

## ***Inverter Drives***



***Safety, Installation, Operation and Maintenance Instructions***

***FläktWoods***

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# Introduction

Thank you for purchasing a FlaktWoods Drive. You will benefit from the fact that we have already commissioned it to suit your fan selection. This allows you to simply wire in the installation and control the fan knowing it is fully protected electrically. In this booklet we have put together some simple, easy to follow instructions, which if you follow will ensure a trouble free installation. We hope you find these instructions easy to follow, and we wish you every success, and hope you will use our equipment again and again.

## Section 1 What is the FWD range?

The FlaktWoods Drive (FWD) range is a selection of VLT6000 Frequency Inverters manufactured by Danfoss.

A Frequency Inverter is a speed controller for a 3 Phase motor.

FlaktWoods 'Partnership Range' offers 9 drives from the Danfoss VLT6000 range covering motor ratings from 1.1 to 18.5KW.

Frequency Inverters usually require an initial set-up exercise to be completed.

For your convenience, FlaktWoods have already programmed the inverter with the 'set-up' information required to make the FWD drive ready to use for normal installations, as delivered to site. Pre-programmed drives are easy to recognise – they have a label on the front stating the fan part number they have been programmed for.

This drive is easy to install & wire, and it is ready for immediate use.

If this is your first installation using the new FlaktWoods FWD range of inverter drives, please take the time to read the information within this booklet, particularly the Safety Warning information.

Operating instructions, the units are very simple to use, all units have the same controls from the smallest to the largest sizes. On/Off, Speed Up/Slow Down functions are easy to use and the buttons are shown on the 'Instructions for Use' sticker on the front of the FWD unit itself.

Lastly, FlaktWoods also offer an optional Remote Control device (the 'FWDR1') which is very easily wired to the FWD unit to give the same On/Off Speed Up/Slow Down features controllable remotely by a low voltage control. When used this will enable the FWD unit to be discretely mounted, particularly useful where space is limited, or the environment demands this.

The FWD & FWDR1 are all IP54 rated.

Thankyou for taking the time to read this introduction, the following pages will take a few minutes to read through, but will save you valuable time in installation and help ensure correct & safe operation of this equipment.

## Section 2

## Quick & Easy parts identification.

### 2.1 Which size FWD unit am I installing?

To easily identify which FWD unit you have please refer to the label on the front of the drive which states "FWDX pre-programmed to suit fan XXXXXXXX"

### 2.2 What components are supplied?

Located within the drive enclosure is a plastic bag containing specific components you will need during installation of your FlaktWoods Drive.

Sizes FWD1 to FWD6 (1.1 to 7.5KW) use plug & socket connectors for mains & motor lead connections to drive - see Figure 1 & 2.

Sizes FWD7 and above use direct connection to the drive terminals for mains & motor leads & therefore do not require the items shown in figures 1 & 2.

All sizes of drive are supplied with cable screen clamp & screws, shown fig 3.

#### Component identification:-



fig 1

Fig 1. Motor Fan Connector for FWD sizes 1-6.

4 way plug labelled U,V,W & PE (PE = Earth)  
(this connector also has markings 96,97,98,99 respectively)



fig 2

Fig 2. Mains Connector for FWD sizes 1-6.

3 way plug labelled L1,L2,L3 (this connector also has markings  
91,92,93 respectively)



fig 3

Fig 3 Cable / screen clamp & screws.

(You will not require all of the components supplied)

## 2.3 What components do I need to provide?

- (i) 3 core cable & Earth cable for making the Supply to the FWD unit.
- (ii) 3 core & Earth Screened cable to wire from the FWD unit to the fan/motor terminal box.

Please refer to your cable stockist for cable selection remembering the following notes on cable choice:-

-All cable(s) must be of a suitable type & cross section for the motor Full Load Current\*, considering length of cable run & environment/temperature.

(\*Motor Full Load Current or 'FLA' is stated in Amps (A) on the motor/fan nameplate. Alternatively the maximum current rating the FWD drive can deliver is given in a table see Section 7.3)

-Earth cable to the drive should always be as large as possible to ensure good mechanical/ electrical connection, the manufacture recommends cross section 10sqmm minimum.

-Screened cable is required from the FWD unit to the fan to ensure EMC compliant installation. (preferably a braided screen of copper, aluminium or iron providing 80% coverage is recommended).

MICC cable is NOT recommended from drive to fan.

- If in any doubt consult your cable stockist or Flaktwoods / Danfoss (contact details see Section 7.7)

- (iii) Cable Glands – suitable cable glands for the cable being used will be required in order to install the cables through the knockouts provided in the enclosure.

## Section 3 Where to start.

### 3.1 - Mechanical Installation notes.

IMPORTANT NOTE: BEFORE INSTALLING THE UNIT Ensure the FWD drive is mounted with the relevant fan on site. Each FWD drive is programmed with unique data for the part numbered fan it will be used with.

Mechanical Installation is straightforward, the unit must be installed vertically against a flat surface with 200mm of free space above and below, mount using the 4 'keyhole' type holes in the side mounting flanges.

