

Mechanical installation

■ Mechanical installation



Please pay attention to the requirements that apply to integration and field mounting kit, see the below list. The information given in the list must be observed to avoid serious damage or injury, especially when installing large units.

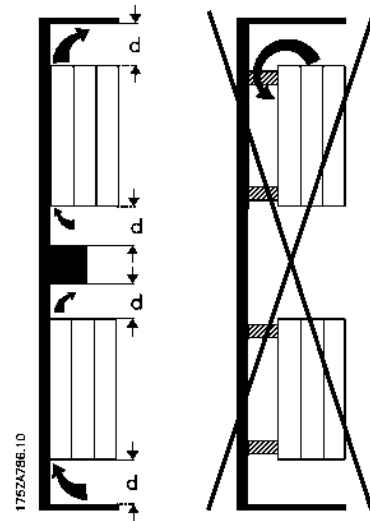
The adjustable frequency drive *must* be installed vertically.

The adjustable frequency drive is cooled by means of air circulation. For the unit to be able to release its cooling air, the *minimum* distance over and below the unit must be as shown in the illustration below.

To protect the unit from overheating, it must be ensured that the ambient temperature *does not rise above the max. temperature stated for the adjustable frequency drive and that the 24-hour average temperature is not exceeded*. The max. temperature and 24-hour average can be seen from the General Technical section.

When installing the adjustable frequency drive on a non flat surface, i.e. a frame, please consult the instruction, MN.50.XX.YY.

If the ambient temperature is in the range of 45° C - 55° C, derating of the adjustable frequency drive will be required in accordance with the diagram in the Design Guide. The service life of the adjustable frequency drive will be reduced if no allowance is made for the derating for ambient temperature.



All Bookstyle and Compact units require a minimum space above and below the enclosure.

■ Installation of VLT 5001-5302

All adjustable frequency drives must be installed in a way that ensures proper cooling.

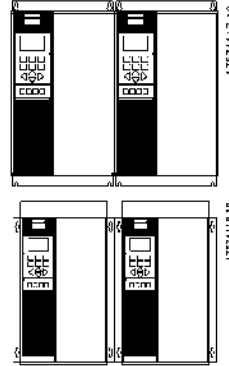
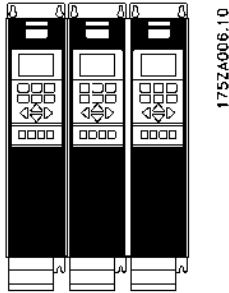
Cooling



VLT® 5000 Series

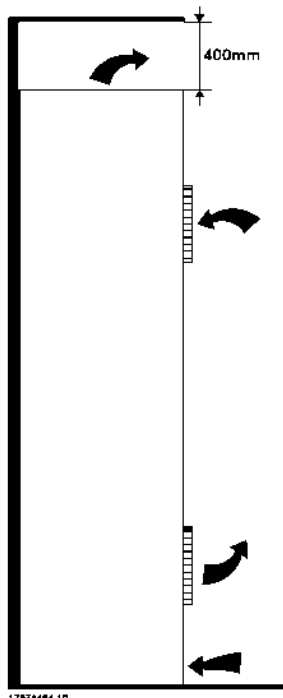
Side by side/flange by flange

All adjustable frequency drives can be mounted side by side/flange by flange.



	d [inches]/[mm]	Comments
Bookstyle		
VLT 5001-5006, 200-240 V	4.00/100	Installation on a plane, vertical surface (no spacers)
VLT 5001-5011, 380-500 V	4.00/100	
Compact (all enclosure types)		
VLT 5001-5006, 200-240 V	4.00/100	Installation on a plane, vertical surface (no spacers)
VLT 5001-5011, 380-500 V	4.00/100	
VLT 5001-5011, 525-600 V	4.00/100	
VLT 5008-5027, 200-240 V	7.87/200	Installation on a plane, vertical surface (no spacers)
VLT 5016-5062, 380-500 V	7.87/200	
VLT 5072-5102, 380-500 V	8.85/225	
VLT 5016-5062, 525-600 V	7.87/200	
VLT 5032-5052, 200-240 V	8.85/225	Installation on a plane, vertical surface (no spacers)
VLT 5122-5302, 380-500 V	8.85/225	IP 54 filter mats must be changed when they are dirty.
VLT 5075-5250, 525-600 V	8.85/225	

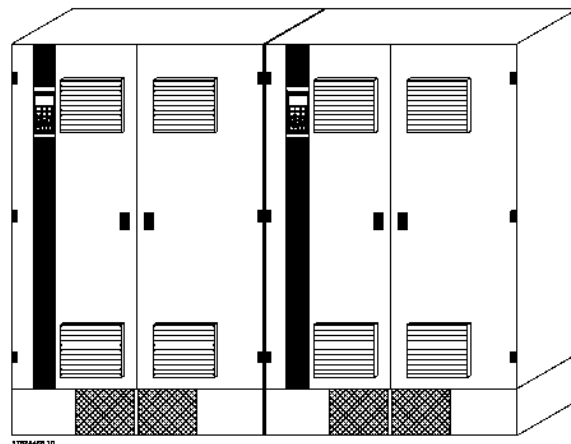
■ **Installation of VLT 5350-5500 380-500 V Compact Nema 1 (IP 20) and Nema12 Cooling**



All units in the above-mentioned series require a minimum space of 15.75 inches/400 mm above the enclosure and must be installed on a plane floor. This applies to both Nema 1 (IP 20) and Nema12 units. Gaining access to the VLT 5350-5500 requires a minimum space of 23.82 inches/605 mm in front of the adjustable frequency drive.

Filter mats in Nema12 units have to be changed when they are dirty.

Side-by-side



Compact Nema 1 (IP 20) and Nema12

All Nema 1 (IP 20) and Nema12 units in the above-mentioned series can be installed side by side without any space between them, since these units do not require cooling on the sides.

■ **IP 00 VLT 5350 - 5500 380 - 500 V**

The IP 00 unit is designed for installation in a cabinet when installed according to the instructions in the

VLT 5350 - 5500 Installation Guide, MG.56.AX.YY. Please note, that the same conditions as for Nema 1 / IP 54 (Nema12) must be fulfilled.

Electrical installation

■ Electrical installation



The voltage on the adjustable frequency drive is dangerous when the unit is connected to mains. Incorrect installation of the motor or the adjustable frequency drive may lead to material damage or serious injury or it may be fatal. Consequently, the instructions in this manual as well as national and local rules and safety regulations must be complied with. Touching the electrical parts may be fatal, even after the mains supply has been disconnected.

Using VLT 5001-5006, 200-240 V and 380-500 V: wait at least 4 minutes.

Using VLT 5008-5052, 200-240 V: wait at least 15 minutes.

Using VLT 5008-5062, 380-500 V: wait at least 15 minutes.

Using VLT 5072-5302, 380-500 V: wait at least 20 minutes.

Using VLT 5350-5500, 380-500 V: wait at least 15 minutes.

Using VLT 5001-5005, 525-600 V: wait at least 4 minutes.

Using VLT 5006-5022, 525-600 V: wait at least 15 minutes.

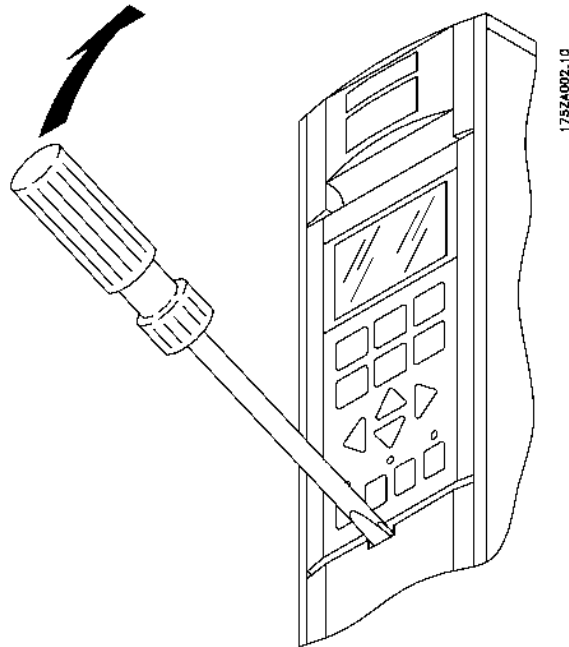
Using VLT 5027-5250, 525-600 V: wait at least 30 minutes.



NOTE

It is the user's or certified electrician's responsibility to ensure correct earthing and protection in accordance with applicable national and local norms and standards.

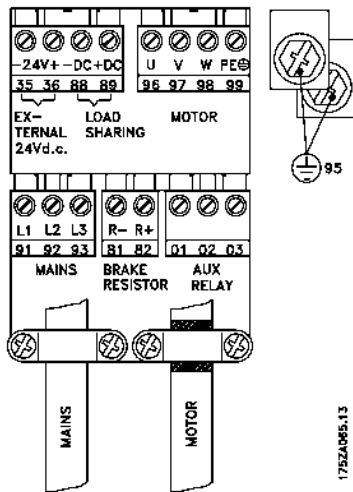
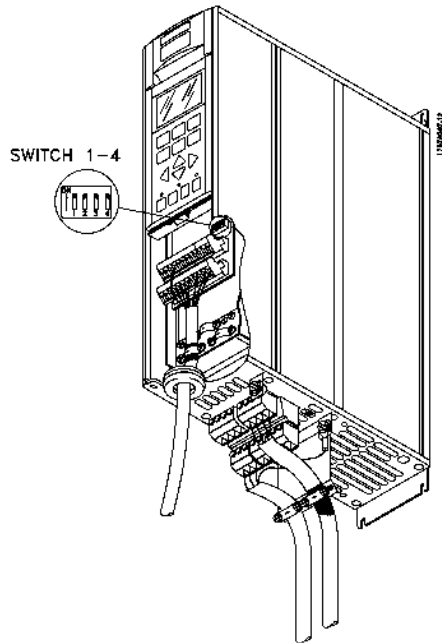
All terminals for the control cables are located under the protective cover of the adjustable frequency drive. The protective cover (see drawing) can be removed by means of a pointed object - a screwdriver or similar.



Once the protective cover has been removed, the actual EMC-correct installation can start. See drawings in the section, *EMC correct installation*.

