305	
5008	5.5	IP 54	SB	R3	175Z0306	
			EB	R3	175Z0307	
			ST	R1	175Z0161	175Z0158
5011	7.5	IP 20	SB	R1	175Z0162	175Z0159
			EB	R1	175Z0163	175Z0160
			ST	R1	175Z0317	
5011	7.5	IP 54	SB	R1	175Z0318	
			EB	R1	175Z0319	

380 / 400 / 415 / 440 / 460 / 500 V

					Ordering No.	
VLT	kW	Enclosure	Vers.	RFI	W/ LCP	W/o LCP
			ST	R0	175Z4096	175Z4090
			SB	R0	175Z4097	175Z4091
5016	11	IP 20	EB	R0	175Z4098	175Z4092
			ST	R3	175Z4099	175Z4093
			SB	R3	175Z4100	175Z4094
			EB	R3	175Z4101	175Z4095
			ST	R0	175Z4102	
			SB	R0	175Z4103	
5016	11	IP 54	EB	R0	175Z4104	
			ST	R3	175Z4105	
			SB	R3	175Z4106	
			EB	R3	175Z4107	
			ST	R0	175Z4114	175Z4108
			SB	R0	175Z4115	175Z4109
5022	15	IP 20	EB	R0	175Z4116	175Z4110
			ST	R3	175Z4117	175Z4111
			SB	R3	175Z4118	175Z4112
			EB	R3	175Z4119	175Z4113
			ST	R0	175Z4120	
			SB	R0	175Z4121	
5022	15	IP 54	EB	R0	175Z4122	
			ST	R3	175Z4123	
			SB	R3	175Z4124	
			EB	R3	175Z4125	
			ST	R0	175Z4132	175Z4126
			SB	R0	175Z4133	175Z4127
5027	18.5	IP 20	EB	R0	175Z4134	175Z4128
			ST	R3	175Z4135	175Z4129
			SB	R3	175Z4136	175Z4130
			EB	R3	175Z4137	175Z4131
			ST	R0	175Z4138	
			SB	R0	175Z4139	
5027	18.5	IP 54	EB	R0	175Z4140	
			ST	R3	175Z4141	
			SB	R3	175Z4142	
			EB	R3	175Z4143	

LCP: Control unit with display and keypad.

ST: Standard unit with/without control unit.

SB: Standard unit with/without control unit and integral brake chopper.

EB: Extended unit with/without control unit, integral brake chopper, connection of external 24 volt DC supply for back-up of control card, connection to DC intermediate circuit for load-sharing (load equalisation between several VLT frequency converters), and quick discharging of DC intermediate circuit.

R0: The VLT frequency converter is supplied without a RFI filter.

R1: With RFI filter option, compliance of EN 55011-1A with 150 m screened motor cable.

R3: With RFI filter option, compliance of EN 55011-1B with 50 m (Bookstyle 20 m) screened motor cable and EN 55011-1A with 150 screened motor cable.

COMPACT

380 / 400 / 415 / 440 / 460 / 500 V

VLT	kW	Enclosure	Vers.	RFI	Ordering No. W/ LCP	Ordering No. W/o LCP
5032	22	IP 20	ST	R0	175Z4150	175Z4144
			SB	R0	175Z4151	175Z4145
			EB	R0	175Z4152	175Z4146
			ST	R3	175Z4153	175Z4147
			SB	R3	175Z4154	175Z4148
			EB	R3	175Z4155	175Z4149
5032	22	IP 54	ST	R0	175Z4156	
			SB	R0	175Z4157	
			EB	R0	175Z4158	
			ST	R3	175Z4159	
			SB	R3	175Z4160	
			EB	R3	175Z4161	
5042	30	IP 20	ST	R0	175Z4168	175Z4162
			SB	R0	175Z4169	175Z4163
			EB	R0	175Z4170	175Z4164
			ST	R3	175Z4171	175Z4165
			SB	R3	175Z4172	175Z4166
			EB	R3	175Z4173	175Z4167
5042	30	IP 54	ST	R0	175Z4174	
			SB	R0	175Z4175	
			EB	R0	175Z4176	
			ST	R3	175Z4177	
			SB	R3	175Z4178	
			EB	R3	175Z4179	
5052	37	IP 20	ST	R0	175Z4186	175Z4180
			SB	R0	175Z4187	175Z4181
			EB	R0	175Z4188	175Z4182
			ST	R3	175Z4189	175Z4183
			SB	R3	175Z4190	175Z4184
			EB	R3	175Z4191	175Z4185
5052	37	IP 54	ST	R0	175Z4192	
			SB	R0	175Z4193	
			EB	R0	175Z4194	
			ST	R3	175Z4195	
			SB	R3	175Z4196	
			EB	R3	175Z4197	
5060	45	IP 00	ST	R0	176F0007	176F0001
			SB	R0	176F0008	176F0002
			EB	R0	176F0009	176F0003
			ST	R3	176F0010	176F0004
			SB	R3	176F0011	176F0005
			EB	R3	176F0012	176F0006
5060	45	IP 20	ST	R0	176F0019	176F0013
			SB	R0	176F0020	176F0014
			EB	R0	176F0021	176F0015
			ST	R3	176F0022	176F0016
			SB	R3	176F0023	176F0017
			EB	R3	176F0024	176F0018
5060	45	IP 54	ST	R0	176F0025	
			SB	R0	176F0026	
			EB	R0	176F0027	
			ST	R3	176F0028	
			SB	R3	176F0029	
			EB	R3	176F0030	

VLT	kW	Enclosure	Vers.	RFI	Ordering No. W/ LCP	Ordering No. W/o LCP
5075	55	IP 00	ST	R0	176F0037	176F0031
			SB	R0	176F0038	176F0032
			EB	R0	176F0039	176F0033
			ST	R3	176F0040	176F0034
			SB	R3	176F0041	176F0035
			EB	R3	176F0042	176F0036
5075	55	IP 20	ST	R0	176F0049	176F0043
			SB	R0	176F0050	176F0044
			EB	R0	176F0051	176F0045
			ST	R3	176F0052	176F0046
			SB	R3	176F0053	176F0047
			EB	R3	176F0054	176F0048
5075	55	IP 54	ST	R0	176F0055	
			SB	R0	176F0056	
			EB	R0	176F0057	
			ST	R3	176F0058	
			SB	R3	176F0059	
			EB	R3	176F0060	
5100	75	IP 00	ST	R0	176F0067	176F0061
			SB	R0	176F0068	176F0062
			EB	R0	176F0069	176F0063
			ST	R3	176F0070	176F0064
			SB	R3	176F0071	176F0065
			EB	R3	176F0072	176F0066
5100	75	IP 20	ST	R0	176F0079	176F0073
			SB	R0	176F0080	176F0074
			EB	R0	176F0081	176F0075
			ST	R3	176F0082	176F0076
			SB	R3	176F0083	176F0077
			EB	R3	176F0084	176F0078
5100	75	IP 54	ST	R0	176F0085	
			SB	R0	176F0086	
			EB	R0	176F0087	
			ST	R3	176F0088	
			SB	R3	176F0089	
			EB	R3	176F0090	

LCP: Control unit with display and keypad.
ST: Standard unit with/without control unit.
SB: Standard unit with/without control unit and integral brake chopper.
EB: Extended unit with/without control unit, integral brake chopper, connection of external 24 volt DC supply for back-up of control card, connection to DC intermediate circuit for load-sharing (load equalisation between several VLT frequency converters), and quick discharging of DC intermediate circuit.
R0: The VLT frequency converter is supplied without a RFI filter.
R1: With RFI filter option, compliance of EN 55011-1A with 150 m screened motor cable.
R3: With RFI filter option, compliance of EN 55011-1B with 50 m (Bookstyle 20 m) screened motor cable and EN 55011-1A with 150 screened motor cable.

380 / 400 / 415 / 440 / 460 / 500 V

VLT	kW	Enclosure	Vers.	RFI	Ordering No. W/ LCP	Ordering No. W/o LCP
5125	90	IP 00	ST	R0	176F0097	176F0091
			SB	R0	176F0098	176F0092
			EB	R0	176F0099	176F0093
			ST	R3	176F0100	176F0094
			SB	R3	176F0101	176F0095
			EB	R3	176F0102	176F0096
5125	90	IP 20	ST	R0	176F0109	176F0103
			SB	R0	176F0110	176F0104
			EB	R0	176F0111	176F0105
			ST	R3	176F0112	176F0106
			SB	R3	176F0113	176F0107
			EB	R3	176F0114	176F0108
5125	90	IP 54	ST	R0	176F0115	
			SB	R0	176F0116	
			EB	R0	176F0117	
			ST	R3	176F0118	
			SB	R3	176F0119	
			EB	R3	176F0120	
5150	110	IP 00	ST	R0	176F0127	176F0121
			SB	R0	176F0128	176F0122
			EB	R0	176F0129	176F0123
			ST	R3	176F0130	176F0124
			SB	R3	176F0131	176F0125
			EB	R3	176F0132	176F0126
5150	110	IP 20	ST	R0	176F0139	176F0133
			SB	R0	176F0140	176F0134
			EB	R0	176F0141	176F0135
			ST	R3	176F0142	176F0136
			SB	R3	176F0143	176F0137
			EB	R3	176F0144	176F0138
5150	110	IP 54	ST	R0	176F0145	
			SB	R0	176F0146	
			EB	R0	176F0147	
			ST	R3	176F0148	
			SB	R3	176F0149	
			EB	R3	176F0150	
5200	132	IP 00	ST	R0	176F0157	176F0151
			SB	R0	176F0158	176F0152
			EB	R0	176F0159	176F0153
			ST	R3	176F0160	176F0154
			SB	R3	176F0161	176F0155
			EB	R3	176F0162	176F0156
5200	132	IP 20	ST	R0	176F0169	176F0163
			SB	R0	176F0170	176F0164
			EB	R0	176F0171	176F0165
			ST	R3	176F0172	176F0166
			SB	R3	176F0173	176F0167
			EB	R3	176F0174	176F0168
5200	132	IP 54	ST	R0	176F0175	
			SB	R0	176F0176	
			EB	R0	176F0177	
			ST	R3	176F0178	
			SB	R3	176F0179	
			EB	R3	176F0180	

VLT	kW	Enclosure	Vers.	RFI	Ordering No. W/ LCP	Ordering No. W/o LCP
5250	160	IP 00	ST	R0	176F0187	176F0181
			SB	R0	176F0188	176F0182
			EB	R0	176F0189	176F0183
			ST	R3	176F0190	176F0184
			SB	R3	176F0191	176F0185
			EB	R3	176F0192	176F0186
5250	160	IP 20	ST	R0	176F0199	176F0193
			SB	R0	176F0200	176F0194
			EB	R0	176F0201	176F0195
			ST	R3	176F0202	176F0196
			SB	R3	176F0203	176F0197
			EB	R3	176F0204	176F0198
5250	160	IP 54	ST	R0	176F0205	
			SB	R0	176F0206	
			EB	R0	176F0207	
			ST	R3	176F0208	
			SB	R3	176F0209	
			EB	R3	176F0210	

LCP: Control unit with display and keypad.
ST: Standard unit with/without control unit.
SB: Standard unit with/without control unit and integral brake chopper.
EB: Extended unit with/without control unit, integral brake chopper, connection of external 24 volt DC supply for back-up of control card, connection to DC intermediate circuit for load-sharing (load equalisation between several VLT frequency converters), and quick discharging of DC intermediate circuit.
R0: The VLT frequency converter is supplied without a RFI filter.
R1: With RFI filter option, compliance of EN 55011-1A with 150 m screened motor cable.
R3: With RFI filter option, compliance of EN 55011-1B with 50 m (Bookstyle 20 m) screened motor cable and EN 55011-1A with 150 screened motor cable.

COMPACT

380 / 400 / 415 / 440 / 460 / 500 V

VLT	kW	Enclosure	Vers.	RFI	Ordering No. W/LCP
5300	200	IP 00	EX	R0	176F0573
			EB	R0	176F0219
			EX	R1	176F0574
			EB	R1	176F0222
5300	200	IP 20	EX	R0	176F0577
			EB	R0	176F0231
			DX	R0	176F0627
			DE	R0	176F0611
			EX	R1	176F0578
			EB	R1	176F0234
			DX	R1	176F0628
			DE	R1	176F0612
5300	200	IP 54	EX	R0	176F0579
			EB	R0	176F0237
			DX	R0	176F0629
			DE	R0	176F0613
			EX	R1	176F0580
			EB	R1	176F0240
			DX	R1	176F0630
			DE	R1	176F0614
5350	250	IP 00	EX	R0	176F0583
			EB	R0	176F0249
			EX	R1	176F0584
			EB	R1	176F0252
5350	250	IP 20	EX	R0	176F0587
			EB	R0	176F0261
			DX	R0	176F0631
			DE	R0	176F0615
			EX	R1	176F0588
			EB	R1	176F0264
			DX	R1	176F0632
			DE	R1	176F0616
5350	250	IP 54	EX	R0	176F0589
			EB	R0	176F0267
			DX	R0	176F0633
			DE	R0	176F0617
			EX	R1	176F0590
			EB	R1	176F0270
			DX	R1	176F0634
			DE	R1	176F0618

LCP: VLT 5300-5500 will always be delivered with a control unit with display and keypad.

EX: Extended unit with control unit, connection of external 24 volt DC supply for back-up of control card, connection to DC intermediate circuit for load-sharing (load equalisation between several VLT frequency converters), and quick discharging of DC intermediate circuit.

EB: Extended unit with control unit, integral brake chopper, connection of external 24 volt DC supply for back-up of control card, connection to DC intermediate circuit for load-sharing (load equalisation between several VLT frequency converters), and quick discharging of DC intermediate circuit.

DX: Extended unit for VLT type 5300 - 5500 with control unit, built-in mains fuses and disconnector, connection of external 24 V DC supply for back-up of control PCB, connection to DC intermediate circuit for load-sharing, as well as quick discharging of DC intermediate circuit.

DE: Extended unit for VLT type 5300 - 5500 with control unit, integral brake chopper, built-in mains fuses and disconnector, connection of external 24 V DC supply for back-up of control PCB, connection to DC intermediate circuit for load-sharing, as well as quick discharging of DC intermediate circuit.

R0: The VLT frequency converter is supplied without a RFI filter.

R1: With RFI filter option, compliance of EN 55011-1A with 150 m unscreened motor cable.

COMPACT

380 / 400 / 415 / 440 / 460 / 500 V

VLT	kW	Enclosure	Vers.	RFI	Ordering No. W/LCP
5450	315	IP 00	EX	R0	176F0593
			EB	R0	176F0279
			EX	R1	176F0594
			EB	R1	176F0282
5450	315	IP 20	EX	R0	176F0597
			EB	R0	176F0291
			DX	R0	176F0635
			DE	R0	176F0619
			EX	R1	176F0598
			EB	R1	176F0294
			DX	R1	176F0636
			DE	R1	176F0620
5450	315	IP 54	EX	R0	176F0599
			EB	R0	176F0297
			DX	R0	176F0637
			DE	R0	176F0621
			EX	R1	176F0600
			EB	R1	176F0300
			DX	R1	176F0638
			DE	R1	176F0622
5500	355	IP 00	EX	R0	176F0603
			EB	R0	176F0309
			EX	R1	176F0604
			EB	R1	176F0312
5500	355	IP 20	EX	R0	176F0607
			EB	R0	176F0321
			DX	R0	176F0639
			DE	R0	176F0623
			EX	R1	176F0608
			EB	R1	176F0324
			DX	R1	176F0640
			DE	R1	176F0624
5500	355	IP 54	EX	R0	176F0609
			EB	R0	176F0327
			DX	R0	176F0641
			DE	R0	176F0625
			EX	R1	176F0610
			EB	R1	176F0330
			DX	R1	176F0642
			DE	R1	176F0626

LCP: VLT 5300-5500 will always be delivered with a control unit with display and keypad.

EX: Extended unit with control unit, connection of external 24 volt DC supply for back-up of control card, connection to DC intermediate circuit for load-sharing (load equalisation between several VLT frequency converters), and quick discharging of DC intermediate circuit.

EB: Extended unit with control unit, integral brake chopper, connection of external 24 volt DC supply for back-up of control card, connection to DC intermediate circuit for load-sharing (load equalisation between several VLT frequency converters), and quick discharging of DC intermediate circuit.

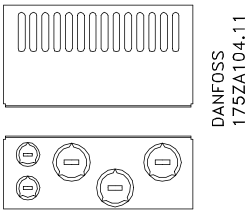
DX: Extended unit for VLT type 5300 - 5500 with control unit, built-in mains fuses and disconnector, connection of external 24 V DC supply for back-up of control PCB, connection to DC intermediate circuit for load-sharing, as well as quick discharging of DC intermediate circuit.

DE: Extended unit for VLT type 5300 - 5500 with control unit, integral brake chopper, built-in mains fuses and disconnector, connection of external 24 V DC supply for back-up of control PCB, connection to DC intermediate circuit for load-sharing, as well as quick discharging of DC intermediate circuit.

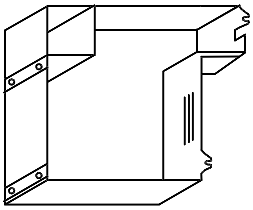
R0: The VLT frequency converter is supplied without a RFI filter.

R1: With RFI filter option, compliance of EN 55011-1A with 150 m unscreened motor cable.