For further detail on mechanical installation please refer to Section 7.4

### 3.2 - Electrical Installation.

BEFORE STARTING ANY ELECTRICAL WORK, PLEASE TAKE TIME TO READ THE FOLLOWING MANUFACTURER'S SAFETY NOTES

ALSO NOTE THE DRIVE WILL BE READY TO START FAN ROTATING AS SOON AS SUPPLY IS MADE & START (OR AUTO START) IS PRESSED – ENSURE FAN IS GUARDED CORRECTLY TO PREVENT INJURY FROM BLADE ROTATION.

The voltage of the frequency converter is dangerous whenever the equipment is connected to mains. Incorrect installation of the motor or the frequency converter may cause damage to the equipment, serious personal injury or death. Consequently, the instructions in this manual, as well as national and local rules and safety regulations, must be complied with.

#### Safety regulations

1. The VLT frequency converter must be disconnected from mains if repair work is to be carried out.

Check that the mains supply has been disconnected and that the necessary time has passed before removing motor and mains plugs.

2. The [OFF/STOP] key on the control panel of the VLT frequency converter does not disconnect the equipment from mains and is thus not to be used as a safety switch.

3. Correct protective earthing of the equipment must be established, the user must be protected against supply voltage, and the motor must be protected against overload in accordance with applicable national and local regulations.

4. The earth leakage currents are higher than 3.5 mA.

5. Protection against motor overload is included in the factory setting. Parameter 117, *Motor thermal protection*, default value is ETR trip 1.

#### NB!

The function is initialised at 1.0 x rated motor current and rated motor frequency (See parameter 117, *Motor thermal protection*). For the North American market: The ETR functions ensure overload protection of the motor, Class 20, in accordance with NEC.

6. Do not remove the plugs for the motor and mains supply while the VLT frequency converter is connected to mains. Check that the mains supply has been disconnected and that the necessary time has passed before removing motor and mains plugs.

7. Reliable galvanic isolation (PELV) is not complied with if the RFI switch is placed in OFF position. This means that all control in- and outputs can only be considered low-voltage terminals with basic galvanic isolation.

8. Please note that the VLT frequency converter has more voltage inputs than L1, L2, L3 when the DC-bus terminals are used. Check that all voltage inputs have been disconnected and that the necessary time has passed before repair work is commenced.

#### Warning against unintended start

1. The motor can be brought to a stop by means of digital commands, bus commands, references or a local stop, while the frequency converter is connected to mains. If personal safety considerations make it necessary to ensure that no unintended start occurs, these stop functions are not sufficient.

2. While parameters are being changed, the motor may start. Consequently, the stop key [OFF/STOP] must always be activated, following which data can be modified.

3. A stopped motor may start if a fault occurs in the electronics of the VLT frequency converter, or if a temporary overload or a fault in the supply mains or the motor connection ceases.

## General information about electrical installation

### High voltage warning

The voltage of the frequency converter is dangerous whenever the equipment is connected to mains. Incorrect installation of the motor or the frequency converter may cause damage to the equipment, serious personal injury or death. Consequently, the instructions in this Design Guide, as well as national and local safety regulations, must be complied with. Touching the electrical parts may be fatal -even after disconnection from mains: Using VLT 6002-6005 wait at least 4 minutes and using VLT 6006-6550 wait at least 15 minutes.

The following pages are a basic guide to the electrical connections for the FWD Frequency drive. Further details, if required, can be found in Section 7.4

Getting started - easy to follow steps.

All cables must pass through the 'knockout' holes in the bottom of the enclosure using a suitable compression gland / grommet (not supplied) before the connectors are wired on the lead ends!

### Step 1

Choose and remove Knockouts as necessary.

Consider where inside the FWD unit the mains cable, motor cable & ancillary cables (if any) will be connected to when deciding which knockout to use for each. To identify these positions look ahead through this section for pictures of the connection points.

Taking a second to consider this will help keep cables away from one another, keep the installation neater & is good practise to help with interference reduction.

Note also, that there are usually alternative size knockouts provided to suit your gland / grommet size.



### Step 2

Thread cable through cable gland (ensuring in correct direction) BEFORE threading cable through Knockout hole into the FWD unit.

Add gland back-nut as necessary, if using a compression type gland, do not tighten gland onto cable at this stage. This will allow you to pull excess cable through ready for preparation of lead ends.

### Step 3

Prepare the lead as necessary depending on cable type and drive model:-

Sizes FWD1-6 utilise the connector plugs detailed earlier, see text immediately below 'Sizes FWD1-6 Motor Connection' for detail on this step.

Sizes FWD7-9 utilise direct terminal connections, skip ahead of section immediately below to 'Sizes FWD7-9 Motor Connection'.

SIZES 'FWD1-6' Motor Connection: Remove outer cover & braiding sheath for sufficient distance to allow cables cores to be neatly connected into plug. Strip each of the 4 cores the correct length to make neat connections.

Connect the 4 core screened motor cable coming from terminals U1,V1,W1 & Earth of the motor/fan connections to terminals marked U,V,W & PE on the motor connector plug (96,97,98,99). The connector is pictured in section 2 - 'parts identification'.

