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1. Safety

1.1.1. High Voltage Warning

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

1.1.2. Safety Instructions

- Make sure the frequency converter is properly connected to earth.
- Do not remove mains connections, motor connections or other power connections while the frequency converter is connected to power.
- Protect users against supply voltage.
- Protect the motor against overloading according to national and local regulations.
- The earth leakage current exceeds 3.5 mA.
- The [OFF] key is not a safety switch. It does not disconnect the frequency converter from mains.

1.1.3. Approvals

1.1.4. General Warning

Warning:
Touching the electrical parts may be fatal - even after the equipment has been disconnected from mains.
Also make sure that other voltage inputs have been disconnected, (linkage of DC intermediate circuit).
Be aware that there may be high voltage on the DC link even when the LEDs are turned off.
Before touching any potentially live parts of the VLT Micro Drive, wait at least 4 minutes for all sizes.
Shorter time is allowed only if indicated on the nameplate for the specific unit.
1. Safety

1.1.5. IT Mains

IT Mains
Installation on isolated mains source, i.e. IT mains.
Max. supply voltage allowed when connected to mains: 440 V.

As an option, Danfoss offers line filters for improved harmonics performance.

1.1.6. Avoid unintended Start

While the frequency converter is connected to mains, the motor can be started/stopped using digital commands, bus commands, references or via the Local Control Panel.

- Disconnect the frequency converter from mains whenever personal safety considerations make it necessary to avoid unintended start of any motors.
- To avoid unintended start, always activate the [OFF] key before changing parameters.

1.1.7. Disposal Instruction

Equipment containing electrical components must not be disposed of together with domestic waste.
It must be separately collected with electrical and electronic waste according to local and currently valid legislation.
1.1.8. Before Commencing Repair Work

1. Disconnect FC 51 from mains (and external DC supply, if present.)
2. Wait for 4 minutes for discharge of the DC-link.
3. Disconnect DC bus terminals and brake terminals (if present)
4. Remove motor cable
2. Mechanical Installation

2.1. Before Starting

2.1.1. Checklist

When unpacking the frequency converter, make sure that the unit is undamaged and complete. Check that the packaging contains the following:

- VLT Micro Drive FC 51
- Quick Guide

Optional: LCP and/or de-coupling plate.

Illustration 2.1: Content of box.

2.2. Side-by-Side Installation

The Danfoss VLT Micro Drive can be mounted side-by-side for IP 20 rating units and requires 100 mm clearance above and below for cooling. Regarding surroundings in general, please see chapter 7. Specifications.

Illustration 2.2: Side-by-side installation.
2.3.1. Mechanical Dimensions

Illustration 2.3: Mechanical dimensions.

**NB!**
A template for drilling can be found on the flap of the packaging.

<table>
<thead>
<tr>
<th>Power (kW)</th>
<th>Height (mm)</th>
<th>Width (mm)</th>
<th>Depth 1) (mm)</th>
<th>Max. Weight</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Frame</strong></td>
<td><strong>A</strong> (incl. decoupling plate)</td>
<td><strong>a</strong></td>
<td><strong>B</strong></td>
<td><strong>b</strong></td>
</tr>
<tr>
<td>M1 0.18 - 0.75</td>
<td>150</td>
<td>205</td>
<td>140.4</td>
<td>70</td>
</tr>
<tr>
<td>M2 1.5</td>
<td>176</td>
<td>230</td>
<td>166.4</td>
<td>75</td>
</tr>
<tr>
<td>M3 2.2</td>
<td>2)</td>
<td>2)</td>
<td>2)</td>
<td>2)</td>
</tr>
</tbody>
</table>

Table 2.1: Mechanical Dimensions

1) For LCP with potentiometer, please add 7.6 mm.
2) These dimensions will be announced at a later point.

**NB!**
DIN rail mounting kit is available for M1. Please use ordering number 132B0111
3. Electrical Installation

3.1. How to Connect

3.1.1. Electrical Installation in General

**NB!**
All cabling must comply with national and local regulations on cable cross-sections and ambient temperature. Copper conductors required, (60-75°C) recommended.

<table>
<thead>
<tr>
<th>Details of terminal tightening torques.</th>
<th>Power (kW)</th>
<th>Torque (Nm)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Frame</td>
<td>Line</td>
</tr>
<tr>
<td>M1</td>
<td>0.18 - 0.75</td>
<td>1.4</td>
</tr>
<tr>
<td>M2</td>
<td>1.5</td>
<td>1.4</td>
</tr>
<tr>
<td>M3</td>
<td>2.2</td>
<td>1.4</td>
</tr>
</tbody>
</table>

1) Spade connectors

Table 3.1: Tightening of terminals.

3.1.2. Fuses

**Branch circuit protection:**
In order to protect the installation against electrical and fire hazard, all branch circuits in an installation, switch gear, machines etc., must be short-circuited and overcurrent protected according to national/international regulations.

**Short circuit protection:**
Danfoss recommends using the fuses mentioned in the following tables to protect service personnel or other equipment in case of an internal failure in the unit or short-circuit on DC-link. The frequency converter provides full short circuit protection in case of a short-circuit on the motor or brake output.

**Overcurrent protection:**
Provide overload protection to avoid overheating of the cables in the installation. Overcurrent protection must always be carried out according to national regulations. Fuses must be designed for protection in a circuit capable of supplying a maximum of 100,000 A_{rms} (symmetrical), 480 V maximum.