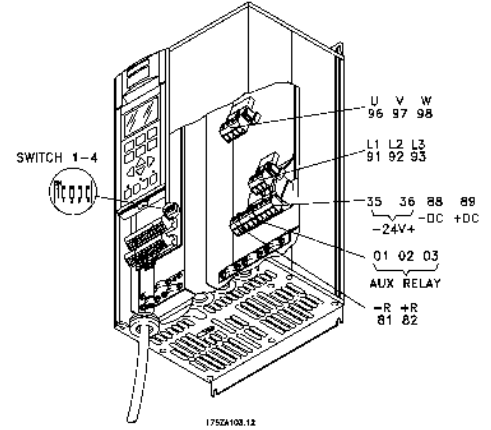
VL^T® 5000 Series

■ Electrical installation, power cables

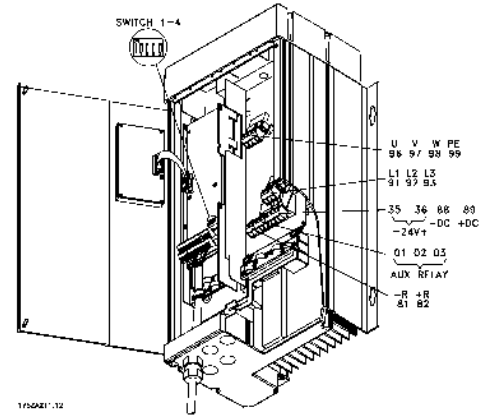


Bookstyle
 VLT 5001-5006 200-240 V
 VLT 5001-5011 380-500 V

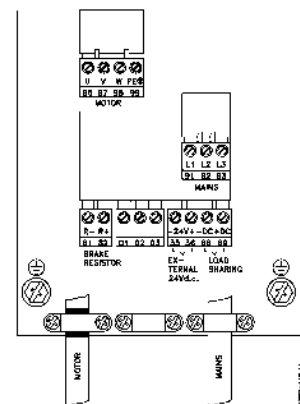
17524055.13



Compact Protected chassis / Nema 1



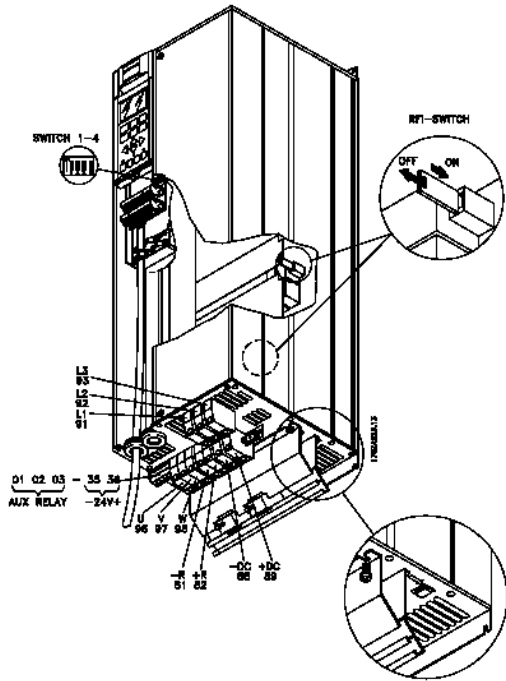
Compact IP 54 / Nema12



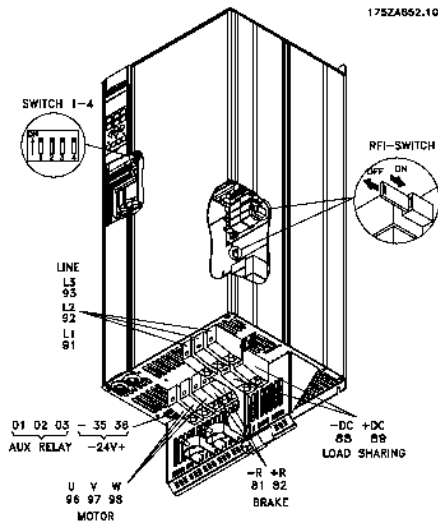
Compact
 VLT 5001-5006 200-240 V
 VLT 5001-5011 380-500 V
 VLT 5001-5011 525-600 V

VLT® 5000 Series

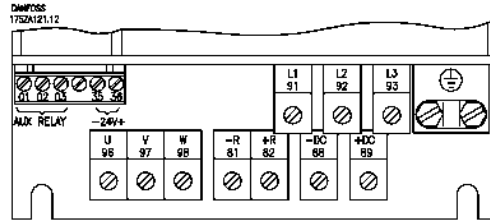
■ Electrical installation, power cables



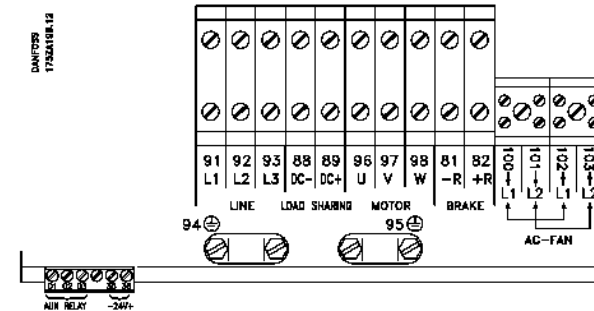
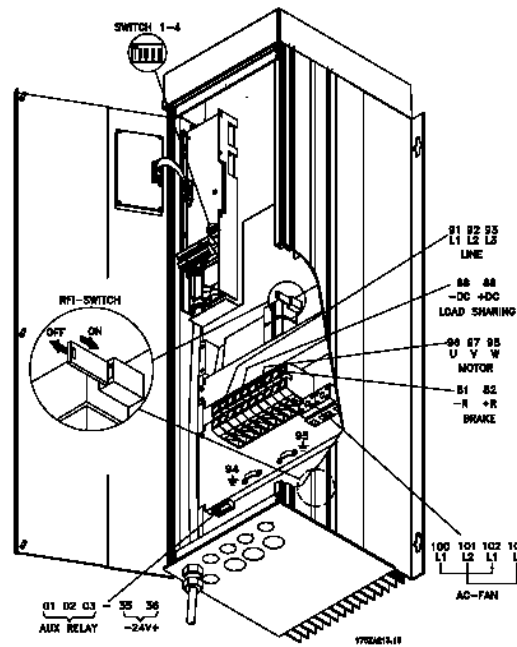
Compact Protected chassis / Nema 1
 VLT 5008-5027 200-240 V
 VLT 5016-5062 380-500 V
 VLT 5016-5062 525-600 V



Compact Protected chassis / Nema1
 VLT 5072-5102 380-500 V

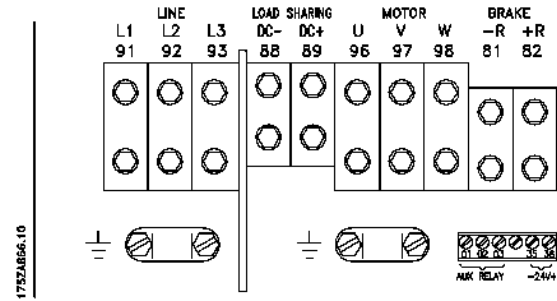
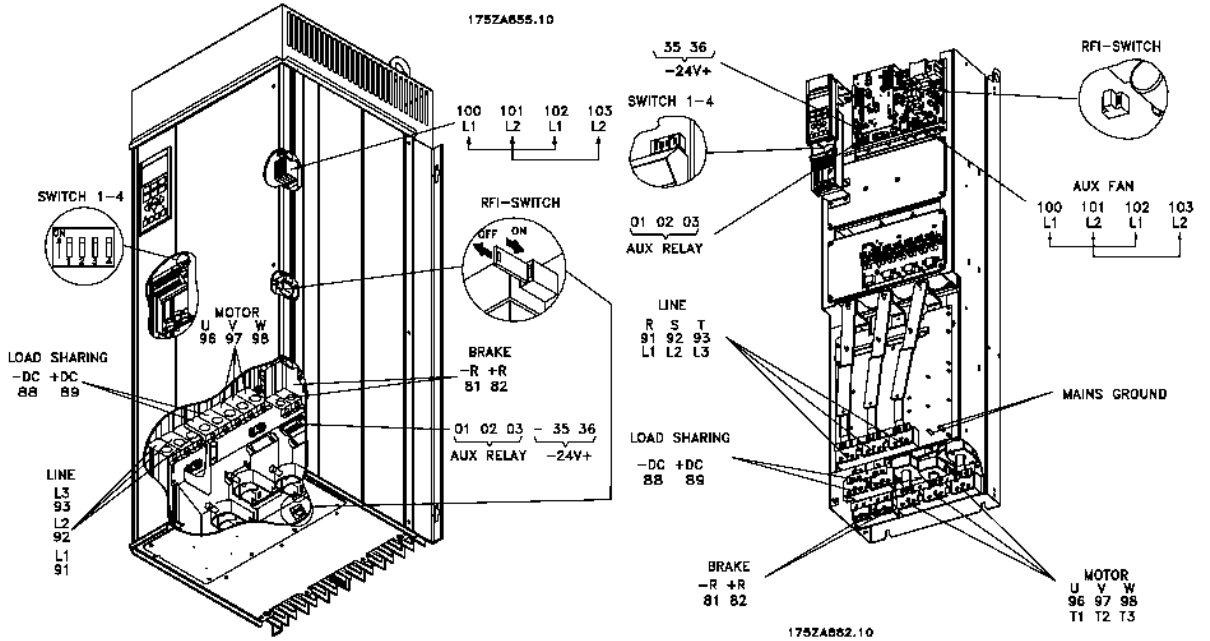


Compact Protected chassis / Nema 1
 VLT 5008-5027 200-240 V
 VLT 5016-5102 380-500 V
 VLT 5016-5062 525-600 V



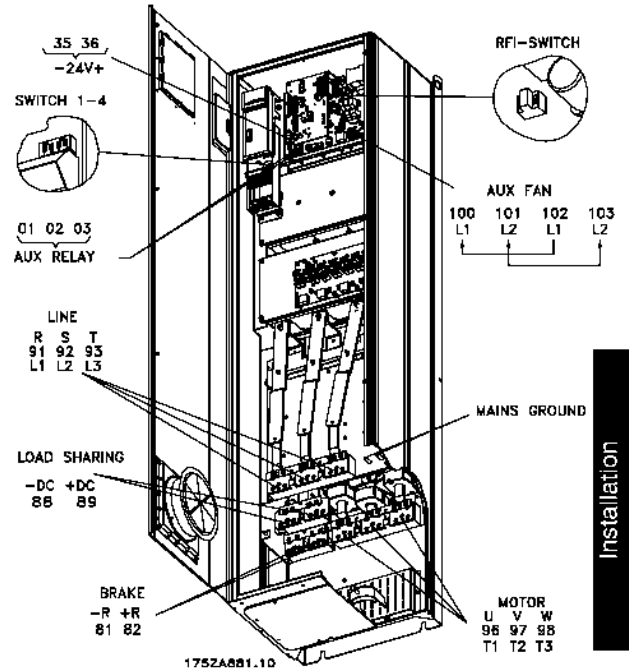
Compact IP 54 / Nema12
 VLT 5008-5027 200-240 V
 VLT 5016-5062 380-500 V

