

■ VLT 6000 HVAC



■ Ordering guide

This section makes it easier for you to specify and order a VLT 6000 HVAC.

■ Choice of frequency converter

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

VLT 6000 HVAC is available for two mains voltage ranges: 200-240 V and 380-460 V.

■ Mains voltage

Choose mains voltage for 50/60 Hz:

- 200-240 V three-phase AC voltage
- 380-460 V three-phase AC voltage

Mains voltage 200 - 240 V

| VLT type | Typical shaft output | | Max continuous output current $I_{VLT,N}$ [A] | Max continuous output power at 240 V $S_{VLT,N}$ [kVA] |
|----------|----------------------|------|---|--|
| | $P_{VLT,N}$ [kW] | [HP] | | |
| 6002 | 1.1 | 1.5 | 6.6 | 2.7 |
| 6003 | 1.5 | 2.0 | 7.5 | 3.1 |
| 6004 | 2.2 | 3.0 | 10.6 | 4.4 |
| 6005 | 3.0 | 4.0 | 12.5 | 5.2 |
| 6006 | 4.0 | 5.0 | 16.7 | 6.9 |
| 6008 | 5.5 | 7.5 | 24.2 | 10.1 |
| 6011 | 7.5 | 10 | 30.8 | 12.8 |
| 6016 | 11 | 15 | 46.2 | 19.1 |
| 6022 | 15 | 20 | 59.4 | 24.7 |
| 6027 | 18.5 | 25 | 74.8 | 31.1 |
| 6032 | 22 | 30 | 88.0 | 36.6 |
| 6042 | 30 | 40 | 115/104* | 43.2 |
| 6052 | 37 | 50 | 143/130* | 54.0 |
| 6062 | 45 | 60 | 170/154* | 64.0 |

* The first figure is for a motor voltage of 200-230 V.
The next figure is for a motor voltage of 231-240 V.

VLT® 6000 HVAC

Mains voltage 380 - 415 V

| VLT type | Typical shaft output | | Max continuous output current | Max continuous output power at 400 V S _{VLT.N} |
|----------|----------------------|------|-------------------------------|--|
| | P _{VLT.N} | | | |
| | [kW] | [HP] | I _{VLT.N} [A] | [kVA] |
| 6002 | 1.1 | 1.5 | 3.0 | 2.2 |
| 6003 | 1.5 | 2.0 | 4.1 | 2.9 |
| 6004 | 2.2 | 3.0 | 5.6 | 4.0 |
| 6005 | 3.0 | - | 7.2 | 5.2 |
| 6006 | 4.0 | 5.0 | 10.0 | 7.2 |
| 6008 | 5.5 | 7.5 | 13.0 | 9.3 |
| 6011 | 7.5 | 10 | 16.0 | 11.5 |
| 6016 | 11 | 15 | 24.0 | 17.3 |
| 6022 | 15 | 20 | 32.0 | 23.0 |
| 6027 | 18.5 | 25 | 37.5 | 27.0 |
| 6032 | 22 | 30 | 44.0 | 31.6 |
| 6042 | 30 | 40 | 61.0 | 43.8 |
| 6052 | 37 | 50 | 73.0 | 52.5 |
| 6062 | 45 | 60 | 90.0 | 64.7 |
| 6075 | 55 | 75 | 106 | 73.0 |
| 6100 | 75 | 100 | 147 | 102 |
| 6125 | 90 | 125 | 177 | 123 |
| 6150 | 110 | 150 | 212 | 147 |
| 6175 | 132 | 200 | 260 | 180 |
| 6225 | 160 | 250 | 315 | 218 |
| 6275 | 200 | 300 | 368 | 255 |

Mains voltage 440 - 460 V

| VLT type | Typical shaft output | | Max continuous output current | Max continuous output power at 460 V S _{VLT.N} |
|----------|----------------------|------|-------------------------------|--|
| | P _{VLT.N} | | | |
| | [kW] | [HP] | I _{VLT.N} [A] | [kVA] |
| 6002 | 1.1 | 1.5 | 3.0 | 2.4 |
| 6003 | 1.5 | 2.0 | 3.4 | 2.7 |
| 6004 | 2.2 | 3.0 | 4.8 | 3.8 |
| 6005 | 3.0 | - | 6.3 | 5.0 |
| 6006 | 4.0 | 5.0 | 8.2 | 6.5 |
| 6008 | 5.5 | 7.5 | 11.0 | 8.8 |
| 6011 | 7.5 | 10 | 14.0 | 11.2 |
| 6016 | 11 | 15 | 21.0 | 16.7 |
| 6022 | 15 | 20 | 27.0 | 21.5 |
| 6027 | 18.5 | 25 | 34.0 | 27.1 |
| 6032 | 22 | 30 | 40.0 | 31.9 |
| 6042 | 30 | 40 | 52.0 | 41.4 |
| 6052 | 37 | 50 | 65.0 | 51.8 |
| 6062 | 45 | 60 | 77.0 | 61.3 |
| 6075 | 55 | 75 | 106 | 84.5 |
| 6100 | 75 | 100 | 130 | 104 |
| 6125 | 90 | 125 | 160 | 127 |
| 6150 | 110 | 150 | 190 | 151 |
| 6175 | 132 | 200 | 240 | 191 |
| 6225 | 160 | 250 | 302 | 241 |
| 6275 | 200 | 300 | 361 | 288 |

