

VLT 4000 VT Engineering Data – Control Inputs and Outputs



The standard I/O supplied on the VLT 4000 VT is equal to or greater than that supplied by most competitors with extended I/O options.

Standard I/O includes:

- 8 digital inputs
- 2 analog inputs
- 3 pulse inputs
- 2 digital and analog outputs
- 2 relay outputs

Electrical Installation, control cables

Torque on Terminals: 0.5-0.6 Nm

Terminal Screw size: M3

Electrical Installation, Control Cables

Generally speaking, control cables must be screened/armored and the screen must be connected by means of a cable clamp at both ends to the metal cabinet of the unit.

Normally, the screen must also be connected to the body of the controlling unit (follow the instructions for installation given for the unit in question).

In very long control cables are used, 50/60 Hz earth loops may occur that may disturb the system. This problem can be solved by connecting one end of the screen to earth via a 100nF condenser (keeping leads short).

Galvanic Isolation (PELV)

All analog and digital inputs and outputs and the RS 485 serial communication port are *galvanically isolated from the supply voltage*. Because these points do not share a common, the drive can eliminate ground loop problems.

In the VLT 4000 VT Series, all control terminals as well as terminals 1-5 (AUX relays) are supplied by or connected to circuits that comply with PELV (high impedance) requirements in relation to the AC line potential.

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.

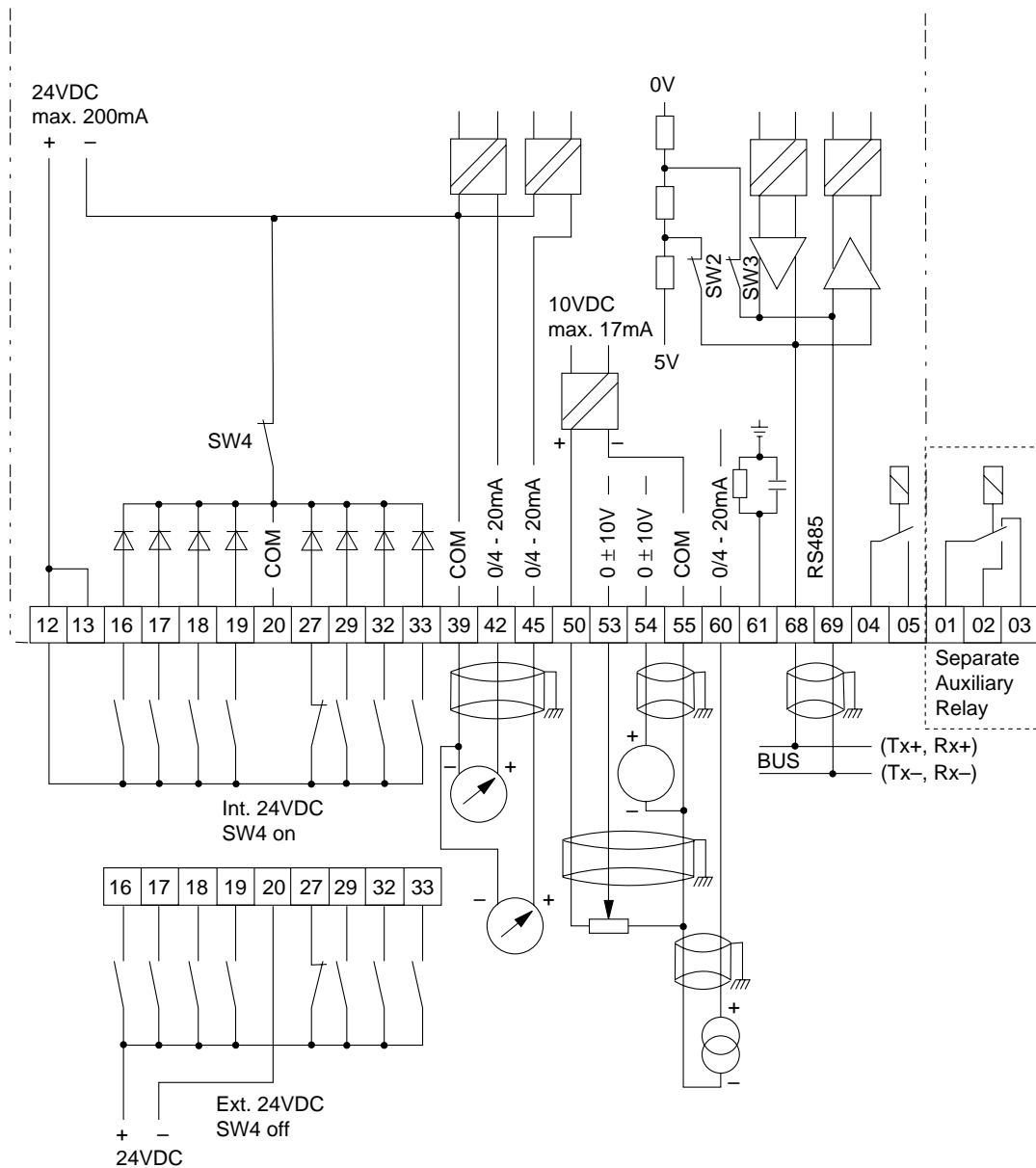
In VLT 4000 VT, all control terminals as well as terminals 1-3 (AUX relay) are supplied from or in connection with extra low voltage (PELV).