VL[®] 5000 Series



Compact IP 54 / Nema12
VLT 5072-5102 380-500 V

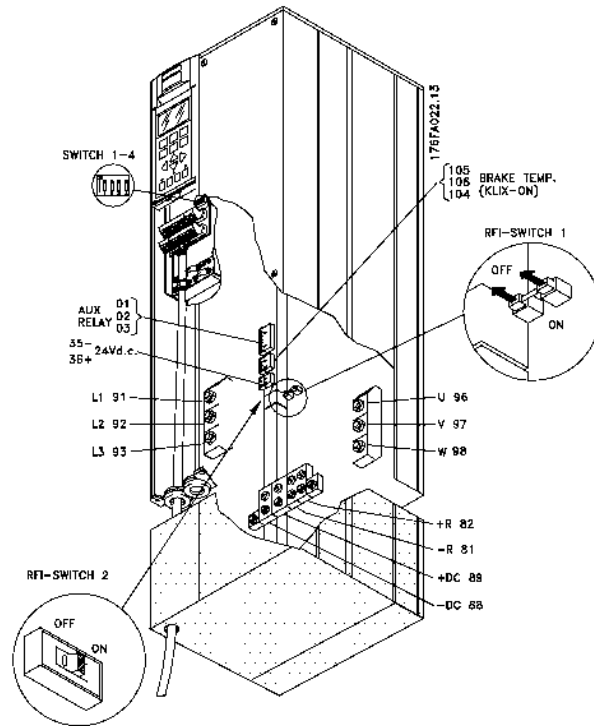
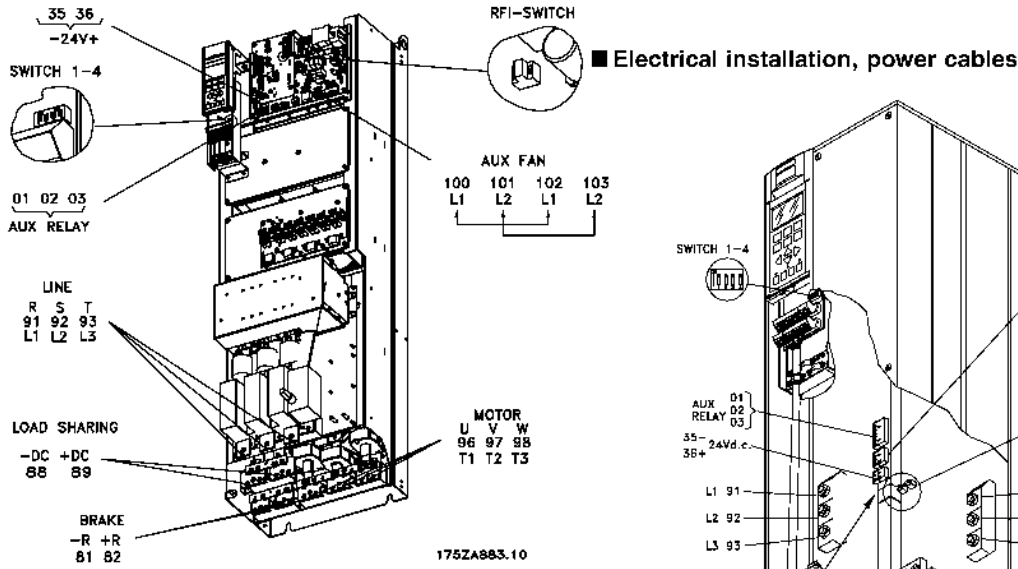
Compact chassis without disconnect and fuse
VLT 5122-5152 380-500 V



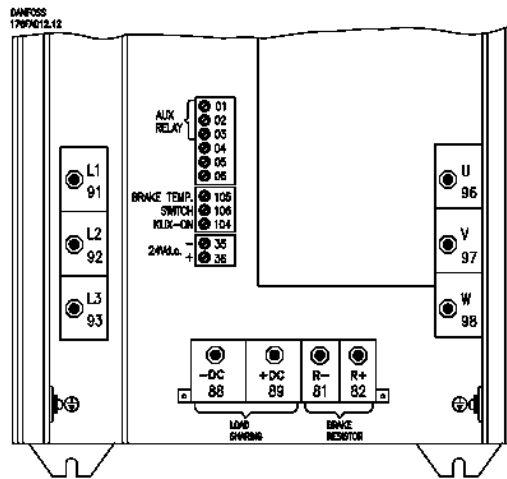
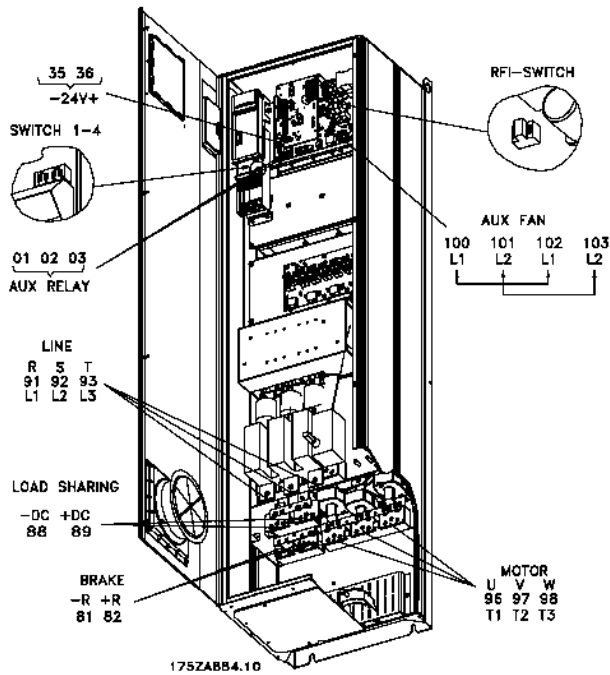
Compact Nema1 / Nema12 without
disconnect and fuse
VLT 5122-5152 380-500 V

Installation

VLT® 5000 Series



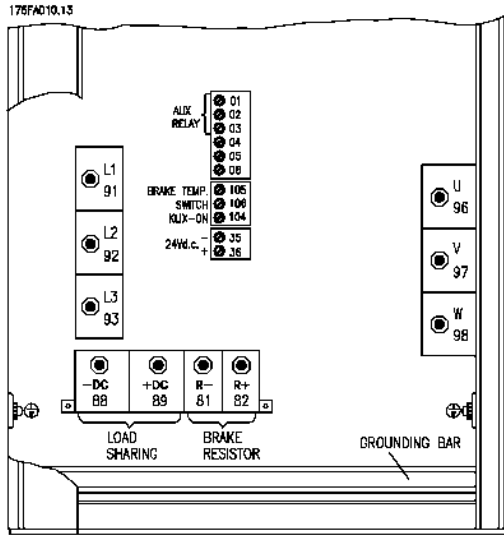
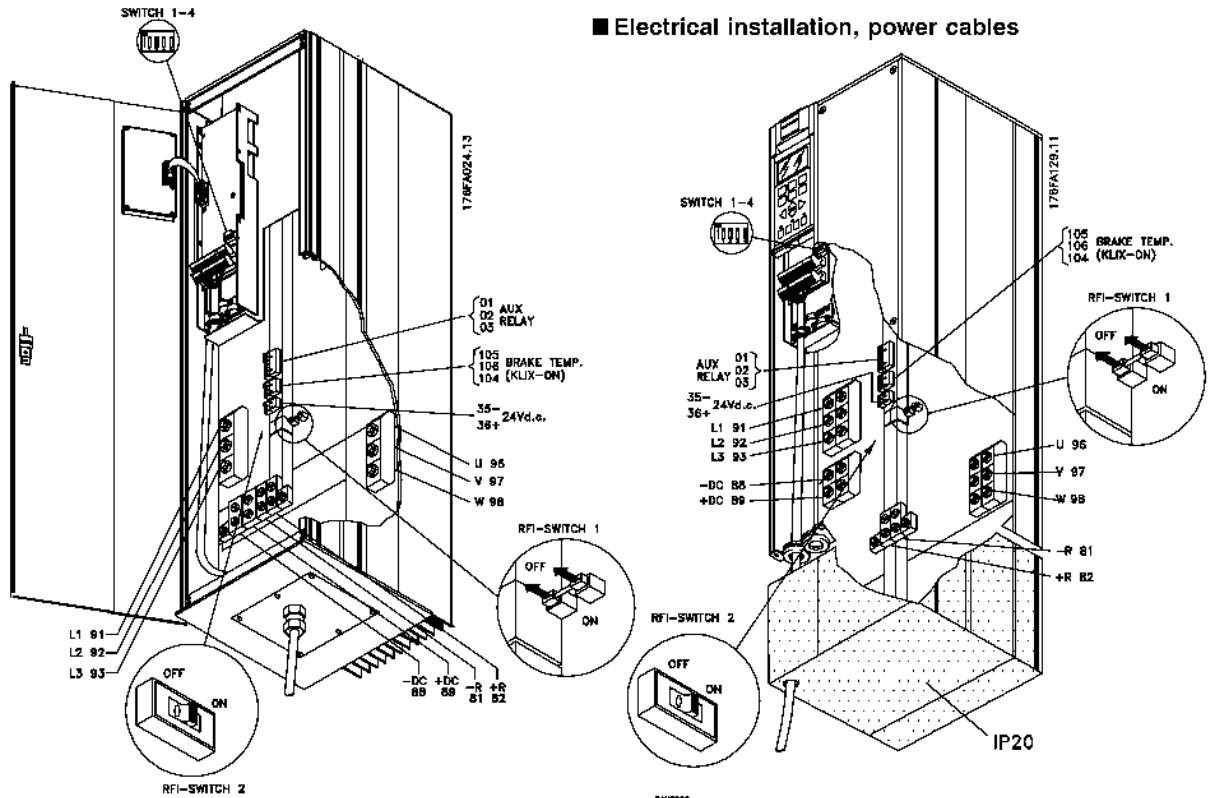
Compact chassis with disconnect and fuse
VLT 5202-5302 380-500 V



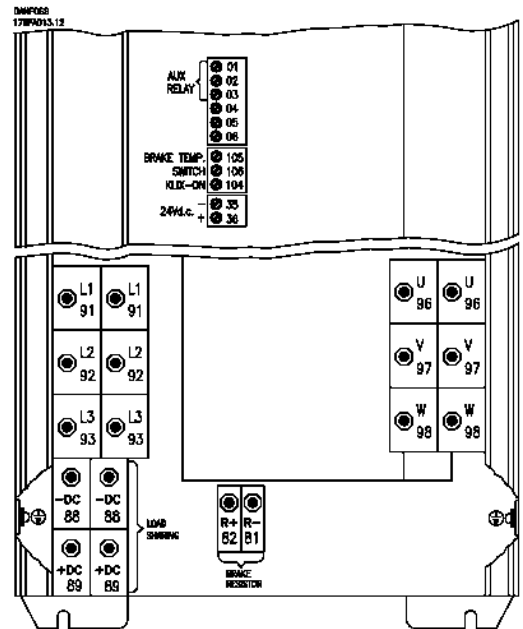
Compact Nema1 / Nema12 with disconnect and fuse
VLT 5202-5302 380-500 V