■ Enclosure

VLT 6000 HVAC is available with the following enclosures:

- IP 00: 30 to 45 kW / 200-240 V
- IP 00: 55 to 200 kW / 380-460 V
- Bookstyle IP 20: 1.1 to 3.0 kW / 200-240 V
- Bookstyle IP 20: 1.1 to 7.5 kW / 380-460 V
- IP 20: 1.1 to 45 kW / 200-240 V
- IP 20: 1.1 to 200 kW / 380-460 V
- IP 54: 1.1 to 45 kW / 200-240 V
- IP 54: 1.1 to 200 kW / 380-460 V

IP 00: This enclosure is only available for the larger power sizes of the VLT 6000 HVAC series. It is recommended for installation in standard cabinets.

IP 20 Bookstyle: This enclosure is designed for cabinet installation. It takes up a minimum of space and can be fitted side-by-side without installation of extra cooling equipment.

IP 20: This enclosure is used as standard enclosure for VLT 6000 HVAC. It is ideal for cabinet installation in areas where a high degree of protection is required. This enclosure also permits side-by-side installation.

IP 54: This enclosure can be fitted direct to the wall. Cabinets are not required. IP 54 units can also be installed side-by-side.

■ RFI filter

As standard, the VLT 6000 HVAC has an integral RFI filter up to and including 7.5 kW (3 kW 200 V).

These RFI filters comply with EMC standards EN 55011-1A, provided max. 150 m screened/armoured cable is used, and with EN 55011-1B, provided 50 m screened/armoured cable is used (Bookstyle max. 20 m screened/armoured).

Select a RFI filter for dampening of interference in accordance with EN 55011-1A and EN 55011-1B.

■ Harmonic filter

The harmonic currents do not directly affect the electricity consumption, but they do increase the heat losses in the installation (transformers, cables). That is why in systems with a rather high percentage of rectifier load it is important to keep the harmonic currents at a low level in order to avoid transformer overloads and high cable temperatures.

As standard, the VLT 6000 HVAC has coils in the intermediate circuit in order to ensure low harmonic currents. This typically reduces the input current I_{RMS} by 40 %.

■ Control unit (LCP)

The VLT 6000 HVAC is available with or without control unit (LCP); however, IP 54 units always come with the control unit.

This control unit makes up a complete interface for control and programming of the VLT 6000 HVAC. The control panel is detachable and may - as an alternative - be mounted up to 3 metres away from the VLT frequency converter, i.e. in a cabinet, by means of a fitting kit delivered with the unit.

Data information is given in a 4-line alpha-numerical display, which under normal operation is able to continuously show four operating data items and three operating modes. During programming, all the information required for quickly and efficiently setting up VLT frequency converter parameters will be shown.

As a supplement to the display, there are three indicator lamps for voltage (ON), warning (WARNING) and alarm (ALARM).

All VLT frequency converter parameter Setups can be changed directly via the control panel.

The following options are available:

- Control panel LCP (only for IP 20 units).
- LCP remote-mounting kit for remote control of IP 00 and IP 20 units.
- LCP remote-mounting kit for remote control of IP 54.
- 3 metre cable for LCP.

■ **Fieldbus protocols**

Danfoss VLT frequency converters are able to fulfil many different functions in an automated building management system. The VLT frequency converter can be integrated directly in an overall monitoring system.

This means that detailed process data can be transmitted via serial communication. The protocols listed below are based on a RS 485 bus system with a maximum transmission speed of 9600 bauds.

As standard, the following protocols are supported:

- Danfoss FC protocol
- Johnson's Control Metasys N2
- Landis & Staefa FLN

A frequency converter can be set and applied in all building management control systems.

Status messages, warnings and alarms provide valuable assistance in visualising and assessing processes.

■ **Fieldbus options**

The increasing need for information in building management systems makes it necessary to collect or visualise many different types of process data. Important process data can help the system technician in the day-by-day monitoring of the system, which means that a negative development - e.g. an increase in energy consumption - can be rectified in time.

The substantial amount of data in large buildings may generate a need for a higher transmission speed than 9600 baud. Danfoss VLT 6000 HVAC is available with LonWorks® or Profibus®, both of which have higher performance than standard integrated serial communication.

■ **Profibus**

Profibus is a fieldbus system with FMS and DP, which can be used for linking automation units, such as sensors and actuators, to the controls by means of a two-conductor cable.

Profibus **FMS** is used if major communication tasks are to be solved at cell and system level by means of large volumes of data.

Profibus **DP** is an extremely fast communication protocol, made specially for communication between the automation system and various units.

■ **LON - Local Operating Network**

LonWorks is an intelligent fieldbus system which improves the possibility of decentralising control, as communication is enabled between individual units in the same system (Peer-to-Peer).

This means that there is no need for a big main station for handling all the signals of the system (Master-Slave). Signals are sent direct to the unit that needs them via a common network medium. This makes communication much more flexible and the central building state control and monitoring system can be changed into a dedicated building state monitoring system whose task is to ensure that everything is running as planned. If the potential of LonWorks is fully utilised, sensors will also be connected to the bus, which means that a sensor signal can quickly be moved to another controller. If room dividers are mobile, this is a particularly useful feature.