(For information on the lead connections at the motor/fan end of this cable refer to section 7.5)

Remember the screened cable needs its outer insulation removed where the cable clamp is to be fixed to earth the screen, to complete this neatly:-

Temporarily clip the plug into the motor connector socket labelled U,V,W,PE. (this connector socket is shown below) and mark either side of the cable clamp position on the cable sheath with a marker pen, unclip the connector and carefully remove the outer insulation for this section taking care not to damage braid or conductors.

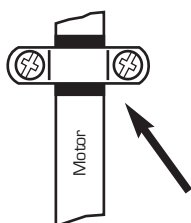


Motor connector socket sizes FWD1-6.

Cable clamp threaded holes.

Once the outer cover has been removed reconnect the motor connector, and secure the cable/screen clamp. Note make sure the cable between the clamp and connector is not placed under undue strain when tightening the clamp.

Ensure the clamp/screen clamp achieves good electrical contact on the screen. This is essential for EMC correct installation.



Braided portion of cable clamped by screen clamp.

SIZES 'FWD1-6' Supply Connection: The mains supply lead is installed in a similar manner to the supply fan i.e. through the knockout & enclosure, fit gland back nut, prepare lead ends and secure in the connector provided labelled L1,L2,L3 (91,92,93) This connector is pictured in section 2 – 'Parts identification'. The mains supply cable does not have to be screened type.



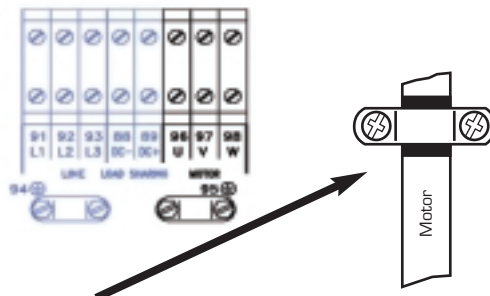
Supply Connection Socket sizes FWD1-6.

Detailed next are the above 2 steps repeated for FWD sizes 7-9, skip this section if you have just followed the FWD1-6 steps above and continue from "IMPORTANT SAFETY NOTE FOR ALL FWD UNITS" – this is essential EARTHING information.

SIZES 'FWD7-9' Motor Connection: For the larger size FWD drives the motor connections are made directly to terminals provided inside the drive. Terminal numbers 96,97,98 & 95 for U,V,W & Earth respectively.

Follow basic installation steps at start of this section i.e. thread conduit gland on cable, bring cable through knockout, secure back nut, bare lead ends suitable for connection with terminals. (leave braiding as far as possible on cable)

Remember the screened cable needs its outer insulation removed where the cable clamp is to be fixed to earth the screen, to complete this neatly; hold the lead ends (or temporarily clamp them) where they will be installed in the motor connector terminals labelled U,V,W,PE (96,97,98 & 95 respectively) shown below and mark either side of the cable clamp position (shown below) on the cable sheath with a marker pen. Carefully remove the outer insulation for this section.



Braided Portion clamped

Connect the 4 core screened motor cable coming from terminals U1,V1,W1 & Earth of the motor/fan connections to terminals marked U,V,W & PE (96,97,98 & 95 respectively)

(For more information on the lead connections at the motor/fan end of this cable refer to section 7.5)

Now connect the screen/ clamp, make sure the cable between the clamp and the terminal connections is not placed under undue strain when tightening the clamp.

Ensure the clamp/screen clamp achieves good electrical contact on the screen. This is essential for EMC correct installation.



SIZES 'FWD7-9' Supply Connection: The mains supply lead is installed in a similar manner to the motor i.e. through the knockout & enclosure, fit back nut, prepare lead ends and secure in connector terminals 91,92,93 & 94 (L1,L2,L3 & Earth respectively), the supply cable does not need to be screened type.

## **IMPORTANT SAFETY NOTE FOR ALL FWD UNITS:-**

Earth Connection: It is vital that this product & the motor/fan installation are correctly earthed.

It is important that a good quality earth connection is made to this product, this is a SAFETY CRITICAL requirement - Operator & installation safety is dependent on correct earthing..

A good earth connection, preferably minimum 10sqmm cross section should be made to the earth terminal provided (see below). This cable is installed via a knockout entry as with other cables. For further information on earthing see the appendix section 7.4



Earth Terminal(s)

Unless other ancillaries such as the FWDR1 Remote Control etc are also to be use, installation is nearly finished, the final stage is :-

Complete a check of the installation, pay particular attention to quality of connections i.e. screws are correctly tightened & no 'stray' wires are present.

### **CHECK THE EARTH PROVISION.**

Shut enclosure door & replace screws.

Installation is now complete\*

\*If the FlaktWoods drive remote control 'FWDR1' has been ordered then please follow the additional steps in Section 4 "FWDR1 – Remote Control Device".

\*When testing fan check Direction of Rotation – The blade MUST spin in the correct direction to achieve correct fan performance. If the rotation is correct but airflow is in wrong direction check the fan is installed facing the correct direction.