Compact chassis / NEMA 1 (IP 20)
VLT 5032-5052 200-240 V
VLT 5075-5125 525-600 V

■ Electrical installation, power cables



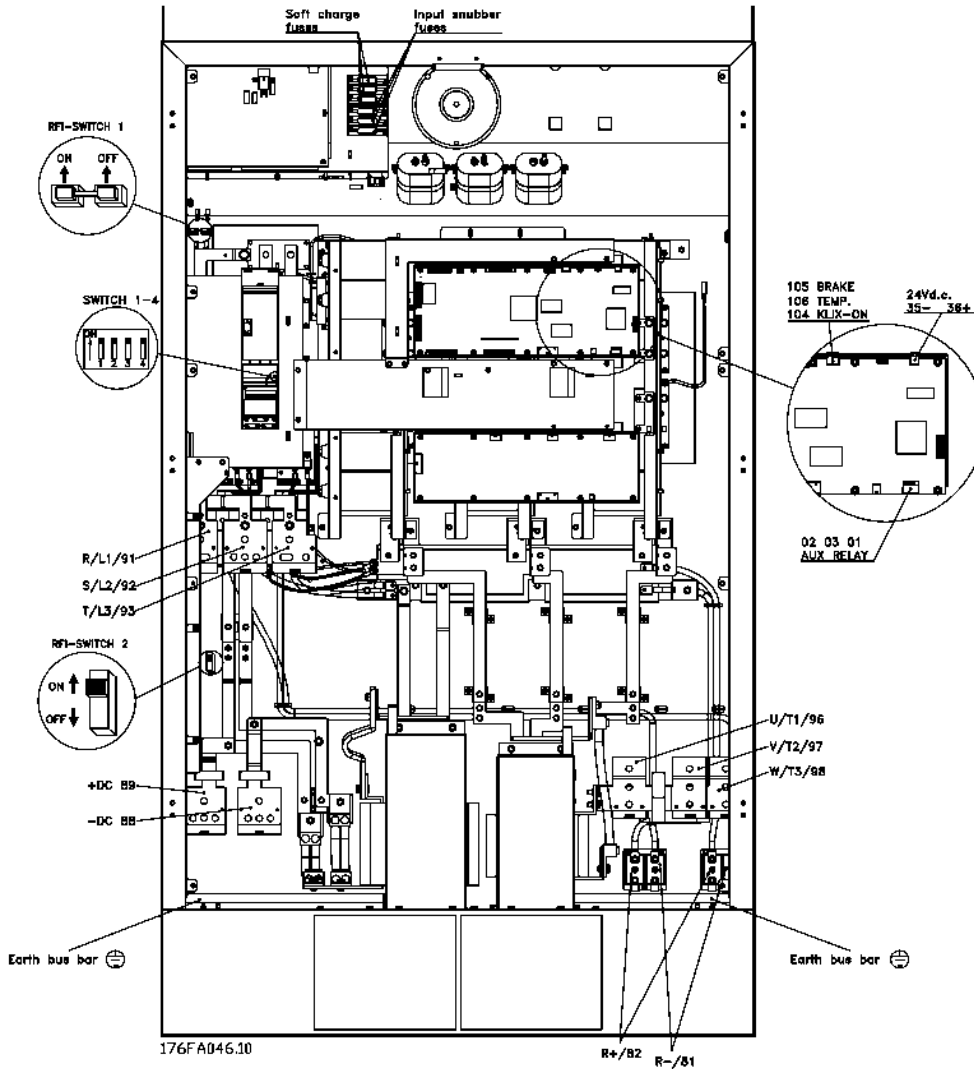
Compact IP 54 / Nema12
VLT 5032-5052 200-240 V



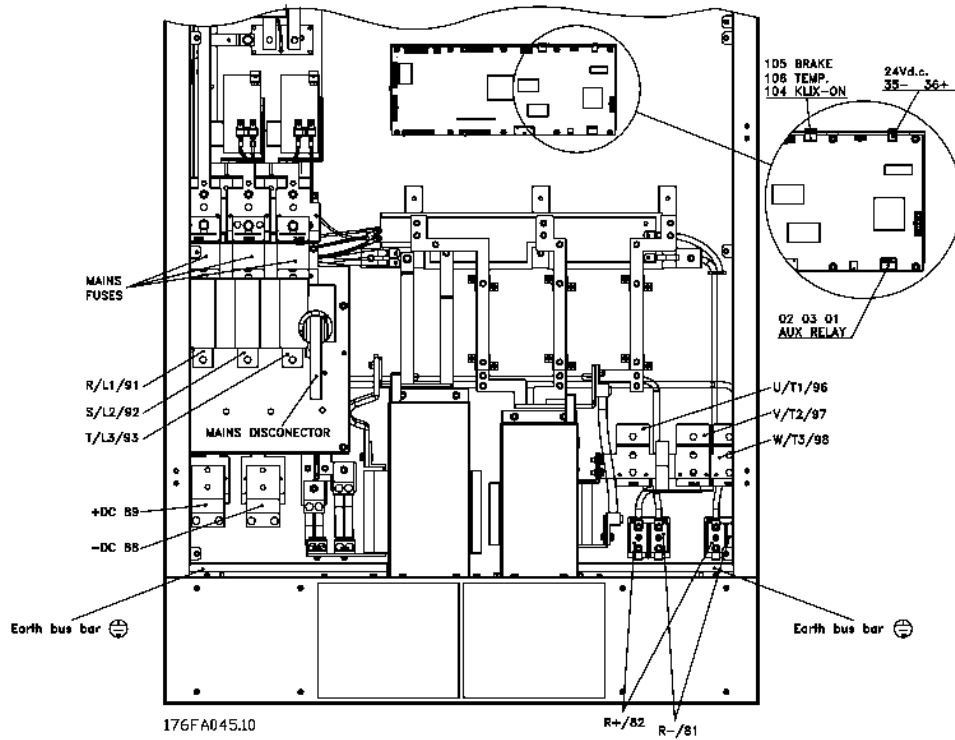
Compact chassis / Nema 1 (IP 20)
VLT 5150-5250 525-600 V

Installation

■ Electrical installation, power cables



Compact chassis /Nema 1 (IP 20)/IP 54
 without disconnecter and mains fuses
 VLT 5350 - 5500 380 - 500 V



**Compact chassis / Nema 1 (IP 20)/IP 54
with disconnect and mains fuses
VLT 5350 - 5500 380 - 500 V**



VLT® 5000 Series

■ Torques and screw sizes

The table shows the torque required when fitting terminals to the adjustable frequency drive. For VLT 5001-5027 200-240 V, VLT 5001-5062 380-500 V and VLT 5001-5062 525-600 V, the cables must be fastened with screws. For VLT 5032 - 5052 200-240 V, VLT 5075-5500 380-500 V, 5075-5250 525-600 V the cables must be fastened with bolts.

These figures apply to the following terminals:

Mains terminals Nos 91, 92, 93
L1, L2, L3

Motor terminals Nos 96, 97, 98
U, V, W

Earth terminal No 94, 95, 99

Brake resistor terminals 81, 82

Loadsharing 88, 89

VLT type		Torque [Nm]/[In-lbs]	Screw/ Boltsize	Tool
200-240 V				
5001-5006		0.6/5.31	M3	Slotted screw
5008	Chassis/Nema1	1.8/15.93	M4	Slotted screw
5008-5011	Nema12	1.8/15.93	M4	Slotted screw
5011-5022	Chassis/Nema1	3/26.55	M5	4 mm Allen wrench
5016-5022 ³⁾	Nema12	3/26.55	M5	4 mm Allen wrench
5027		6/53.10	M6	4 mm Allen wrench
5032-5052 ¹⁾		11.3/100.01	M8 (bolt and stud)	
380-500 V				
5001-5011		0.6/5.31	M3	Slotted screw
5016-5022	Chassis/Nema1	1.8/15.93	M4	Slotted screw
5016-5027	Nema12	1.8/15.93	M4	Slotted screw
5027-5042	Chassis/Nema1	3/26.55	M5	4 mm Allen wrench
5032-5042 ³⁾	Nema12	3/26.55	M5	4 mm Allen wrench
5052-5062		6/53.10	M6	5 mm Allen wrench
5072-5102	Chassis/Nema1	15/132.76	M6	6 mm Allen wrench
	Nema12 ²⁾	24/212.42	M8	8 mm Allen wrench
5122-5302 ⁴⁾		19/168.16	M10 bolt	
5350-5500 ⁵⁾		42/371.73	M12 bolt	
525-600 V				
5001-5011		0.6/5.31	M3	Slotted screw
5016-5027		1.8/15.93	M4	Slotted screw
5032-5042		3/26.55	M5	4 mm Allen wrench
5052-5062		6/53.10	M6	5 mm Allen wrench
5075-5125 ¹⁾		11.3/100.01	M8 (bolt and stud)	
5150-5250		11.3/100.01	M8 (bolt and stud)	

- 1) Brake terminals: 3,0 Nm, Nut: M6
- 2) Brake and loadsharing: 14 Nm, M6 Allen screw
- 3) IP54 with RFI - Line terminals 6Nm, Screw: M6 - 5 mm Allen wrench
- 4) Loadshare and brake terminals: 9,5 Nm; Bolt M8
- 5) Brake terminals: 11,3 Nm; Bolt M8



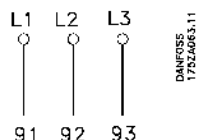
Contact Esys for more information about this product:
Esys® The Energy Control Company™
 4520 Stine Road, Ste 7
 Bakersfield, CA 93313
 (661) 833-1902

email: esys@esys.us
 website: <http://www.esys.us>



■ Electrical installation - mains supply

Connect the three mains phases to terminals L₁, L₂, L₃.



If ELCB relays are used, local regulations must be observed. Relays must be suitable for protection of 3-phase equipment with a bridge rectifier and for a brief discharge on power-up.

■ High voltage test

A high voltage test can be carried out by short-circuiting terminals U, V, W, L₁, L₂ and L₃ and energizing by max. 2.15 kV DC for one second between this short-circuit and the chassis.


NOTE

The RFI switch must be closed (position ON) when high voltage tests are carried out (see section *RFI Switch*).

The mains and motor connection must be interrupted in the case of high voltage tests of the total installation if the leakage currents are too high.

■ Safety earthing

NOTE

The adjustable frequency drive has a high leakage current and must be earthed appropriately for safety reasons. Use earth terminal (see section *Electrical installation, power cables*), which enables reinforced earthing. Apply national safety regulations.

■ Motor thermal protection

The electronic thermal relay in UL-approved adjustable frequency drives has received the UL-approval for single motor protection when parameter 128 has been set for *ETR Trip* and parameter 105 has been programmed to the rated motor current (see motor nameplate).

■ Extra protection (RCD)

ELCB relays, multiple protective earthing or earthing can be used as extra protection, provided that local safety regulations are complied with.

In the case of an earth fault, a DC content may develop in the faulty current.

■ RFI switch

Mains supply isolated from earth:

If the adjustable frequency drive is supplied from an isolated mains source (IT mains and grounded delta), the RFI switch can be turned off (OFF). In OFF position, the internal RFI capacities (filter capacitors) between the chassis and the intermediate circuit are cut off to avoid damage to the intermediate circuit and to reduce the earth capacity currents (according to IEC 61800-3).



NOTE

The RFI switch is not to be operated with mains connected to the unit. Check that the mains supply has been disconnected before operating the RFI switch.



NOTE

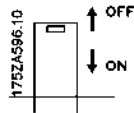
Open RFI switch is only allowed at factory set switching frequencies.