Two feedback signals can be linked to the VLT 6000 HVAC by means of LonWorks, thereby enabling the internal PID regulator to regulate directly on the bus feedback.

■ **Unpacking and ordering a VLT frequency converter**

Are you are in doubt as to which VLT frequency converter you have received and which options it contains? Use the following table to find out. The table can also be used for ordering a VLT 6000 HVAC.

■ **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-6008-H-T4-B20-R3-DL-F10-A10

This means that the frequency converter ordered is a VLT 6008 for three-phase mains voltage of 380-460 V (**T4**) in Bookstyle enclosure IP 20 (**B20**). The hardware variant is with integral RFI filter, classes A & B (**R3**). The frequency converter features a control unit (**DL**) with a PROFIBUS option card (**F10**). Character no. 8 (**H**) indicates the application range of the unit: **H** = HVAC.

Bookstyle IP 20

| Motor power | Mains voltage, rated: | |
|-------------|-----------------------|-----------|
| | 200-240 V | 380-460 V |
| 1.1 kW | VLT 6002 | VLT 6002 |
| 1.5 kW | VLT 6003 | VLT 6003 |
| 2.2 kW | VLT 6004 | VLT 6004 |
| 3.0 kW | VLT 6005 | VLT 6005 |
| 4.0 kW | | VLT 6006 |
| 5.5 kW | | VLT 6008 |
| 7.5 kW | | VLT 6011 |

| Motor power | Mains voltage, rated: | |
|-------------|-----------------------|-----------|
| | 200-240 V | 380-460 V |
| 1.1 kW | VLT 6002 | VLT 6002 |
| 1.5 kW | VLT 6003 | VLT 6003 |
| 2.2 kW | VLT 6004 | VLT 6004 |
| 3.0 kW | VLT 6005 | VLT 6005 |
| 4.0 kW | VLT 6006 | VLT 6006 |
| 5.5 kW | VLT 6008 | VLT 6008 |
| 7.5 kW | VLT 6011 | VLT 6011 |
| 11 kW | VLT 6016 | VLT 6016 |
| 15 kW | VLT 6022 | VLT 6022 |
| 18.5 kW | VLT 6027 | VLT 6027 |
| 22 kW | VLT 6032 | VLT 6032 |
| 30 kW | VLT 6042 | VLT 6042 |
| 37 kW | VLT 6052 | VLT 6052 |
| 45 kW | VLT 6062 | VLT 6062 |

Units in the range of 1.1-45 kW come with enclosure IP 20, IP 54.

| Motor power | Mains voltage, rated: | |
|-------------|-----------------------|---------------------|
| | 400 V ¹⁾ | 460 V ¹⁾ |
| 55 kW | VLT 6075 | - |
| 75 kW | VLT 6100 | VLT 6075 |
| 90 kW | VLT 6125 | VLT 6100 |
| 110 kW | VLT 6150 | VLT 6125 |
| 132 kW | VLT 6175 | VLT 6150 |
| 160 kW | VLT 6225 | VLT 6175 |
| 200 kW | VLT 6275 | VLT 6225 |
| 250 kW | | VLT 6275 |

Units in the range of 55-250 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.

RFI-filter

Bookstyle units always come *with* an integral RFI filter that complies with EN 55011-1B with 20 m screened /armoured motor cable and EN 55011-1A with 150 m screened/armoured motor cable.

Units for a mains voltage of 240 V and a motor power of up to and including 4.0 kW (VLT 6006) and units for a mains voltage of 380-460 V and a motor power of up to 7.5 kW (VLT 6011) are always supplied with an integral class 1A & 1B filter.

Units for higher motor power than these (4.0 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, can be ordered either with or without the control unit. IP 54 units always come *with* a control unit.

■ Ordering form VLT 6000 HVAC

VLT 6 **-H-T-** **-S-T-R-** **D**

Power sizes
e.g. 6008

| | |
|------|---------|
| 6002 | 1.1 kW |
| 6003 | 1.5 kW |
| 6004 | 2.2 kW |
| 6005 | 3.0 kW |
| 6006 | 4.0 kW |
| 6008 | 5.5 kW |
| 6011 | 7.5 kW |
| 6016 | 11 kW |
| 6022 | 15 kW |
| 6027 | 18.5 kW |
| 6032 | 22 kW |
| 6042 | 30 kW |
| 6052 | 37 kW |
| 6062 | 45 kW |

| | |
|------|------------|
| 6002 | 1.1 kW |
| 6003 | 1.5 kW |
| 6004 | 2.2 kW |
| 6005 | 3.0 kW |
| 6006 | 4.0 kW |
| 6008 | 5.5 kW |
| 6011 | 7.5 kW |
| 6016 | 11 kW |
| 6022 | 15 kW |
| 6027 | 18.5 kW |
| 6032 | 22 kW |
| 6042 | 30 kW |
| 6052 | 37 kW |
| 6062 | 45 kW |
| 6075 | 55 kW |
| 6100 | 75/90 kW |
| 6125 | 90/110 kW |
| 6150 | 110/132 kW |
| 6175 | 132/160 kW |
| 6225 | 160/200 kW |
| 6275 | 200/250 kW |