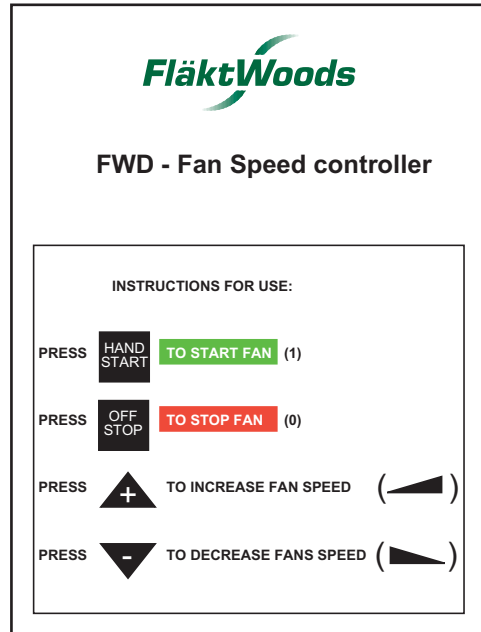
If the motor rotates the opposite direction to that required by the fan blade, interchange any two of the motor supply leads connected to the U,V,W (terminals 96,97,98 respectively).

## Operating Instructions:-

When the drive is powered up the following controls will work:-

The operating instructions for ON/OFF Speed Up/Slow Down are shown below.

[This information is also reproduced on a sticker on the front of the FWD unit].



## Further information:-

Note: Regarding the "DISPLAY BUTTON"

The drive display shows 'Percentage Speed' as the main value in large text.

Speed can be varied between 20% and 100% (Full Speed) in 1% increments.

If other information is required, particularly during installation and testing. When running currents and other values might need to be checked, the drive can display these by pressing the 'Display Mode' button followed by the + & - Buttons to scroll through the various readouts available.

When you have finished with this feature, with the fan still running press the 'Hand Start' button once again and the display will revert back to the usual display (% Speed). NOTE: The + & - Buttons will NOT control speed until the display is returned to % Speed again. Alternatively if the fan is stopped using 'Off Stop' button it will reset automatically to the normal '% Speed' display when restarted.

(note: voltage if displayed is the output voltage to the motor not mains supply voltage, this value may be less than the supply voltage due to the automatic energy saving function of the drive, which reduces this when possible.)

## Section 4 Optional Remote Control Unit – The ‘FWDR1’

### 4.1 What is it?

The FWDR1 is an additional device that can be supplied for use with all FlaktWoods ‘FWD’ type speed controllers.

Functions are On/Off and Speed Up/Slow Down.

#### Why use it?

The FWDR1 is smaller, and has simple familiar looking controls.

It allows the drive to be mounted out of the area from where the user is located. Useful if space is limited or the environment is not ideal for the FWD.

The wiring between the FWD & the FWDR1 Remote is low voltage (24V DC max)

### 4.2 How is it wired to the FWD?

The unit is very simple to wire, it uses a multicore cable to carry LOW VOLTAGE between the FWD and the FWDR1 remote.

**NOTE: 5 Core screened cable is required. Max cross section of conductors 1.5mm<sup>2</sup>**

#### Quick & easy guide to wiring the remote:-

The remote is wired into the FWD in a similar manner to the connections already made i.e. through another knockout using a gland or grommet and under a cable clamp into the connector plug.

The connector plug(s) in the FWD that the cable wires are connected to have already been fitted. (A link wire will be observed already fitted between terminals 12 & 27 of these connectors) – see right



To wire the connections it is recommended easier to leave these connectors in place.

The FWDR1 Remote unit has specially labelled terminals 12,18,50,53,55 which must be wired to the corresponding terminals from the 2 rows available in the FWD drive. Screened cable is required (max cable cross section 1.5sq mm)



To wire the connections it is recommended easier to leave these connectors in place.

The FWDR1 Remote unit has specially labelled terminals 12,18,50,53,55 which must be wired to the corresponding terminals from the 2 rows available in the FWD drive. Screened cable is required (max cable cross section 1.5sq mm)

(for reference terminals 12 & 18 are the stop/start circuit from the switch. Terminals 50,53,55 are the potentiometer for speed control signal)

## **IMPORTANT NOTE:-**

Once the FWD & FWDR1 units are installed and power is supplied to the FWD unit for the first time it is important to press the "AUTO START" button (not the "HAND START" button) this will then enable the FWDR1 remote to be used from this point on.

i.e. The AUTO Start only has to be pressed once during the first power-up of the FWD unit. Power cuts or other switching/isolating of the supply to the FWD unit will NOT require this operation to be completed again. The unit will work entirely from the FWDR1 from now on.

Now the unit is fully functional providing On/Off and Speed Up/Slow Down remotely:-

## **Operation of the FWDR1**

Operation of the FWDR1 Remote Control is simple, the remote has an ON/OFF switch to start & stop the fan, and a dial which allows minimum to maximum speed control.

## Section 5 Ancillary features.

5.1 Overheat Protection – If overheat protection is fitted this will be seen as two ancillary terminals in the motor/fan terminal box at the customer point of wiring. Thermostat Overheat Protection is identifiable on a fan when there are 2 terminals labelled 'K' in the fan terminal box.

