

Mains Supply (L1, L2, L3):

Supply voltage	200 – 240 V ±10%
	380 – 480 V ±10%
	525 – 600 V ±10%
Supply frequency	50/60 Hz
Max. imbalance temporary between mains phases.....	3.0% of rated supply voltage
True Power Factor (λ).....	≥0.9 nominal at rated load
Displacement Power Factor (cosφ)	near unity (>0.98)
Switching on input supply	
L1, L2, L3 (power-ups) ≤10 HP	maximum 2 times/min.
L1, L2, L3 (power-ups) ≥15 HP	maximum 1 time/min.
Environment according to EN60664-1.....	overvoltage category III/pollution degree 2.

The unit is suitable for use on a circuit capable of delivering not more than 100.000 RMS symmetrical Amperes, 240/480/600 V maximum.

Motor Output (U, V, W):

Output voltage.....	0 – 100% of supply voltage
Output frequency.....	0 – 120 Hz
Switching on output	Unlimited
Ramp times.....	1 – 3600 sec.

Torque Characteristics:

Starting torque (Constant torque)	maximum 110% for 60 sec.*
Starting torque.....	maximum 135% up to 0.5 sec.*
Overload torque (Constant torque)	maximum 110% for 60 sec.*

**Percentage relates to the nominal torque.*

Cable Lengths and Cross Sections:

Max. motor cable length, shielded	165 ft (50 m)
Max. motor cable length, unshielded.....	1000 ft (300 m)
Maximum cross section	
To motor, mains, load sharing and brake*	
To control terminals,	
Rigid wire:	16 AWG /1.5 mm ² (2 x 0.75 mm ²)
Flexible cable	18 AWG/1 mm ²
Cable with enclosed core	20 AWG/0.5 mm ²
Minimum cross section	
To control terminals.....	24 AWG/0.25 mm ²

**See Mains Supply table for more information)*

Protection and Features:

- Electronic thermal motor protection against overload.
- Temperature monitoring of the heatsink ensures that the drive trips if the temperature reaches a predefined level. An overload temperature cannot be reset until the temperature of the heatsink is below the values stated in the tables on the following pages (Guideline - these temperatures may vary for different power sizes, enclosures, etc.).
- The drive is protected against short-circuits on motor terminals U, V, W.
- If a mains phase is missing, the drive trips or issues a warning (depending on the load).
- Monitoring of the intermediate circuit voltage ensures that the drive trips if the intermediate circuit voltage is too low or too high.
- The drive constantly checks for critical levels of internal temperature, load current, high voltage on the intermediate circuit and low motor speeds. As a response to a critical level, the drive can adjust the switching frequency and/ or change the switching pattern in order to ensure the performance of the drive.

Digital Inputs:

Programmable digital inputs	4 (6)
Terminal number	18, 19, 27 ¹⁾ , 29, 32, 33,
Logic.....	PNP or NPN
Voltage level.....	0 – 24 VDC
Voltage level, logic '0' PNP.....	<5 VDC
Voltage level, logic '1' PNP.....	>10 VDC
Voltage level, logic '0' NPN ²⁾	>19 VDC
Voltage level, logic '1' NPN ²⁾	<14 VDC
Maximum voltage on input.....	28 VDC
Input resistance.....	approx. 4 kΩ

All digital inputs are galvanically isolated from the supply voltage (PELV) and other high-voltage terminals.

1) Terminals 27 and 29 can also be programmed as output.

General Specifications

Analog Inputs:

Number of analog inputs	2
Terminal number	53, 54
Modes	Voltage or current
Mode select	Switch S201 and switch S202
Voltage mode	Switch S201/switch S202 = OFF (U)
Voltage level	0 to +10 (scaleable)
Input resistance	approx. 10 kΩ
Max. voltage	± 20 V
Current mode	Switch S201/switch S202 = ON (I)
Current level	0/4 to 20 mA (scaleable)
Input resistance	approx. 200 Ω
Max. current	30 mA
Resolution for analog inputs	10 bit (+ sign)
Accuracy of analog inputs	Max. error 0.5% of full scale
Bandwidth	200 Hz

The analog inputs are galvanically isolated from the supply voltage (PELV) and other high-voltage terminals.

Pulse Inputs:

Programmable pulse inputs	2
Terminal number pulse/encoder	29, 33
Max. frequency at terminal 29, 33	110 kHz (Push-pull driven) 5 kHz (open collector)
Min. frequency at terminal 29, 33	4 Hz
Voltage level	see section on Digital input
Maximum voltage on input	28 VDC
Input resistance	approx. 4 kΩ
Pulse input accuracy (0.1 - 1 kHz)	Max. error: 0.1% of full scale

The pulse and encoder inputs (terminals 29, 32, 33) are galvanically isolated from the supply voltage (PELV) and other high-voltage terminals.

Analog Output:

Number of programmable analog outputs	1
Terminal number	42
Current range at analog output	0/4 – 20 mA
Max. load to common at analog output	500 Ω
Accuracy on analog output	Max. error: 0.5 % of full scale
Resolution on analog output	8 bit

The analog output is galvanically isolated from the supply voltage (PELV) and other high voltage terminals.

Control Card, RS 485 Serial Communication:

Terminal number	68 (P,TX+, RX+), 69 (N,TX-, RX-)
Terminal number	61 Common for terminals 68 and 69

The RS 485 serial communication circuit is functionally separated from other central circuits and galvanically isolated from the supply voltage (PELV).