Application range
HVAC H

Mains voltage
3 x 200 - 240 V T2
3 x 380 - 460 V T4

Enclosure
Bookstyle IP 20 B 20
6002-6005 200-240 V
6002-6011 380-460 V

IP 00 C 00
6042-6062 200-240 V
6075-6275 380-460 V

IP 20 C 20
6002-6062 200-240 V
6002-6275 380-460 V

IP 54 C 54
6002-6062 200-240 V
6002-6275 380-460 V

Hardware variant
standard only ST

RFI filter
Available w/o filter in the ranges R0
6006-6062 200-240 V
6016-6275 380-460 V

With integral 1A + 1B filter R3

Control unit (LCP)
W/o LCP (not an option with IP 54) D0
W/ LCP DL

Fieldbus option card
No option F 00
Profibus F 10
LonWorks Free Topology Process F 40
LonWorks 78 KBPS F 41
LonWorks 1.25 MBPS F 42

Application option card
W/ relay card A 31
(not with fieldbus option)

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.

■ 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. output frequency | Power loss | Order no. |
|---------------------------|------------------------|---------------------------|--------------------------|---------------|-----------|
| 6002-6003 Bookstyle | IP 20 Bookstyle | 7.8 A | 120 Hz | | 175Z0825 |
| 6004-6005 Booksyle | IP 20 Bookstyle | 15.2 A | 120 Hz | | 175Z0826 |
| 6002-6005 | IP 20 | 15.2 A | 120 Hz | | 175Z0832 |
| 6006-6008 | IP 00 | 25.0 A | 60 Hz | 85 W | 175Z4600 |
| 6011 | IP 00 | 32 A | 60 Hz | 90 W | 175Z4601 |
| 6016 | IP 00 | 46 A | 60 Hz | 110 W | 175Z4602 |
| 6022 | IP 00 | 61 A | 60 Hz | 170 W | 175Z4603 |
| 6027 | IP 00 | 73 A | 60 Hz | 250 W | 175Z4604 |
| 6032 | IP 00 | 88 A | 60 Hz | 320 W | 175Z4605 |

Mains supply 3 x 380 - 460 V

| LC filter for VLT type | LC filter enclosure | Rated current at 400/460 V | Max. output frequency | Power loss | Order no. |
|---------------------------|------------------------|-------------------------------|--------------------------|---------------|-----------|
| 6002-6005 Bookstyle | IP 20 Bookstyle | 7.2 A / 6.3 A | 120 Hz | | 175Z0825 |
| 6006-6011 Bookstyle | IP 20 Bookstyle | 16 A / 16 A | 120 Hz | | 175Z0826 |
| 6002-6011 | IP 20 | 16 A / 16 A | 120 Hz | | 175Z0832 |
| 6016 | IP 00 | 24 A / 21.7 A | 60 Hz | 125 W | 175Z4606 |
| 6022 | IP 00 | 32 A / 27.9 A | 60 Hz | 130 W | 175Z4607 |
| 6027 | IP 00 | 37.5 A / 32 A | 60 Hz | 140 W | 175Z4608 |
| 6032 | IP 00 | 44 A / 41.4 A | 60 Hz | 170 W | 175Z4609 |
| 6042 | IP 00 | 61 A / 54 A | 60 Hz | 250 W | 175Z4610 |
| 6052 | IP 00 | 73 A / 65 A | 60 Hz | 360 W | 175Z4611 |
| 6062 | IP 00 | 90 A / 78 A | 60 Hz | 450 W | 175Z4612 |
| 6075 | IP 20 | 106 A / 106 A | 60 Hz | | 175Z4701 |
| 6100 | IP 20 | 147 A / 130 A | 60 Hz | | 175Z4702 |
| 6125 | IP 20 | 177 A / 160 A | 60 Hz | | 175Z4703 |
| 6150 | IP 20 | 212 A / 190 A | 60 Hz | | 175Z4704 |
| 6175 | IP 20 | 260 A / 240 A | 60 HZ | | 175Z4705 |
| 6225 | IP 20 | 315 A / 302 A | 60 HZ | | 175Z4706 |
| 6275 | IP 20 | 395 A / 361 A | 60 Hz | | 175Z4707 |

■ 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 380-460 V units | 3 x 380/400/415/440/460 V ±10% |
| Supply frequency | 50/60 Hz +/- 1% |
| Max. imbalance of supply voltage: | |
| VLT 6002 - 6011 / 380 - 460 V and VLT 6002 - 6005 / 200 - 240 V | ±2.0% of rated supply voltage |
| VLT 6016 - 6062 / 380 - 460 V and VLT 6006 - 6032 / 200 - 240 V | ±1.5% of rated supply voltage |
| VLT 6075 - 6275 / 380 - 460 V and VLT 6042 - 6062 / 200 - 240 V | ±3.0% 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. short-circuit current | 100.000 A |

VLT output data (U, V, W):

| | |
|--|---------------------------|
| Output voltage | 0-100% of supply voltage |
| Output frequency | 0 - 120 Hz, 0 - 1000 Hz |
| Rated motor voltage, 200-240 V units | 200/208/220/230/240 V |
| Rated motor voltage, 380-460 V units | 380/400/415/440/460/500 V |
| Rated motor frequency | 50/60 Hz |
| Switching on output | Unlimited |
| Ramp times | 1- 3600 sec. |

Torque characteristics:

| | |
|--|--------------------------------|
| Starting torque | 110% for 1 min. |
| Starting torque (parameter 110 <i>High break-away torque</i>) | Max. torque: 160% for 0.5 sec. |
| Acceleration torque | 100% |
| Overload torque | 110% |

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 k Ω |
| 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.