**NonUL compliance:**
If UL/cUL is not to be complied with, Danfoss recommends using the fuses mentioned in table 1.3, which will ensure compliance with EN50178:
In case of malfunction, not following the fuse recommendation may result in damage to the frequency converter.
Table 3.2: Fuses

<table>
<thead>
<tr>
<th>KW</th>
<th>Type RK1</th>
<th>Type J</th>
<th>Type T</th>
<th>Type RK1</th>
<th>Type CC</th>
<th>Type RK1</th>
<th>Type gG</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.25</td>
<td>KTN-R15</td>
<td>JKS-25</td>
<td>JIN-15</td>
<td>KLN-R15</td>
<td>ATM-R15</td>
<td>A2K-15R</td>
<td>15A</td>
</tr>
<tr>
<td>0.75</td>
<td>KTN-R25</td>
<td>JKS-25</td>
<td>JIN-25</td>
<td>KLN-R25</td>
<td>ATM-R25</td>
<td>A2K-25R</td>
<td>25A</td>
</tr>
<tr>
<td>1</td>
<td>KTN-R35</td>
<td>JKS-35</td>
<td>JIN-35</td>
<td>KLN-R35</td>
<td>-</td>
<td>A2K-35R</td>
<td>35A</td>
</tr>
<tr>
<td>2</td>
<td>KTN-R45</td>
<td>JKS-45</td>
<td>JIN-45</td>
<td>KLN-R45</td>
<td>-</td>
<td>A2K-45R</td>
<td>45A</td>
</tr>
</tbody>
</table>

3 x 200-240 V

<table>
<thead>
<tr>
<th>KW</th>
<th>KTN-R10</th>
<th>JKS-10</th>
<th>JIN-10</th>
<th>KLN-R10</th>
<th>ATM-R10</th>
<th>A2K-10R</th>
<th>10A</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.25</td>
<td>KTN-R15</td>
<td>JKS-15</td>
<td>JIN-15</td>
<td>KLN-R15</td>
<td>ATM-R15</td>
<td>A2K-15R</td>
<td>15A</td>
</tr>
<tr>
<td>2.5</td>
<td>KTN-R20</td>
<td>JKS-20</td>
<td>JIN-20</td>
<td>KLN-R20</td>
<td>ATM-R20</td>
<td>A2K-20R</td>
<td>20A</td>
</tr>
<tr>
<td>5</td>
<td>KTN-R30</td>
<td>JKS-30</td>
<td>JIN-30</td>
<td>KLN-R30</td>
<td>ATM-R30</td>
<td>A2K-30R</td>
<td>30A</td>
</tr>
<tr>
<td>7.5</td>
<td>KTN-R45</td>
<td>JKS-45</td>
<td>JIN-45</td>
<td>KLN-R45</td>
<td>-</td>
<td>A2K-45R</td>
<td>45A</td>
</tr>
</tbody>
</table>

3 x 380-480 V

<table>
<thead>
<tr>
<th>KW</th>
<th>KTS-R10</th>
<th>JKS-10</th>
<th>JJS-10</th>
<th>KLS-R10</th>
<th>ATM-R10</th>
<th>A6K-10R</th>
<th>10A</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>KTS-R15</td>
<td>JKS-15</td>
<td>JJS-15</td>
<td>KLS-R15</td>
<td>ATM-R15</td>
<td>A2K-15R</td>
<td>15A</td>
</tr>
<tr>
<td>2.2</td>
<td>KTS-R20</td>
<td>JKS-20</td>
<td>JJS-20</td>
<td>KLS-R20</td>
<td>ATM-R20</td>
<td>A6K-20R</td>
<td>20A</td>
</tr>
<tr>
<td>5</td>
<td>KTS-R30</td>
<td>JKS-30</td>
<td>JJS-30</td>
<td>KLS-R30</td>
<td>ATM-R30</td>
<td>A6K-30R</td>
<td>30A</td>
</tr>
<tr>
<td>7.5</td>
<td>KTS-R35</td>
<td>JKS-35</td>
<td>JJS-35</td>
<td>KLS-R35</td>
<td>-</td>
<td>A6K-35R</td>
<td>35A</td>
</tr>
</tbody>
</table>

3.1.3. EMC-Correct Installation

Following these guidelines is advised, where compliance with EN 61000-6-3/4, EN 55011 or EN 61800-3 *First environment* is required. If the installation is in EN 61800-3 *Second environment*, then it is acceptable to deviate from these guidelines. It is however not recommended.

Good engineering practice to ensure EMC-correct electrical installation:

- Use only braided screened/armoured motor cables and control cables. The screen should provide a minimum coverage of 80%. The screen material must be metal, not limited to but typically copper, aluminium, steel or lead. There are no special requirements for the mains cable.
- Installations using rigid metal conduits are not required to use screened cable, but the motor cable must be installed in conduit separate from the control and mains cables. Full connection of the conduit from the drive to the motor is required. The EMC performance of flexible conduits varies a lot and information from the manufacturer must be obtained.
- Connect the screen/armour/conduit to earth at both ends for motor cables and control cables.
- Avoid terminating the screen/armour with twisted ends (pigtails). Such a termination increases the high frequency impedance of the screen, which reduces its effectiveness at high frequencies. Use low impedance cable clamps or glands instead.
- Ensure good electrical contact between the de-coupling plate and the metal chassis of the frequency converter, see Instruction MI.02.BX.YY
- Avoid using unscreened/unarmoured motor or control cables inside cabinets housing the drive(s), where possible.
3.2. Mains Connection

3.2.1. Connecting to Mains

Step 1: First mount earth cable.

Step 2: Mount wires in terminals L1/L, L2 and L3/N and tighten.

For 3-phase connection, connect wires to all three terminals.
For single-phase connection, connect wires to terminals L1/L and L3/N.

Illustration 3.1: Mounting of earth cable and mains wires.