NOTE

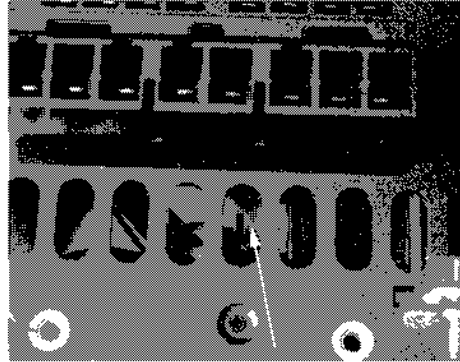
The RFI switch disconnects the capacitors galvanically to ground.

The red switches are operated by means of e.g. a screwdriver. They are set in the OFF position when they are pulled out and in ON position when they are pushed in (see drawing below). Factory setting is ON.



Mains supply connected to earth:

The RFI switch must be in ON position in order for the adjustable frequency drive to comply with the EMC-standard.



175ZA649.10

Bookstyle IP 20

VLT 5001 - 5006 200 - 240 V

VLT 5001 - 5011 380 - 500 V



175ZA650.10

Compact IP 20/NEMA 1

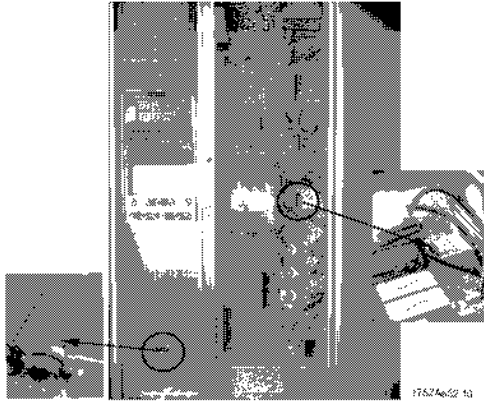
VLT 5001 - 5006 200 - 240 V

VLT 5001 - 5011 380 - 500 V

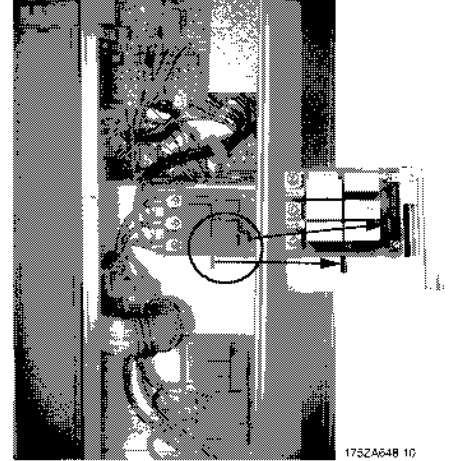
VLT 5001 - 5011 525 - 600 V



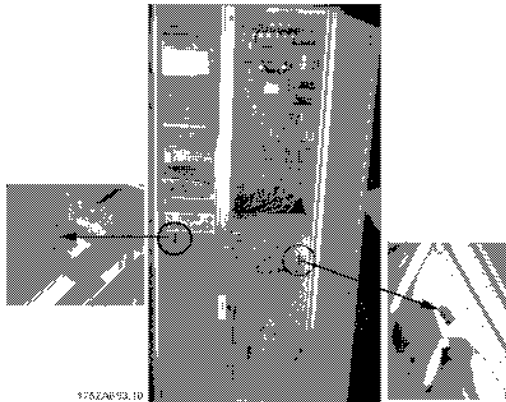
VLT® 5000 Series



Compact IP 20/NEMA 1
VLT 5008 200 - 240 V
VLT 5016 - 5022 380 - 500 V
VLT 5016 - 5022 525 - 600 V



Compact IP 20/NEMA 1
VLT 5022 - 5027 200 - 240 V
VLT 5042 - 5062 380 - 500 V
VLT 5042 - 5062 525 - 600 V



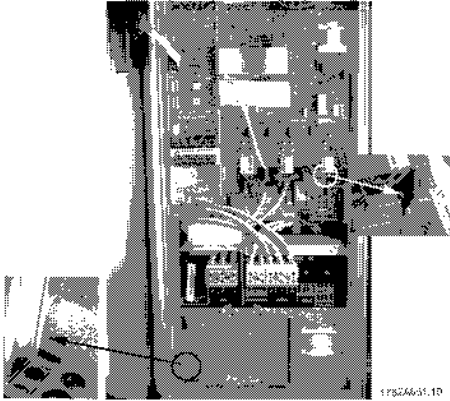
Compact IP 20/NEMA 1
VLT 5011 - 5016 200 - 240 V
VLT 5027 - 5032 380 - 500 V
VLT 5027 - 5032 525 - 600 V



Compact IP 54
VLT 5001 - 5006 200 - 240 V
VLT 5001 - 5011 380 - 500 V



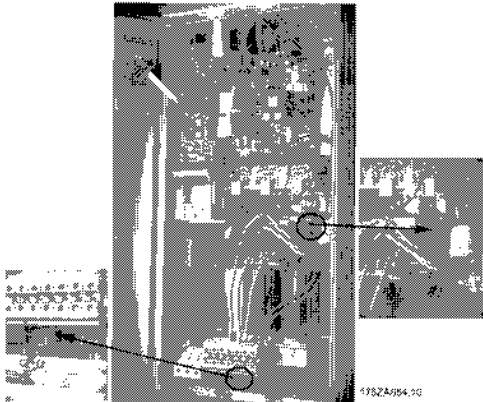
VLT® 5000 Series



Compact IP 54

VLT 5008 - 5011 200 - 240 V

VLT 5016 - 5027 380 - 500 V



Compact IP 54

VLT 5016 - 5027 200 - 240 V

VLT 5032 - 5062 380 - 500 V



Contact Esys for more information about this product:
Esys® The Energy Control Company™
4520 Stine Road, Ste 7
Bakersfield, CA 93313
(661) 833-1902

email: esys@esys.us
website: <http://www.esys.us>



■ Installation of motor cables



NOTE

If an unshielded cable is used, some EMC requirements are not complied with.

If the EMC specifications regarding emission are to be complied with, the motor cable must be shielded, unless otherwise stated for the RFI filter in question. It is important to keep the motor cable as short as possible so as to reduce the noise level and leakage currents to a minimum.

The motor cable shield must be connected to the metal cabinet of the adjustable frequency drive and to the metal cabinet of the motor. The shield connections are to be made with the biggest possible surface (cable clamp). This is enabled by different installation devices in the different adjustable frequency drives.

Installation with twisted shield ends (pigtailed) is to be avoided, since these spoil the shielding effect at higher frequencies.

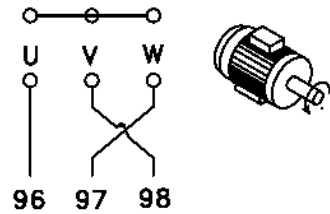
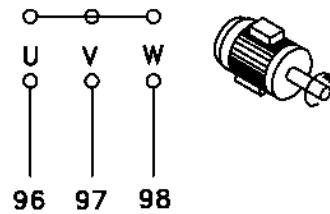
If it is necessary to break the shield to install a motor isolator or motor contactor, the shield must be continued at the lowest possible HF impedance.

The adjustable frequency drive has been tested with a given length of cable and a given cross-section of that cable. If the cross-section is increased, the cable capacitance — and thus the leakage current — increases, and the cable length must be reduced correspondingly.

■ Connection of motor

All types of 3-phase standard induction motors can be used with the VLT 5000 Series.

■ Direction of motor rotation



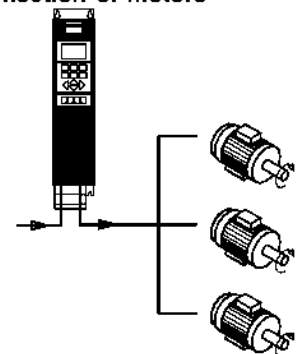
175HA36.00

The factory setting is for clockwise rotation with the frequency transformer output connected as follows.

Terminal 96 connected to U-phase
Terminal 97 connected to V-phase
Terminal 98 connected to W-phase

The direction of motor rotation can be changed by switching two phases in the motor cable.

■ Parallel connection of motors



1752M1C.12

The adjustable frequency drive is able to control several motors connected in parallel. If the motors are to have different rpm values, the motors must have different rated rpm values. Motor rpm is changed simultaneously, which means that the ratio between the rated rpm values is maintained across the range.

The total current consumption of the motors is not to exceed the maximum rated output current I_{VLT-N} for the adjustable frequency drive.



VLT® 5000 Series

Problems may arise at the start and at low rpm values if the motor sizes are widely different. This is because the relatively high ohmic resistance in small motors calls for a higher voltage at the start and at low rpm values.

In systems with motors connected in parallel, the electronic thermal relay (ETR) of the adjustable frequency drive cannot be used as motor protection for the individual motor. Consequently, additional motor protection is required, such as thermistors in each motor (or individual thermal relays) suitable for adjustable frequency drive use.

Please note that the individual motor cable for each motor must be summed and is not to exceed the total motor cable length permitted.

■ Electrical installation - relay outputs

Torque: 4.4-5.3 In-lbs
Screw size: M3

No.	Function
1-3	Relay output, 1+3 break, 1+2 make See parameter 323 of the Operating Instructions. See also <i>General technical data</i> .
4, 5	Relay output, 4+5 make See parameter 326 of the Operating Instructions. See also <i>General technical data</i> .

■ Installation of brake cable

(Only standard with brake and extended with brake. Typecode: SB, EB).

No.	Function
81, 82	Brake resistor terminals

Size the brake cable cross-section to match the brake torque. See also Brake instructions, MI.90.FX.YY and MI.50.SX.YY for further information regarding safe installation.



NOTE

Please note that voltages up to 950 V DC may occur on the brake terminals.

VLT® 5000 Series

■ Electrical installation - 24 Volt external DC supply

(Only extended versions. Typecode: EB, EX, DE, DX).

Torque: 4.4-5.3 In-lbs

Screw size: M3

No.	Function
35, 36	24 V external DC supply

External 24 V DC supply can be used as low-voltage supply to the control card and any option cards installed. This enables full operation of the LCP (incl. parameter setting) without connection to mains. Please note that a warning of low voltage will be given when 24 V DC has been connected; however, there will be no tripping. If 24 V external DC supply is connected or switched on at the same time as the mains supply, a time of min. 200 msec. must be set in parameter 120 *Start delay*.

A pre-fuse of min. 6 Amp, slow-blow, can be fitted to protect the external 24 V DC supply.

The power consumption is 15-50 W, depending on the load on the control card.



NOTE

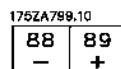
Use 24 V DC supply of type PELV to ensure correct galvanic isolation (type PELV) on the control terminals of the adjustable frequency drive.

■ Electrical installation - loadsharing

(Only extended with typecode EB, EX, DE, DX).

No.	Function
88, 89	Loadsharing

Terminals for loadsharing



The connection cable must be screened and the max. length from the adjustable frequency drive to the DC bus is 82 ft.