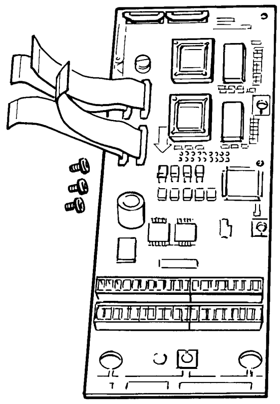
■ Accessories for VLT 5000 Series



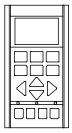
Terminal cover



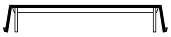
IP 20 bottom cover



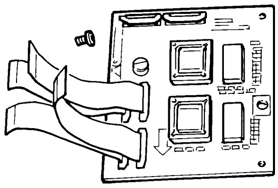
Application option



LCP: Control unit



IP 4x, top cover



Memory option

■ Ordering numbers, misc. hardware:

Type	Description	Ordering no.
IP 4x top cover 1)	Option, VLT type 5001-5006, 200-240 V	175Z0928
IP 4x top cover 1)	Option, VLT type 5001-5011, 380-500 V	175Z0928
NEMA 12 bonding plate 2)	Option, VLT type 5001-5006, 200-240 V	175H4195
NEMA 12 bonding plate 2)	Option, VLT type 5001-5011, 380-500 V	175H4195
IP 20 terminal cover	Option, VLT type 5008-5016, 200-240 V	175Z4622
IP 20 terminal cover	Option, VLT type 5022-5027, 200-240 V	175Z4623
IP 20 terminal cover	Option, VLT type 5016-5032, 380-500 V	175Z4622
IP 20 terminal cover	Option, VLT type 5042-5052, 380-500 V	175Z4623
IP 20 bottom cover	Option, VLT type 5060-5100, 380 - 500 V	176F1800
IP 20 bottom cover	Option, VLT type 5032-5052, 200 - 240 V	176F1800
IP 20 bottom cover	Option, VLT type 5125-5250, 380 - 500 V	176F1801
Terminal Adapter Kit	VLT type 5060-5100, IP 00/IP 20, ST	176F1805
Terminal Adapter Kit	VLT type 5060-5100, IP 00/IP 20, SB	176F1806
Terminal Adapter Kit	VLT type 5060-5100, IP 00/IP 20, EB	176F1807
Terminal Adapter Kit	VLT type 5060-5100, IP 54, ST	176F1808
Terminal Adapter Kit	VLT type 5060-5100, IP 54, SB	176F1809
Terminal Adapter Kit	VLT type 5060-5100, IP 54, EB	176F1810
Terminal Adapter Kit	VLT type 5125-5250, IP 00/IP 20/IP 54, ST	176F1811
Terminal Adapter Kit	VLT type 5125-5250, IP 00/IP 20/IP 54, SB	176F1812
Terminal Adapter Kit	VLT type 5125-5250, IP 00/IP 20, EB	176F1813
Terminal Adapter Kit	VLT type 5125-5250, IP 54, EB	176F1814
Terminal Adapter Kit	VLT type 5300-5500, EX	176F1815
Terminal Adapter Kit	VLT type 5300-5500, EB	176F1816
Encoder converter / 5 V TTL Linedriver / 24 V DC		175Z1929

■ Ordering numbers, control card options, etc.:

LCP:

Type	Description	Ordering no.	
IP 65 LCP option	Separate LCP, only for IP 20 units	175Z0401	
LCP remote-mounting kit 3)	Remote-mounting kit for LCP, for IP 00/20 units	175Z0850	incl. 3 m cable
LCP remote-mounting kit IP 54	Remote-mounting kit for LCP, for IP 54 units	175Z0802	incl. 3 m cable
Cable for LCP	Separate cable	175Z0929	3 m cable

LCP: Control unit with display and keypad.
Supplied excl. LCP.
1) IP 4xNEMA 1 top cover is for Compact IP 20 units only and is only intended for horizontal surfaces that comply with IP 4x. The kit also contains a bonding plate (UL).
2) NEMA 12 bonding plate (UL) is for compact IP 54 units only.
3) The remote-mounting kit is only for IP 00 and IP 20 units.

VLT 5000 Series is available with an integral fieldbus option and/or application option. Ordering numbers for the individual VLT types with integrated options can be seen from the relevant manuals or instructions. In addition, the ordering number system can be used for ordering a VLT frequency converter with an option.
If the VLT 5000 has a serial number lower than xxxx10Gwwy, contact Danfoss before installing the Profibus option.

■ Fieldbus options:

Profibus:

Type	Description	Ordering no.
Profibus option	Incl. memory option	175Z0404
Profibus option	excl. memory option	175Z0402

LonWorks:

LonWorks option, Free topology	Incl. memory option	176F1500
LonWorks option, Free topology	excl. memory option	176F1512
LonWorks option, 78 KBPS	Incl. memory option	176F1501
LonWorks option, 78 KBPS	excl. memory option	176F1513
LonWorks option, 1.25 MBPS	Incl. memory option	176F1502
LonWorks option, 1.25 MBPS	excl. memory option	176F1514

DeviceNet:

DeviceNet option	Incl. memory option	176F1580
DeviceNet option	excl. memory option	176F1584

Modbus Plus:

Modbus Plus for Compact units	Incl. memory option	176F1551
Modbus Plus for Compact units	Excl. memory option	176F1559
Modbus Plus for Bookstyle units	Incl. memory option	176F1550
Modbus Plus for Bookstyle units	Excl. memory option	176F1558

■ Application options:

Synchronising/positioning:

Synchronising/positioning	Application option	175Z0833

■ Ordering numbers, PC software tools:

VLT Software Dialog	CD-ROM version*	175Z0953

* Incl. Basic, Logging, Template, Guided tour modules in 6 languages (Danish, English, German, Italian, Spanish and French).

LC filters for VLT 5000

When a motor is controlled by a frequency converter, resonance noise will be heard from the motor. This noise, which is the result of the design of the motor, arises every time one of the inverter switches in the frequency converter is activated. The frequency of the resonance noise thus corresponds to the switching frequency of the frequency converter.

For the VLT 5000 Series, Danfoss is able to supply a LC filter to dampen the acoustic motor noise.

The filter reduces the ramp-up time of the voltage, the peak load voltage U_{PEAK} and the ripple current ΔI to the motor, which means that current and voltage become almost sinusoidal. Consequently, the acoustic motor noise is reduced to a minimum.

Because of the ripple current in the coils, there will be some noise from the coils. This problem can be solved by integrating the filter in a cabinet or similar.

Ordering numbers, LC filter modules

Mains supply 3 x 200-240 V

LC filter for VLT type	LC filter enclosure	Rated current at 200 V	Max. torque at CT/VT	Max. output frequency	Power dissipation	Ordering no.
5001-5003	Bookstyle IP 20	7.8 A	160%	120 Hz		175Z0825
5004-5006	Bookstyle IP 20	15.2 A	160%	120 Hz		175Z0826
5001-5006	Compact IP 20	15.2 A	160%	120 Hz		175Z0832
5008	Compact IP 00	25 A	160%	60 Hz	85 W	175Z4600
5008	Compact IP 00	32 A	110%	60 Hz	90 W	175Z4601
5011	Compact IP 00	32 A	160%	60 Hz	90 W	175Z4601
5011	Compact IP 00	46 A	110%	60 Hz	110 W	175Z4602
5016	Compact IP 00	46 A	160%	60 Hz	110 W	175Z4602
5016	Compact IP 00	61 A	110%	60 Hz	170 W	175Z4603
5022	Compact IP 00	61 A	160%	60 Hz	170 W	175Z4603
5022	Compact IP 00	73 A	110%	60 Hz	250 W	175Z4604
5027	Compact IP 00	73 A	160%	60 Hz	250 W	175Z4604
5027	Compact IP 00	88 A	110%	60 Hz	320 W	175Z4605
5032	Compact IP 20	88 A	150 %	60 Hz		175Z4700
5032	Compact IP 20	115 A	110 %	60 Hz		175Z4702
5045	Compact IP 20	115 A	150 %	60 Hz		175Z4702
5045	Compact IP 20	143 A	110 %	60 Hz		175Z4702
5052	Compact IP 20	143 A	150 %	60 Hz		175Z4702
5052	Compact IP 20	170 A	110 %	60 Hz		175Z4703

Mains supply 3 x 380 - 500 V

LC filter for VLT type	LC filter enclosure	Rated current at 400/500 V	Max. torque at CT/VT	Max. Output frequency	Power dissipation	Ordering no.
5001-5005	Bookstyle IP 20	7.2 A / 6.3 A	160%	120 Hz		175Z0825
5006-5011	Bookstyle IP 20	16 A / 14.5 A	160%	120 Hz		175Z0826
5001-5011	Compact IP 20	16 A / 14.5 A	160%	120 Hz		175Z0832
5016	Compact IP 00	24 A / 21.7 A	160%	60 Hz	125 W	175Z4606
5016	Compact IP 00	32 A / 27.9 A	110%	60 Hz	130 W	175Z4607
5022	Compact IP 00	32 A / 27.9 A	160%	60 Hz	130 W	175Z4607
5022	Compact IP 00	37.5 A / 32 A	110%	60 Hz	140 W	175Z4608
5027	Compact IP 00	37.5 A / 32 A	160%	60 Hz	140 W	175Z4608
5027	Compact IP 00	44 A / 41.4 A	110%	60 Hz	170 W	175Z4609
5032	Compact IP 00	44 A / 41.4 A	160%	60 Hz	170 W	175Z4609
5032	Compact IP 00	61 A / 54 A	110%	60 Hz	250 W	175Z4610
5042	Compact IP 00	61 A / 54 A	160%	60 Hz	250 W	175Z4610
5042	Compact IP 00	73 A / 65 A	110%	60 Hz	360 W	175Z4611
5052	Compact IP 00	73 A / 65 A	160%	60 Hz	360 W	175Z4611
5052	Compact IP 00	90 A / 78 A	110%	60 Hz	450 W	175Z4612
5060	Compact IP 20	90 A / 80 A	150 %	60 Hz		175Z4700
5060	Compact IP 20	106 A / 106 A	110 %	60 Hz		175Z4701
5075	Compact IP 20	106 A / 106 A	150 %	60 Hz		175Z4701
5075	Compact IP 20	147 A / 130 A	110 %	60 Hz		175Z4702
5100	Compact IP 20	147 A / 130 A	150 %	60 Hz		175Z4702
5100	Compact IP 20	177 A / 160 A	110 %	60 Hz		175Z4703
5125	Compact IP 20	177 A / 160 A	150 %	60 Hz		175Z4703
5125	Compact IP 20	212 A / 190 A	110 %	60 Hz		175Z4704
5150	Compact IP 20	212 A / 190 A	150 %	60 Hz		175Z4704
5150	Compact IP 20	260 A / 240 A	110 %	60 Hz		175Z4705
5200	Compact IP 20	260 A / 240 A	150 %	60 Hz		175Z4705
5200	Compact IP 20	315 A / 302 A	110 %	60 Hz		175Z4706
5250	Compact IP 20	315 A / 302 A	150 %	60 Hz		175Z4706
5250	Compact IP 20	368 A / 361 A	110 %	60 Hz		175Z4707
5300	Compact IP 20	395 A / 361 A	150 %	60 Hz		175Z4707

Ordering numbers, Brake resistors

VLT 5001 - 5052 / 200 - 240 V

	10% duty cycle			40% duty cycle		
VLT	Resistance [ohm]	Power [kW]	Code No.	Resistance [ohm]	Power [kW]	Code No.
5001	145	0.065	175U0820	145	0.260	175U0920
5002	90	0.095	175U0821	90	0.430	175U0921
5003	65	0.250	175U0822	65	0.80	175U0922
5004	50	0.285	175U0823	50	1.00	175U0923
5005	35	0.430	175U0824	35	1.35	175U0924
5006	25	0.8	175U0825	25	3.00	175U0925
5008	20	1.0	175U0826	20	3.50	175U0926
5011	15	1.8	175U0827	15	5.00	175U0927
5016	10	2.8	175U0828	10	9.0	175U0928
5022	7	4.0	175U0829	7	10.0	175U0929
5027	6	4.8	175U0830	6	12.7	175U0930
5032	4.7	6	175U0954	4.7	NA*	NA*
5042	3.3	8	175U0955	3.3	NA*	NA*
5052	2.7	10	175U0956	2.7	NA*	NA*

VLT 5001 - 5052 / 380 - 500 V

	10% duty cycle			40% duty cycle		
VLT	Resistance [ohm]	Power [kW]	Code No.	Resistance [ohm]	Power [kW]	Code No.
5001	620	0.065	175U0840	620	0.260	175U0940
5002	425	0.095	175U0841	425	0.430	175U0941
5003	310	0.250	175U0842	310	0.80	175U0942
5004	210	0.285	175U0843	210	1.35	175U0943
5005	150	0.430	175U0844	150	2.0	175U0944
5006	110	0.60	175U0845	110	2.4	175U0945
5008	80	0.85	175U0846	80	3.0	175U0946
5011	56	1.0	175U0847	56	4.5	175U0947
5016	40	1.8	175U0848	40	5.0	175U0948
5022	30	2.8	175U0849	30	9.3	175U0949
5027	25	3.5	175U0850	25	12.7	175U0950
5032	20	4.0	175U0851	20	13.0	175U0951
5042	15	4.8	175U0852	15	15.6	175U0952
5052	12	5.5	175U0853	12	19.0	175U0953
5060	7.8	12	175U0957	7.8	NA*	NA*
5075	5.7	14	175U0958	5.7	NA*	NA*
5100	4.7	18	175U0959	4.7	NA*	NA*
5125	3.8	22	175U0960	3.8	NA*	NA*
5150	3.2	27	175U0961	3.2	NA*	NA*
5200	2.6	32	175U0962	2.6	NA*	NA*
5250	2.1	39	175U0963	2.1	NA*	NA*

*= Not available.

■ **Type code ordering number system**

Using the ordering number system, it is possible to design a VLT 5000 Series frequency converter. VLT 5000 Series with integral options can only be ordered if Danfoss receives an ordering number string. In addition, the ordering number system can easily be used for ordering basic units.

■ **Type code ordering number string**

On the basis of your order, the VLT frequency converter is given an ordering number that can be seen from the nameplate on the unit. The number may look as follows:

VLT-5008-P-T5-B20-EB-R3-DL-F10-A10

This means that the frequency converter ordered is a VLT 5008 for three-phase mains voltage of 380-500 V (T5) in Bookstyle enclosure IP 20 (B20). The hardware variant is an extended unit with brake chopper (EB), with integral RFI filter, classes A & B (R3). The frequency converter features a control unit (DL) with a PROFIBUS option card (F10) and a synchronising and positioning option card (A10). Character no. 8 (P) indicates the application range of the unit - for VLT 5000 Series: P = process.

Bookstyle IP 20 at 160% CT/VT

	Mains voltage, rated:	
Motor power	240 V	380-500 V
0.75 kW	VLT 5001	VLT 5001
1.1 kW	VLT 5002	VLT 5002
1.5 kW	VLT 5003	VLT 5003
2.2 kW	VLT 5004	VLT 5004
3.0 kW	VLT 5005	VLT 5005
3.7 kW	VLT 5006	
4.0 kW		VLT 5006
5.5 kW		VLT 5008
7.5 kW		VLT 5011

Compact at 160% CT/VT

	Mains voltage, rated:	
Motor power	240 V	380-500 V
0.75 kW	VLT 5001	VLT 5001
1.1 kW	VLT 5002	VLT 5002
1.5 kW	VLT 5003	VLT 5003
2.2 kW	VLT 5004	VLT 5004
3.0 kW	VLT 5005	VLT 5005
3.7 kW	VLT 5006	
4.0 kW		VLT 5006
5.5 kW	VLT 5008	VLT 5008
7.5 kW	VLT 5011	VLT 5011
11 kW	VLT 5016	VLT 5016
15 kW	VLT 5022	VLT 5022
18.5 kW	VLT 5027	VLT 5027
22 kW	VLT 5032	VLT 5032
30 kW	VLT 5042	VLT 5042
37 kW	VLT 5052	VLT 5052

Compact units in the range of 0.75-37 kW come with enclosure IP 20, IP 54 or NEMA 1.

Compact at 150% CT/VT

	Mains voltage, rated:	
Motor power	400 V [1)]	500 V [1)]
45 kW	VLT 5060	
55 kW	VLT 5075	VLT 5060
75 kW	VLT 5100	VLT 5075
90 kW	VLT 5125	VLT 5100
110 kW	VLT 5150	VLT 5125
132 kW	VLT 5200	VLT 5150
160 kW	VLT 5250	VLT 5200
200 kW	VLT 5300	VLT 5250
250 kW	VLT 5350	VLT 5300
300 kW	VLT 5450	VLT 5350
355 kW	VLT 5500	VLT 5450
400 kW		VLT 5500

Compact units in the range of 45-400 kW come with enclosure IP 00, IP 20 or IP 54.

1) The max. output depends on the mains voltage connected to the unit.

Hardware variants

All units in the programme are available in the following hardware variants:

ST: Standard unit w/ or w/o control unit.

SB: Standard unit w/ or w/o control unit and integral brake chopper.

EB: Extended unit w/ or w/o control unit, integral brake chopper, connection of external 24 V DC supply for back-up of control PCB, connection to DC intermediate circuit for load-sharing, as well as quick discharging of DC intermediate circuit.

EX: Extended unit for VLT type 5300 - 5500 with control unit, connection of external 24 V DC supply for back-up of control PCB, connection to DC intermediate circuit for load-sharing, as well as quick discharging of DC intermediate circuit.

DE: Extended unit for VLT type 5300 - 5500 with control unit, integral brake chopper, built-in mains fuses and disconnector, connection of external 24 V DC supply for back-up of control PCB, connection to DC intermediate circuit for load-sharing, as well as quick discharging of DC intermediate circuit.

DX: Extended unit for VLT type 5300 - 5500 with control unit, built-in mains fuses and disconnector, connection of external 24 V DC supply for back-up of control PCB, connection to DC intermediate circuit for load-sharing, as well as quick discharging of DC intermediate circuit.

RFI filter

Bookstyle units always come with an integral RFI filter that complies with EN 55011-1B with 20 m screened motor cable and EN 55011-1A with 150 m screened motor cable.
Compact units for mains voltage of 240 V and a motor power of up to and including 3.7 kW (VLT 5006) and Compact units for a mains voltage of 380-500 V and a motor power of up to 7.5 kW (VLT 5011) are always supplied *with* an integral class A & B filter.
Compact units for higher motor power than these (3.7 and 7.5 kW, respectively) can be ordered either with or without an RFI filter.

Control unit (keypad and display)

All types of units in the programme, except for IP 54 units and VLT 5300-5500, can be ordered either with or without the control unit. IP 54 units and VLT 5300-5500 always come *with* a control unit.