Galvanic (ensured) isolation is obtained by fulfilling requirements concerning higher isolation and by providing the relevant creepage/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 three locations (see drawing below), namely:

1. Power supply (SMPS) including signal isolation of V_{DC} indicating the intermediate current voltage.
2. Gate drive that runs the IGBTs (trigger transformers/opto-couplers).
3. Current transducers (Hall effect current transducers).

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Switches SW2 and SW3 are closed for terminating the first and last drive in an RS-485 serial communication network. SW4 is used if an external 24 VDC supply is required for the control terminals. SW4 separates the common potential for the internal 24 VDC supply from the common potential of the external 24 VDC supply.

VLT 4000 VT Engineering Data – Control Inputs and Outputs



Analog Inputs

No. of programmable analog voltage inputs	2
Terminal nos.	53, 54
Voltage level	0-10 VDC (scalable)
Input resistance, R_1	approx. 10 k Ω
No. of programmable analog current inputs	1
Terminal no.	60
Current range	0-20mA (scalable)
Input resistance, R_1	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 analog inputs are galvanically isolated from the supply voltage (PELV) and other high-voltage terminals.

Thermistor

Thermistor is selected if a thermistor integrated in the motor is to be able to stop the VLT 4000 VT drive in case of motor overtemperature.

The cutout value is 3 Kohm.

If a motor features a Klaxon thermal switch instead, this can also be connected to the input. If motors run in parallel, the thermistors/thermal switches can be connected in series (total resistance < 3 Kohm).

Parameter 117 *Motor thermal protection* must be programmed for *Thermal warning* [1] or *Thermistor trip* [2] and the thermistor must be inserted between terminal 53 or 54 (analog voltage input) and terminal 50 (+10 V supply).

Digital Inputs

Number of programmable digital inputs	8
Terminal nos.	16, 17, 18, 19, 27, 29, 32, 33
Voltage level	0-24 VDC (PNP positive logics)
Voltage level, logical '0'	< 5 VDC
Voltage level, logical '1'	> 10 VDC
Maximum voltage on input	28 VDC
Input resistance, R_1	approx. 2 k Ω
Scanning timer 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 VDC supply and opening switch 4.

Pulse Inputs

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 VDC (PNP positive logics)
Voltage level, logic '0'	< 5 VDC
Voltage level, logic '1'	> 10 VDC
Maximum voltage on input	28 VDC
Input resistance, R_1	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 VDC supply and opening switch 4.

Digital/Pulse and Analog Outputs

Number of programmable digital and analog outputs	2
Terminal nos.	42, 45
Voltage level at digital/pulse output	0-24 VDC
Minimum load to frame (terminal 39) at digital/pulse output) .	600 Ω
Frequency ranges (digital output used as pulse output)	0-32 kHz
Current range at analog output	0/4-20 mA
Maximum load to frame (terminal 39) at analog output	500 Ω
Accuracy of analog output	Max. error: 1.5% of full scale
Resolution on analog output	8 bit

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

VLT 4000 VT Engineering Data – Control Inputs and Outputs



24 VDC Supply

Terminal no. 12, 13

Max. load 200 mA

Reliable galvanic isolation: The 24 VDC supply is galvanically isolated from the supply voltage (PELV), but has the same potential as the analog outputs.

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 (AC) on 4-5, control card

for UL/cUL applications 30 VAC, 1 A

Max. terminal load (DC) on 4-5, control card

for UL/cUL applications 42.2 VDC, 1 A

Terminal nos., power card and relay card 1-3 (break), 1-2 (make)

Max. terminal load (AC) on 1-3, 1-2, power card

and relay card 240 VAC, 2 A, 60 VA

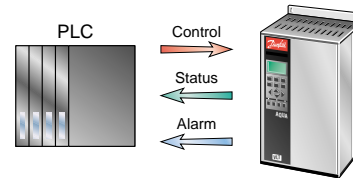
Min. terminal load on 1-3, 1-2, power card

and relay card 24 VDC 10 mA, 24 VAC 100 mA

RS 485 Serial Communication

Terminal nos. 68 (TX+, RX+), 69 (TX-, RX-)

Reliable galvanic isolation: Full galvanic isolation (PELV).



Three signal types between PLC and VLT 4000 VT

All Danfoss VLT 4000 VT drives incorporate a standard RS-485 interface allowing up to 31 units to be controlled over a single twisted pair cable. The controlling PC, or PLC, or EMS could be up to three-quarters of a mile away, without using repeaters. The units transmit data in turns over the common wire connection (the bus).