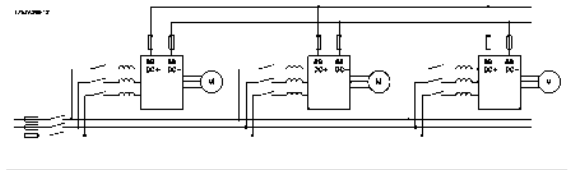
Load sharing enables linking of the DC intermediate circuits of several adjustable frequency drives.



NOTE

Please note that voltages up to 850 V DC may occur on the terminals.

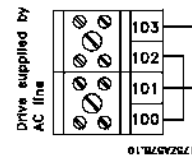
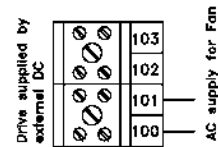
Load sharing calls for extra equipment. For further information please consult Loadsharing Instructions MI.50.NX.XX.



■ Fan Supply

Torque 4.4-5.3 In-lbs

Screwsize: M3



Only for IP54 units in the power range VLT 5016-5062, 380-500V and VLT 5008-5027, 200-240 VAC. If the drive is supplied by the DC bus (loadsharing), the internal fans are not supplied with AC power. In this case they must be supplied with an external AC supply.

■ Installation of brake resistor temperatureswitch

Torque: 4.4-5.3 In-lbs

Screw size: M3

No.	Function
106, 104, 105	Brake resistor temperature switch.

VLT® 5000 Series

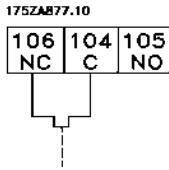


NOTE

This function is only available on VLT 5032-5052 200-240 V, VLT 5350-5500 380-500 V and VLT 5075-5250, 525-600 V.

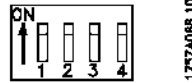
If the temperature of the brake resistor gets too high and the thermostat switch drops out, the adjustable frequency drive will stop braking. The motor will start coasting.

A thermostat switch must be installed that is 'normally closed'. If this function is not used, 106 and 104 must be short-circuited together.



■ DIP Switches 1-4

The dipswitch is located on the control card. It is used for serial communication, terminals 68 and 69. The switching position shown is the factory setting.



Switch 1 has no function.

Switches 2 and 3 are used for terminating an RS 485 interface, serial communication.

Switch 4 is used for separating the common potential for the internal 24 V DC supply from the common potential of the external 24 V DC supply.



NOTE

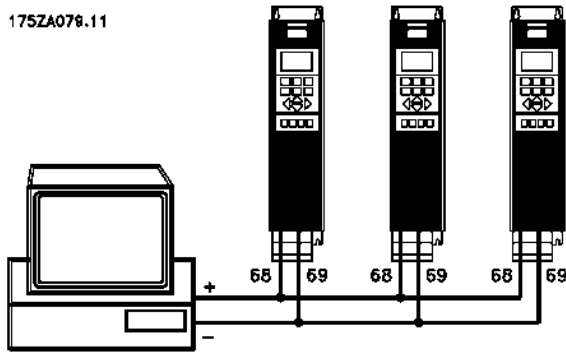
Please note that when Switch 4 is in position "OFF", the external 24 V DC supply is galvanically isolated from the adjustable frequency drive.

■ Electrical installation - bus connection

The serial bus connection in accordance with the RS 485 (2-conductor) norm is connected to terminals 68/69 of the adjustable frequency drive (signals P and N). Signal P is the positive potential (TX+,RX+), while signal N is the negative potential (TX-,RX-).

If more than one adjustable frequency drive is to be connected to a given master, use parallel connections.

175ZA078.11



In order to avoid potential equalizing currents in the screen, the cable screen can be earthed via terminal 61, which is connected to the frame via an RC-link.

Bus termination

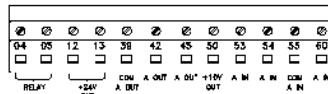
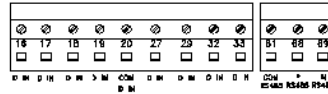
The bus must be terminated by a resistor network at both ends. For this purpose, set switches 2 and 3 on the control card for "ON".

■ Installation of control cables

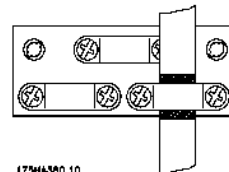
Torque: 4.4-5.3 In-lbs

Screw size: M3

See section *earthing of braided screened/armoured control cables*.



175HA378.10

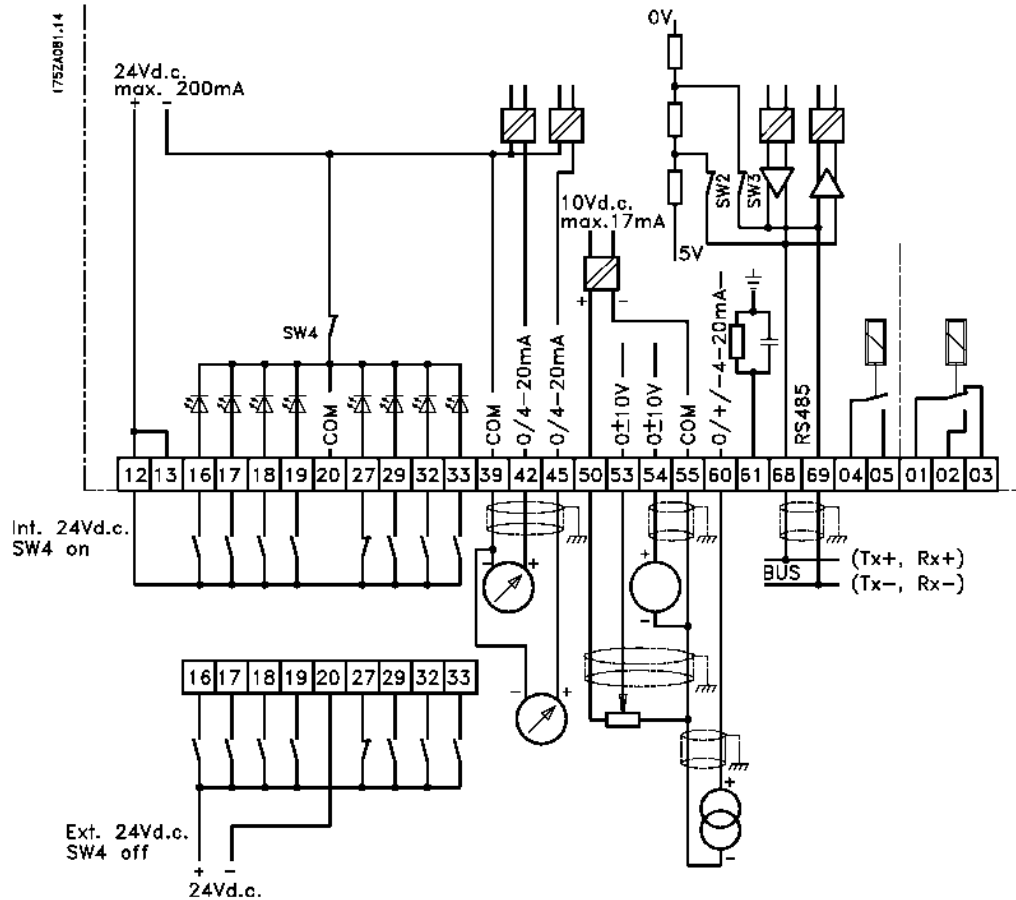


No.	Function
12, 13	Voltage supply to digital inputs For the 24 V DC to be usable for the digital inputs, switch 4 on the control card must be closed, position "ON".
16-33	Digital inputs/encoder inputs
20	Ground for digital inputs
39	Ground for analog/digital outputs
42, 45	Analog/digital outputs for indicating frequency, reference, current and torque
50	Supply voltage to potentiometer and thermistor 10 V DC
53, 54	Analog reference input, voltage 0 - ± 10 V
55	Ground for analog reference inputs
60	Analog reference input, current 0/4-20 mA
61	Termination for serial communication. See section <i>Bus connection</i> . This terminal is normally not to be used.
68, 69	RS 485 interface, serial communication. Where the adjustable frequency drive is connected to a bus, switches 2 and 3 (switches 1- 4) must be closed on the first and the last adjustable frequency drive. On the remaining adjustable frequency drives, switches 2 and 3 must be open. The factory setting is closed (position "ON").



VLT® 5000 Series

■ Electrical installation



Conversion of analogue inputs

Current input signal to voltage input

0-20 mA	0-10 V	Connect 510 ohms resistor between input terminal 53 and 55 (terminal 54 and 55) and adjust minimum and maximum values in parameters 309 and 310 (parameters 312 and 313).
4-20 mA	2-10 V	



Contact Esys for more information about this product:
 Esys® The Energy Control Company™
 4520 Stine Road, Ste 7
 Bakersfield, CA 93313
 (661) 833-1902

email: esys@esys.us
 website: <http://www.esys.us>

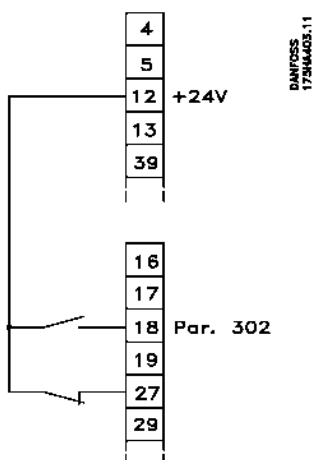


■ Connection examples

Digital inputs	Terminal no.	16	17	18	19	27	29	32	33
	parameter	300	301	302	303	304	305	306	307
Value:									
No function	{NO OPERATION}	[0]	[0]	[0]	[0]		[0]	[0]	[0]
Reset	{RESET}	[1]*	[1]				[1]	[1]	[1]
Coasting stop, inverse	{COAST INVERSE}						[0]*		
Reset and coasting stop, inverse	{COAST & RESET INVERS}						[1]		
Quick-stop, inverse	{QSTOP INVERSE}						[2]		
DC-braking, inverse	{DCBRAKE INVERSE}						[3]		
Stop inverse	{STOP INVERSE}	[2]	[2]				[4]	[2]	[2]
Start	{START}				[1]*				
Latched start	{LATCHED START}			[2]					
Reversing	{REVERSING}				[1]*				
Start reversing	{START REVERSE}				[2]				
Only start clockwise, on	{ENABLE START FWD.}	[3]		[3]			[3]	[3]	
Only start anti-clockwise, on	{ENABLE START REV}		[3]		[3]		[4]		[3]
Jog	{JOGGING}	[4]	[4]				[5]*	[4]	[4]
Preset reference, on	{PRESET REF. ON}	[5]	[5]				[5]	[5]	[5]
Preset reference, lsb	{PRESET REF. SEL. LSB}	[5]					[7]	[6]	
Preset reference, msb	{PRESET REF. MSB}		[6]				[8]		[6]
Freeze reference	{FREEZE REFERENCE}	[7]	[7]*				[9]	[7]	[7]
Freeze output	{FREEZE OUTPUT}	[8]	[8]				[10]	[8]	[8]
Speed up	{SPEED UP}	[9]					[11]	[9]	
Speed down	{SPEED DOWN}		[9]				[12]		[9]
Choice of Setup, lsb	{SETUP SELECT LSB}	[10]					[13]	[10]	
Choice of Setup, msb	{SETUP SELECT MSB}		[10]				[14]		[10]
Choice of Setup, msb/speed up	{SETUP MSB/SPEED UP}							[11]*	
Choice of Setup, lsb/speed down	{SETUP LSB/SPEED DOWN}								[11]*
Catch-up	{CATCH UP}	[11]					[15]	[12]	
Slow-down	{SLOW DOWN}		[11]				[16]		[12]
Ramp 2	{RAMP 2}	[12]	[12]				[17]	[13]	[13]
Mains failure inverted	{MAINS FAILURE INVERSE}	[13]	[13]				[18]	[14]	[14]
Pulse reference	{PULSE REFERENCE}		[23]				[28] ¹		
Pulse feedback	{PULSE FEEDBACK}								[24]
Encoder feedback input, A	{ENCODER INPUT 2A}								[25]
Encoder feedback input, B	{ENCODER INPUT 2B}							[24]	
Safety interlock	{SAFETY INTERLOCK}		[24]			[5]			
Data change lock	{PROGRAMMING LOCK}	[29]	[29]				[29]	[29]	[29]