■ Ordering form VLT 5000 Series - Typecode

VLT 5 _ _ _ -P- T _ - _ _ _ - _ _ -R _ -D _ -F _ _ -A _ _ -C _

Power sizes
e.g. 5008

Type	110/160%
5001	-/0.75 kW
5002	-/1.1 kW
5003	-/1.5 kW
5004	-/2.2 kW
5005	-/3.0 kW
5006	-/3.7 kW
5008	7.5/5.5 kW
5011	11/7.5 kW
5016	15/11 kW
5022	18.5/15 kW
5027	22/18.5 kW
5032	30/22 kW
5042	37/30 kW
5052	45/37 kW
5001	-/0.75 kW
5002	-/1.1 kW
5003	-/1.5 kW
5004	-/2.2 kW
5005	-/3.0 kW
5006	-/3.7 kW
5008	-/5.5 kW
5011	-/7.5 kW
5016	15/11 kW
5022	18.5/15 kW
5027	22/18.5 kW
5032	30/22 kW
5042	37/30 kW
5052	45/37 kW
5060	55/45 kW
5075	75/55 kW
5100	90/75 kW
5125	110/90 kW
5150	132/110 kW
5200	160/132 kW
5250	200/160 kW
5300	250/200 kW
5350	315/250 kW
5450	355/315 kW
5500	400/355 kW

Application
Process **P**

Mains voltage
3 x 200 - 240 V **T 2**
3 x 380 - 500 V **T 5**

Enclosure
Bookstyle IP 20 **B 2 0**
5001-5006 / 200-240 V
5001-5011 / 380-500 V
IP 00 **C 0 0**
5032-5052 / 200-240 V
5060-5500 / 380-500 V
IP 20 **C 2 0**
5001-5052 / 200-240 V
5001-5500 / 380-500 V
IP 54 **C 5 4**
5001-5052 / 200-240 V
5001-5500 / 380-500 V

Hardware variant
Standard **S T**
Standard with brake **S B**
Extended with brake, load-sharing and external 24 V DC. **E B**
Extended with loadsharing and external 24 V DC. **E X**
Only available for VLT 5300-5500 380-500 V
Extended with brake, load-sharing, external 24 V DC and built-in mains fuses and disconnector. **D E**
Only available for VLT 5300-5500 380-500 V
Extended with loadsharing, external 24 V DC and built-in mains fuses and disconnector. **D X**
Only available for VLT 5300-5500 380-500 V

RFI-filter
Available w/o filter in the ranges **R 0**
5008-5052 / 200-240 V
5016-5250 / 380-500 V
With integral 1A-filter, **R 1**
With integral 1A +1B-filter **R 3**

Control unit (LCP)
W/o LCP (not an option with IP 54 and VLT 5300-5500) **D 0**
W/ LCP **D L**

Fieldbus-optionscard
No option **F 0 0**
Profibus DP/FMS **F 1 0**
Modbus Plus **F 2 0**
DeviceNet **F 3 0**
LonWorks Free Topology Process **F 4 0**
LonWorks 78 KBPS **F 4 1**
LonWorks 1,25 MBPS **F 4 2**

Application option cards
No option **A 0 0**
With synchronizing/positioning option **A 1 0**
With relay card (not with fieldbus option) **A 3 1**

Coating
Without conformal coating **C 0**
With conformal coating **C 1**

No. units of this type

Required delivery date

Ordered by:

Date:

Take a copy of the ordering forms. Fill them in and send or fax your order to the nearest office of the Danfoss sales organisation.

■ General technical data

Mains supply (L1, L2, L3):

Supply voltage 200-240 V units	3 x 200/208/220/230/240 V ±10%
Supply voltage 380-500 V units	3 x 380/400/415/440/460/500 V ±10%
Supply frequency	50/60 Hz +/- 1%
Max. imbalance of supply voltage:	
VLT 5001-5011 / 380-500 V and VLT 5001-5006 / 200-240 V	±2% of rated supply voltage
VLT 5016-5052 / 380-500 V and VLT 5008-5027 / 200-240 V	±1.5% of rated supply voltage
VLT 5060-5500 / 380-500 V and VLT 5032-5052 / 200-240 V	±3% of rated supply voltage
Power factor / cos. φ	0.90/1.0 at rated load
No. of switches on supply input L1, L2, L3	approx. 1 time/min.
Max. shortcircuit rating	100,000 A

See the section on special conditions in the Design Guide

VLT output data (U, V, W):

Output voltage	0-100% of supply voltage
Output frequency	0 - 132 Hz, 0 - 1000 Hz
Rated motor voltage, 200-240 V units	200/208/220/230/240 V
Rated motor voltage, 380-500 V units	380/400/415/440/460/480/500 V
Rated motor frequency	50/60 Hz
Switching on output	Unlimited
Ramp times	0.05-3600 sec.

Torque characteristics:

Starting torque, VLT 5001-5027, 200-240 V and VLT 5001 - 5052, 380 - 500 V	160% for 1 min.
Starting torque, VLT 5032-5052, 200 - 240 V and VLT 5060-5500, 380-500 V	150% for 1 min.
Starting torque	180% for 0.5 sec.
Acceleration torque	100%
Overload torque, VLT 5001-5027, 200 - 240 V and VLT 5001-5052, 380 - 500 V	160%
Overload torque, VLT 5032-5052, 200 - 240 V and VLT 5060-5500, 380 - 500 V	150%
Arresting torque at 0 rpm (closed loop)	100%

The torque characteristics given are for the VLT frequency converter at the high overload torque level (160%). At the normal overload torque (110%), the values are lower.

Control card, digital inputs:

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

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

■ General technical data

Control card, analogue inputs:

No. of programmable analogue voltage inputs/thermistor inputs 2
Terminal nos. 53, 54
Voltage level .... 0 - ±10 V DC (scalable)
Input resistance, R_i .... approx. 10 kΩ
No. of programmable analogue current inputs 1
Terminal no. 60
Current range .... 0/4 - ±20 mA (scala ble)
Input resistance, R_i .... 200 Ω
Resolution .... 10 bit + sign
Accuracy on input .... Max. error 1% of full scale
Scanning time per input .... 3 msec.
Terminal no. ground 55
Reliable galvanic isolation: All analogue inputs are galvanically isolated from the supply voltage (PELV) as well as other inputs and outputs.

Control card, pulse/encoder input:

No. of programmable pulse/encoder inputs 4
Terminal nos. 17, 29, 32, 33
Max. frequency on terminal 17 .... 5 kHz
Max. frequency on terminals 29, 32, 33 .... 20 kHz (PNP open collector)
Max. frequency on terminals 29, 32, 33 .... 65 kHz (Push-pull)
Voltage level .... 0-24 V DC (PNP positive logics)
Voltage level, logical '0' .... < 5 V DC
Voltage level, logical '1' .... > 10 V DC
Maximum voltage on input .... 28 V DC
Input resistance, R_i .... approx. 2 kΩ
Scanning time per input .... 3 msec.
Resolution .... 10 bit + sign
Accuracy (100-1 kHz), terminals 17, 29, 33 .... Max. error: 0.5% of full scale
Accuracy (1-5 kHz), terminal 17 .... Max. error: 0.1% of full scale
Accuracy (1-65 kHz), terminals 29, 33 .... Max. error: 0.1% of full scale
Reliable galvanic isolation: All pulse/encoder inputs are galvanically isolated from the supply voltage (PELV). In addition, pulse and encoder inputs can be isolated from the other terminals on the control card by connecting an external 24 V DC supply and opening switch 4.

Control card, digital/pulse and analogue outputs:

No. of programmable digital and analogue outputs 2
Terminal nos. 42, 45
Voltage level at digital/pulse output .... 0 - 24 V DC
Minimum load to ground (terminal 39) at digital/pulse output .... 600 Ω
Frequency ranges (digital output used as pulse output) .... 0-32 kHz
Current range at analogue output .... 0/4 - 20 mA
Maximum load to ground (terminal 39) at analogue output .... 500 Ω
Accuracy of analogue output .... Max. error: 1.5% of full scale
Resolution on analogue output. .... 8 bit
Reliable galvanic isolation: All digital and analogue outputs are galvanically isolated from the supply voltage (PELV) as well as other inputs and outputs.

■ General technical data

Control card, 24 V DC supply:

Terminal nos. 12, 13
Max. load (short-circuit protection) .... 200 mA
Terminal nos. ground 20, 39
Reliable galvanic isolation: The 24 V DC supply is galvanically isolated from the supply voltage (PELV), but has the same potential as the analogue outputs.

Control card, RS 485 serial communication:

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

Relay outputs:

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

Brake resistor terminals (only SB and EB units):

Terminal nos. 81, 82

External 24 Volt DC supply:

Terminal nos. 35, 36
Voltage range .... 24 V DC ±15% (max. 37 V DC for 10 sec.)
Max. voltage ripple .... 2 V DC
Power consumption .... 15 W - 50 W (50 W for start-up, 20 msec.)
Min. pre-fuse .... 6 Amp
Reliable galvanic isolation: Full galvanic isolation if the external 24 V DC supply is also of the PELV type.

Cable lengths and cross-sections:

Max. motor cable length, screened cable .... 150 m
Max. motor cable length, unscreened cable .... 300 m
Max. motor cable length, screened cable VLT 5011 380-500 V .... 100 m
Max. brake cable length, screened cable .... 20 m
Max. loadsharing cable length, screened cable .... 25 m from frequency converter to DC bar.
Max. cable cross-section for motor, brake and loadsharing, see next section
Max. cable cross-section for 24 V external DC supply .... 4.0 mm^2/10 AWG
Max. cross-section for control cables .... 1.5 mm^2/16 AWG
Max. cross-section for serial communication .... 1.5 mm^2/16 AWG

Accuracy of display readout (parameters 009-012):

Motor current [6] 0-140% load .... Max. error: ±2.0% of rated output current
Torque % [7], -100 - 140% load .... Max. error: ±5% of rated motor size
Output [8], power HP [9], 0-90% load .... Max. error: ±5% of rated output

■ General technical data

Control characteristics:

Frequency range .... 0 - 1000 Hz
Resolution on output frequency .... ±0.003 Hz
System response time .... 3 msec.
Speed, control range (open loop) .... 1:100 of synchro. speed
Speed, control range (closed loop) .... 1:1000 of synchro. speed
Speed, accuracy (open loop) .... < 1500 rpm: max. error ± 7.5 rpm
> 1500 rpm: max. error of 0.5% of actual speed
Speed, accuracy (closed loop) .... < 1500 rpm: max. error ± 1.5 rpm
> 1500 rpm: max. error of 0.1% of actual speed
Torque control accuracy (open loop) .... 0- 150 rpm: max. error ±20% of rated torque
150-1500 rpm: max. error ±10% of rated torque
> 1500 rpm: max. error ±20% of rated torque
Torque control accuracy (speed feedback) .... Max. error ±5% of rated torque
All control characteristics are based on a 4-pole asynchronous motor

Externals:

Enclosure .... IP 00, IP 20, IP 54
Vibration test .... 0.7 g RMS 18-1000 Hz random. 3 directions for 2 hours (IEC 68-2-34/35/36)
Max. relative humidity .... 93 % (IEC 68-2-3) for storage/transport
Max. relative humidity .... 95 % non condensing (IEC 721-3-3; class 3K3) for operation
Ambient temperature IP 20 (high overload torque 160%) .... Max. 45°C (24-hour average max. 40°C)
Ambient temperature IP 20 (normal overload torque 110%) .... Max. 40°C (24-hour average max. 35°C)
Ambient temperature IP 54 (high overload torque 160%) .... Max. 40°C (24-hour average max. 35°C)
Ambient temperature IP 54 (normal overload torque 110%) .... Max. 40°C (24-hour average max. 35°C)
Ambient temperature IP 20/54 VLT 5011 500 V .... Max. 40°C (24-hour average max. 35°C)

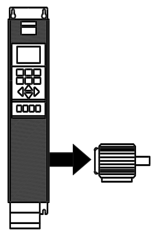
Min. ambient temperature in full operation .... 0°C
Min. ambient temperature at reduced performance .... -10°C
Temperature during storage/transport .... -25 - +65/70°C
Max. altitude above sea level .... 1000 m

EMC standards applied, Emission .... EN 50081-1/2, EN 61800-3, EN 55011, EN 55014
Immunity .... EN 50082-2, EN 61000-4-2, IEC 1000-4-3, EN 61000-4-4
EN 61000-4-5, ENV 50140, ENV 50141, VDE 0160/1990.12
See section on special conditions in the Design Guide

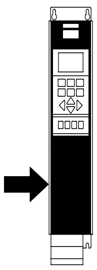
VLT 5000 Series protection:

- Electronic motor thermal protection against overload.
- Temperature monitoring of heat-sink ensures that the VLT frequency converter cuts out if the temperature reaches 90°C for IP 00 and IP 20. For IP 54, the cut-out temperature is 80°C. An overtemperature can only be reset when the temperature of the heat-sink has fallen below 60°C.
- The VLT frequency converter is protected against short-circuiting on motor terminals U, V, W.
- The VLT frequency converter is protected against earth fault on motor terminals U, V, W.
- Monitoring of the intermediate circuit voltage ensures that the VLT frequency converter cuts out if the intermediate circuit voltage gets too high or too low.
- If a motor phase is missing, the VLT frequency converter cuts out.
- If there is a mains fault, the VLT frequency converter is able to carry out a controlled deramping.
- If a mains phase is missing, the VLT frequency converter will cut out when a load is placed on the motor.

■ Mains supply 3 x 200 - 240 V

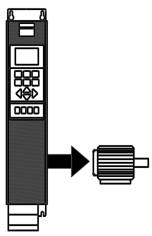


According to international requirements	VLT type	5001	5002	5003	5004	5005	5006
Output current	$I_{VLT,N}$ [A]	3.7	5.4	7.8	10.6	12.5	15.2
	$I_{VLT,MAX}$ (60 s) [A]	5.9	8.6	12.5	17	20	24.3
Output (240 V)	$S_{VLT,N}$ [kVA]	1.5	2.2	3.2	4.4	5.2	6.3
Typical shaft output	$P_{VLT,N}$ [kW]	0.75	1.1	1.5	2.2	3.0	3.7
Typical shaft output	$P_{VLT,N}$ [HP]	1	1.5	2	3	4	5
Max. cable cross-section to motor, brake and loadsharing	[mm²]/[AWG] 2)	4/10	4/10	4/10	4/10	4/10	4/10

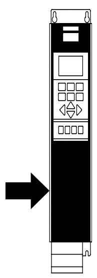


		5001	5002	5003	5004	5005	5006
Rated input current	(200 V) $I_{L,N}$ [A]	3.4	4.8	7.1	9.5	11.5	14.5
Max. cable cross-section power	[mm²]/[AWG] 2)	4/10	4/10	4/10	4/10	4/10	4/10
Max. pre-fuses	[-]/UL 1) [A]	16/10	16/10	16/15	25/20	25/25	35/30
Efficiency 3)		0.95					
Weight IP 20 EB	[kg]	7	7	7	9	9	9,5
Power loss at max. load. [W]	Total	58	76	95	126	172	194
Enclosure	VLT type	IP 20					

■ Mains supply 3 x 380 - 500 V



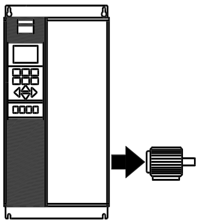
According to international requirements	VLT type	5001	5002	5003	5004	5005	5006	5008	5011
Output current	$I_{VLT,N}$ [A] (380-440 V)	2.2	2.8	4.1	5.6	7.2	10	13	16
	$I_{VLT,MAX}$ (60 s) [A] (380-440 V)	3.5	4.5	6.5	9	11.5	16	20.8	25.6
	$I_{VLT,N}$ [A] (441-500 V)	1.9	2.6	3.4	4.8	6.3	8.2	11	14.5
	$I_{VLT,MAX}$ (60 s) [A] (441-500 V)	3	4.2	5.5	7.7	10.1	13.1	17.6	23.2
Output	$S_{VLT,N}$ [kVA] (380-440 V)	1.7	2.1	3.1	4.3	5.5	7.6	9.9	12.2
	$S_{VLT,N}$ [kVA] (441-500 V)	1.6	2.3	2.9	4.2	5.5	7.1	9.5	12.6
Typical shaft output	$P_{VLT,N}$ [kW]	0.75	1.1	1.5	2.2	3.0	4.0	5.5	7.5
Typical shaft output	$P_{VLT,N}$ [HP]	1	1.5	2	3	4	5	7.5	10
Max. cable cross-section to motor, brake and loadsharing	[mm²]/[AWG] 2)	4/10	4/10	4/10	4/10	4/10	4/10	4/10	4/10



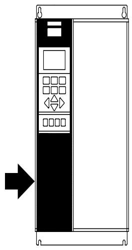
		5001	5002	5003	5004	5005	5006	5008	5011
Rated input current	$I_{L,N}$ [A] (380 V)	2.3	2.6	3.8	5.3	7	9.1	12.2	15.0
	$I_{L,N}$ [A] (460 V)	1.9	2.5	3.4	4.8	6	8.3	10.6	14.0
Max. cable cross-section, power	[mm²]/[AWG] 2)	4/10	4/10	4/10	4/10	4/10	4/10	4/10	4/10
Max. pre-fuses	[-]/UL 1) [A]	16/6	16/6	16/10	16/10	16/15	25/20	25/25	35/30
Efficiency 3)		0.96							
Weight IP 20 EB	[kg]	7	7	7	7.5	7.5	9.5	9.5	9.5
Power loss at max. load. [W]	Total	55	67	92	110	139	198	250	295
Enclosure	VLT type	IP 20							

1. If UL/cUL is to be complied with, pre-fuses type Bussmann KTN-R 200 V, KTS-R 500 V or similar must be used. Pre-fuses type gG must be used for VLT 5001 - VLT 5027, 200/240 V and VLT 5001 - VLT 5052, 380/500 V. Pre-fuses type gR must be used for VLT 5032 - 5052, 200/240 V and VLT 5060 - VLT 5500, 380/500 V. Fuses must be designed for protection in a circuit capable of supplying a maximum of 100,000 Amps ms (symmetrical), 500 V maximum.
2. American Wire Gauge.
3. Measured using 30 m screened motor cables at rated load and rated frequency.