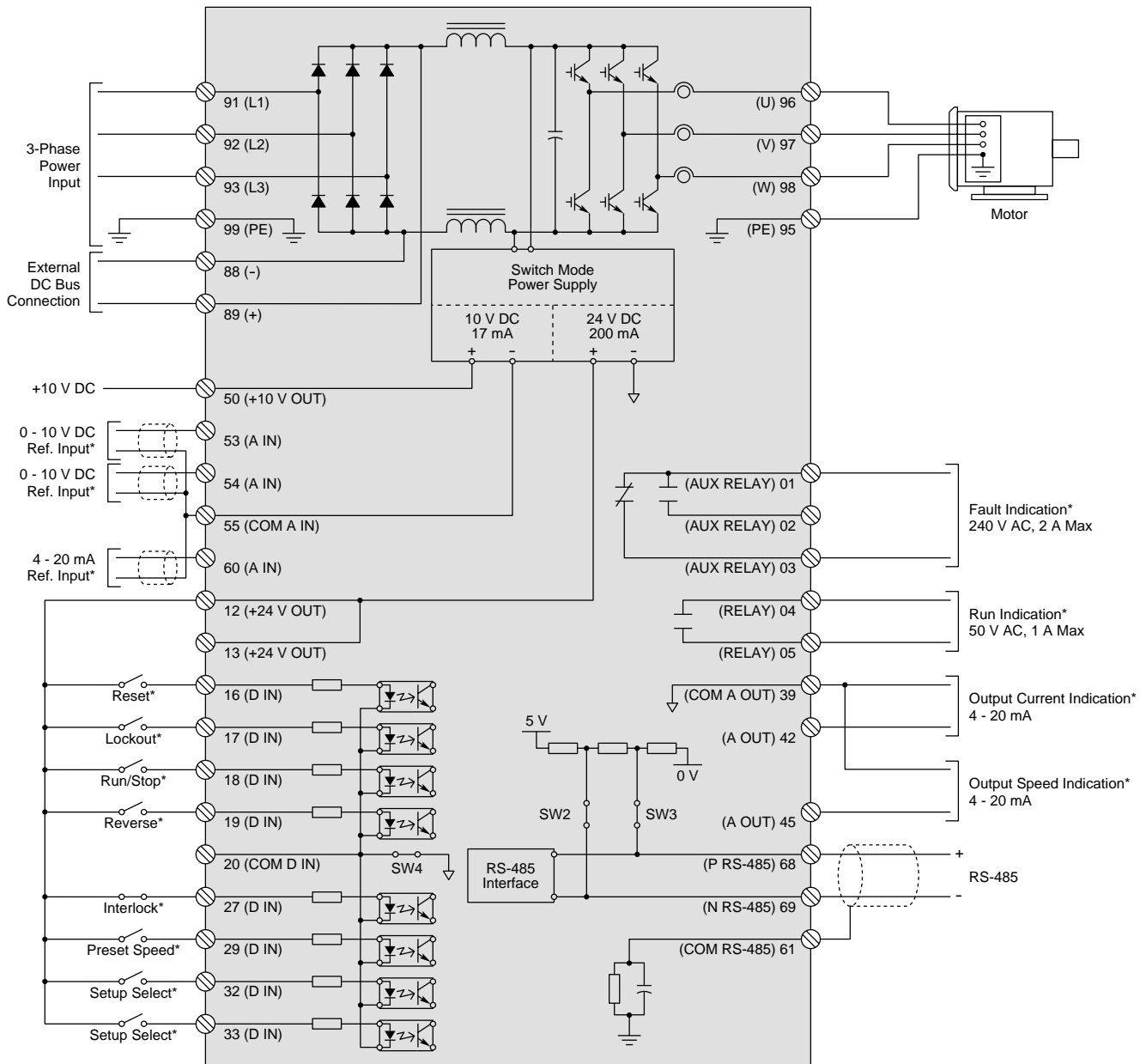
In the communication between PLC and the VLT 4000 VT there are three types of signals:

- Control signals (speed change, start/stop, reversing)
- Status signals (motor current, motor frequency, frequency reached)
- Alarm signals (motor stopped, over temperature)

VLT 4000 VT Engineering Data – Typical Interconnection



Shown below is how a VLT 4000 VT typically interfaces with other components in an industrial system. The terminal numbers and functions are identical on all VLT 4000 VT drives. The analog and digital input terminals, and the analog and relay output terminals are all programmable. The functions shown here are typical, but show only a small portion of the total capability. An optional relay output card, not shown, can provide four additional Form C relays.



*The operation of all control inputs and outputs is programmable. Typical terminal functions are shown.

VLT 4000 VT Engineering Data – Typical Interconnection



Drive Block Diagrams