3.3. Motor Connection

3.3.1. How to Connect the Motor

See the chapter Specifications for correct dimensioning of motor cable cross-section and length.

- Use a shielded/armored motor cable to comply with EMC emission specifications, and connect this cable to both the decoupling plate and the motor metal.
- Keep motor cable as short as possible to reduce the noise level and leakage currents.

For further details on mounting of the decoupling plate, please see instruction MI.02.BX.YY.

All types of three-phased asynchronous standard motors can be connected to the frequency converter. Normally, small motors are star-connected (230/400 V, Δ/Y). Large motors are delta-connected (400/690 V, Δ/Y). Refer to motor nameplate for correct connection and voltage.

Illustration 3.2: Three-phase and single-phase wire connections.

Illustration 3.3: Star and delta connections.
Step 1: First, mount the earth cable.

Step 2: Connect wires to terminals either in star or delta-connection. See motor nameplate for further information.

For EMC correct installation, use optional decoupling plate, see chapter Options for VLT Micro Drive FC 51.

3.4. Control Terminals

3.4.1. Access to Control Terminals

All control cable terminals are located underneath the terminal cover in front of the frequency converter. Remove the terminal cover using a screwdriver.

NB!
See back of terminal cover for outlines of control terminals and switches.

3.4.2. Connecting to Control Terminals

This illustration shows all control terminals of the VLT Micro Drive. Applying Start (term. 18) and an analog reference (term. 53 or 60) make the frequency converter run.
3.5. Switches

NB!
Do not operate switches with power on the frequency converter.

Bus termination:
Switch **BUS TER** pos. ON terminates the RS485 port, terminals 68, 69. See power circuit drawing.

Default setting = Off.

S200 Switches 1-4:

Switch 1: *OFF = PNP terminals 29  
ON = NPN terminals 29

Switch 2: *OFF = PNP terminal 18, 19, 27 and 33  
ON = NPN terminal 18, 19, 27 and 33

Switch 3: No function

Switch 4: *OFF = Terminal 53 0 - 10 V  
ON = Terminal 53 0/4 - 20 mA  
* = default setting

Table 3.3: Settings for S200 Switches 1-4

NB!
Parameter 6-19 must be set according to Switch 4 position.
3.6. Power Circuit - Overview

3.6.1. Power Circuit - Overview

Illustration 3.10: Diagram showing all electrical terminals.

Brake not applicable for frame M1.

Brake resistors are available from Danfoss. Improved power factor and EMC performance can be achieved by installing optional Danfoss line filters. Danfoss power filters can also be used for load sharing.

3.6.2. Load sharing/Brake

Use 6.3 mm insulated Faston Plugs designed for high voltage for DC (Load Sharing and brake). Contact Danfoss or see instruction no. MI.50Nx.02 for load sharing and instruction no. MI.90Fx.02 for brake.

Load sharing: Connect terminals UDC- and UDC/BR+.

Brake: Connect terminals BR- and UDC/BR+.

Note that voltage levels of up to 850 V DC may occur between terminals UDC+/BR+ and UDC-. Not short circuit protected.
4. Programming

4.1. How to Programme

4.1.1. Programming with MCT-10

The frequency converter can be programmed from a PC via RS485 com-port by installing the MCT-10 Set-up Software.

This software can either be ordered using code number 130B1000 or downloaded from the Danfoss Web site: www.danfoss.com, Business Area: Motion Controls.

Please refer to manual MG.10.RX.YY.

4.1.2. Programming with LCP 11 or LCP 12

The LCP is divided into four functional groups:
1. Numeric display.
2. Menu key.
4. Operation keys and indicator lights (LEDs).

Illustration 4.1: LCP 12 with potentiometer
Illustration 4.2: LCP 11 without potentiometer
Illustration 4.3: Indicating Set-up

The display:
A number of information can be read from the display.

Set-up number shows the active set-up and the edit set-up. If the same set-up acts as both active and edit set-up, only that set-up number is shown (factory setting).
When active and edit set-up differ, both numbers are shown in the display (Setup 12). The number flashing, indicates the edit set-up.
The small digits to the left are the selected parameter number.

The large digits in the middle of the display show the value of the selected parameter.

The right side of the display shows the unit of the selected parameter. This can be either Hz, A, V, kW, HP, %, s or RPM.

Motor direction is shown to the bottom left of the display - indicated by a small arrow pointing either clockwise or counterclockwise.

Use the [MENU] key to select one of the following menus:

**Status Menu:**
The Status Menu is either in Readout Mode or Hand on Mode. In Readout Mode the value of the currently selected readout parameter is shown in the display.

In Hand on Mode the local LCP reference is displayed.

**Quick Menu:**
Displays Quick Menu parameters and their settings. Parameters in the Quick Menu can be accessed and edited from here. Most applications can be run by setting the parameters in the Quick Menus.

**Main Menu:**
Displays Main Menu parameters and their settings. All parameters can be accessed and edited here. A parameter overview is found later in this chapter. For detailed information on programming, please see Programming Guide, MG02CXYY.
Indicator lights:
- Green LED: Power is on the frequency converter.
- Yellow LED: Indicates a warning.
- Flashing red LED: Indicates an alarm.

Navigation Keys:
[Back]: For moving to the previous step or layer in the navigation structure.
Arrows [▲] [▼]: For manoeuvring between parameter groups, parameters and within parameters.
[OK]: For selecting a parameter and for accepting changes to parameter settings.