■ Mains supply 3 x 200 - 240 V



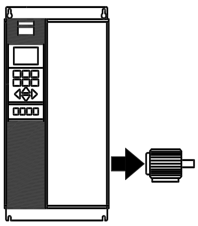
According to international requirements	VLT type	5001	5002	5003	5004	5005	5006
High overload torque (160 %):							
Output current	$I_{VLT,N}$ [A]	3.7	5.4	7.8	10.6	12.5	15.2
	$I_{VLT, MAX}$ (60 s) [A]	5.9	8.6	12.5	17	20	24.3
Output (240 V)	$S_{VLT,N}$ [kVA]	1.5	2.2	3.2	4.4	5.2	6.3
Typical shaft output	$P_{VLT,N}$ [kW]	0.75	1.1	1.5	2.2	3.0	3.7
Typical shaft output	$P_{VLT,N}$ [HP]	1	1.5	2	3	4	5
Max. cable cross-section to motor, brake and loadsharing	[mm²]/[AWG] 2)	4/10	4/10	4/10	4/10	4/10	4/10



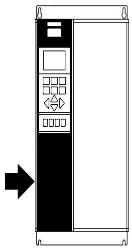
Rated input current	(200 V) $I_{L,N}$ [A]	3.4	4.8	7.1	9.5	11.5	14.5
Max. cable cross-section, power	[mm²]/[AWG] 2)	4/10	4/10	4/10	4/10	4/10	4/10
Max. pre-fuses	[-]/UL 1) [A]	16/10	16/10	16/15	25/20	25/25	35/30
Efficiency 3)		0.95					
Weight IP 20 EB	[kg]	8	8	8	10	10	10
Weight IP 54	[kg]	11.5	11.5	11.5	13.5	13.5	13.5
Power loss at max. load. [W]	Total	58	76	95	126	172	194
Enclosure		IP 20/IP 54					

■ Mains supply 3 x 200 - 240 V

According to international requirements	VLT type		5008	5011	5016	5022	5027
Normal overload torque (110 %):							
Output current	$I_{VLT,N}$ [A]		32	46	61,2	73	88
	$I_{VLT, MAX}$ (60 s) [A]		35.2	50.6	67.3	80.3	96.8
Output (240 V)	$S_{VLT,N}$ [kVA]		13.3	19.1	25.4	30.3	36.6
Typical shaft output	$P_{VLT,N}$ [kW]		7.5	11	15	18.5	22
Typical shaft output	$P_{VLT,N}$ [HP]		10	15	20	25	30



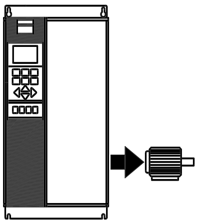
High overload torque (160 %):							
Output current	$I_{VLT,N}$ [A]		25	32	46	61,2	73
	$I_{VLT, MAX}$ (60 s) [A]		40	51.2	73.6	97.9	116.8
Output (240 V)	$S_{VLT,N}$ [kVA]		10	13	19	25	30
Typical shaft output	$P_{VLT,N}$ [kW]		5.5	7.5	11	15	18.5
Typical shaft output	$P_{VLT,N}$ [HP]		7.5	10	15	20	25
Max. cable cross-section to motor,		IP 54	16/6	16/6	35/2	35/2	50
brake and loadsharing	[mm²/AWG] 2)	IP 20	16/6	35/2	35/2	35/2	50/0
Min. cable cross-section to motor, brake and loadsharing 4)	[mm²/AWG] 2)		10/8	10/8	10/8	10/8	16/6

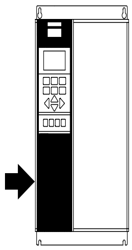


Rated input current (200 V)	$I_{L,N}$ [A]		32	46	61	73	88
Max. cable cross-section,		IP 54	16/6	16/6	35/2	35/2	50/0
power	[mm²]/[AWG] 2)	IP 20	16/6	35/2	35/2	35/2	50/0
Max. pre-fuses	[-]/UL 1) [A]		50	60	80	125	125
Pre-fuse SMPS	[-]/UL 1) [A]		4.0/4.0				
Efficiency 3)			0.95				
Weight IP 00	[kg]						
Weight IP 20 EB	[kg]		23	23	30	30	48
Weight IP 54	[kg]		35	38	49	50	55
Power loss at max. load.							
- high overload torque (160 %)	[W]		340	426	626	833	994
- normal overload torque (110 %)	[W]		426	545	783	1042	1243
Enclosure			IP 20+NEMA 1 kit, IP 54/NEMA 12				

1. If UL/cUL is to be complied with, pre-fuses type Bussmann KTN-R or similar must be used. Pre-fuses type gG must be used for VLT 5001 - VLT 5027, 200/240 V and VLT 5001 - VLT 5052, 380/500 V. Pre-fuses type gR must be used for VLT 5032 - 5052, 200/240 V and VLT 5060 - VLT 5500, 380/500 V. Fuses must be designed for protection in a circuit capable of supplying a maximum of 100,000 Amps ms (symmetrical), 500 V maximum.
2. American Wire Gauge.
3. Measured using 30 m screened motor cables at rated load and rated frequency.
4. Min. cable cross-section is the smallest cable cross-section allowed to be fitted on the terminals. Always comply with national and local regulations on min. cable cross-section.

■ Mains supply 3 x 380 - 500 V

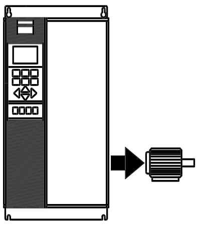




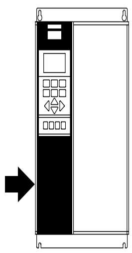
According to international requirements	VLT type	5001	5002	5003	5004	5005	5006	5008	5011
High overload torque (160 %):									
Output current	$I_{VLT,N}$ [A] (380-440 V)	2.2	2.8	4.1	5.6	7.2	10	13	16
	$I_{VLT, MAX}$ (60 s) [A] (380-440 V)	3.5	4.5	6.5	9	11.5	16	20.8	25.6
	$I_{VLT,N}$ [A] (441-500 V)	1.9	2.6	3.4	4.8	6.3	8.2	11	14.5
	$I_{VLT, MAX}$ (60 s) [A] (441-500 V)	3	4.2	5.5	7.7	10.1	13.1	17.6	23.2
Output	$S_{VLT,N}$ [kVA] (380-440 V)	1.7	2.1	3.1	4.3	5.5	7.6	9.9	12.2
	$S_{VLT,N}$ [kVA] (441-500 V)	1.6	2.3	2.9	4.2	5.5	7.1	9.5	12.6
Typical shaft output	$P_{VLT,N}$ [kW]	0.75	1.1	1.5	2.2	3.0	4.0	5.5	7.5
Typical shaft output	$P_{VLT,N}$ [HP]	1	1.5	2	3	4	5	7.5	10
Max. cable cross-section to motor, brake and loadsharing	[mm²]/[AWG] 2)	4/10	4/10	4/10	4/10	4/10	4/10	4/10	4/10
Rated input current	$I_{L,N}$ [A] (380 V)	2.3	2.6	3.8	5.3	7	9.1	12.2	15.0
	$I_{L,N}$ [A] (460 V)	1.9	2.5	3.4	4.8	6	8.3	10.6	14.0
Max. cable cross-section, power	[mm²]/[AWG] 2)	4/10	4/10	4/10	4/10	4/10	4/10	4/10	4/10
Max. pre-fuses	[-]/UL 1) [A]	16/6	16/6	16/10	16/10	16/15	25/20	25/25	35/30
Efficiency 3)		0.96							
Weight IP 20 EB	[kg]	8	8	8	8.5	8.5	10.5	10.5	10.5
Weight IP 54	[kg]	11.5	11.5	11.5	12	12	14	14	14
Power loss at load [W]	Total	55	67	92	110	139	198	250	295
Enclosure		IP 20/IP 54							

1. If UL/cUL is to be complied with, pre-fuses type Bussmann KTS-R or similar must be used. Pre-fuses type gG must be used for VLT 5001 - VLT 5027, 200/240 V and VLT 5001 - VLT 5052, 380/500 V. Pre-fuses type gR must be used for VLT 5032 - 5052, 200/240 V and VLT 5060 - VLT 5500, 380/500 V. Fuses must be designed for protection in a circuit capable of supplying a maximum of 100,000 Amps ms (symmetrical), 500 V maximum.
2. American Wire Gauge.
3. Measured using 30 m screened motor cables at rated load and rated frequency.

■ Mains supply 3 x 380 - 500 V



According to international requirements	VLT type		5016	5022	5027	5032	5042	5052
Normal overload torque (110 %):								
Output current	$I_{VLT,N}$ [A] (380-440 V)		32	37.5	44	61	73	90
	$I_{VLT,MAX}$ (60 s) [A] (380-440 V)		35.2	41.3	48.4	67.1	80.3	99
	$I_{VLT,N}$ [A] (441-500 V)		27.9	34	41.4	54	65	78
	$I_{VLT,MAX}$ (60 s) [A] (441-500 V)		30.7	37.4	45.5	59.4	71.5	85.8
Output	$S_{VLT,N}$ [kVA] (380-440 V)		24.4	28.6	33.5	46.5	55.6	68.6
	$S_{VLT,N}$ [kVA] (441-500 V)		24.2	29.4	35.8	46.8	56.3	67.5
Typical shaft output	$P_{VLT,N}$ [kW]		15	18.5	22	30	37	45
Typical shaft output	$P_{VLT,N}$ [HP]		20	25	30	40	50	60
High overload torque (160 %):								
Output current	$I_{VLT,N}$ [A] (380-440 V)		24	32	37.5	44	61	73
	$I_{VLT,MAX}$ (60 s) [A] (380-440 V)		38.4	51.2	60	70.7	97.6	116.8
	$I_{VLT,N}$ [A] (441-500 V)		21.7	27.9	34	41.4	54	65
	$I_{VLT,MAX}$ (60 s) [A] (441-500 V)		34.7	44.6	54.4	66.2	86	104
Output	$S_{VLT,N}$ [kVA] (380-440 V)		18.3	24.4	28.6	33.5	46.5	55.6
	$S_{VLT,N}$ [kVA] (441-500 V)		18.8	24.2	29.4	35.9	46.8	56.3
Typical shaft output	$P_{VLT,N}$ [kW]		11	15	18.5	22	30	37
Typical shaft output	$P_{VLT,N}$ [HP]		15	20	25	30	40	50
Max. cable cross-section to motor,		IP 54	16/6	16/6	16/6	35/2	35/2	50/0
brake and loadsharing [mm2]/[AWG][2]		IP 20	16/6	16/6	35/2	35/2	35/2	50/0
Min. cable cross-section to motor,								
brake and loadsharing	[mm2]/[AWG]		10/8	10/8	10/8	10/8	10/8	16/6

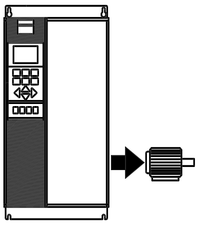


Rated input current	$I_{L,N}$ [A] (380 V)		32	37.5	44	60	72	89
	$I_{L,N}$ [A] (460 V)		27.6	34	41	53	64	77
Max. cable cross-section,		IP 54	16/6	16/6	16/6	35/2	35/2	50/0
power	[mm²]/[AWG]	IP 20	16/6	16/6	35/2	35/2	35/2	50/0
Max. pre-fuses	[-]/UL [1] [A]		63/40	63/50	63/60	80/80	100/100	125/125
Pre-fuse SMPS	[-]/UL [1] [A]		4.0/4.0					
Efficiency			0.96					
Weight IP 20 EB	[kg]		23	23	30	30	48	48
Weight IP 54	[kg]		48	48	51	61	67	70
Power loss at max. load.								
- high overload torque (160 %)	[W]		419	559	655	768	1065	1275
- normal overload torque (110 %)	[W]		559	655	768	1065	1275	1571
Enclosure			IP 20/IP 54					

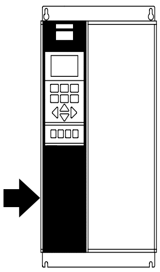
1. If UL/cUL is to be complied with, pre-fuses type Bussmann KTS-R or similar must be used. Pre-fuses type gG must be used for VLT 5001 - VLT 5027, 200/240 V and VLT 5001 - VLT 5052, 380/500 V. Pre-fuses type gR must be used for VLT 5032 - 5052, 200/240 V and VLT 5060 - VLT 5500, 380/500 V. Fuses must be designed for protection in a circuit capable of supplying a maximum of 100,000 Amps ms (symmetrical), 500 V maximum.
2. American Wire Gauge.
3. Measured using 30 m screened motor cables at rated load and rated frequency.
4. Min. cable cross-section is the smallest cable cross-section allowed to be fitted on the terminals.
   Always comply with national and local regulations on min. cable cross-section.

■ Mains supply 3 x 200 - 240 V

According to international requirements	VLT type	5032	5042	5052
Normal overload torque (110 %):				
Output current	$I_{VLT,N}$ [A] (200-230 V)	115	143	170
	$I_{VLT, MAX}$ (60 s) [A] (200-230 V)	127	158	187
	$I_{VLT,N}$ [A] (231-240 V)	104	130	154
	$I_{VLT, MAX}$ (60 s) [A] (231-240 V)	115	143	170
Output	$S_{VLT,N}$ [kVA] (200-230 V)	41	52	61
	$S_{VLT,N}$ [kVA] (231-240 V)	41	52	61
Typical shaft output (200-240 V)	$P_{VLT,N}$ [kW]	30	37	45
Typical shaft output (200-240 V)	$P_{VLT,N}$ [HP]	40	50	60
High overload torque (150 %):				
Output current	$I_{VLT,N}$ [A] (200-230 V)	88	115	143
	$I_{VLT, MAX}$ (60 s) [A] (200-230 V)	132	173	215
	$I_{VLT,N}$ [A] (231-240 V)	80	104	130
	$I_{VLT, MAX}$ (60 s) [A] (231-240 V)	120	156	195
Output	$S_{VLT,N}$ [kVA] (200-230 V)	32	41	52
	$S_{VLT,N}$ [kVA] (231-240 V)	32	41	52
Typical shaft output (200-240 V)	$P_{VLT,N}$ [kW]	22	30	37
Typical shaft output (200-240 V)	$P_{VLT,N}$ [HP]	30	40	50
Max. cross-section of copper cable to motor, brake and loadsharing (200-240 V)	[mm²] 5)	70	90	120
Max. cross-section of aluminium cable to motor, brake and loadsharing (200-240 V)	[mm²] 5)	95	95	120
Max. cross-section of copper cable to motor, brake and loadsharing (200-240 V)	[AWG] 2) 5)	1/0	3/0	4/0
Max. cross-section of aluminium cable to motor, brake and loadsharing (200-240 V)	[AWG] 2) 5)	3/0	250mcm	300mcm
Min. cable cross-section to motor, brake and loadsharing 4)	[mm²/AWG] 2) 5)	10/8	10/8	10/8



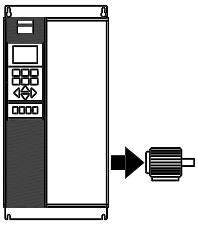
Rated input current	$I_{L,N}$ [A] (230 V)	101.3	126.6	149.9
Max. cross-section of copper cable to power (200-240 V)	[mm²] 5)	70	90	120
Max. cross-section of aluminium cable to power (200-240 V)	[mm²] 5)	95	95	120
Max. cross-section of copper cable to power (200-240 V)	[AWG] 2) 5)	1/0	3/0	4/0
Max. cross-section of aluminium cable to power (200-240 V)	[AWG] 2) 5)	3/0	250mcm	300mcm
Min. cable cross-section to motor, brake and loadsharing 4)	[mm²/AWG] 2) 5)	10/8	10/8	10/8
Max. pre-fuses (mains)	[-]/UL 1) [A]	150	200	250
Integral pre-fuses (softcharge circuit)	[-]/UL 1) [A]	15/15	15/15	15/15
Integral pre-fuses (softcharge resistors)	[-]/UL 1) [A]	12/12	12/12	12/12
Integral pre-fuses (SMPS)	[-]/UL 1) [A]	12/12		
Efficiency 3)		0.96-0.97		
Weight IP 00	[kg]	90	90	90
Weight IP 20 EB	[kg]	101	101	101
Weight IP 54	[kg]	104	104	104
Power loss at max. load	[W]	1089	1361	1613
Enclosure		IP 00 / IP 20/ IP 54		



1. If UL/cUL is to be complied with, pre-fuses type Bussmann FWH and FWX or similar must be used. Pre-fuses type gG must be used for VLT 5001 - VLT 5027, 200/240 V and VLT 5001 - VLT 5052, 380/500 V. Pre-fuses type gR must be used for VLT 5032 - 5052, 200/240 V and VLT 5060 - VLT 5500, 380/500 V. Fuses must be designed for protection in a circuit capable of supplying a maximum of 100,000 Amps ms (symmetrical), 500 V maximum.
2. American Wire Gauge.
3. Measured using 30 m screened motor cables at rated load and rated frequency.
4. Min. cable cross-section is the smallest cable cross-section allowed to be fitted on the terminals. Always comply with national and local regulations on min. cable cross-section.
5. Connection stud 1 x M8 / 2 x M8.

■ Mains supply 3 x 380-500 V

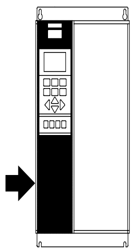
According to international requirements



VLT type	5060	5075	5100	5125	5150	5200	5250
Normal overload torque (110 %):							
Output current $I_{VLT,N}$ [A] (380-440 V)	106	147	177	212	260	315	368
$I_{VLT,MAX}$ (60 s) [A] (380-440 V)	117	162	195	233	286	347	405
$I_{VLT,N}$ [A] (441-500 V)	106	130	160	190	240	302	361
$I_{VLT,MAX}$ (60 s) [A] (441-500 V)	117	143	176	209	264	332	397
Output $S_{VLT,N}$ [kVA] (380-440 V)	73	102	123	147	180	218	255
$S_{VLT,N}$ [kVA] (441-500 V)	92	113	139	165	208	262	313
Typical shaft output (380-440 V) $P_{VLT,N}$ [kW]	55	75	90	110	132	160	200
Typical shaft output (380-440 V) $P_{VLT,N}$ [HP]	75	100	125	150	200	250	300
Typical shaft output (441-500 V) $P_{VLT,N}$ [kW]	75	90	110	132	160	200	250
Typical shaft output (441-500 V) $P_{VLT,N}$ [HP]	100	125	150	200	250	300	350
High overload torque (150 %):							
Output current $I_{VLT,N}$ [A] (380-440 V)	90.0	106	147	177	212	260	315
$I_{VLT,MAX}$ (60 s) [A] (380-440 V)	135	159	221	266	318	390	473
$I_{VLT,N}$ [A] (441-500 V)	80.0	106	130	160	190	240	302
$I_{VLT,MAX}$ (60 s) [A] (441-500 V)	120	159	195	240	285	360	453
Output $S_{VLT,N}$ [kVA] (380-440 V)	62.0	73.0	102	123	147	180	218
$S_{VLT,N}$ [kVA] (441-500 V)	69.0	92.0	113	139	165	208	262
Typical shaft output (380-440 V) $P_{VLT,N}$ [kW]	45	55	75	90	110	132	160
Typical shaft output (380-440 V) $P_{VLT,N}$ [HP]	60	75	100	125	150	200	250
Typical shaft output (441-500 V) $P_{VLT,N}$ [kW]	55	75	90	110	132	160	200
Typical shaft output (441-500 V) $P_{VLT,N}$ [HP]	75	100	125	150	200	250	300
Max. cross-section of copper cable to motor, brake and loadsharing (380-440 V) [mm²][5)]	70	95	120	2x70	2x70	2x95	2x120
Max. cross-section of copper cable to motor, brake and loadsharing (441-500 V) [mm²][5)]	70	70	95	2x70	2x70	2x95	2x120
Max. cross-section of aluminium cable to motor, brake and loadsharing (380-440 V) [mm²][5)]	95	120	150	2x70	2x120	2x120	2x150
Max. cross-section of aluminium cable to motor, brake and loadsharing (441-500 V) [mm²][5)]	70	90	120	2x70	2x95	2x120	2x150
Max. cross-section of copper cable to motor, brake and loadsharing (380-440 V) [AWG][2) 5)]	1/0	3/0	4/0	2x1/0	2x2/0	2x3/0	2x250mcm
Max. cross-section of copper cable to motor, brake and loadsharing (441-500 V) [AWG][2) 5)]	1/0	2/0	3/0	2x1/0	2x1/0	2x3/0	2x4/0
Max. cross-section of aluminium cable to motor, brake and loadsharing (380-440 V) [AWG][2) 5)]	3/0	250mcm	300mcm	2x2/0	2x4/0	2x250mcm	2x350mcm
Max. cross-section of aluminium cable to motor, brake and loadsharing (441-500 V) [AWG][2) 5)]	3/0	4/0	250mcm	2x2/0	2x3/0	2x250mcm	2x300mcm
Min. cable cross-section to motor, brake and loadsharing [4)] [mm²/AWG][2) 5)]	10/8	10/8	10/8	10/8	10/8	16/6	

1. If UL/cUL is to be complied with, pre-fuses type Bussmann FWH and FWX or similar must be used. Pre-fuses type gG must be used for VLT 5001 - VLT 5027, 200/240 V and VLT 5001 - VLT 5052, 380/500 V. Pre-fuses type gR must be used for VLT 5032 - 5052, 200/240 V and VLT 5060 - VLT 5500, 380/500 V. Fuses must be designed for protection in a circuit capable of supplying a maximum of 100,000 Amps ms (symmetrical), 500 V maximum.
2. American Wire Gauge.
3. Measured using 30 m screened motor cables at rated load and rated frequency.
4. Min. cable cross-section is the smallest cable cross-section allowed to be fitted on the terminals.
   Always comply with national and local regulations on min. cable cross-section.
5. Connection stud 1 x M8 / 2 x M8.