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 k Ω |
| No. of programmable analogue current inputs | 1 |
| Terminal no. ground | 55 |
| Current range | 0/4 - 20 mA (scalable) |
| Input resistance, R_i | approx. 200 Ω |
| Resolution | 10 bit + sign |
| Accuracy on input | Max error 1% of full scale |
| Scanning time per input | 3 msec. |

Reliable galvanic isolation: All analogue inputs are galvanically isolated from the supply voltage (PELV) and other high-voltage terminals.

■ General technical data
Control card, pulse input:

| | |
|--|---------------------------------|
| No. of programmable pulse inputs | 3 |
| Terminal nos. | 17, 29, 33 |
| Max. frequency on terminal 17 | 5 kHz |
| Max. frequency on terminals 29, 33 | 20 kHz (PNP open collector) |
| Max. frequency on terminals 29, 33 | 65 kHz (Push-pull) |
| Voltage level | 0-24 V DC (PNP positive logics) |
| Voltage level, logic '0' | < 5 V DC |
| Voltage level, logic '1' | > 10 V DC |
| Maximum voltage on input | 28 V DC |
| Input resistance, R_i | approx. 2 k Ω |
| 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 inputs are galvanically isolated from the supply voltage (PELV). In addition, pulse 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) and other high-voltage terminals.

Control card, 24 V DC supply:

| | |
|----------------------------|--------|
| Terminal nos. | 12, 13 |
| Max. load | 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 (PELV).

Relay outputs:

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

■ General technical data
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 6011 380-460 V | 100 m |
| Max. DC-bus cable length, screened cable | 25 m from frequency converter to DC bar. |
| <i>Max. cable cross-section to motor, see next section</i> | |
| Max. cross-section for control cables | 1.5 mm ² /16 AWG |
| Max. cross-section for serial communication | 1.5 mm ² /16 AWG |

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 |
| Process, accuracy (closed loop) | < 1500 rpm: max. error ± 1.5 rpm |
| | > 1500 rpm: max. error of 0.1% of actual speed |

All control characteristics are based on a 4-pole asynchronous motor

Accuracy of Display readout (parameters 009-012 Display readout):

| | |
|--|---|
| Motor current [5], 0 - 140% load | Max. error: ±2.0% of rated output current |
| Power kW [6], Power HP [7], 0 - 90% load | Max. error: ±5.0% of rated output power |

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 % +2 %, -3 % (IEC 68-2-3) for storage/transport |
| Max. relative humidity | 95% non condensing (IEC 721-3-3; class 3K3) for operation |
| Ambient temperature | |
| VLT 6002-6005 200-240V, 6002-6011 380-460V, Bookstyle, IP20 | Max. 45°C (24-hour average max. 40°C) |
| VLT 6006-6062 200-240V, 6016-6275 380-460V, IP00, IP20 | Max. 40°C (24-hour average max. 35°C) |
| VLT 6002-6062 200-240V, 6002-6275 380-460V, IP54 | 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 50204, EN 61000-4-6, VDE 0160/1990.12 |

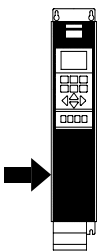
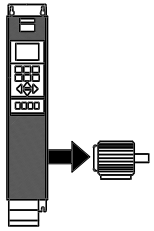
VLT 6000 HVAC protection:

- 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.

■ Technical data, mains supply 3 x 380 - 460 V

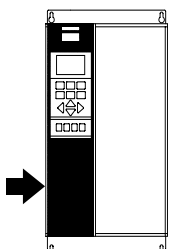
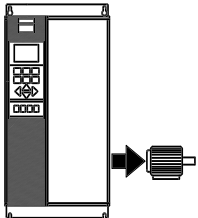
According to international requirements