Operation Keys:
A yellow light above the operation keys indicates the active key.
[Hand on]: Starts the motor and enables control of the frequency converter via the LCP.
[Off/Reset]: The motor stops except in alarm mode. In that case the motor will be reset.
[Auto on]: The frequency converter is controlled either via control terminals or serial communication.
[Potentiometer] (LCP12): The potentiometer works in two ways depending on the mode in which the frequency converter is running.
In Auto Mode the potentiometer acts as an extra programmable analog input.
In Hand on Mode the potentiometer controls local reference.

4.2. Status Menu

After power up the Status Menu is active. Use the [MENU] key to toggle between Status, Quick Menu and Main Menu.

Arrows [▲] and [▼] toggles between the choices in each menu.

The display indicates the status mode with a small arrow above “Status”.

Illustration 4.8: Indicating Status mode

4.3. Quick Menu

The Quick Menu gives easy access to the most frequently used parameters.

1. To enter the Quick Menu, press [MENU] key until indicator in display is placed above Quick Menu, then press [OK].
2. Use [▲] [▼] to browse through the parameters in the Quick Menu.
3. Press [OK] to select a parameter.
4. Use [▲] [▼] to change the value of a parameter setting.
5. Press [OK] to accept the change.
6. To exit, press either [Back] twice to enter Status, or press [Menu] once to enter Main Menu.

Illustration 4.9: Indicating Quick Menu mode
### 4.4. Quick Menu Parameters

#### 4.4.1. Quick Menu Parameters - Basic Settings QM1

Below are descriptions of all parameters found in the Quick Menu.

* = Factory setting.

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Range</th>
<th>Function</th>
</tr>
</thead>
<tbody>
<tr>
<td>1-20 Motor Power [kW]/[HP] (P_m,n)</td>
<td>0.09 kW/0.12 HP - 11 kW/15 HP</td>
<td>Enter motor power from nameplate data. Two sizes down, one size up from nominal VLT rating. NB! Changing this parameter affects par. 1-22 to 1-25, 1-30, 1-33 and 1-35.</td>
</tr>
<tr>
<td>1-22 Motor Voltage (U_m,n)</td>
<td>230/400 V [50 - 999 V]</td>
<td>Enter motor voltage from nameplate data.</td>
</tr>
<tr>
<td>1-23 Motor Frequency (f_m,n)</td>
<td>50 Hz* [20-400 Hz]</td>
<td>Enter motor frequency from nameplate data.</td>
</tr>
<tr>
<td>1-24 Motor Current (I_m,n)</td>
<td>M-type dependent* [0.01 - 26.00 A]</td>
<td>Enter motor current from nameplate data.</td>
</tr>
<tr>
<td>1-25 Motor Nominal Speed (n_m,n)</td>
<td>M-type dependent* [100 - 9999 RPM]</td>
<td>Enter motor nominal speed from nameplate data.</td>
</tr>
<tr>
<td>1-29 Automatic Motor Tuning (AMT)</td>
<td></td>
<td>Use AMT to optimize motor performance. NB! This parameter cannot be changed while motor runs.</td>
</tr>
</tbody>
</table>
1. Stop VLT – make sure motor is at standstill
3. Apply start signal
   – Via LCP: Press Hand On
   - Or in Remote On mode: Apply start signal on terminal

<p>| | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>[0]</td>
<td>Off</td>
<td>AMT function is disabled.</td>
</tr>
</tbody>
</table>

**NB!**
To gain optimum tuning of frequency converter, run AMT on a cold motor.

### 3-02 Minimum Reference

**Range:** 0.00* [-4999 - 4999]

**Function:** Enter value for minimum reference.

The sum of all internal and external references are clamped (limited) to the minimum reference value, par. 3-02.

### 3-03 Maximum Reference

**Range:**

50.00* [-4999 - 4999]

**Function:** Enter value for Maximum Reference.

The sum of all internal and external references are clamped (limited) to the maximum reference value, par. 3-03.

### 3-41 Ramp1 Ramp-up Time

**Range:** 3.00 s* [0.05 - 3600 s]

**Function:** Enter ramp-up time from 0 Hz to rated motor frequency ($f_{MN}$) set in par. 1-23.

Choose a ramp-up time ensuring that torque limit is not exceeded, see par. 4-16.

### 3-42 Ramp1 Ramp-down Time

**Range:** 3.00* [0.05 - 3600 s]

**Function:** Enter ramp down time from rated motor frequency ($f_{MN}$) in par. 1-23 to 0 Hz.

Choose a ramp down time that does not cause over-voltage in inverter due to regenerative operation of motor. Furthermore, regenerative torque must not exceed limit set in par. 4-17.

### 4.4.2. Quick Menu Parameters - PI Basic Settings QM2

The following is a brief description of the parameters for the PI Basic Settings. For a more detailed description, please see *VLT Micro Drive Programming Guide*, MG.02.CX.YY.
### 1-00 Configuration Mode


### 3-02 Min. Reference


### 3-03 Max. Reference


### 3-10 Preset Reference

| Range: [-100.00 - 100.00] | Function: Preset [0] works as set-point. |

### 4-12 Motor Speed Low Limit

| Range: [0.0 - 400 Hz] | Function: Lowest possible output frequency. |

### 4-14 Motor Speed High Limit

| Range: [0.0 - 400.00 Hz] | Function: Highest possible output frequency. |

**NB!**
Default 65 Hz should normally be reduced to 50 - 55 Hz.

### 6-22 Terminal 60 Low Current

| Range: [0.00 - 19.99 mA] | Function: Normally set to 0 or 4 mA. |

### 6-23 Terminal 60 High Current

| Range: [0.01 - 20.00 mA] | Function: Normally (default) set to 20 mA. |

### 6-24 Terminal 60 Low Feedback Value

| Range: [-4999 - 4999] | Function: Value corresponding to P. 6-22 setting. |
### 6-25 Terminal 60 High Feedback Value