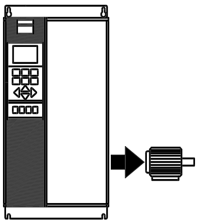
■ Mains supply 3 x 380-500 V



According to international requirements	VLT type	5060	5075	5100	5125	5150	5200	5250
Rated input current	$I_{L,MAX}$ [A] (400 V)	87.6	103	145	174	206	256	318
	$I_{L,MAX}$ [A] (460 V)	77.9	103	128	158	185	236	304
Max. cross-section of copper cable to power (380-440 V)	$[mm^2]$[5]	70	95	120	2x70	2x70	2x95	2x120
Max. cross-section of copper cable to power (460-500 V)	$[mm^2]$[5]	70	70	95	2x70	2x70	2x95	2x120
Max. cross-section of aluminium cable to power (380-440 V)	$[mm^2]$[5]	95	120	150	2x70	2x120	2x120	2x150
Max. cross-section of aluminium cable to power (460-500 V)	$[mm^2]$[5]	70	90	120	2x70	2x95	2x120	2x150
Max. cross-section of copper cable to power (380-440 V)	[AWG][2, 5]	1/0	3/0	4/0	2x1/0	2x2/0	2x3/0	2x250mcm
Max. cross-section of copper cable to power (460-500 V)	[AWG][2, 5]	1/0	2/0	3/0	2x1/0	2x1/0	2x3/0	2x4/0
Max. cross-section of aluminium cable to power (380-440 V)	[AWG][2, 5]	3/0	250mcm	300mcm	2x2/0	2x4/0	2x250mcm	2x350mcm
Max. cross-section of aluminium cable to power (460-500 V)	[AWG][2, 5]	3/0	4/0	250mcm	2x2/0	2x3/0	2x250mcm	2x300mcm
Min. cable cross-section to motor, brake and loadsharing [4]	$[mm^2/AWG]$[2, 5]	10/8	10/8	10/8	10/8	10/8	16/6	
Max. pre-fuses (mains)	[-]/UL [1] [A]	150/150	250/220	250/250	300/300	350/350	450/400	500/500
Integral pre-fuses (softcharge circuit)	[-]/UL [1] [A]	15/15	15/15	15/15	30/30	30/30	30/30	30/30
Integral pre-fuses (softcharge resistors)	[-]/UL [1] [A]	12/12	12/12	12/12	12/12	12/12	12/12	12/12
Integral pre-fuses (SMPS)	[-]/UL [1] [A]	5.0/5.0						
Efficiency		0.96-0.97						
Weight IP 00	[kg]	109	109	109	146	146	146	146
Weight IP 20 EB	[kg]	121	121	121	161	161	161	161
Weight IP 54	[kg]	124	124	124	177	177	177	177
Power loss at max. load	[W]	1430	1970	2380	2860	3810	4770	5720
Enclosure		IP 00 / IP 20/ IP 54						

1. If UL/cUL is to be complied with, pre-fuses type Bussmann FWH and FWX or similar must be used. Pre-fuses type gG must be used for VLT 5001 - VLT 5027, 200/240 V and VLT 5001 - VLT 5052, 380/500 V. Pre-fuses type gR must be used for VLT 5032 - 5052, 200/240 V and VLT 5060 - VLT 5500, 380/500 V. Fuses must be designed for protection in a circuit capable of supplying a maximum of 100,000 Amps ms (symmetrical), 500 V maximum.
2. American Wire Gauge.
3. Measured using 30 m screened motor cables at rated load and rated frequency.
4. Min. cable cross-section is the smallest cable cross-section allowed to be fitted on the terminals.
   Always comply with national and local regulations on min. cable cross-section.
5. Connection stud 1 x M8 / 2 x M8.

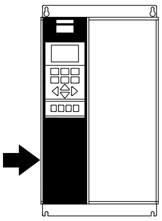
■ Mains supply 3 x 380-500 V



According to international requirements VLT type	5300	5350	5450	5500
Normal overload torque (110 %):				
Output current $I_{VLT,N}$ [A] (380-440 V)	480	600	658	745
$I_{VLT, MAX}$ (60 s) [A] (380-440 V)	528	660	724	820
$I_{VLT,N}$ [A] (441-500 V)	443	540	590	678
$I_{VLT, MAX}$ (60 s) [A] (441-500 V)	487	594	649	746
Output $S_{VLT,N}$ [kVA] (380-440 V)	333	416	456	516
$S_{VLT,N}$ [kVA] (441-500 V)	384	468	511	587
Typical shaft output (380-440 V) $P_{VLT,N}$ [kW]	250	315	355	400
Typical shaft output (380-440 V) $P_{VLT,N}$ [HP]	300	350	450	500
Typical shaft output (441-500 V) $P_{VLT, N}$ [kW]	315	355	400	500
Typical shaft output (441-500 V) $P_{VLT, N}$ [HP]	350	450	500	600
High overload torque (150 %):				
Output current $I_{VLT,N}$ [A] (380-440 V)	395	480	600	658
$I_{VLT, MAX}$ (60 s) [A] (380-440 V)	593	720	900	987
$I_{VLT,N}$ [A] (441-500 V)	361	443	540	590
$I_{VLT, MAX}$ (60 s) [A] (441-500 V)	542	665	810	885
Output $S_{VLT,N}$ [kVA] (380-440 V)	274	333	416	456
$S_{VLT,N}$ [kVA] (441-500 V)	313	384	468	511
Typical shaft output (380-440 V) $P_{VLT,N}$ [kW]	200	250	315	355
Typical shaft output (380-440 V) $P_{VLT,N}$ [HP]	300	350	450	500
Typical shaft output (441-500 V) $P_{VLT, N}$ [kW]	250	315	355	400
Typical shaft output (441-500 V) $P_{VLT, N}$ [HP]	350	450	500	600
Max. cross-section of copper cable to motor, brake and loadsharing (380-440 V) [mm²] 5)	2 x 150 3 x 70	2 x 185 3 x 95	2 x 240 3 x 120	2 x 300 3 x 150
Max. cross-section of copper cable to motor, brake and loadsharing (441-500 V) [mm²] 5)	2 x 120 3 x 70	2 x 150 3 x 95	2 x 185 3 x 95	2 x 300 3 x 120
Max. cross-section of aluminium cable to motor, brake and loadsharing (380-440 V) [mm²] 5)	2 x 185 3 x 120	2 x 240 3 x 150	2 x 300 3 x 185	3 x 185
Max. cross-section of aluminium cable to motor, brake and loadsharing (441-500 V) [mm²] 5)	2 x 150 3 x 95	2 x 185 3 x 120	2 x 240 3 x 150	3 x 185
Max. cross-section of copper cable to motor, brake and loadsharing (380-440 V) [AWG] 2) 5)	2 x 250mcm 3 x 2/0	2 x 350mcm 3 x 3/0	2 x 400mcm 3 x 4/0	2 x 500mcm 3 x 250mcm
Max. cross-section of copper cable to motor, brake and loadsharing (441-500 V) [AWG] 2) 5)	2 x 4/0 3 x 1/0	2 x 300mcm 3 x 3/0	2 x 350mcm 3 x 3/0	2 x 500mcm 3 x 4/0
Max. cross-section of aluminium cable to motor, brake and loadsharing (380-440 V) [AWG] 2) 5)	2 x 350mcm 3 x 4/0	2 x 500mcm 3 x 250mcm	2 x 600mcm 3 x 300mcm	2 x 700mcm 3 x 350mcm
Max. cross-section of aluminium cable to motor, brake and loadsharing (441-500 V) [AWG] 2) 5)	2 x 300mcm 3 x 3/0	2 x 400mcm 3 x 4/0	2 x 500mcm 3 x 250mcm	2 x 600mcm 3 x 300mcm

1. If UL/cUL is to be complied with, pre-fuses type Bussmann FWH and FWX or similar must be used. Pre-fuses type gG must be used for VLT 5001 - VLT 5027, 200/240 V and VLT 5001 - VLT 5052, 380/500 V. Pre-fuses type gR must be used for VLT 5032 - 5052, 200/240 V and VLT 5060 - VLT 5500, 380/500 V. Fuses must be designed for protection in a circuit capable of supplying a maximum of 100,000 Amps ms (symmetrical), 500 V maximum.
2. American Wire Gauge.
3. Measured using 30 m screened motor cables at rated load and rated frequency.
4. Min. cable cross-section is the smallest cable cross-section allowed to be fitted on the terminals.
   Always comply with national and local regulations on min. cable cross-section.
5. Connection stud 2 x M12 / 3 x M12.

■ Mains supply 3 x 380-500 V



According to international requirements	VLT type	5300	5350	5450	5500
Rated input current	$I_{L,MAX}$ [A] (400 V)	389	467	584	648
	$I_{L,MAX}$ [A] (460 V)	356	431	526	581
Max. cross-section of copper cable to power (380-440 V)	[mm²][5]	2 x 150 3 x 70	2 x 185 3 x 95	2 x 240 3 x 120	2 x 300 3 x 150
Max. cross-section of copper cable to power (460-500 V)	[mm²][5]	2 x 120 3 x 70	2 x 150 3 x 95	2 x 185 3 x 95	2 x 300 3 x 120
Max. cross-section of aluminium cable to power (380-440 V)	[mm²][5]	2 x 185 3 x 120	2 x 240 3 x 150	2 x 300 3 x 185	3 x 185
Max. cross-section of aluminium cable to power (460-500 V)	[mm²][5]	2 x 150 3 x 95	2 x 185 3 x 120	2 x 240 3 x 150	3 x 185
Max. cross-section of copper cable to power (380-440 V)	[AWG][2) 5)]	2 x 250mcm 3 x 2/0	2 x 350mcm 3 x 3/0	2 x 400mcm 3 x 4/0	2 x 500mcm 3 x 250mcm
Max. cross-section of copper cable to power (460-500 V)	[AWG][2) 5)]	2 x 4/0 3 1/0	2 x 300mcm 3 x 3/0	2 x 350mcm 3 x 3/0	2 x 500mcm 3 x 4/0
Max. cross-section of aluminium cable to power (380-440 V)	[AWG][2) 5)]	2 x 350mcm 3 x 4/0	2 x 500mcm 3 x 250mcm	2 x 600mcm 3 x 300mcm	2 x 700mcm 3 x 350mcm
Max. cross-section of aluminium cable to power (460-500 V)	[AWG][2) 5)]	2 x 300mcm 3 x 3/0	2 x 400mcm 3 x 4/0	2 x 500mcm 3 x 250mcm	2 x 600mcm 3 x 300mcm
Max. pre-fuses (mains)	[-]/UL [1)] [A]	630/600	700/700	800/800	800/800
Integral pre-fuses (softcharge circuit)	[-]/UL [1)] [A]	15/15	15/15	15/15	30/30
Integral pre-fuses (softcharge resistors)	[-]/UL [1)] [A]	12/12	12/12	12/12	12/12
Integral pre-fuses (SMPS)	[-]/UL [1)] [A]	5.0/5.0			
Efficiency		0.97			
Weight IP 00	[kg]	480	515	560	585
Weight IP 20	[kg]	595	630	675	700
Weight IP 54	[kg]	605	640	685	710
Power loss at max. load	[W]	7500	9450	10650	12000
Enclosure		IP 00 / IP 20/ IP 54			

1. If UL/cUL is to be complied with, pre-fuses type Bussmann FWH and FWX or similar must be used. Pre-fuses type gG must be used for VLT 5001 - VLT 5027, 200/240 V and VLT 5001 - VLT 5052, 380/500 V. Pre-fuses type gR must be used for VLT 5032 - 5052, 200/240 V and VLT 5060 - VLT 5500 , 380/500 V. Fuses must be designed for protection in a circuit capable of supplying a maximum of 100,000 Amps ms (symmetrical), 500 V maximum.
2. American Wire Gauge.
3. Measured using 30 m screened motor cables at rated load and rated frequency.
4. Min. cable cross-section is the smallest cable cross-section allowed to be fitted on the terminals.
   Always comply with national and local regulations on min. cable cross-section.
5. Connection stud 2 x M12 / 3 x M12.

■ Bookstyle IP 20

IP 20 enclosure 200-240 V

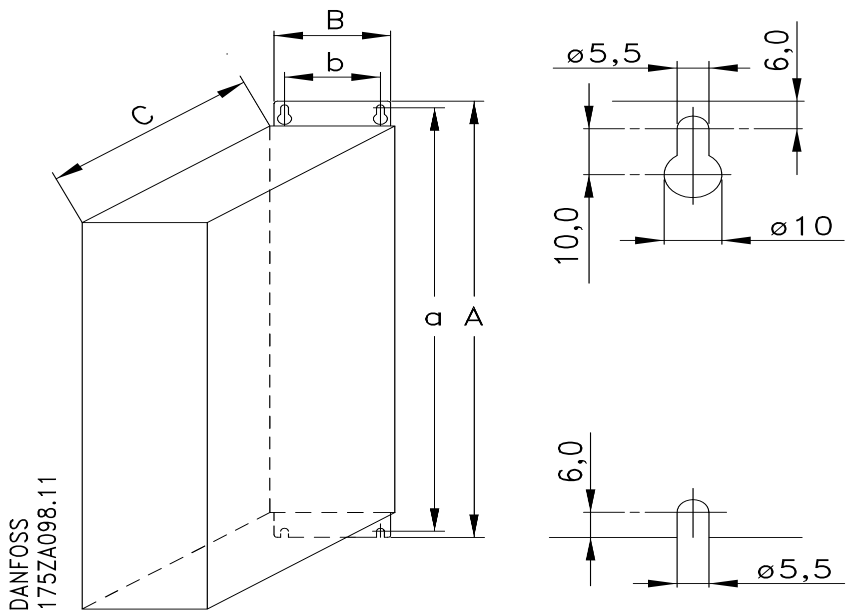
VLT type	A (mm)	B (mm)	C (mm)	a (mm)	b (mm)	ab/be (mm)	l/r (mm)
5001 - 5003	395	90	260	384	70	100	0
5004 - 5006	395	130	260	384	70	100	0

IP 20 enclosure 380-500 V

VLT type	A (mm)	B (mm)	C (mm)	a (mm)	b (mm)	ab/be (mm)	l/r (mm)
5001 - 5005	395	90	260	384	70	100	0
5006 - 5011	395	130	260	384	70	100	0

ab:Min. space above enclosure.
be:Min. space below enclosure.
l/r: Min. distance between VLT frequency converter and other plant components, left and right sides.

VLT 5001 - 5006/200-240 V
VLT 5001 - 5011/380-500 V

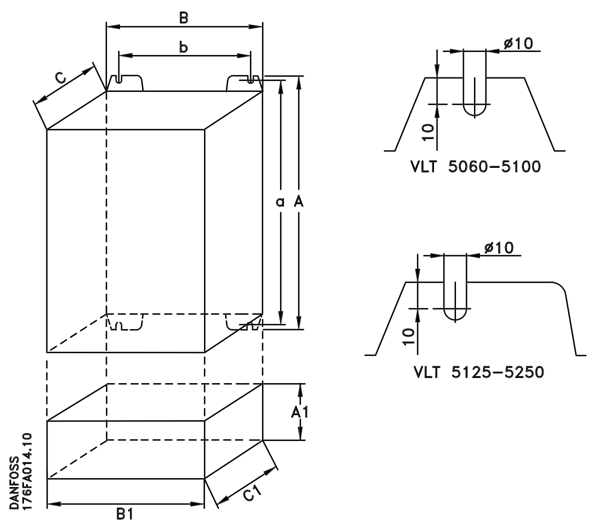


■ Compact IP 00

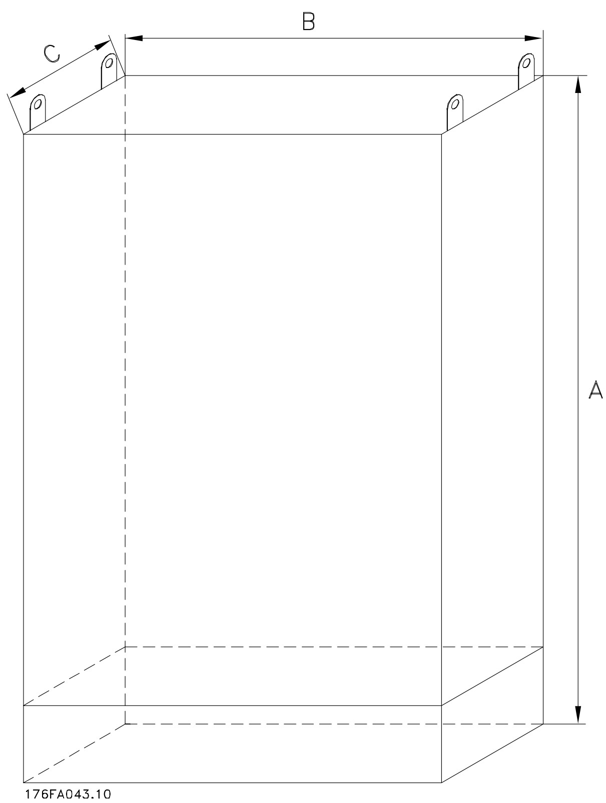
IP 00 enclosure 200-240 V							
VLT type	A (mm)	B (mm)	C (mm)	a (mm)	b (mm)	ab/be (mm)	l/r (mm)
5032 - 5052	800	370	335	780	270	225	0

IP 00 enclosure 380-500 V							
VLT type	A (mm)	B (mm)	C (mm)	a (mm)	b (mm)	ab/be (mm)	l/r (mm)
5060 - 5100	800	370	335	780	270	225	0
5125 - 5250	1400	420	400	1380	350	225	0
5300 - 5500	1896	1099	490	-	-	400	0

ab:Min. space above enclosure. be: Min. space below enclosure.
l/r: Min. distance between VLT frequency converter and other plant components, left and right sides.