| VLT type | 6002 | 6003 | 6004 | 6005 | 6006 | 6008 | 6011 |
|--|---|-----------|-----------|-----------|------------|-----------|-----------|
| Output current $I_{VLT,N}$ [A] (380-415 V) | 3.0 | 4.1 | 5.6 | 7.2 | 10.0 | 13.0 | 16.0 |
| $I_{VLT,MAX}$ (60 s) [A] (380-415 V) | 3.3 | 4.5 | 6.2 | 7.9 | 11.0 | 14.3 | 17.6 |
| $I_{VLT,N}$ [A] (440-460 V) | 3.0 | 3.4 | 4.8 | 6.3 | 8.2 | 11.0 | 14.0 |
| $I_{VLT,MAX}$ (60 s) [A] (440-460 V) | 3.3 | 3.7 | 5.3 | 6.9 | 9.0 | 12.1 | 15.4 |
| Output $S_{VLT,N}$ [kVA] (400 V) | 2.2 | 2.9 | 4.0 | 5.2 | 7.2 | 9.3 | 11.5 |
| $S_{VLT,N}$ [kVA] (460 V) | 2.4 | 2.7 | 3.8 | 5.0 | 6.5 | 8.8 | 11.2 |
| Typical shaft output $P_{VLT,N}$ [kW] | 1.1 | 1.5 | 2.2 | 3.0 | 4.0 | 5.5 | 7.5 |
| Typical shaft output $P_{VLT,N}$ [HP] | 1.5 | 2 | 3 | - | 5 | 7.5 | 10 |
| Max. cable cross-section to motor [mm ² /AWG] | 4/10 | 4/10 | 4/10 | 4/10 | 4/10 | 4/10 | 4/10 |
| Max. input current $I_{L,N}$ [A] (380 V) (RMS) | 2.8 | 3.8 | 5.3 | 7.0 | 9.1 | 12.2 | 15.0 |
| $I_{L,N}$ [A] (460 V) | 2.5 | 3.4 | 4.8 | 6.0 | 8.3 | 10.6 | 14.0 |
| Max. cable cross-section, power [mm ²]/[AWG] ²⁾ | 4/10 | 4/10 | 4/10 | 4/10 | 4/10 | 4/10 | 4/10 |
| Max. pre-fuses [A]/UL ¹⁾ [A] | 16/6 | 16/10 | 16/10 | 16/15 | 25/20 | 25/25 | 35/30 |
| Mains contactor [Danfoss type] [AC value] | CI 6 AC-3 | CI 6 AC-3 | CI 6 AC-3 | CI 9 AC-3 | CI 12 AC-3 | CI 5 AC-1 | CI 6 AC-1 |
| Efficiency ³⁾ | 0.96 | | | | | | |
| Weight IP 20 [kg] | 8 | 8 | 8,5 | 8,5 | 10,5 | 10,5 | 10,5 |
| Weight IP 54 [kg] | 11.5 | 11.5 | 12 | 12 | 14 | 14 | 14 |
| Power loss at max. load. [W] Total | 67 | 92 | 110 | 139 | 198 | 250 | 295 |
| Enclosure VLT type | Bookstyle IP 20/Compact IP 20/IP 54 | | | | | | |
| | (Bookstyle IP 20 is available in the VLT 6002-6011 power range) | | | | | | |


■ Mains supply 3 x 380 - 460 V

According to international requirements

| VLT type | 6016 | 6022 | 6027 | 6032 | 6042 | 6052 | 6062 |
|---|-------------|-------|-------|-------|-------|---------|---------|
| Output current $I_{VLT,N}$ [A] (380-415 V) | 24.0 | 32.0 | 37.5 | 44.0 | 61.0 | 73.0 | 90.0 |
| $I_{VLT,MAX}$ (60 s) [A] (380-415 V) | 26.4 | 35.2 | 41.3 | 48.4 | 67.1 | 80.3 | 99.0 |
| $I_{VLT,N}$ [A] (440-460 V) | 21.0 | 27.0 | 34.0 | 40.0 | 52.0 | 65.0 | 77.0 |
| $I_{VLT,MAX}$ (60 s) [A] (440-460 V) | 23.1 | 29.7 | 37.4 | 44.0 | 57.2 | 71.5 | 84.7 |
| Output $S_{VLT,N}$ [kVA] (400 V) | 17.3 | 23.0 | 27.0 | 31.6 | 43.8 | 52.5 | 64.7 |
| $S_{VLT,N}$ [kVA] (460 V) | 16.7 | 21.5 | 27.1 | 31.9 | 41.4 | 51.8 | 61.3 |
| Typical shaft output $P_{VLT,N}$ [kW] | 11 | 15 | 18.5 | 22 | 30 | 37 | 45 |
| Typical shaft output $P_{VLT,N}$ [HP] | 15 | 20 | 25 | 30 | 40 | 50 | 60 |
| Max. cable cross-section to motor and DC-bus [mm ² /AWG] | 16/6 | 16/6 | 16/6 | 16/6 | 35/2 | 35/2 | 50/0 |
| Min. cable cross-section to motor and DC-bus ⁴⁾ [mm ² /AWG] | 10/8 | 10/8 | 10/8 | 10/8 | 10/8 | 10/8 | 16/6 |
| Max. input current $I_{L,N}$ [A] (380 V) (RMS) | 24.0 | 32.0 | 37.5 | 44.0 | 60.0 | 72.0 | 89.0 |
| $I_{L,N}$ [A] (460 V) | 21.0 | 27.6 | 34.0 | 41.0 | 53.0 | 64.0 | 77.0 |
| Max. cable cross-section, power [mm ²]/[AWG] | 16/6 | 16/6 | 16/6 | 16/6 | 35/2 | 35/2 | 50/0 |
| Max. pre-fuses [A]/UL ¹⁾ [A] | 63/40 | 63/40 | 63/50 | 63/60 | 80/80 | 100/100 | 125/125 |
| Efficiency at rated frequency | 0.96 | | | | | | |
| Weight IP 20 [kg] | 23 | 23 | 23 | 30 | 30 | 48 | 48 |
| Weight IP 54 [kg] | 48 | 48 | 48 | 51 | 61 | 67 | 70 |
| Power loss at max. load. [W] | 419 | 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 6002 - VLT 6032, 200/240 V and VLT 6002 - VLT 6062, 380/460 V. Pre-fuses type gR must be used for VLT 6042 - 6062, 200/240 V and VLT 6075 - VLT 6275, 380/460 V. The fuses must be placed to protect a circuit capable of supplying max. 100,000 amps rms (symmetrical), 500 V maximum.
2. American Wire Gauge.
3. Measured using 30 m screened motor cable 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.