**Range:** [-4999 - 4999]  
**Function:** Value corresponding to P. 6-23 setting.

### 6-26 Terminal 60 Filter Time Constant

**Range:** [0.01 - 10.00 s]  
**Function:** Noise suppressing filter.

### 7-20 Process CL Feedback Resource

**Range:** []  
**Function:** Choose [2] analog input 60.

### 7-30 Process PI Normal/Inverse

**Range:** []  
**Function:** Most PI controllers are "Normal".

### 7-31 Process PI Anti Windup

**Range:** []  
**Function:** Leave Enabled normally.

### 7-32 Process PI Start Speed

**Range:** [0.0 - 200.0 Hz]  
**Function:** Choose expected normal running speed.

### 7-33 Process PI Proportional Gain

**Range:** [0.00 - 10.00]  
**Function:** Enter the P-factor.

### 7-34 Process PI Integral Time

**Range:** [0.10 - 9999.00 s]  
**Function:** Enter the I-factor.

### 7-38 Process Feed Forward Factor

**Range:** [0 - 400%]  
**Function:** Only applicable with changing set-points.
4.5. Main Menu

The Main Menu gives access to all parameters.

1. To enter the Main Menu, press [MENU] key until indicator in display is placed above Main Menu.
2. Use [▲] [▼] to browse through the parameter groups.
3. Press [OK] to select a parameter group.
4. Use [▲] [▼] to browse through the parameters in the specific group.
5. Press [OK] to select the parameter.
6. Use [▲] [▼] to set/change the parameter value.
7. Press [OK] to accept the value.
8. To exit, press either [Back] twice to enter Quick Menu, or press [Menu] once to enter Status.
5. Parameter Overview

- Operation/Display
  - Basic Settings
    - Regional Settings
      - US
      - International
    - Oper. State at Power-up (Hand)
      - Resume
      - Forced stop, ref = old
      - Forced stop, ref = 0
  - Setup Handling
    - Setup 1
    - Setup 2
    - Multi Setup
    - Active Setup
    - Link Setups
      - Not Linked
      - Linked
  - LCP Keypad
    - Hand on LCP
      - Key on LCP
        - Disabled
        - Enabled
    - Off / Reset
      - Key on LCP
        - Disabled
        - Enabled
    - Auto on LCP
      - Key on LCP
        - Disabled
        - Enabled
  - Copy / Save
    - LCP Copy
      - No copy
      - All to LCP
      - All from LCP
    - Copy / Save
      - Load
        - 0 - 999 %

- General Settings
  - Configuration Mode
    - Speed open loop
    - Process
  - Motor Control Principle
    - CONSTANT TORQUE
    - Automatic Energy Optim.
  - Local Mode Configuration
    - Resume
    - Forced stop, ref = old
    - Forced stop, ref = 0

- Setup Handling
  - Setup 1
  - Setup 2
  - Multi Setup
  - Active Setup
  - Link Setups
    - Not Linked
    - Linked

- LCP Keypad
  - Hand on LCP
    - Key on LCP
      - Disabled
      - Enabled
  - Off / Reset
    - Key on LCP
      - Disabled
      - Enabled
  - Auto on LCP
    - Key on LCP
      - Disabled
      - Enabled

- Copy / Save
  - LCP Copy
    - No copy
    - All to LCP
    - All from LCP
  - Copy / Save
    - Load
      - 0 - 999 %

- Load Depen. Setting
  - Low Speed Load Compensation
    - 0 - 999 %

Parameter Overview

- 0-00 Configuration Mode
  - 0: Speed open loop
  - 1: Process

- 0-03 Local Mode Configuration
  - Resume
  - Forced stop, ref = old
  - Forced stop, ref = 0

- 0-04 Oper. State at Power-up (Hand)
  - Resume
  - Forced stop, ref = old
  - Forced stop, ref = 0

- 0-10 Active Set-up
  - Setup 1
  - Setup 2
  - Multi Setup
  - Active Setup
  - Link Setups
    - Not Linked
    - Linked

- 0-11 Edit Set-up
  - Setup 1
  - Setup 2
  - Multi Setup

- 0-12 Link Setups
  - Not Linked
  - Linked

- 0-14 LCP Keypad
  - Hand on LCP
    - Key on LCP
      - Disabled
      - Enabled
  - Off / Reset
    - Key on LCP
      - Disabled
      - Enabled
  - Auto on LCP
    - Key on LCP
      - Disabled
      - Enabled

- 0-15 Copy / Save
  - LCP Copy
    - No copy
    - All to LCP
    - All from LCP
  - Copy / Save
    - Load
      - 0 - 999 %

- 0-20 DC-Brake
  - DC Hold Current
    - 0 - 150 %
  - DC Brake Current
    - 0 - 150 %
  - DC Braking Time
    - 0 - 10 s
  - DC Brake Cut In Speed
    - 0 - 400 Hz
  - DC Brake Energy Function
    - 0 - 10 %
### 3-17 Reference Resource

<table>
<thead>
<tr>
<th>No function</th>
<th>Analog Input 53</th>
<th>Analog input 60</th>
<th>Pulse input 33</th>
<th>Local bus ref</th>
<th>Lcp Potentiometer</th>
</tr>
</thead>
</table>

### 3-18 Relative Scaling Ref. Resource

<table>
<thead>
<tr>
<th>No function</th>
<th>Analog Input 53</th>
<th>Analog input 60</th>
<th>Pulse input 33</th>
<th>Local bus ref</th>
<th>Lcp Potentiometer</th>
</tr>
</thead>
</table>