VLT 5060 - 5250/380-500 V



VLT 5300 - 5500/380-500 V

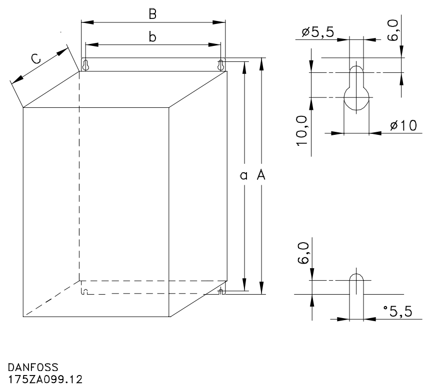
IP 20 bottom cover			
VLT type	A1 (mm)	B1 (mm)	C1 (mm)
5060 - 5100	175	370	335
5125 - 5250	175	420	400

■ Compact IP 20

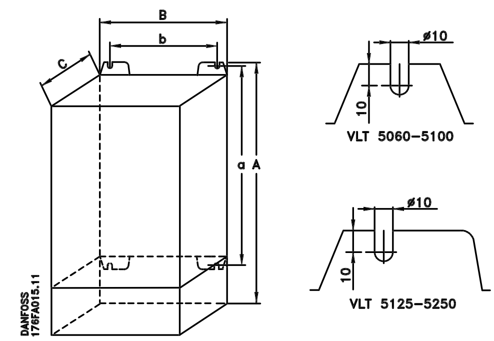
IP 20 enclosure 200-240 V							
VLT type	A (mm)	B (mm)	C (mm)	a (mm)	b (mm)	ab/be (mm)	l/r (mm)
5001 - 5003	395	220	160	384	200	100	0
5004 - 5006	395	220	200	384	200	100	0
5008	560	242	260	540	200	200	0
5011 - 5016	700	242	260	680	200	200	0
5022 - 5027	800	308	296	780	270	200	0
5032 - 5052	954	370	335	780	270	225	0

IP 20 enclosure 380-500 V							
VLT type	A (mm)	B (mm)	C (mm)	a (mm)	b (mm)	ab/be (mm)	l/r (mm)
5001 - 5005	395	220	160	384	200	100	0
5006 - 5011	395	220	200	384	200	100	0
5016 - 5022	560	242	260	540	200	200	0
5027 - 5032	700	242	260	680	200	200	0
5042 - 5052	800	308	296	780	270	200	0
5060 - 5100	975	370	335	780	270	225	0
5125 - 5250	1575	420	400	1380	350	225	0
5300 - 5500	2010	1200	600	-	-	400	0

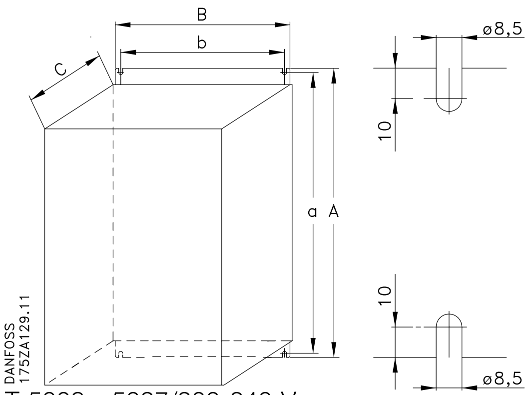
ab:Min. space above enclosure. be: Min. space below enclosure.
l/r: Min. distance between VLT frequency converter and other plant components, left and right sides.



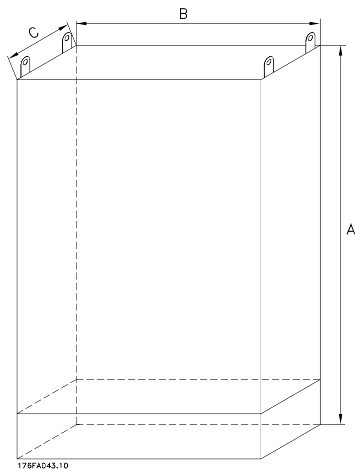
VLT 5001 - 5006/200-240 V
VLT 5001 - 5011/380-500 V



VLT 5032 - 5052/200-240 V
VLT 5060 - 5250/380-500 V



VLT 5008 - 5027/200-240 V
VLT 5016 - 5052/380-500 V



VLT 5300 - 5500/380-500 V

■ Compact IP 54

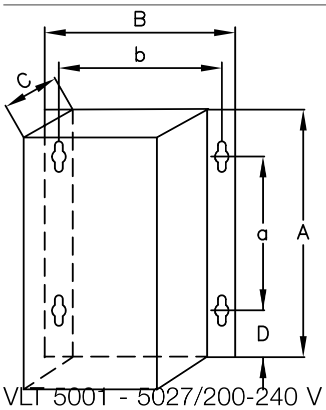
IP 54 enclosure 200-240 V

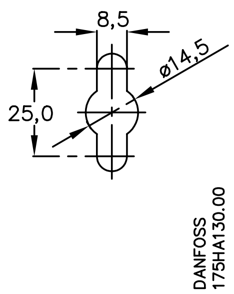
VLT type	A (mm)	B (mm)	C (mm)	D (mm)	a (mm)	b (mm)	ab/be (mm)	l/r (mm)
5001 - 5003	460	282	195	85	260	258	100	0
5004 - 5006	530	282	195	85	330	258	100	0
5008 - 5011	810	355	280	70	560	330	200	0
5016 - 5027	940	400	280	70	690	375	200	0
5032 - 5052	937	495	421	-	830	374	225	50

IP 54 enclosure 380-500 V

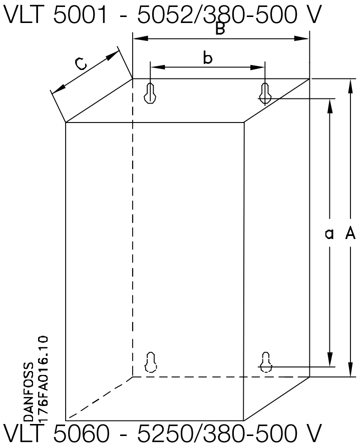
VLT type	A (mm)	B (mm)	C (mm)	D (mm)	a (mm)	b (mm)	ab/be (mm)	l/r (mm)
5001 - 5005	460	282	195	85	260	258	100	0
5006 - 5011	530	282	195	85	330	258	100	0
5016 - 5027	810	355	280	70	560	330	200	0
5032 - 5052	940	400	280	70	690	375	200	0
5060 - 5100	937	495	421	-	830	374	225	50
5125 - 5250	1572	495	425	-	1465	445	225	0
5300 - 5500	2010	1200	600	-	-	-	400	0

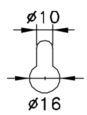
ab:Min. space above enclosure. be: Min. space below enclosure.
l/r: Min. distance between VLT frequency converter and other plant components, left and right sides.



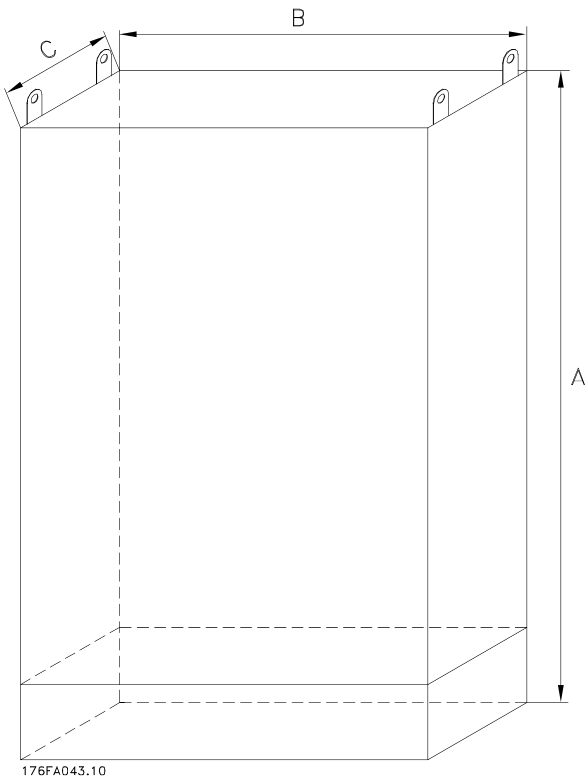


VLT 5001 - 5027/200-240 V
VLT 5001 - 5052/380-500 V



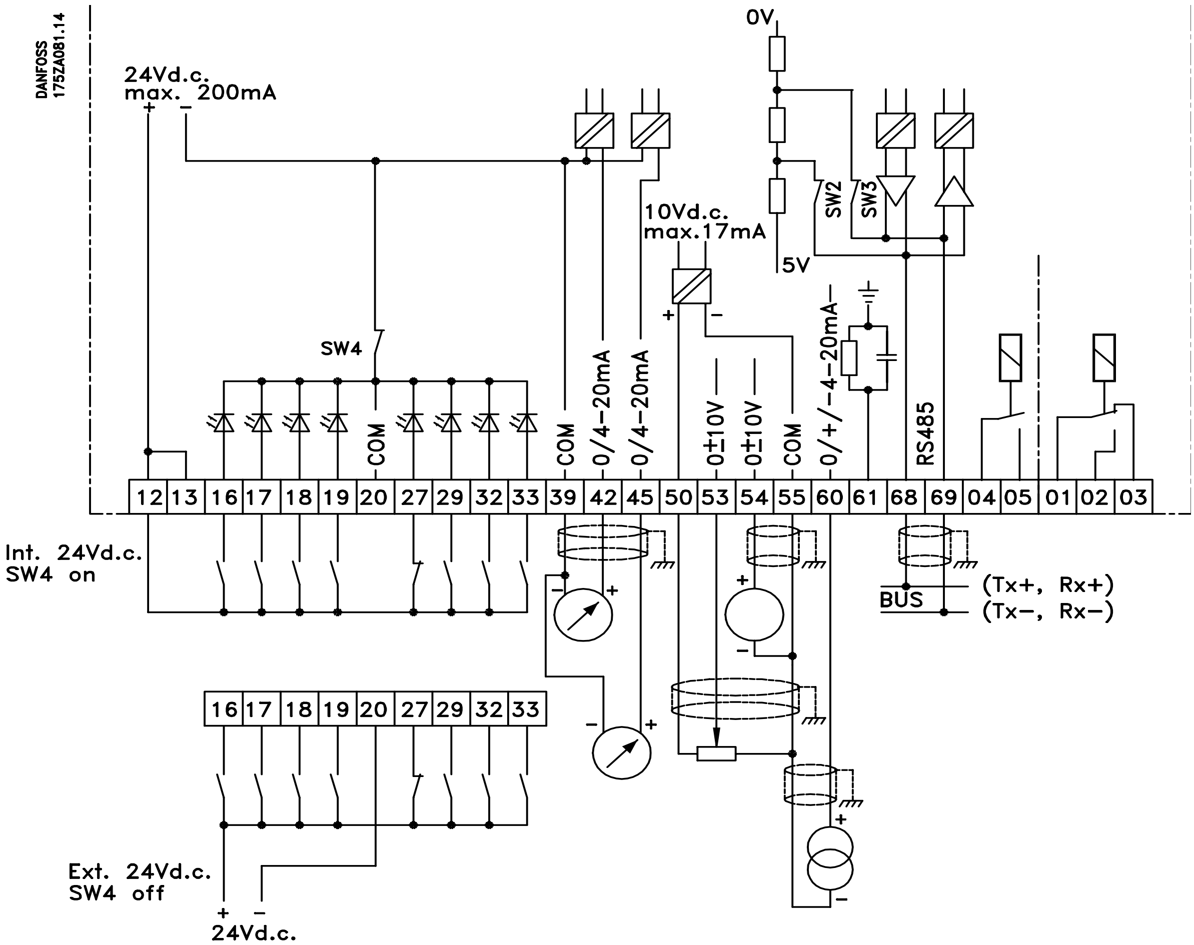


VLT 5060 - 5250/380-500 V
VLT 5032 - 5052/200-240 V



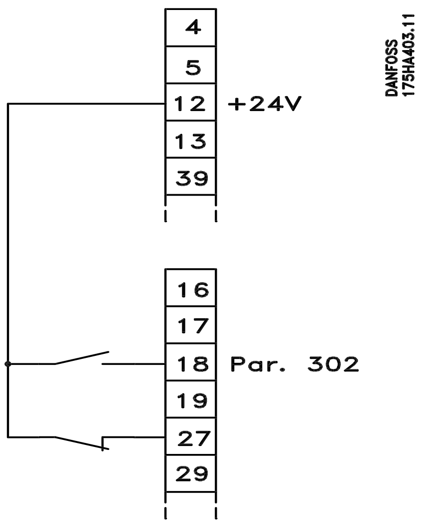
VLT 5300 - 5500/380-500 V

■ Electrical installation



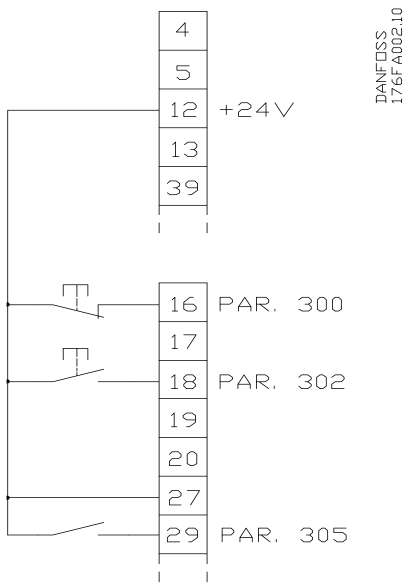
■ Connection examples

2-wire start/stop



- Start/stop using terminal 18.
  Parameter 302 = *Start* [1]
- Quick-stop using terminal 27.
  Parameter 304 = *Coasting stop inverted* [0]

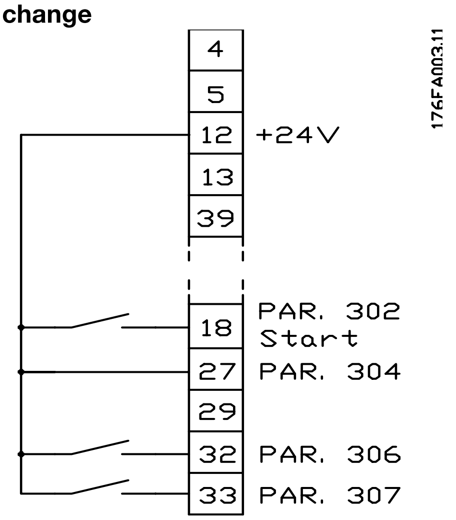
Pulse start/stop



- Stop inverted by means of terminal 16.
  Parameter 300 = *Stop inverted* [2]
- Pulse start using terminal 18.
  Parameter 302 = *Pulse start* [2]
- Jog by means of terminal 29.
  Parameter 305 = *Jog* [5]

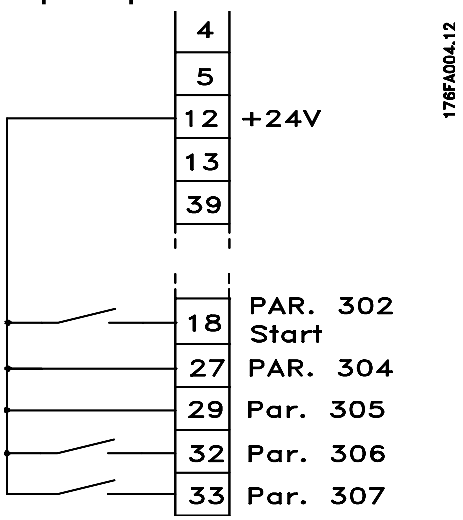
Connection examples, cont.

Setup change



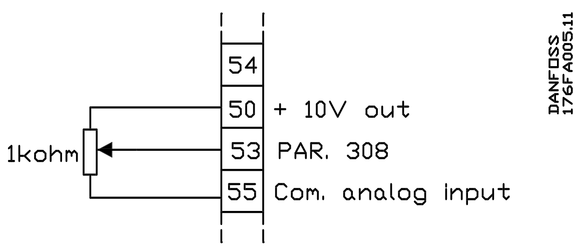
- Selection of setup using terminals 32 and 33.
  Parameter 306 = *Selection of setup, lsb* [10]
  Parameter 307 = *Selection of setup, msb* [10]
  Parameter 004 = *Multi-setup* [5].

Digital speed up/down



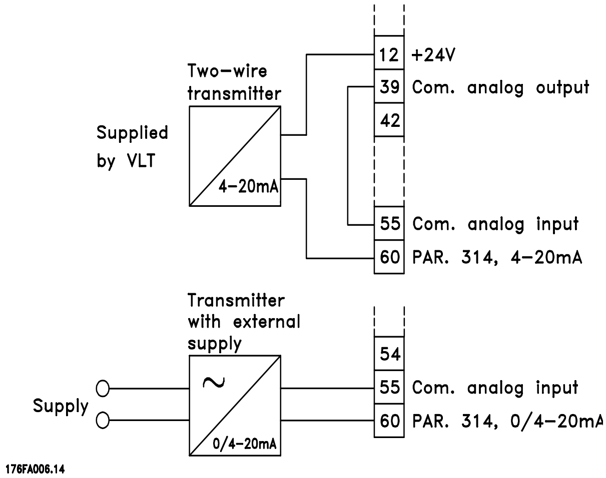
- Speed up and down using terminals 32 and 33.
  Parameter 306 = *Speed up* [9]
  Parameter 307 = *Speed down* [9]
  Parameter 305 = *Freeze reference* [9].