If you wish to utilise this feature please remove the link fitted from terminals 12 to 27 & wire the 2 'K' labelled leads to these two terminals on the FlaktWoods Drive. (it does not matter which way round)

(nb. If there are 2 terminals labelled 'SS' in the fan terminal box instead of KK, then Thermister type Overheat Protection is fitted to the fan. This cannot be wired in the manner detailed above, please enquire for further information.)

Note: All cables should be installed into the drive using identical practise to the previous cables i.e. through a gland/grommet under a cable clamp and into the relevant terminals.

5.2 Fail Indication - can be obtained from this FlaktWoods Drive unit by connecting to relevant terminals using the 3 way connector labelled "AUX RELAY" (see below)

Signal type is 'Volt Free' i.e. a switching circuit only, not a powered output. The circuit is suitable for switching an externally applied Voltage upto 230V @ 2 Amp max load.

There are 3 terminals, their label & function is as follows:-

Terminal O1 = 'Common' terminal i.e. customers live supply made to this terminal.

Terminal O2 = 'Normally Open'

Terminal O3 = 'Normally Closed'

On FWD 1 to FWD 6 units there is a connector provided (as for supply & motor leads), on FWD 7 and above, numbered terminals are provided.



Picture of terminal connector block

## **Section 6 Trouble shooting.**

If any problems occur with the unit only a suitably qualified /skilled engineer should investigate.

SAFETY NOTE: Before opening enclosure door isolate supply to drive and wait 15 minutes before proceeding. Refer to the SAFETY NOTES section earlier in this manual.

Initial checks to be made include:-

- Check all connections are secure.
- Check link wire from terminal 12 to 27 is fitted & secure.
- Check mains incoming supply is healthy.
- If using the drive with the FWD1 Remote check all connections between the remote and the drive.

-If motor appears to draw excess current when used on Centrifugal & Mixed Flow type fans (e.g. DSC,DVC,DSM,DVM,BSC, BSM & AX3) visibly check direction of motor rotation. These fan types will overload the motor if running backwards BUT airflow will still appear in same direction!

In the unlikely event that the motor or FWD develop a problem the drive will 'Trip', if the trip was not of a serious nature it will automatically reset and the unit can be restarted as usual.

If a serious fault occurs the drive will 'Trip-Lock' – the unit has locked itself 'OFF' till the fault is corrected, this would only occur in exceptional circumstances and is a Safety feature - if this happens consult your supplier for further assistance.

Fault codes displayed can be identified by referring to the table in Section 7.6 to establish why the drive tripped.

### **FWDR1 – Remote Unit.**

If the remote unit fails to control the FWD drive when first installed and powered up, refer to the paragraph titled "IMPORTANT NOTE" at the end of Section 4 – FWDR1 Remote.

If the unit still fails to operate check through the connections from the FWDR1 to the FWD drive.

If further assistance is needed please refer to Section 7.7 - Contact Details

## Section 7 Appendix.

### 7.1 CE Labelling

#### CE-labelling

What is CE-labelling? What is CE-labelling? What is CE-labelling? What is CE-labelling? What is CE-labelling?

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

#### The machine directive (89/392/EEC)

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

#### The low voltage directive (73/23/EEC)

Frequency converters must be CE-labelled in accordance with the low voltage directive which came into force on 1 January 1997. This directive applies to all electrical equipment and units used in the 50-1000 V AC and 75-1500 V DC voltage ranges. Danfoss provides its units with CE-labels in accordance with the directive and issues declarations of conformity upon request.

#### The EMC directive (89/336/EEC) ective

EMC is short for electromagnetic compatibility. The presence of electromagnetic compatibility means that the mutual interference between different components/appliances is so small that the functioning of the appliances is not affected. The EMC directive came into force on 1 January 1996. In accordance with the directive, Danfoss CE-labels its products and issues a declaration of conformity upon request.

To help ensure that your installation is EMC-correct, the manual provides detailed instructions for installation. Furthermore, we specify which norms that are complied with by which of our products. We offer the filters that can be seen from the specifications and gladly provide other types of assistance that can help you obtain the best possible EMC result.

In most cases the VLT frequency converter is used by professionals of the trade as a complex component forming part of a larger appliance, system or installation. It must be noted that the responsibility for the final EMC properties of the appliance, system or installation rests with the installer.

### 7.3 Part Numbers / Drive references / KW / Current / Pre-fuse Value

Part No	FWD Size	KW rating	Max Current (400V)	MAX Pre-fuse.
DA301000	FWD1	1.1KW	3A	16A
DA302000	FWD2	2.2KW	5.6A	16A
DA303000	FWD3	3.0KW	7.2A	16A
DA304000	FWD4	4.0KW	10A	25A
DA305000	FWD5	5.5KW	13A	25A
DA306000	FWD6	7.5KW	16A	35A
DA307000	FWD7	11.0KW	24A	63A
DA308000	FWD8	15.0KW	32A	63A
DA309000	FWD9	18.5KW	37.5A	63A

## 7.4 Mechanical & Electrical Installation – more detail.

### 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 VLT frequency converter must be installed vertically.

The VLT frequency converter 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 VLT frequency converter* and that the 24-hour average temperature is not exceeded. If the ambient temperature is in the range of 45°C - 55°C, derating of the VLT frequency converter will become relevant

The service life of the VLT frequency converter will be reduced if derating for ambient temperature is not taken into account.