### 3-4 Ramp 1

#### 3-40 Ramp 1 Type

- **Linear**
- **Sine2 ramp**

#### 3-41 Ramp 1 Ramp up Time

- 0.05 - 3600 s
- 3.00 s

#### 3-42 Ramp 1 Ramp down Time

- 0.05 - 3600 s
- 3.00 s

### 3-5 Ramp 2

#### 3-50 Ramp 2 Type

- **Linear**
- **Sine2 ramp**

#### 3-51 Ramp 2 Ramp up Time

- 0.05 - 3600 s
- 3.00 s

#### 3-52 Ramp 2 Ramp down Time

- 0.05 - 3600 s
- 3.00 s

### 3-8 Other Ramps

#### 3-80 Jog Ramp Time

- 0.05 - 3600 s
- 3.00 s

#### 3-81 Quick Stop Ramp Time

- 0.05 - 3600 s
- 3.00 s

### 4-1 Motor Limits

#### 4-10 Motor Speed Direction

- **Clockwise**
- **CounterClockwise**
- **Both**

#### 4-12 Motor Speed Low Limit [Hz]

- 0.0 - 400.0 Hz
- 0.0 Hz

#### 4-14 Motor Speed High Limit [Hz]

- 0.1 - 400.0 Hz
- 65.0 Hz

### 4-16 Torque Limit Motor Mode

- 0 - 400 %
- 150 %

### 4-17 Torque Limit Generator Mode

- 0 - 400 %
- 100 %

### 4-5 Adjust Warnings

#### 4-50 Warning Current Low

- 0.00 - 26.00 A
- 0.00 A

#### 4-51 Warning Current High

- 0.00 - 26.00 A
- 26.00 A

### 4-6 Speed Bypass

#### 4-61 Bypass Speed From [Hz]

- 0.0 - 400.0 Hz
- 0.0 Hz

#### 4-63 Bypass Speed To [Hz]

- 0.0 - 400.0 Hz
- 0.0 Hz

### 5-1 Digital Inputs

#### 5-10 Terminal 18 Digital Input

- No function
- Reset
- Coast inverse
- Coast and reset inv.
- Quick stop inverse
- DC-brake inv.
- A (up)
- Counter A (down)
- Reset counter A
- Counter B (up)
- Counter B (down)
- ResetCounter B

#### 5-11 Terminal 19 Digital Input

- See par. 5-10
- Reversing

#### 5-12 Terminal 27 Digital Input

- See par. 5-10
- Reset

#### 5-13 Terminal 29 Digital Input

- See par. 5-10
- Jog

#### 5-15 Terminal 33 Digital Input

- See par. 5-10
- Jog
- Precise Stop Inverse
- Start, Precise Stop
- Pulse Input

### 5-4 Relays

#### 5-40 Function Relay

- No operation
- Control ready
- Drive ready
- Drive ready, Remote
- Enable / No warning
- Drive ready, Remote, Drive in hand mode
- Drive ready, Drive in auto mode
- Comparator 0-3
- Logic rule 0-3
- SL digital output B