Potentiometer reference



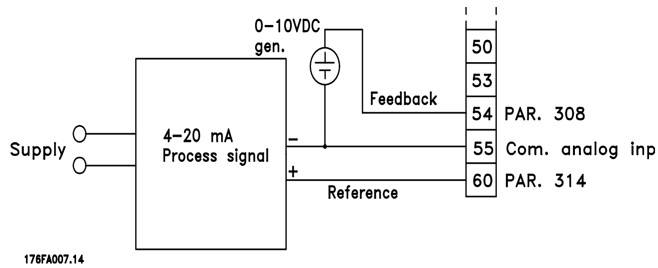
Parameter 308 = *Reference* [1]
Parameter 309 = *Terminal 53, min. scaling*
Parameter 310 = *Terminal 53, max. scaling*

Two-wire transmitter



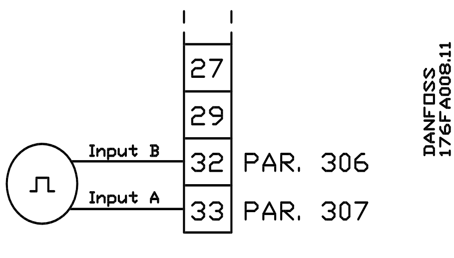
Parameter 314 = *Reference* [1], *Feedback* [2]
Parameter 315 = *Terminal 60, min. scaling*
Parameter 316 = *Terminal 60, max. scaling*

4-20 mA reference with speed feedback



Parameter 100 = *Speed control, closed loop*
Parameter 308 = *Feedback* [2]
Parameter 309 = *Terminal 53, min. scaling*
Parameter 310 = *Terminal 53, max. scaling*
Parameter 314 = *Reference* [1]
Parameter 315 = *Terminal 60, min. scaling*
Parameter 316 = *Terminal 60, max. scaling*

Encoder connection



Parameter 306 = *Encoder input B* [24]
Parameter 307 = *Encoder input A* [25]

If an encoder is connected that only has one output to *Encoder input A* [25], *Encoder input B* [24] must be set to *No function* [0].

■ Galvanic isolation (PELV)

PELV offers protection by way of extra low voltage. Protection against electric shock is considered to be ensured when the electrical supply is of the PELV type and the installation is made as described in local/ national regulations on PELV supplies.

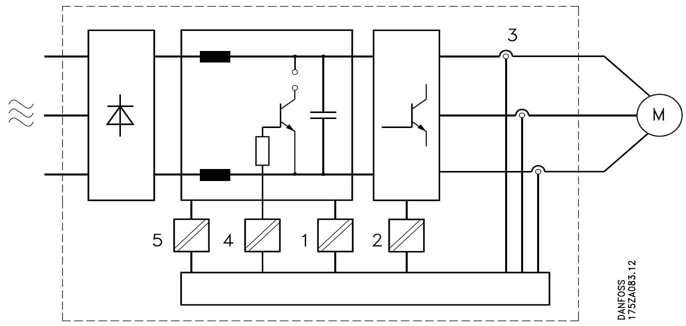
In VLT 5000 Series all control terminals as well as terminals 01-03 (AUX relay) are supplied from or in connection with extra low voltage (PELV).

Galvanic (ensured) isolation is obtained by fulfilling requirements concerning higher isolation and by providing the relevant creapage/clearance distances. These requirements are described in the EN 50178 standard.

The components that make up the electrical isolation, as described below, also comply with the requirements concerning higher isolation and the relevant test as described in EN 50178.
The galvanic isolation can be shown in five locations (see drawing below), namely:

1. Power supply (SMPS) incl. signal isolation of U_{DC}, indicating the intermediate current voltage.
2. Gate drive that runs the IGBTs (trigger transformers/opto-couplers).
3. Current transducers (Hall effect current transducers).
4. Opto-coupler, brake module.
5. Opto-coupler, 24 V external supply.

Galvanic isolation



■ Earth leakage current

Earth leakage current is primarily caused by the capacitance between motor phases and the motor cable screen. When an RFI filter is used, this contributes additional leakage current, as the filter circuit is connected to earth through capacitors.
The size of the leakage current to the ground depends on the following factors, in order of priority:

1. Length of motor cable
2. Motor cable with or without screen
3. Switching frequency
4. RFI filter used or not
5. Motor grounded on site or not

The leakage current is of importance to safety during handling/operation of the frequency converter if (by mistake) the frequency converter has not been earthed.

NB! RCD
Since the leakage current is > 3.5 mA, reinforced earthing must be established, which is required if EN 50178 is to be complied with.
Never use ELCB relays (type A) that are not suitable for DC fault currents (type A).

If ELCB relays are used, they must be:

- Suitable for protecting equipment with a direct current content (DC) in the fault current (3-phase bridge rectifier)
- Suitable for power-up with short pulse-shaped charging current to earth
- Suitable for a high leakage current.

Extreme running conditions

Short circuit

VLT 5000 Series is protected against short circuits by means of current measurement in each of the three motor phases. A short circuit between two output phases will cause an overcurrent in the inverter. However, each transistor of the inverter will be turned off individually when the short circuit current exceeds the permitted value.

After 5-10 µs the driver card turns off the inverter and the frequency converter will display a fault code, although depending on impedance and motor frequency.

Earth fault

The inverter cuts out within 100 µs in case of an earth fault on a motor phase, although depending on impedance and motor frequency.

Switching on the output

Switching on the output between the motor and the frequency converter is fully permitted. It is not possible to damage VLT 5000 Series in any way by switching on the output. However, fault messages may appear.

Motor-generated overvoltage

The voltage in the intermediate circuit is increased when the motor acts as a generator. This occurs in two cases:

1. The load drives the motor (at constant output frequency from the frequency converter), i.e. the load generates energy.
2. During deceleration ("ramp-down") if the moment of inertia is high, the load is low and the ramp-down time is too short for the energy to be dissipated as a loss in the VLT frequency converter, the motor and the installation.

The control unit attempts to correct the ramp if possible.
The inverter turns off to protect the transistors and the intermediate circuit capacitors when a certain voltage level is reached.

Mains drop-out

During a mains drop-out, VLT 5000 Series continues until the intermediate circuit voltage drops below the minimum stop level, which is typically 15% below VLT 5000 Series's lowest rated supply voltage.

The time before the inverter stops depends on the mains voltage before the drop-out and on the motor load.

Static overload

When VLT 5000 Series is overloaded (the torque limit in parameter 221/222 has been reached), the controls will reduce the output frequency in an attempt to reduce the load.
If the overload is excessive, a current may occur that makes the VLT frequency converter cut out after approx. 1.5 sec.

Operation within the torque limit can be limited in time (0-60 s) in parameter 409.

Peak voltage on motor

When a transistor in the inverter is opened, the voltage across the motor increases by a dV/dt ratio that depends on:

- the motor cable (type, cross-section, length screened or unscreened)
- inductance

The natural induction causes an overshot U_{PEAK} in the motor voltage before it stabilises itself at a level which depends on the voltage in the intermediate circuit. The rise time and the peak voltage U_{PEAK} affect the service life of the motor. If the peak voltage is too high, motors without phase coil insulation are the ones that will primarily be affected. If the motor cable is short (a few metres), the rise time and peak voltage are lower.
If the motor cable is long (100 m), the rise time and peak voltage will increase.

If very small motors are used without phase coil insulation, it is recommended to fit a LC filter after the frequency converter.
Typical values for the rise time and peak voltage U_{PEAK} measured on the motor terminals between two phases:

VLT 5001-5006 200-240 V, VLT 5001-5011 380-500 V

Cable length	Mains voltage	Rise time	Peak voltage
50 metres	380 V	0.3 µsec.	850 V
50 metres	500 V	0.4 µsec.	950 V
150 metres	380 V	1.2 µsec.	1000 V
150 metres	500 V	1.3 µsec.	1300 V

VLT 5008-5027 200-240 V, VLT 5016-5052 380-500 V

Cable length	Mains voltage	Rise time	Peak voltage
50 metres	380 V	0.1 µsec.	900 V
150 metres	380 V	0.2 µsec.	1000 V

VLT 5060-5250 / 380-500 V

Cable length	Mains voltage	Rise time	Peak voltage
13 metres	460 V	670 V/µsec.	815 V
20 metres	500 V	620 V/µsec.	915 V

Switching on the input

Switching on the input depends on the mains voltage in question and on whether Quick discharge of the intermediate capacitor has been selected.
The table below states the waiting time between cut-ins.

Mains voltage	380 V	415 V	460 V	580 V
Without quick discharge	48 s	65 s	89 s	117 s
With quick discharge	74 2	95 s	123 s	158 s

Acoustic noise

The acoustic interference from the frequency converter comes from two sources:

1. DC intermediate circuit coils
2. Integral fan.

Below are the typical values measured at a distance of 1 m from the unit at full load:

VLT 5001-5006 200 V, VLT 5001-5011 400 V

IP 20 units: 50 dB(A)

VLT 5008-5027 200 V, VLT 5016-5052 400 V

IP 20 units: 61 dB(A)
IP 54 units: 66 dB(A)

VLT 5032-5052 / 200 - 240 V

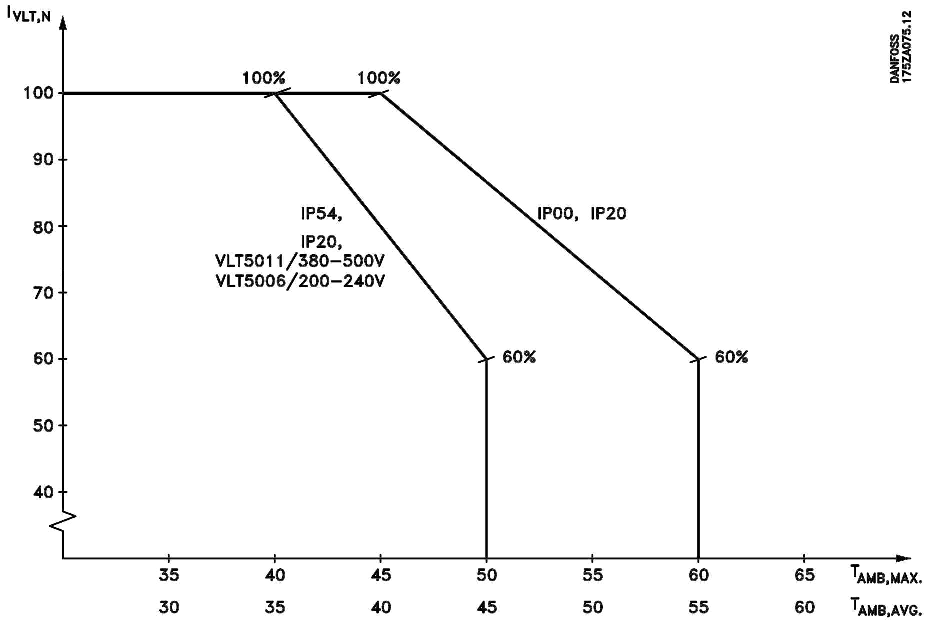
IP 20 units: 70 dB(A)
IP 54 units: 65 dB(A)

VLT 5060-5250 / 380 - 500 V

IP 20 units: 70 dB(A)
IP 54 units: 75 dB(A)

■ Derating for ambient temperature

The ambient temperature ($T_{AMB,MAX}$) is the maximum temperature allowed. The average ($T_{AMB,AVG}$) measured over 24 hours must be at least 5ºC lower.
If VLT 5000 Series is operated at temperatures above 45 ºC, a derating of the continuous output current is necessary.

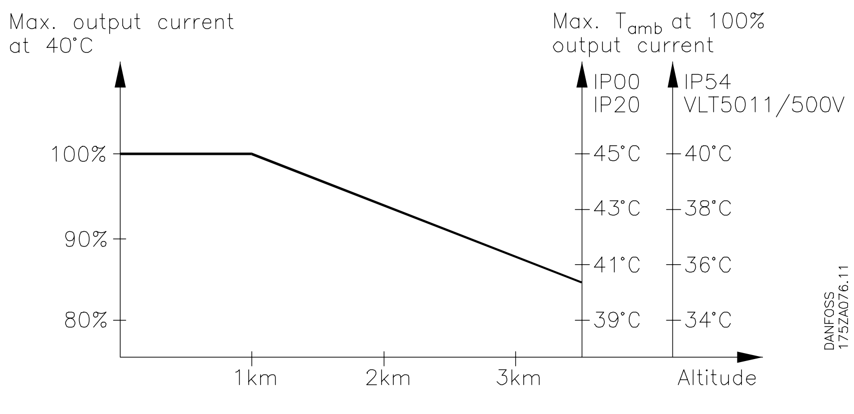


■ Derating for air pressure

Below 1000 m altitude no derating is necessary.

Above 1000 m the ambient temperature (T_{AMB}) or max. output current ($I_{VLT,MAX}$) must be derated in accordance with the diagram below:

1) Derating of output current versus altitude at T_{AMB} = max. 45°C
2) Derating of max. T_{AMB} versus altitude at 100% output current.



■ Derating for running at low speed

When a motor is connected to a frequency converter, it is necessary to check whether the cooling of the motor is adequate.
At low rpm values, the motor fan is not able to supply the required volume of air for cooling. This problem occurs when the load torque is constant (e.g. a conveyor belt) across the regulating range. The reduced ventilation available decides the size of the torque that can be permitted under a continuous load. If the motor is to run continuously at an rpm value lower than half the rated value, the motor must be supplied with additional air for cooling.
Instead of such extra cooling, the load level of the motor can be reduced. This can be done by choosing a bigger motor. However, the design of the frequency converter sets limits as to the size of motor that can be connected to it.

■ Derating for installing long motor cables or cables with larger cross-section

VLT 5000 Series has been tested using 300 m unscreened cable and 150 m screened cable.

VLT 5000 Series has been designed to work using a motor cable with a rated cross-section. If a cable with a larger cross-section is to be used, it is recommended to reduce the output current by 5% for every step the cross-section is increased.
(Increased cable cross-section leads to increased capacity to earth, and thus an increased earth leakage current).

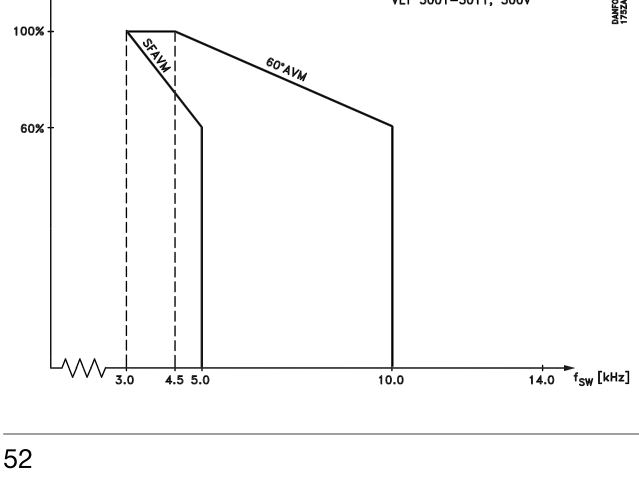
■ Derating for high switching frequency

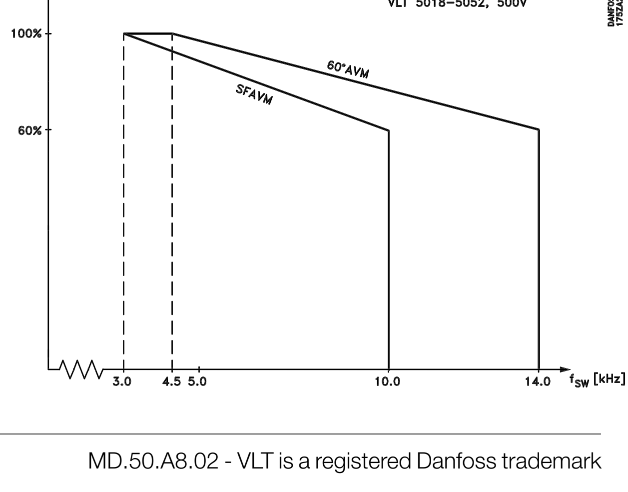
A higher switching frequency (to be set in parameter 411) leads to higher losses in the electronics of the VLT frequency converter.

If *SFAVM* has been selected in parameter 446, the VLT frequency converter will automatically derate the rated output current $I_{VLT,N}$ when the switching frequency exceeds 3.0 kHz.

If *60°AVM* is selected, the VLT frequency converter will automatically derate when the switching frequency exceeds 4.5 kHz. In both cases, the reduction is carried out linearly, down to 60% of $I_{VLT,N}$.
The table gives the min., max. and factory-set switching frequencies for VLT 5000 units. The switching pattern can be changed in parameter 446 and the switching frequency in parameter 411.

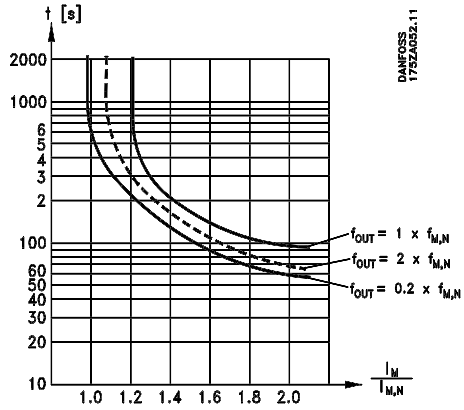
	SFAVM			**60 deg. AVM**		
	Min. [kHz]	Max. [kHz]	Fac. [kHz]	Min. [kHz]	Max. [kHz]	Fac. [kHz]
VLT 5001-5006, 200 V	3.0	5.0	3.0	3.0	10.0	4.5
VLT 5008-5027, 200 V	3.0	10.0	3.0	3.0	14.0	4.5
VLT 5032-5052, 200 V	3.0	4.5	3.0	3.0	4.5	4.5
VLT 5001-5011, 500 V	3.0	5.0	3.0	3.0	10.0	4.5
VLT 5016-5052, 500 V	3.0	10.0	3.0	3.0	14.0	4.5
VLT 5060-5250, 500 V	3.0	4.5	3.0	3.0	4.5	4.5





■ Motor thermal protection

The motor temperature is calculated on the basis of motor current, output frequency and time. See parameter 128 in the Operating Instructions.



■ Vibration and shock

VLT 5000 Series has been tested according to a procedure based on the following standards:

IEC 68-2-6:	Vibration (sinusoidal) - 1970
IEC 68-2-34:	Random vibration broad-band - general requirements
IEC 68-2-35:	Random vibration broad-band - high reproducibility
IEC 68-2-36:	Random vibration broad-band - medium reproducibility

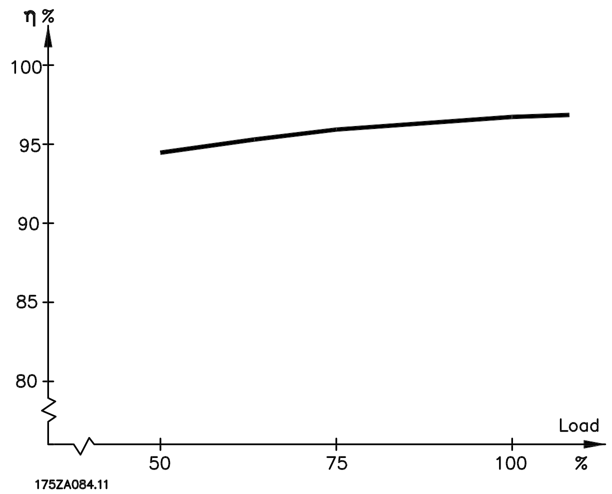
VLT 5000 Series complies with requirements that correspond to conditions when the unit is mounted on the walls and floors of production premises, as well as in panels bolted to walls or floors.