■ Mechanical dimensions

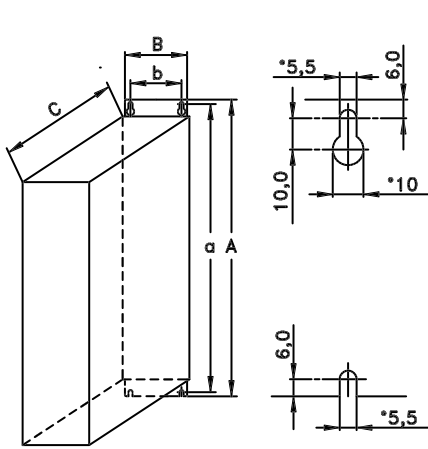
All measurements in mm.

| VLT type | A | B | C | | a | b | aa/bb | Type |
|----------------------------------|------|-----|-----|----|------|-----|-------|------|
| Bookstyle IP 20 200-240 V | | | | | | | | |
| 6002 - 6003 | 395 | 90 | 260 | | 384 | 70 | 100 | A |
| 6004 - 6005 | 395 | 130 | 260 | | 384 | 70 | 100 | A |
| Bookstyle IP 20 380-460 V | | | | | | | | |
| 6002 - 6005 | 395 | 90 | 260 | | 384 | 70 | 100 | A |
| 6006 - 6011 | 395 | 130 | 260 | | 384 | 70 | 100 | A |
| IP 00 200-240 V | | | | | | | | |
| 6042 - 6062 | 800 | 370 | 335 | | 780 | 270 | 225 | B |
| IP 00 380-460 V | | | | | | | | |
| 6075 - 6125 | 800 | 370 | 335 | | 780 | 270 | 225 | B |
| 6150 - 6275 | 1400 | 420 | 400 | | 1380 | 350 | 225 | B |
| IP 20 200-240 V | | | | | | | | |
| 6002 - 6003 | 395 | 220 | 160 | | 384 | 200 | 100 | C |
| 6004 - 6005 | 395 | 220 | 200 | | 384 | 200 | 100 | C |
| 6006 - 6011 | 560 | 242 | 260 | | 540 | 200 | 200 | D |
| 6016 - 6022 | 700 | 242 | 260 | | 680 | 200 | 200 | D |
| 6027 - 6032 | 800 | 308 | 296 | | 780 | 270 | 200 | D |
| 6042 - 6062 | 954 | 370 | 335 | | 780 | 270 | 225 | E |
| IP 20 380-460 V | | | | | | | | |
| 6002 - 6005 | 395 | 220 | 160 | | 384 | 200 | 100 | C |
| 6006 - 6011 | 395 | 220 | 200 | | 384 | 200 | 100 | C |
| 6016 - 6027 | 560 | 242 | 260 | | 540 | 200 | 200 | D |
| 6032 - 6042 | 700 | 242 | 260 | | 680 | 200 | 200 | D |
| 6052 - 6062 | 800 | 308 | 296 | | 780 | 270 | 200 | D |
| 6075 - 6125 | 954 | 370 | 335 | | 780 | 270 | 225 | E |
| 6150 - 6275 | 1554 | 420 | 400 | | 1380 | 350 | 225 | E |
| VLT type | A | B | C | D | a | b | a/b | Type |
| IP 54 200-240 V | | | | | | | | |
| 6002 - 6003 | 460 | 282 | 195 | 85 | 260 | 258 | 100 | F |
| 6004 - 6005 | 530 | 282 | 195 | 85 | 330 | 258 | 100 | F |
| 6006 - 6011 | 810 | 355 | 280 | 70 | 560 | 330 | 200 | F |
| 6016 - 6032 | 940 | 400 | 280 | 70 | 690 | 375 | 200 | F |
| 6042 - 6062 | 937 | 495 | 421 | - | 830 | 374 | 225 | G |
| IP 54 380-460 V | | | | | | | | |
| 6002 - 6005 | 460 | 282 | 195 | 85 | 260 | 258 | 100 | F |
| 6006 - 6011 | 530 | 282 | 195 | 85 | 330 | 258 | 100 | F |
| 6016 - 6032 | 810 | 355 | 280 | 70 | 560 | 330 | 200 | F |
| 6042 - 6062 | 940 | 400 | 280 | 70 | 690 | 375 | 200 | F |
| 6075 - 6125 | 937 | 495 | 421 | - | 830 | 374 | 225 | G |
| 6150 - 6275 | 1572 | 495 | 425 | - | 1465 | 445 | 225 | G |
| Option for IP 00 VLT 6075-6275 | A1 | B1 | C1 | | | | | |
| IP 20 bottom cover | | | | | | | | |
| 6075 - 6125 | 175 | 370 | 335 | | | | | |
| 6150 - 6275 | 175 | 420 | 400 | | | | | |