### 5-5 Pulse Input

#### 5-55 Terminal 33 Low Frequency

- 20 - 4999 Hz
- 20 Hz

#### 5-56 Terminal 33 High Frequency

- 21 - 5000 Hz
- 5000 Hz

#### 5-57 Term. 33 Low Ref./Feedb. Value

- -4999 - 4999
- 0.000

#### 5-58 Term. 33 High Ref./Feedb. Value

- -4999 - 4999
- 50.000

### 6-0 Analog I/O Mode

#### 6-00 Live Zero Timeout Time

- 1 - 99 s
- 10 s

#### 6-01 Live Zero Timeout Function

- Off
- Freeze output
- Stop
- Jogging
- Max speed
- Stop and trip

### 6-1 Analog Input 1

#### 6-10 Terminal 53 Low Voltage

- 0.00 - 9.99 V
- 0.07 V

#### 6-11 Terminal 53 High Voltage

- 0.01 - 10.00 V
- 10.00 V

#### 6-12 Terminal 53 Low Current

- 0.00 - 19.99 mA
- 0.14 mA

#### 6-13 Terminal 53 High Current

- 0.01 - 20.00 mA
- 20.00 mA

#### 6-14 Term. 53 Low Ref./Feedb. Value

- -4999 - 4999
- 0.000

#### 6-15 Term. 53 High Ref./Feedb. Value

- -4999 - 4999
- 50.000

#### 6-16 Terminal 53 Filter Time Constant

- 0.01 - 10.00 s
- 0.01 s

#### 6-19 Terminal 53 mode

- Voltage mode
- Current mode

### 6-2 Analog Input 2

#### 6-22 Terminal 60 Low Current

- 0.00 - 19.99 mA
- 0.14 mA

#### 6-23 Terminal 60 High Current

- 0.01 - 20.00 mA
- 20.00 mA

#### 6-24 Term. 60 Low Ref./Feedb. Value

- -4999 - 4999
- 0.000

#### 6-25 Term. 60 High Ref./Feedb. Value

- -4999 - 4999
- 50.000

#### 6-26 Term. 60 Filter Time Constant

- 0.01 - 10.00 s
- 0.01 s

#### 6-29 Terminal 60 mode

- Voltage mode
- Current mode
6-24 Term. 60 Low Ref./Feedb. Value
-4999 - 4999 * 0.000
6-25 Term. 60 High Ref./Feedb. Value
-4999 - 4999 * 50.00
6-26 Terminal 60 Filter Time Constant
0.01 - 10.00 s * 0.01 s
6-8* LCP potmeter
6-81 LCP potm. Low Reference
-4999 - 4999 * 0.000
6-82 LCP potm. High Reference
-4999 - 4999 * 50.00
6-9* Analog Output xx
6-90 Terminal 42 Mode
*[0] 0-20 mA
*[1] 4-20 mA
6-91 Terminal 42 Analog Output
*[0] No operation
*[1] 0-20 mA
*[2] 4-20 mA
*[3] Digital Output
6-93 Terminal 42 Digital Output
See par. 5-40
*[0] No Operation
*[0] SL Digital Output A
6-94 Terminal 42 Digital Input
See par. 8-50
*[0] No Operation
*[1] Digital Input
*[2] Analog Input
*[3] Pulse Input
*[4] Motor Power
*[5] Motor Voltage
*[6] DCLink Voltage
*[7] Counter A
*[8] Counter B
6-10 Process PT Anti Windup
*[0] Disable
*[1] Enable
7-32 Process PI Start Speed
0.0 - 200.0 Hz * 0.0 Hz
7-33 Process PI Proportional Gain
0.00 - 10.00 * 0.01
7-34 Process PI Integral Time
0.10 - 9999 s * 9999 s
7-38 Process PI Feed Forward Factor
0 - 400 % * 0 %
7-39 On Reference Bandwidth
0 - 200 % * 5 %
B-4** Comm. and Options
B-4* General Settings
8-01 Control Site
*[0] Digital and ControlWord
*[1] Digital only
*[2] ControlWord only
8-02 Control Word Source
*[0] None
*[1] FC RS485
8-03 Control Word Timeout Time
0.1 - 6000 s * 1.0 s
8-04 Control Word Timeout Function
*[0] Off
*[1] Freeze Output
*[2] Stop
*[3] Jogging
*[4] Max. Speed
*[5] Stop and trip
8-06 Reset Control Word Timeout
*[0] No Function
*[1] Do reset
8-3* FC Port Settings
8-30 Protocol
*[0] FC
*[1] Modbus
8-31 Address
1 - 247 * 1
8-32 FC Port Baud Rate
*[0] 2400 Baud
*[1] 4800 Baud
*[2] 9600 Baud
8-33 FC Port Parity
*[0] Even Parity, 1 Stop Bit
*[1] Odd Parity, 1 Stop Bit
*[2] No Parity, 1 Stop Bit
*[3] No Parity, 2 Stop Bits
8-35 Minimum Response Delay
0.010 - 0.5 * 0.010 s
8-36 Max Response Delay
0.100 - 10.00 s * 5.000 s
8-5* Digital/ Bus
8-50 Coasting Select
*[0] DigitalInput
*[1] Bus
*[2] LogicAnd
*[3] LogicOr
8-51 Quick Stop Select
See par. 8-50 * [3] LogicOr
8-52 DC Brake Select
See par. 8-50 * [3] LogicOr
8-53 Start Select
See par. 8-50 * [3] LogicOr
8-54 Reversing Select
See par. 8-50 * [3] LogicOr
8-55 Set-up Select
See par. 8-50 * [3] LogicOr
8-56 Preset Reference Select
See par. 8-50 * [3] LogicOr
8-9* Bus Jog / Feedback
8-94 Bus feedback
8-95 Bus feedback
0x8000 - 0x7FFF * 0
13-0* Controllers
13-0* Analog Output xx
13-00 Terminal 102 Mode
*[0] 0-20 mA
*[1] 4-20 mA
*[2] Digital Output
13-01 Terminal 102 Analog Output
See par. 5-40
*[0] No Operation
*[1] 0-20 mA
*[2] 4-20 mA
*[3] Digital Output
13-02 Terminal 102 Digital Output
See par. 8-50
*[0] No Operation
*[1] Digital Input
*[2] Analog Input
*[3] Pulse Input
*[4] Motor Power
*[5] Motor Voltage
*[6] DCLink Voltage
*[7] Counter A
*[8] Counter B
13-1* Process Ctrl. Feedb
13-20 Process CL Feedback 1 Resource
*[0] No Function
*[1] Analog Input 53
*[2] Analog input 60
*[3] Pulse Input 33
*[4] LocalBusRef
13-3* Controllers
13-30 Process PI Normal/ Inverse Ctrl
*[0] Normal
*[1] Inverse
13-31 Process PI Anti Windup
*[0] Disable
*[1] Enable
13-32 Process PI Start Speed
0.0 - 200.0 Hz * 0.0 Hz
13-33 Process PI Proportional Gain
0.00 - 10.00 * 0.01
13-34 Process PI Integral Time
0.10 - 9999 s * 9999 s
13-38 Process PI Feed Forward Factor
0 - 400 % * 0 %
13-39 On Reference Bandwidth
0 - 200 % * 5 %
13-4* Smart Logic
13-40 SLC Settings
13-40 SL Controller Mode
*[0] Off
*[1] On
13-41 Start Event
*[0] False
*[1] True
*[2] Running
*[3] InRange
*[4] OnReference
*[5] OutOfCurrentRange
13-42 Bus Feedback
13-43 Bus Feedback
13-44 Bus Feedback
13-45 Bus Feedback
13-46 Bus Feedback
13-47 Bus Feedback
13-48 Bus Feedback
13-49 Bus Feedback
13-4A Bus Feedback
**5. Parameter Overview**

### 13-12 Comparator Value
-9999 - 9999 * 0.0

### 13-2" Timers
- 0.0 - 3600 s * 0.0 s

### 13-4" Logic Rules
- 13-40 Logic Rule Boolean 1
  - See par. 13-01 * [0] False
- 13-41 Logic Rule Operator 1
  - [0] Disabled
  - [1] And
  - [2] Or
  - [3] And not
  - [4] Or not
  - [5] Not and
  - [6] Not or
  - [7] Not and not
  - [8] Not or not