### Enclosure protection

	IP 00	IP 20	IP 54
Bookstyle	-	OK	-
VLT6002-6032 200-240 V	-	OK	OK
VLT 6002-6550 380-460 V	OK	OK	OK

### Field-mounting

	IP 00	IP 20	IP 54
Bookstyle	-	No	-
VLT6002-6032 200-240 V	-	No	OK
VLT 6002-6550 380-460 V	No	No	OK

### IP 20 with 4x top cover

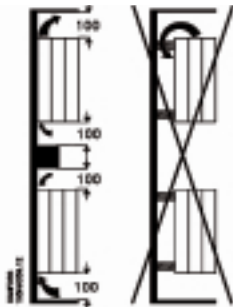
VLT 6002-6005 200-240 V	-	OK	OK
VLT 6002-6016 380-460 V	-	OK	OK

### IP 20 terminal cover

VLT 6006-6032 200-240 V	-	OK	OK
VLT 6022-6062 380-460 V	-	OK	OK

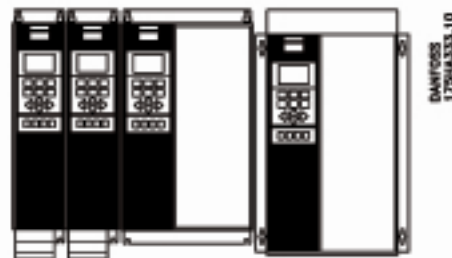
### Spacing when installing of VLT 6002-6005 200-240 V, VLT 6002-6011 380-460 V Bookstyle IP 00, IP 20 and IP 54.

Cooling



All the above-mentioned units require a minimum space of 100 mm above and below the enclosure.

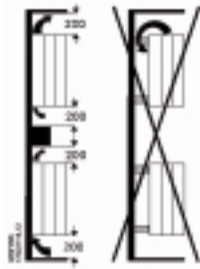
Side-by-side



All the above-mentioned units can be installed side by side without any space, since these units do not require any cooling on the sides.

**Installation of VLT 6006-6032 200-240 V, VLT 6016-6062 380-460 V IP 20 and IP 54**

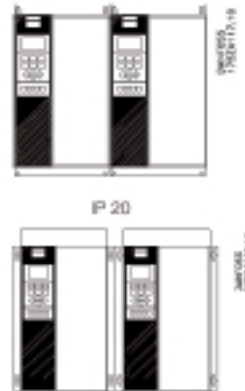
Cooling



All units in the above-mentioned series require a minimum space of 200 mm above and below the enclosure and must be installed on a plane, vertical surface (no spacers). This applies both to IP 20 and IP 54 units.

These units can be installed side by side without any spacing, since they do not require any cooling on the sides.

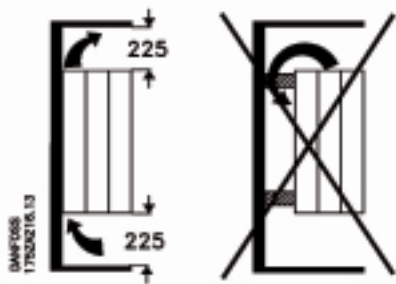
Side by Side



IP 54 (flange-by-flange)

**Installation of VLT 6042-6062 200-240 V, VLT 6075-6275 380-460 V IP 00, IP 20 and IP 54**

Cooling



VLT 6075-6275

All units require a minimum space of 225 mm above and below the enclosure and must be installed on a plane, vertical surface (no spacers). This applies to IP 00, IP 20 and IP 54 units alike.

Side by Side

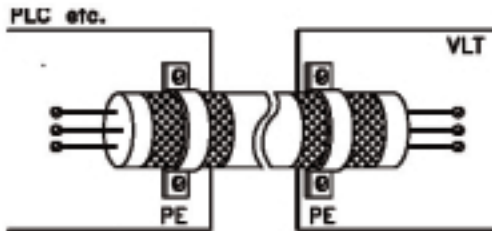


All IP 00 and IP 20 units in the above-mentioned series can be installed side by side without any spacing.

## Earthing of screened/armoured control cables

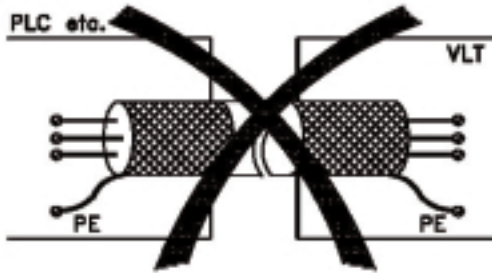
Generally speaking, control cables must be screened/armoured and the screen must be connected by means of a cable clamp at both ends to the metal cabinet of the unit.