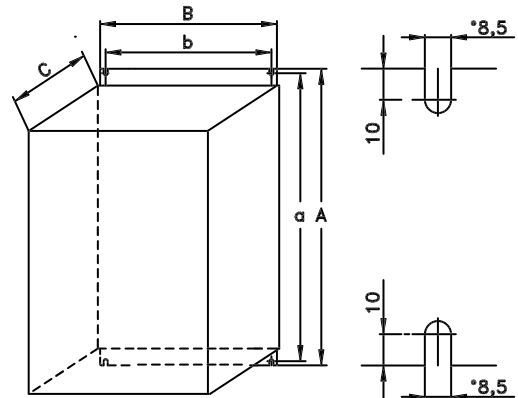
aa: Min. air above enclosure

ab: Min. air below enclosure

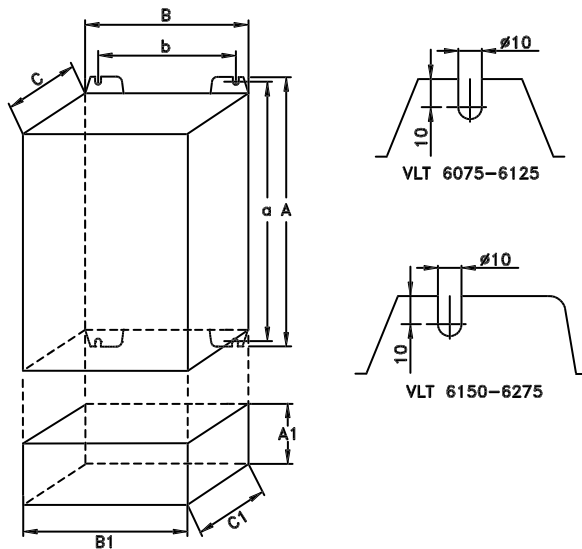
■ Mechanical dimensions



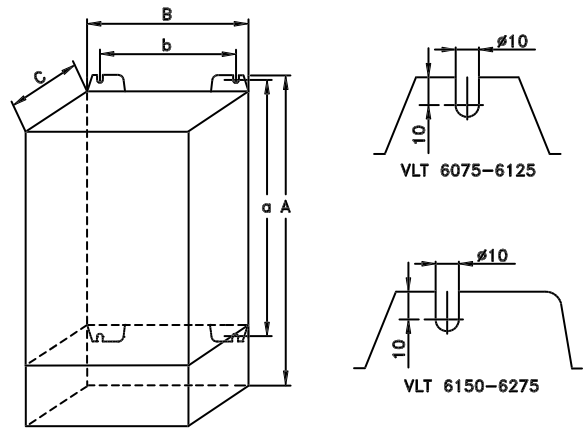
Type A, IP20



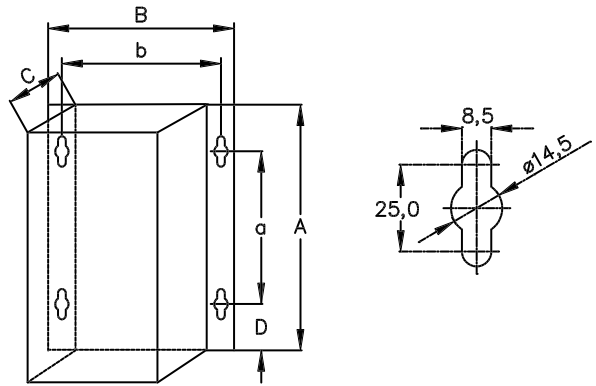
Type D, IP20



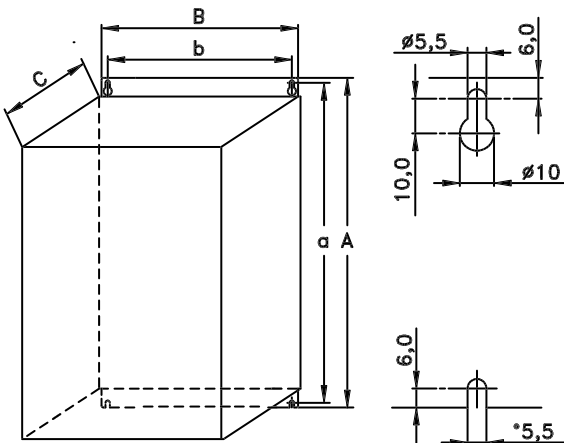
Type B, IP00
With option and enclosure IP20



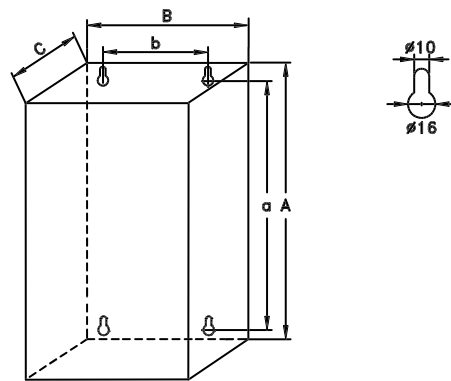
Type E, IP20



Type F, IP54



Type C, IP20



Type G, IP54