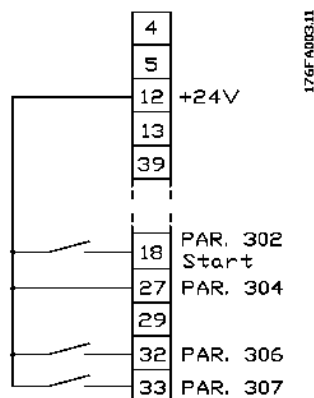
1) If this function is selected for terminal 29, the same function for terminal 17 will not be valid, even if it has been selected to be active.

■ Two wire start/stop



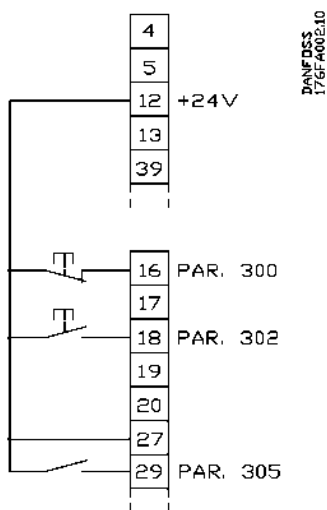
- Start/stop using terminal 18.
Parameter 302 = *Start* [1]
- Quick-stop using terminal 27.
Parameter 304 = *Coasting stop inverted* [0]

■ Setup change



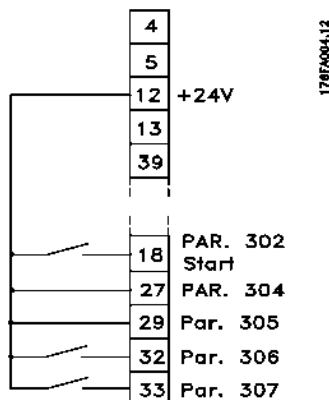
- Selection of setup using terminals 32 and 33.
Parameter 306 = *Selection of setup, lsb* [10]
Parameter 307 = *Selection of setup, msb* [10]
Parameter 004 = *Multi-setup* [5].

■ Pulse start/stop



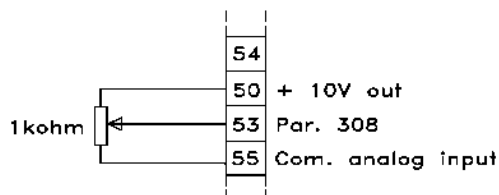
- Stop inverted by means of terminal 16.
Parameter 300 = *Stop inverted* [2]
- Pulse start using terminal 18.
Parameter 302 = *Pulse start* [2]
- Jog by means of terminal 29.
Parameter 305 = *Jog* [5]

■ 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].

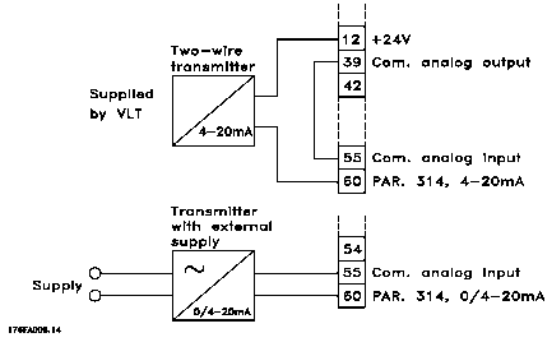
■ Potentiometer reference



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

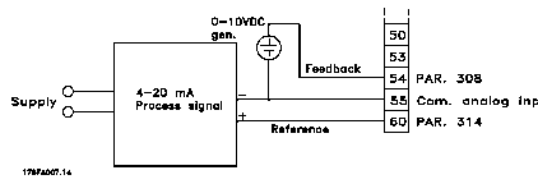
If an encoder is connected that only has one output to Encoder input A [25], Encoder input B [24] must be set to No function [0].

Two-wire transmitter



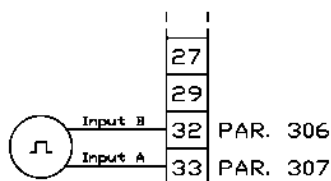
Parameter 314 = Reference [1], Feedback [2]
 Parameter 315 = Terminal 60, min. scaling
 Parameter 316 = Terminal 60, max. scaling

Current 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]



VLT® 5000 Series

■ Control panel (LCP)

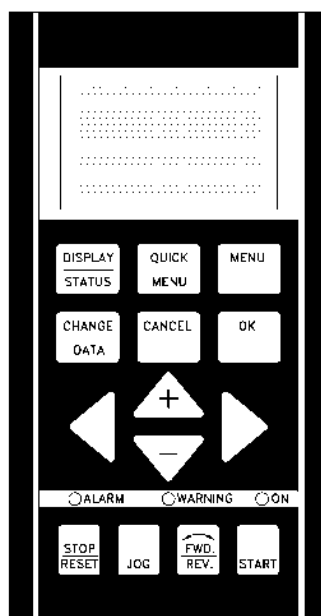
The front of the adjustable frequency drive features a control panel - LCP (Local Control Panel), which makes up a complete interface for operation and monitoring of the VLT 5000 Series.

The control panel is detachable and can - as an alternative - be installed up to 3 meters away from the adjustable frequency drive, e.g. on a front panel, by means of a mounting kit option.

The functions of the control panel can be divided into three groups:

- display
- keys for changing program parameters
- keys for local operation

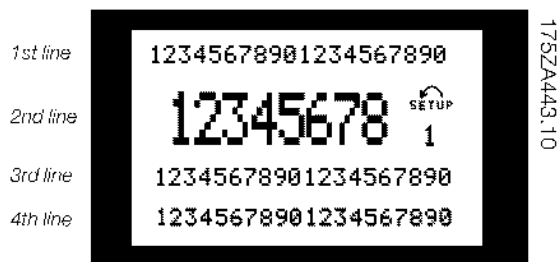
All data are indicated by means of a 4-line alpha-numeric display, which in normal operation is able to show 4 measurements and 3 operating conditions continuously. During programming, all the information required for quick, effective parameter Setup of the adjustable frequency drive will be displayed. As a supplement to the display, there are three LEDs for voltage (power or 24 V external), warning and alarm. All program parameters of the adjustable frequency drive can be changed immediately from the control panel, unless this function has been blocked via parameter 018.



DANFOSS
175ZA004.10

■ Control panel - display

The LCD-display has rear lighting and a total of 4 alpha-numeric lines together with a box that shows the direction of rotation (arrow) and the chosen Setup as well as the Setup in which programming is taking place if that is the case.



1st line shows up to 3 measurements continuously in normal operating status or a text which explains the 2nd line.

2nd line shows a measurement with related unit continuously, regardless of status (except in the case of alarm/warning).

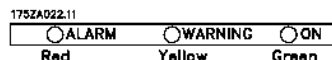
3rd line is normally blank and is used in the menu mode to show the selected parameter number or parameter group number and name.

4th line is used in operating status for showing a status text or in data change mode for showing the mode or value of the selected parameter.

An arrow indicates the direction of rotation of the motor. Furthermore, the Setup which has been selected as the Active Setup in parameter 004 is shown. When programming another Setup than the Active Setup, the number of the Setup which is being programmed will appear to the right. This second Setup number will flash.

■ Control panel - LEDs

At the bottom of the control panel is a red alarm LED and a yellow warning LED, as well as a green voltage LED.

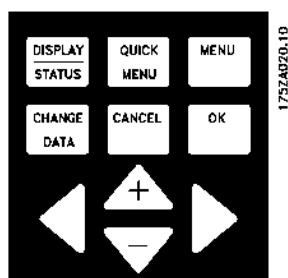


If certain threshold values are exceeded, the alarm and/or warning LED lights up together with a status and alarm text on the control panel.

The voltage LED is activated when the adjustable frequency drive receives voltage, or 24 V external supply; at the same time the rear lighting of the display will be on.

■ Control panel - control keys

The control keys are divided into functions. This means that the keys between display and indicator lamps are used for parameter Setup, including choice of display indication during normal operation.



Keys for local control are found under the indicator LEDs.



■ Control key functions

[DISPLAY / STATUS] is used for selecting the mode of display or for changing back to Display mode from either the Quick menu mode or the Menu mode.

[QUICK MENU] is used for programming the parameters that belong under the Quick menu mode. It is possible to switch directly between Quick menu mode and Menu mode.

[MENU] is used for programming all parameters. It is possible to switch directly between Menu mode and Quick menu mode.

[CHANGE DATA] is used for changing the parameter selected either in the Menu mode or the Quick menu mode.

[CANCEL] is used if a change of the selected parameter is not to be carried out.

[OK] is used for confirming a change of the parameter selected.

[+/-] is used for selecting parameter and for changing the chosen parameter or for changing the read out in line 2.

[<>] is used for selecting group and to move the cursor when changing numerical parameters.

[STOP / RESET] is used for stopping the motor connected or for resetting the adjustable frequency drive after a drop-out (trip). Can be selected via parameter 014 to be active or inactive. If stop is activated, line 2 will flash, and [START] must be activated.

[JOG] overrides the output frequency to a preset frequency while the key is kept down. Can be selected via parameter 015 to be active or inactive.

[FWD / REV] changes the direction of rotation of the motor, which is indicated by means of the arrow on the display although only in Local. Can be selected via parameter 016 to be active or inactive.

[START] is used for starting the adjustable frequency drive after stop via the "Stop" key. Is always active, but cannot override a stop command given via the terminal strip.



NOTE

If the keys for local control have been selected as active, they will remain active both when the frequency has been set for *Local Control* and for *Remote Control* via parameter 002, although with the exception of [Fwd/rev], which is only active in Local operation.



NOTE

If no external stop function has been selected and the [Stop] key has been selected as inactive, the motor can be started and can only be stopped by disconnecting the voltage to the motor.