■ Air humidity

VLT 5000 Series has been designed to meet the IEC 68-2-3 standard, EN 50178 pkt. 9.4.2.2/DIN 40040, class E, at 40°C.

■ Efficiency

To reduce energy consumption it is very important to optimize the efficiency of a system. The efficiency of each single element in the system should be as high as possible.



Efficiency of VLT 5000 Series (η_{VLT})

The load on the frequency converter has little effect on its efficiency. In general, the efficiency is the same at the rated motor frequency $f_{M,N}$, regardless of whether the motor supplies 100% of the rated shaft torque or only 75%, i.e. in case of part loads.

This also means that the efficieny of the frequency converter does not change even if other U/f characteristics are chosen.
However, the U/f characteristics influence the efficiency of the motor.

The efficiency declines a little when the switching frequency is set to a value of above 4 kHz (3 kHz for VLT 5005) (parameter 411). The rate of efficiency will also be slightly reduced if the mains voltage is 500 V, or if the motor cable is longer than 30 m.

Efficiency of the motor (η_{MOTOR})

The efficiency of a motor connected to the frequency converter depends on the sine shape of the current. In general, the efficiency is just as good as with mains operation. The efficiency of the motor depends on the type of motor.

In the range of 75-100% of the rated torque, the efficiency of the motor is practically constant, both when it is controlled by the frequency converter and when it runs directly on mains.

In small motors, the influence from the U/f characteristic on efficiency is marginal; however, in motors from 11 kW and up, the advantages are significant.

In general, the switching frequency does not affect the efficiency of small motors. Motors from 11 kW and up have their efficiency improved (1-2%). This is because the sine shape of the motor current is almost perfect at high switching frequency.

Efficiency of the system (η_{SYSTEM})

To calculate the system efficiency, the efficiency of VLT 5000 Series (η_{VLT}) is multiplied by the efficiency of the motor (η_{MOTOR}):

$\eta_{SYSTEM} = \eta_{VLT} \times \eta_{MOTOR}$

Based on the graph on this page, it is possible to calculate the efficiency of the system at different loads.

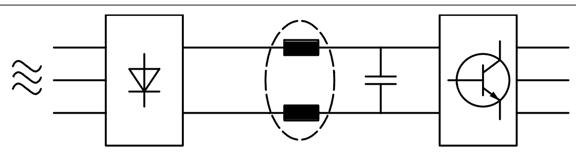
■ Mains supply interference/harmonics

A frequency converter takes up a non-sinusoidal current from mains, which increases the input current I_{RMS}. A non-sinusoidal current can be transformed by means of a Fourier analysis and split up into sine wave currents with different frequencies, i.e. different harmonic currents I_N with 50 Hz as the basic frequency:

Harmonic currents	I_1	I_5	I_7
Hz	50 Hz	250 Hz	350 Hz

The harmonics do not affect the power consumption directly, but increase the heat losses in the installation (transformer, cables). Consequently, in plants with a rather high percentage of rectifier load, it is important to maintain harmonic currents at a low level to avoid overload of the transformer and high temperature in the cables.

Some of the harmonic currents might disturb communication equipment connected to the same transformer or cause resonance in connection with power-factor correction batteries.



Harmonic currents compared to the RMS input current:

	Input current
I_{RMS}	1.0
I_1	0.9
I_5	0.4
I_7	0.2
I_{11-49}	< 0.1

To ensure low, harmonic currents, VLT 5000 has intermediate circuit coils as standard. This normally reduces the input current I_{RMS} by 40%.

The voltage distortion on the mains supply depends on the size of the harmonic currents multiplied by the mains impedance for the frequency in question. The total voltage distortion THD is calculated on the basis of the individual voltage harmonics using the following formula:

$$\text{THD\%} = \sqrt{U_5^2 + U_7^2 + \cdots U_N^2} \quad (U_N\% \text{ of } U)$$

■ Power factor

The power factor is the relation between I_1 and I_{RMS}.

The power factor for 3-phase control

$$= \frac{\sqrt{3} \times U \times I_1 \times \cos \varphi_1}{\sqrt{3} \times U \times I_{RMS}}$$

$$\text{Power factor} = \frac{I_1 \times \cos \varphi_1}{I_{RMS}} = \frac{I_1}{I_{RMS}} \quad \text{since } \cos \varphi = 1$$

The power factor indicates the extent to which the frequency converter imposes a load on the mains supply.
The lower the power factor, the higher the I_{RMS} for the same kW performance.

In addition, a high power factor indicates that the different harmonic currents are low.

$$I_{RMS} = \sqrt{I_1^2 + I_5^2 + I_7^2 + \ldots + I_n^2}$$

What is CE labelling?

The purpose of CE labelling is to avoid technical obstacles to trade within EFTA and the EU. The EU has introduced the CE label as a simple way of showing whether a product complies with the relevant EU directives. The CE label says nothing about the specifications or quality of the product. Frequency converters are regulated by three EU directives:

The machinery directive (89/392/EEC)

All machines with critical moving parts are covered by the machinery directive, which came into force on 1 January 1995. Since a frequency converter is largely electrical, it does not fall under the machinery directive. However, if a frequency converter is supplied for use in a machine, we provide information on safety aspects relating to the VLT frequency converter. We do this by means of a manufacturer's declaration.

The low-voltage directive (72/23/EEC)

Frequency converters must be CE labelled in accordance with the low-voltage directive. The directive applies to all electrical equipment and appliances used in the voltage range of 50-1000 V AC and 75-1500 V DC.

The EMC directive (89/336/EEC)

EMC is short for electromagnetic compatibility. The presence of electromagnetic compatibility means that the mutual interference between different components/ appliances is so small that the functioning of the appliances is not affected. The EMC directive came into force on 1 January 1996. The directive distinguishes between components, appliances, systems and installations.

What is covered?

The EU "Guidelines on the Application of Council Directive 89/336/EEC" outline three typical situations of using a frequency converter. For each of these situations, explanations are offered as to whether the situation in question is covered by the EMC directive and must be CE labelled.

1. The frequency converter is sold directly to the end-consumer. The frequency converter is for example sold to a DIY market. The end-consumer is a layman. He installs the frequency converter himself for use with a hobby machine, a kitchen appliance, etc. For such applications, the VLT frequency converter must be CE labelled in accordance with the EMC directive.

2. The frequency converter is sold for installation in a plant. The plant is built up by professionals of the trade. It could be a production plant or a heating/ ventilation plant designed and installed by professionals of the trade. Neither the frequency converter nor the finished plant has to be CE labelled under the EMC directive. However, the unit must comply with the basic EMC requirements of the directive. The installer can ensure this by using components, appliances and systems that are CE labelled under the EMC directive.

3. The frequency converter is sold as part of a complete system. The system is being marketed as complete. It could be e.g. an air-conditioning system. The complete system must be CE labelled in accordance with the EMC directive. The manufacturer who supplies the system can ensure CE labelling under the EMC directive either by using CE labelled components or by testing the EMC of the system. If he chooses to use only CE labelled components, he does not have to test the entire system.

■ Danfoss VLT frequency converter and CE labelling

CE labelling is a positive feature when used for its original purpose, i.e. to facilitate trade within the EU and EFTA.

However, CE labelling may cover many different specifications. This means that is has to be checked what a given CE label specifically covers.

The specifications covered can in fact be widely different. That is why a CE label can give the installer a false feeling of security when using a frequency converter as a component in a system or an appliance.

We CE label our VLT frequency converters in accordance with the low-voltage directive. This means that as long as the VLT frequency converter is installed correctly, we guarantee that it complies with the low-voltage directive. We issue a declaration of conformity that confirms our CE labelling in accordance with the low-voltage directive.

The CE label also applies to the EMC directive, on condition that the instructions given in the Operating Instructions for EMC-correct installation and filtering have been followed. On this basis, a declaration of conformity in accordance with the EMC directive is issued.

The Operating Instructions give detailed instructions for installation to ensure that your installation is EMC-correct. Furthermore, we specify which norms that are complied with by our different products.

We offer the filters that can be seen from the specifications and gladly provide other types of assistance that can help you obtain the best EMC result.

■ Compliance with EMC directive 89/336/EEC

In the great majority of cases, the VLT frequency converter is used by professionals of the trade as a complex component forming part of a larger appliance, system or installation. It must be noted that the responsibility for the final EMC properties of the appliance, system or installation rests with the installer. As an aid to the installer, Danfoss has prepared EMC installation guidelines for the Power Drive System. The standards and test levels stated for Power Drive Systems are complied with, provided the right EMC-correct instructions for installation have been followed, see electrical installation.

■ General aspects of EMC emissions

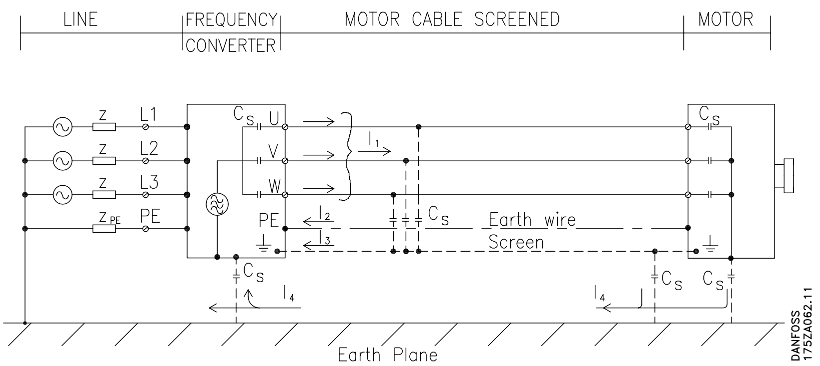
Electrical interference at frequences in the range 150 kHz to 30 MHz are usually conducted. Airborne interference from the drive system in the range 30 MHz to 1 GHz is generated from the inverter, the motor cable and the motor.

As the sketch below shows, capacitive currents in the motor cable together with a high dV/dt from the motor voltage generate leakage currents.

The use of a screened motor cable increases the leakage current (see figure below). This is because screened cables have higher capacitance to earth than unscreened cables. If the leakage current is not filtered, it will cause greater interference on the mains in the radio frequency range below approx. 5 MHz. Since the leakage current (I_1) is carried back to the unit through the screen (I_3), there will in principle only be a small electro-magnetic field (I_4) from the screened motor cable according to the below figure.

The screen reduces the radiated interference, but increases the low-frequency interference on the mains. The motor cable screen must be connected to the VLT enclosure as well as on the motor enclosure. The best way of doing this is by using integrated screen clamps (see drawing on page 30 of the Operating Instructions) so as to avoid twisted screen ends (pigtails). These increase the screen impedance at higher frequencies, which reduces the screen effect and increases the leakage current (I_4).

If a screened cable is used for Profibus, standard bus, relay, control cable, signal interface and brake, the screen must be mounted on the enclosure at both ends. In some situations, however, it will be necessary to break the screen to avoid current loops.



In the cases when the screen is to be placed on a mounting plate for the VLT frequency converter, the mounting plate must be made of metal, because the screen currents are to be conveyed back to the unit. It is also important to ensure good electrical contact from the mounting plate through the mounting screws to the VLT frequency converter chassis.

With respect to installation, it is generally less complicated to use unscreened cables than screened ones.

NB!
Please note, however, that when unscreened cables are used, some emission requirements are not complied with, although the immunity requirements are complied with, see test results on page 59-61.

In order to reduce the interference level from the system overall (unit + installation) as far as possible, it is important to make motor and brake cables as short as possible. Cables with a sensitive signal level must not be alongside motor and brake cables. Radio interference higher than 50 MHz (airborne) will be generated especially by the control electronics.

■ EMC test results (Emission, Immunity)

The following test results have been obtained using a system with a VLT frequency converter (with options if relevant), a screened control cable, a control box with potentiometer, as well as a motor and motor cable.

VLT 5001-5011/380-500V VLT 5001-5006/200-240V	Emission					
	Environment	Industrial environment		Housing, trades and light industries		
	Basic standard	EN 55011 Class A1		EN 55011 Class B1		EN 55014
Setup	Motor cable	Conducted 150 kHz-30 MHz	Radiated 30 MHz-1 GHz	Conducted 150 kHz-30 MHz	Radiated 30 MHz-1 GHz	Conducted 150 kHz-230 MHz
VLT 5000 with RFI filter option	300 m unscreened/ unarmoured	Yes 3)	No	No	No	No
	50 m br. screened/ armoured (Bookstyle 20m)	Yes	Yes	Yes 2)	No	No
	150m br. screened/ armoured	Yes 1)	Yes 1)	No	No	No
VLT 5000 with integrated RFI-filter (+ LC-module)	300 m unscreened/ unarmoured	Yes	No	No	No	No
	50 m br. screened/ armoured	Yes	Yes	Yes 2)	No	No
	150m br. screened/ armoured	Yes	Yes	No	No	No

1) For VLT 5011/380-500 V and VLT 5006/200-240 V this is only complied with if a maximum braided screened/ armoured cable of 100 m is used.
2) Does not apply to 5011/380-500 V and 5006/200-240 V.
3) Depending on installation conditions

VLT 5016-5500/380-500 V VLT 5008-5052/200-240 V	Emission				
	Environment	Industrial environment		Housing, trades and light industries	
	Basic standard	EN 55011 Class A1		EN 55011 Class B1	
Setup	Motor cable	Conducted 150 kHz-30 MHz	Radiated 30 MHz-1 GHz	Conducted 150 kHz-30 MHz	Radiated 30 MHz-1 GHz
VLT 5000 w/o RFI filter option	300 unscreened/ unarmoured	No	No	No	No
	150 m br. screened/ armoured	No	Yes	No	No
VLT 5000 with RFI-module (integrated)	300 m unscreened/ unarmoured	Yes 1) 2)	No	No	No
	50 m br. screened/ armoured	Yes	Yes	Yes 1)	No
	150 m br. screened/ armoured	Yes	Yes	No	No

1) Does not apply to VLT 5008-5027/200-240 V IP 54, VLT 5016-5052/380-500 V IP 54 and VLT 5300 - 5500/380-500 V
2) Depending on installation conditions

In order to minimise the conducted noise to the mains supply and the radiated noise from the frequency converter system, the motor cables should be as short as possible and the screen ends should be made in accordance with the section on electrical installation.

■ Generic standards

Standard/ Environment	Housing, trades and light industries		Industrial environment	
	Conducted	Radiated	Conducted	Radiated
EN 50081-1	Class B	Class B		
EN 50081-2			Class A-1	Class A-1
EN 61800-3	Class B	Class B	Threshold values are being considered	
EN 61800-3	Class A-1	Class A-1	Threshold values are being considered	

EN 55011: Threshold values and measuring methods for radio interference from industrial, scientific and medical (ISM) high-frequency equipment.

Class A-1: Equipment used in a manufacturing environment.

Class B-1: Equipment used in areas with a public supply network (dwellings, commerce and light industries).

■ EMC Immunity

In order to confirm immunity against interference from electrical phenomena, the following immunity test has been made on a system consisting of a VLT frequency converter (with options, if relevant), a screened control cable and control box with potentiometer, motor cable and motor.

The tests were made in accordance with the following basic standards:

- ***EN 61000-4-2 (IEC 1000-4-2):*** **Electrostatic discharges (ESD)**
  Simulation of electrostatic discharges from human beings.

- ***EN 61000-4-3 (IEC 1000-4-3):*** **Incoming electromagnetic field radiation, amplitude modulated**
  Simulation of the effects of radar and radio communication equipment as well as mobile communications equipment.

- ***EN 61000-4-4 (IEC 1000-4-4):*** **Burst transients**
  Simulation of interference brought about by switching with a contactor, relays or similar devices.

- ***EN 61000-4-5 (IEC 1000-4-5):*** **Surge transients**
  Simulation of transients brought about e.g. by lightning that strikes near installations.

- ***ENV 50140:*** **Incoming electromagnetic field, pulse modulated**
  Simulation of the impact from GSM telephones.

- ***ENV 50141:*** **Cable-borne HF**
  Simulation of the effect of radio transmission equipment connected to supply cables.

- ***VDE 0160 class W2 test pulse:*** **Mains transients**
  Simulation of high-energy transients brought about by main fuse breakage, switching of power factor-correction capacitors, etc.

■ Immunity, continued

VLT 5001-5500 380-500 V, VLT 5001-5027 200-240 V

Basic standard	Burst IEC 1000-4-4	Surge IEC 1000-4-5		ESD 1000-4-2	Radiated electro-magnetic field IEC 1000-4-3	Mains distortion VDE 0160	RF common mode voltage ENV 50141	Radiated radio freq.elect.field ENV 50140
Acceptance criterion	B	B		B	A		A	A
Port connection	CM	DM	CM		DM	CM	DM	
Line	OK	OK	OK	-	-	OK	OK	-
Motor	OK	-	-	-	-	-	-	-
Control lines	OK	-	OK	-	-	-	OK	-
PROFIBUS option	OK	-	OK	-	-	-	-	-
Signal Interface<3 m	OK	-	-	-	-	-	-	-
Enclosure	-	-	-	OK	OK	-	-	OK
Load sharing	OK	-	-	-	-	-	OK	-
Standard bus	OK	-	OK	-	-	-	OK	-
Brake	OK	-	-	-	-	-	OK	-
External 24 V DC	OK	-	OK	-	-	-	OK	-
Basic specifications								
Line	4 kV/5kHz/DCN	2 kV/2Ω	4 kV/12Ω	-	-	$2,3 \times U_N$ [2]	10 V_{RMS}	-
Motor	4 kV/5kHz/CCC	-	-	-	-	-	10 V_{RMS}	-
Control lines	2 kV/5kHz/CCC	-	2 kV/2Ω [1]	-	-	-	10 V_{RMS}	-
PROFIBUS option	2 kV/5kHz/CCC	-	2 kV/2Ω [1]	-	-	-	10 V_{RMS}	-
Signal interface<3 m	1 kV/5kHz/CCC	-	-	-	-	-	10 V_{RMS}	-
Enclosure	-	-	-	8 kV AD 6 kV CD	10 V/m	-	-	-
Load sharing	4 kV/5kHz/CCC	-	-	-	-	-	10 V_{RMS}	-
Standard bus	2 kV/5kHz/CCC	-	4 kV/2Ω [1]	-	-	-	10 V_{RMS}	-
Brake	4 kV/5kHz/CCC	-	-	-	-	-	10 V_{RMS}	-
External 24 V DC	2 kV/5kHz/CCC	-	4 kV/2Ω [1]	-	-	-	10 V_{RMS}	-

DM: Differential mode
CM: Common mode
CCC: Capacitive clamp coupling
DCN: Direct coupling network
[1]) Injection on cable shield
[2]) $2,3 \times U_N$: max. test pulse 380 V_{AC}: Class 2/1250 V_{PEAK}, 415 V_{AC}: Class 1/1350 V_{PEAK}