The drawing below indicates how correct earthing is carried out and what to be done if in doubt.



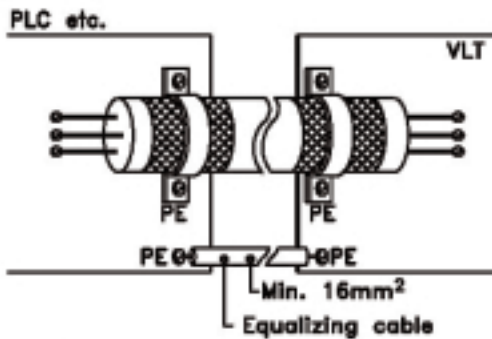
### Correct earthing

Control cables and cables for serial communication must be fitted with cable clamps at both ends to ensure the best possible electrical contact.



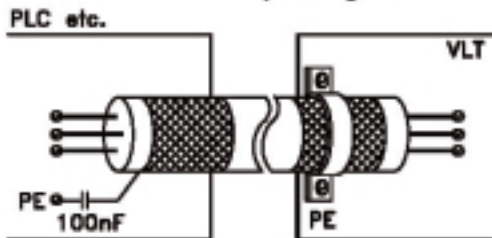
### Wrong earthing

Do not use twisted cable ends (pigtailed), since these increase the screen impedance at high frequencies.



### Protection with respect to earth potential between PLC and VLT

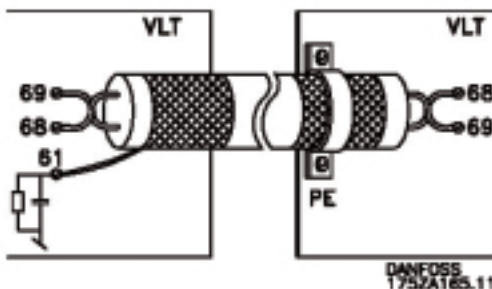
If the earth potential between the VLT frequency converter and the PLC (etc.) is different, electric noise may occur that will disturb the whole system. This problem can be solved by fitting an equalizing cable, to be placed next to the control cable. Minimum cable cross-section: 16 mm<sup>2</sup>



### For 50/60 Hz earth loops

If very long control cables are used, 50/60 Hz earth loops may occur that will disturb the whole system.

This problem can be solved by connecting one end of the screen to earth via a 100nF condenser (keeping leads short).



### Cables for serial communication

Low-frequency noise currents between two VLT frequency converters can be eliminated by connecting one end of the screen to terminal 61. This terminal is connected to earth via an internal RC link. It is recommended to use twisted-pair cables to reduce the differential mode interference between the conductors.

## **IMPORTANT SAFETY NOTES.**

**Smokespill Fans** - fans which are rated for Emergency Smoke Extract must run at full speed during their Emergency run mode. All types of motor protection that the drive would usually provide automatically must be disabled/by-passed to allow the fan to run to destruction. System installation and operation must be in accordance with applicable local & national authority regulations.

**Use of RCD's** – Special type RCDs are required when used to supply a Frequency Inverter due to the high earth leakage current they exhibit during normal operation. If using an RCD consult your controls supplier for advice on a suitable device.

### **7.5 Motor connections at the motor/fan terminal box.**

Your motor output lead U,V,W,PE (96,97,98,99) from the FWD unit will be wired either to the motor terminal box or a fan duct mounted terminal box on the fan dependent on fan type. There will be six terminals present U1,U2,V1,V2,W1,W2.

#### **Simply wire the U,V,W & PE (96,97,98,99) to terminals U1,V1,W1 & the Earth terminal.**

The terminal box will have either Star or Delta links pre-wired across the six motor terminals. DO NOT ADJUST OR REMOVE THESE LINKS.

FURTHER NOTE: These fan ranges DO NOT necessarily follow the traditional practise "Motors will be wound for Star connect upto 4KW, Delta above 4Kw". The motor/fan will already be connected correctly with either 2 links (Star) or 3 links (Delta) for normal operation, therefore please DO NOT alter. If in any doubt refer to Flaktwoods for confirmation / advice contact details Section 7.7.