■ Control panel - display read-outs

The display read-out state can be varied - see the list below - depending on whether the adjustable frequency drive is in normal operation or is being programmed.

■ Display mode

In normal operation, up to 4 different operating variables can be indicated continuously: 1.1 and 1.2 and 1.3 and 2, and in line 4 the present operating status or alarms and warnings that have arisen.



■ Display mode - selection of read-outstate

There are three options in connection with the choice of read-out state in the Display mode - I, II and III. The choice of read-out state determines the number of operating variables read out.

Read-out state:	I:	II:	III:
Line 1	Description for operating variable n in line	Data value for 3 operating variables in line 1	Description for 3 operating variables in line 1
2			

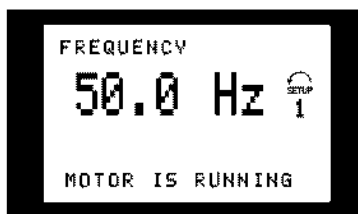
The table below gives the units linked to the variables in the first and second line of the display.

Operating variable:	Unit:
Reference	[%]
Reference	[unit]
Feedback	[unit]
Frequency	[Hz]
Frequency x scaling	[-]
Motor current	[A]
Torque	[%]
Power	[kW]
Power	[IP]
Output energy	[kWh]
Motor voltage	[V]
DC-link voltage	[V]
Motor thermal load	[%]
VLI thermal load	[%]
Hours run	[Hours]
Input status, dig. Input	[Binary code]
Input status, analog terminal 53	[V]
Input status, analog terminal 54	[V]
Input status, analog terminal 60	[mA]
Pulse reference	[Hz]
External reference	[%]
Status word	[Hex]
Brake effect/? min.	[kW]
Brake effect/sec.	[kW]
Heat sink temp.	[°C]
Alarm word	[Hex]
Control word	[Hex]
Warning word 1	[Hex]
Extended status word	[Hex]
Communication option card warning	[Hex]
RPM	[min ⁻¹]
RPM x scaling	[-]
LCP Display text	[-]

Operating variables 1.1 and 1.2 and 1.3 in the first line, and operating variable 2 in the second line are selected via parameter 009, 010, 011 and 012.

- Read-out state I:

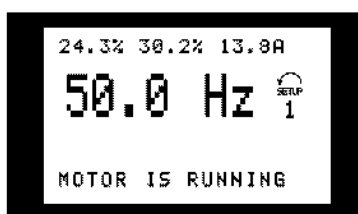
This read-out state is standard after starting up or after initialisation.



Line 2 gives the data value of an operating variable with related unit, and line 1 provides a text which explains line 2, cf. table. In the example, Frequency has been selected as variable via parameter 009. During normal operation another variable can immediately be read out by using the [+/-] keys.

- Read-out state II:

Switching between read-out states I and II is effected by pressing the [DISPLAY / STATUS] key.



In this state, data values for four operating values are shown at the same time, giving the related unit, cf. table. In the example, Reference, Torque, Current and Frequency are selected as variables in the first and second line.

- Read-out state III:

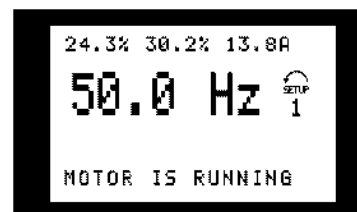
This read-out state can be held as long as the [DISPLAY/STATUS] key is pressed. When the key is released, the system switches back to Read-out state II, unless the key is pressed for less than approx. 1 sec., in which case the system always reverts to Read-out state I.



This is where parameter names and units for operating variables in the first and second line are given - operating variable 2 remains unchanged.

- Display state IV:

This display state can be produced during operation if another setup is to be changed without stopping the adjustable frequency drive. This function is activated in parameter 005, *Programming Setup*.



The selected programming setup number will flash to the right of the active setup.

■ Parameter Setup

The VLT 5000 Series can be used for practically all assignments, which is why the number of parameters is quite large. Also, this series offers a choice between two programming modes - a Menu mode and a Quick menu mode.

The former provides access to all parameters. The latter takes the user through a few parameters which make it possible in most cases to start operating the adjustable frequency drive.

Regardless of the mode of programming, a change of a parameter will take effect and be visible both in the Menu mode and in the Quick menu mode.

■ Structure for the Quick menu mode versus the Menu mode

In addition to having a name, each parameter is linked up with a number which is the same regardless of the programming mode. In the Menu mode, the



VLT® 5000 Series

parameters are divided into groups, with the first digit of the parameter number (from the left) indicating the group number of the parameter in question.

- The quick menu takes the user through a number of parameters that may be enough to get the motor to run nearly optimally, if the factory setting for the other parameters takes the desired control functions into account, as well as the configuration of signal inputs/outputs (control terminals).
- The Menu mode makes it possible to select and change all parameters at the user's option. However, some parameters will be "missing", depending on the choice of configuration (parameter 100), e.g. open loop hides all the P.I.D. parameters.

Pos.:	No.:	Parameter:	Unit:
1	001	Language	
2	102	Motor output	[kW]
3	103	Motor voltage	[V]
4	104	Motor frequency	[Hz]
5	105	Motor current	[A]
6	106	Rated motor speed	[rpm]
7	107	Automatic motor adaptation, AMA	
8	201	Minimum reference	[Hz]
9	205	Maximum reference	[Hz]
10	207	Ramp up time 1	[sec.]
11	208	Ramp down time 1	[sec.]
12	002	Local/remote control	
13	003	Local reference	

■ Quick Setup

The Quick Setup starts with pressing the [QUICK MENU] key, which brings out the following read-out on the display:



At the bottom of the display, the parameter number and name are given together with the status/value of the first parameter under Quick Setup. The first time the [Quick Menu] key is pressed after the unit has been switched on, the read-outs always start at pos. 1 - see table below.

■ Parameter selection

The selection of parameter is effected by means of the [+/-] keys. The following parameters are accessible:

■ Menu mode

The Menu mode is started by pressing the [MENU] key, which produces the following read-out on the display:



Line 3 on the display shows the parameter group number and name.

■ Parameter selection

In the Menu mode the parameters are divided into groups. Selection of parameter group is effected by means of the [<>] keys.

The following parameter groups are accessible:



Contact Esys for more information about this product:
 Esys® The Energy Control Company™
 4520 Stine Road, Ste 7
 Bakersfield, CA 93313
 (661) 833-1902

email: esys@esys.us
 website: <http://www.esys.us>



Group no.	Parameter group:
0	Operation & Display
1	Load & Motor
2	References & Limits
3	Inputs & Outputs
4	Special functions
5	Serial communication
6	Technical functions
7	Application Options
8	Fieldbus Profile
9	Fieldbus Communication

When the desired parameter group has been selected, each parameter can be chosen by means of the [+/-] keys:



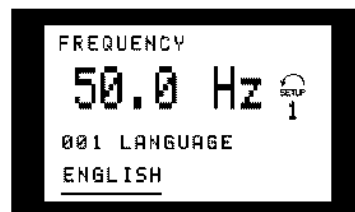
The 3rd line of the display shows the parameter number and name, while the status/value of the selected parameter are shown in line 4.

■ Changing data

Regardless of whether a parameter has been selected under the Quick menu or the Menu mode, the procedure for changing data is the same. Pressing the [CHANGE DATA] key gives access to changing the selected parameter, following which the underlining in line 4 will flash on the display. The procedure for changing data depends on whether the selected parameter represents a numerical data value or a text value.

■ Changing a text value

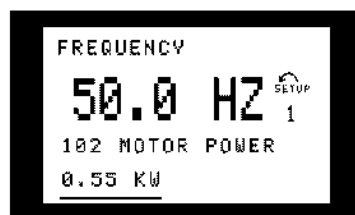
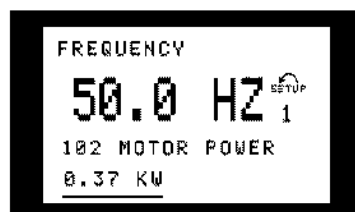
If the selected parameter is a text value, the text value is changed by means of the [+/-] keys.



The bottom display line shows the text value that will be entered (saved) when acknowledgement is given [OK].

■ Change of group of numeric data values

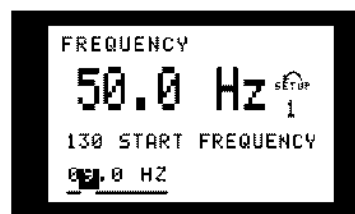
If the chosen parameter represents a numeric data value, the chosen data value is changed by means of the [+/-] keys.



The chosen data value is indicated by the digit flashing. The bottom display line shows the data value that will be entered (saved) when signing off with [OK].

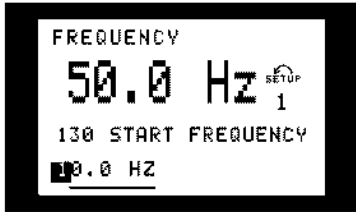
■ Infinitely variable change of numeric data value

If the chosen parameter represents a numeric data value, a digit is first selected by means of the [<>] keys.



Then the chosen digit is changed infinitely variably by means of the [+/-] keys:

VLT® 5000 Series



The chosen digit is indicated by the digit flashing. The bottom display line shows the data value that will be entered (saved) when signing off with [OK].

- Select parameter 620
- Press [CHANGE]
- Select "Initialization"
- Press the [OK] key
- Cut off the mains supply and wait until the display turns off.
- Reconnect the mains supply - the adjustable frequency drive is now reset.

This parameter initializes all except:

500	Serial communication address
501	Baud rate for serial communication
601-605	Operating data
615-617	Fault logs

Manual initialization

- Disconnect from mains and wait until the display turns off.
- Press the following keys at the same time:
[Display/status]
[Change data]
[OK]
- Reconnecting the mains supply while pressing the keys.
- Release the keys
- The adjustable frequency drive has now been programmed for the factory setting.

This parameter initializes all except:

600-605	Operating data
---------	----------------



NOTE

Settings for serial communication and fault logs are reset.

■ Changing of data value, step-by-step

Certain parameters can be changed step by step or infinitely variably. This applies to Motor power (parameter 102), Motor voltage (parameter 103) and Motor frequency (parameter 104).

The parameters are changed both as a group of numeric data values and as numeric data values infinitely variably.

■ Read out and programming of indexed parameters

Parameters are indexed when placed in a rolling stack. Parameter 615 - 617 contain a historical log which can be read out. Choose the actual parameter, press the [CHANGE DATA] key and use the [+] and [-] keys to scroll through the log of values. During the read out line 4 of the display will flash.

If a bus option is mounted in the drive, the programming of parameter 915 - 916 needs to be carried through in the following way:

Choose the actual parameter, press the [CHANGE DATA] key and use the [+] and [-] keys to scroll through the different indexed values. To change the value of the parameter, select the indexed value and press the [CHANGE DATA] key. Using the [+] and [-] keys the value to be changed will flash. To accept the new setting, press [OK], to abort, press [CANCEL].

■ Manual initialization

The adjustable frequency drive can be initialized to factory settings in two ways.

Initialization by parameter 620

- Recommended initialization