Digital Output:

Programmable digital/pulse outputs	2
Terminal number	27, 29 ¹⁾
Voltage level at digital/frequency output	0 – 24 V
Max. output current (sink or source)	40 mA
Max. load at frequency output	1 kΩ
Max. capacitive load at frequency output	10 nF
Minimum output frequency at frequency output	0 Hz
Maximum output frequency at frequency output	32 kHz
Accuracy of frequency output	Max. error: 0.1 % of full scale
Resolution of frequency outputs	12 bit

1) Terminal 27 and 29 can also be programmed as input.

The digital output is galvanically isolated from the supply voltage (PELV) and other high-voltage terminals.

Control Card, 24 V DC Output:

Terminal number	12, 13
Max. load	200 mA

The 24 VDC supply is galvanically isolated from the supply voltage (PELV), but has the same potential as the analog and digital inputs and outputs.

Relay Outputs:

Programmable relay outputs	2
Relay 01 Terminal number	1-3 (break), 1-2 (make)
Max. terminal load (AC-1) ¹⁾ on 1-3 (NC), 1-2 (NO) (Resistive load)	240 VAC, 2 A
Max. terminal load (AC-15) ¹⁾ (Inductive load @ cosφ 0.4)	240 VAC, 0.2 A
Max. terminal load (DC-1) ¹⁾ on 1-2 (NO), 1-3 (NC) (Resistive load)	60 VDC, 1A
Max. terminal load (DC-13) ¹⁾ (Inductive load)	24 VDC, 0.1A
Relay 02 Terminal number	4-6 (break), 4-5 (make)
Max. terminal load (AC-1) ¹⁾ on 4-5 (NO) (Resistive load)	400 VAC, 2 A
Max. terminal load (AC-15) ¹⁾ on 4-5 (NO) (Inductive load @ cosφ 0.4)	240 VAC, 0.2 A
Max. terminal load (DC-1) ¹⁾ on 4-5 (NO) (Resistive load)	80 VDC, 2 A
Max. terminal load (DC-13) ¹⁾ on 4-5 (NO) (Inductive load)	24 VDC, 0.1A
Max. terminal load (AC-1) ¹⁾ on 4-6 (NC) (Resistive load)	240 VAC, 2 A
Max. terminal load (AC-15) ¹⁾ on 4-6 (NC) (Inductive load @ cosφ 0.4)	240 VAC, 0.2A
Max. terminal load (DC-1) ¹⁾ on 4-6 (NC) (Resistive load)	50 VDC, 2 A
Max. terminal load (DC-13) ¹⁾ on 4-6 (NC) (Inductive load)	24 VDC, 0.1 A
Min. terminal load on 1-3 (NC), 1-2 (NO), 4-6 (NC), 4-5 (NO)	24 VDC 10 mA, 24 VAC 20 mA

Environment according
to EN 60664-1 ... overvoltage category III/pollution degree 2

1) IEC 60947 part 4 and 5

The relay contacts are galvanically isolated from the rest of the circuit by reinforced isolation (PELV).

Control Card, 10 V DC Output:

Terminal number	50
Output voltage	10.5 V ±0.5 V
Max. load	15 mA

The 10 V DC supply is galvanically isolated from the supply voltage (PELV) and other high-voltage terminals.

Control Characteristics:

Resolution of output frequency at 0 - 1000 Hz	+/- 0.003 Hz
System response time (terminals 18, 19, 27, 29, 32, 33)	≤2 ms
Speed control range	
Open loop	1:100 of synchronous speed
Speed accuracy	
Open loop	30 – 4000 rpm: error ±8 rpm

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

Control Card, USB Serial Communication:

USB standard	1.1
USB plug	USB type B "device" plug

Connection to PC is carried out via a standard host/device USB cable.

The USB connection is galvanically isolated from the supply voltage (PELV) and other high-voltage terminals.

The USB ground connection is not galvanically isolated from protection earth. Use only an isolated laptop as PC connection to the USB connector on the drive.

Surroundings:

Enclosure ≤ 10 HP	IP20, IP55
Enclosure ≥ 15 HP	IP21, IP55
Enclosure kit available ≤ 10 HP	IP21/TYPE 1
Vibration test	1.0 g RMS
Max. relative humidity	5% – 95% (IEC 60 721-3-3; Class 3K3 (non-condensing) during operation
Aggressive environment (IEC 721-3-3), uncoated ...	class 3C2
Aggressive environment (IEC 721-3-3), coated	class 3C3
Test method according to IEC 60068-2-43 H2S (10 days)	
Ambient temperature	Max. 122° F (50° C) (24-hour average maximum 113° F (45° C)

Derating for high ambient temperature, see Design Guide section on special conditions

Minimum ambient temperature	
During full-scale operation	32° F (0° C)
At reduced performance	14° F (-10° C)
Temperature during storage/transport	-13° F (-25° C) to 149/158° F (65/70° C)

Maximum altitude above sea level

Derating for high altitude, see Design Guide section on special conditions

EMC standards	
Emission	EN 61800-3, EN 61000-6-3/4, EN 55011
Immunity	EN 61800-3, EN 61000-6-1/2, EN 61000-4-2, EN 61000-4-3, EN 61000-4-4, EN 61000-4-5, EN 61000-4-6

General Specifications

Connection example

This diagram shows a typical installation of the VLT[®] HVAC Drive. The numbers represent the terminals on the drive.