## 7.6 List of Warning & Alarm Codes.

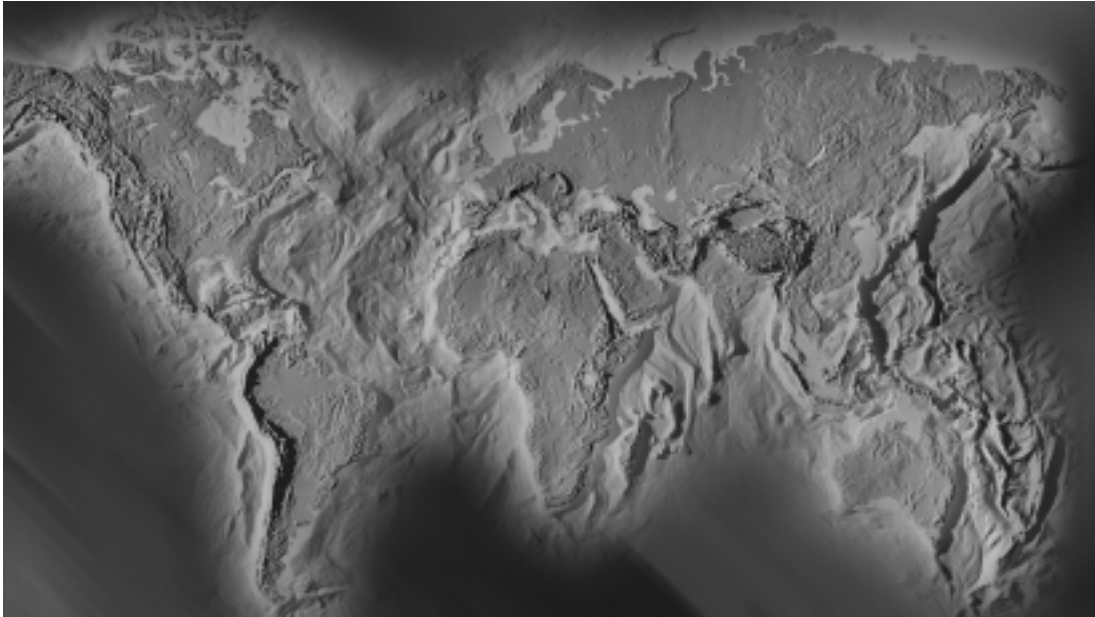
No	Description	Warning	Alarm	Trip locked
1	10 Volts low (10 VOLT LOW)	X		
2	Live zero fault (LIVE ZERO ERROR)	X	X	
4	Mains imbalance (MAINS IMBALANCE)	X	X	X
5	Voltage warning high (DC LINK VOLTAGE HIGH)	X		
6	Voltage warning low (DC LINK VOLTAGE LOW)	X		
7	Overvoltage (DC LINK OVERVOLT)	X	X	
8	Undervoltage (DC LINK UNDERVOLT)	X	X	
9	Inverter overloaded (INVERTER TIME)	X	X	
10	Motor overloaded (MOTOR TIME)	X	X	
11	Motor thermistor (MOTOR THERMISTOR)	X	X	
12	Current limit (CURRENT LIMIT)	X	X	
13	Overcurrent (OVERCURRENT)	X	X	X
14	Earth fault (EARTH FAULT)		X	X
15	Switch mode fault (SWITCH MODE FAULT)		X	X
16	Short-circuit (CURR.SHORT CIRCUIT)		X	X
17	Serial communication timeout (STD BUSTIMEOUT)	X	X	
18	HPFB bus timeout (HPFB TIMEOUT)	X	X	
19	Fault in EEprom on power card (EE ERROR POWER)	X		
20	Fault in EEprom on control card (EE ERROR CONTROL)	X		
22	Auto-optimisation not OK (AMA FAULT)		X	
29	Heat-sink temperature too high (HEAT SINK OVERTEMP)		X	
30	Motor phase U missing (MISSING MOT.PHASE U)		X	
31	Motor phase V missing (MISSING MOT.PHASE V)		X	
32	Motor phase W missing (MISSING MOT.PHASE W)		X	
34	HPFB communication fault (HPFB COMM. FAULT)	X	X	
37	Inverter fault (GATE DRIVE FAULT)		X	X
39	Check parameters 104 and 106 (CHECK P.104 & P.106)	X		
40	Check parameters 103 and 105 (CHECK P.103 & P.106)	X		
41	Motor too big (MOTOR TOO BIG)	X		
42	Motor too small (MOTOR TOO SMALL)	X		
60	Safety stop (EXTERNAL FAULT)		X	
61	Output frequency low (FOUT < FLOW)	X		
62	Output frequency high (FOUT > FHIGH)	X		
63	Output current low (I MOTOR < I LOW)	X	X	
64	Output current high (I MOTOR > I HIGH)	X		
65	Feedback low (FEEDBACK < FDB LOW)	X		
66	Feedback high (FEEDBACK > FDB HIGH)	X		
67	Reference low (REF. < REF. LOW)	X		
68	Reference high (REF. > REF. HIGH)	X		
69	Temperature auto derate (TEMP.AUTO DERATE)	X		
99	Unknown fault (UNKNOWN ALARM)		X	X

## 7.7 Contact Details.

If problems persist please consult your supplier, or contact FläktWoods Service Centre Tel 01206 544122 Fax 01206 244411 or e-mail: enquiry@flaktwoods.com

Or you may contact Danfoss 24hr technical helpline Tel 0870 2417100 (drives)

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## **Head offices**

### **Buildings Air Climate**

Fläkt Woods AB  
Kung Hans väg 12  
SE-192 68 SOLLENTUNA  
Sweden  
Tel: +46 8 626 49 00  
Fax: +46 8 626 73 10

### **Industry Air Movement**

Fläkt Woods Limited  
Tufnell Way  
Colchester, CO4 5AR  
United Kingdom  
Tel: +44 (0) 1206 544122  
Fax: +44 (0) 1206 574434

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