### 13-51 SL Controller Event
- See par. 13-40

### 13-52 SL Controller Action
- [0] Disabled
- [1] NoAction
- [2] SelectSetup1
- [3] SelectSetup2
- [10-17] SelectResetRef-7
- [18] SelectRamp1
- [19] SelectRamp2
- [22] Run
- [23] RunReverse
- [24] Stop
- [25] QStop
- [26] DCStop
- [27] Coast
- [28] FreezeOutput
- [29] StartTimer1
- [30] StartTimer2
- [31] StartTimer3
- [32] StartDigital Output A Low
- [33] StartDigital Output B Low
- [34] StartDigital Output A High
- [35] StartDigital Output B High
- [36] ResetCounterA
- [37] ResetCounterB

### 14-0" Inverter Switching
- 14-01 Switching Frequency
  - [0] 2 kHz
  - [1] 4 kHz
  - [2] 8 kHz
  - [3] 16 kHz
- 14-03 Overmodulation
  - [0] Off
  - [1] On

### 14-5" Special Functions
- 14-0" Inverter Switching
  - 14-01 Switching Frequency
    - [0] 2 kHz
    - [1] 4 kHz
    - [2] 8 kHz
    - [3] 16 kHz
  - 14-03 Overmodulation
    - [0] Off
    - [1] On

### 14-6" Inputs / Outputs
- 14-0" Inverter Switching
  - 14-01 Switching Frequency
    - [0] 2 kHz
    - [1] 4 kHz
    - [2] 8 kHz
    - [3] 16 kHz
  - 14-03 Overmodulation
    - [0] Off
    - [1] On

### 15-04 Over Temps
- 15-05 Over Volts
- 15-06 Reset kWh Counter
  - [0] Do not reset
  - [1] Reset counter

### 16-3" Drive Status
- 16-30 DC Link Voltage
- 16-36 Inv. Nom. Current
- 16-37 Inv. Max. Current
- 16-38 SL Controller State
- 16-5" Ref. / Feedb.
- 16-50 External Reference
- 16-51 Pulse Reference

### 16-6" Inputs / Outputs
- 16-60 Digital Input 18,19,27,33
  - 0 - 1111
- 16-61 Digital Input 29
  - 0 - 1
- 16-62 Analog Input 53 (volt)
- 16-63 Analog Input 53 (current)
- 16-64 Analog Input 60
- 16-65 Analog Output 42 [mA]
- 16-68 Pulse Input [Hz]
- 16-71 Relay Output [bin]

### 16-73 Counter B
- 16-8* Fieldbus / FC Port
  - 16-86 FC Port REF 1
    - 0x8000 - 0x7FFFF
- 16-9" Diagnosis Readouts
  - 16-90 Alarm Word
    - 0 - 0XFFFF
  - 16-92 Warning Word
    - 0 - 0XFFFF
  - 16-94 Ext. Status Word
    - 0 - 0XFFFF

---

* [1] Approximately equals
* [2] Greater Than
* [3] False
* [4] True
<table>
<thead>
<tr>
<th>No.</th>
<th>Description</th>
<th>Warning</th>
<th>Alarm</th>
<th>Trip Lock</th>
<th>Cause of Problem</th>
</tr>
</thead>
<tbody>
<tr>
<td>2</td>
<td>Live zero error</td>
<td>X</td>
<td>X</td>
<td></td>
<td>Signal on terminal 53 or 60 is less than 50% of value set in par. 6-10, 6-12 and 6-22.</td>
</tr>
<tr>
<td>4</td>
<td>Mains phase loss</td>
<td>X</td>
<td></td>
<td>X</td>
<td>Missing phase on supply side, or too high voltage imbalance. Check supply voltage.</td>
</tr>
<tr>
<td>7</td>
<td>DC over voltage</td>
<td>X</td>
<td></td>
<td></td>
<td>Intermediate circuit voltage exceeds limit.</td>
</tr>
<tr>
<td>8</td>
<td>DC under voltage</td>
<td></td>
<td>X</td>
<td></td>
<td>Intermediate circuit voltage drops below “voltage warning low” limit.</td>
</tr>
<tr>
<td>9</td>
<td>Inverter overloaded</td>
<td></td>
<td></td>
<td></td>
<td>More than 100% load for too long.</td>
</tr>
<tr>
<td>10</td>
<td>Motor ETR over temperature</td>
<td></td>
<td>X</td>
<td>X</td>
<td>Motor is too hot due to more than 100% load for too long.</td>
</tr>
<tr>
<td>11</td>
<td>Motor thermistor over temperature</td>
<td></td>
<td>X</td>
<td></td>
<td>Thermistor or thermistor connection is disconnected.</td>
</tr>
<tr>
<td>12</td>
<td>Torque limit</td>
<td></td>
<td>X</td>
<td></td>
<td>Torque exceeds value set in either par. 4-16 or 4-17.</td>
</tr>
<tr>
<td>13</td>
<td>Over Current</td>
<td></td>
<td></td>
<td>X</td>
<td>Inverter peak current limit is exceeded.</td>
</tr>
<tr>
<td>14</td>
<td>Earth fault</td>
<td></td>
<td></td>
<td>X</td>
<td>Discharge from output phases to ground.</td>
</tr>
<tr>
<td>16</td>
<td>Short Circuit</td>
<td></td>
<td></td>
<td>X</td>
<td>Short-circuit in motor or on motor terminals.</td>
</tr>
<tr>
<td>17</td>
<td>Control word timeout</td>
<td></td>
<td></td>
<td>X</td>
<td>No communication to frequency converter.</td>
</tr>
<tr>
<td>25</td>
<td>Brake resistor short-circuited</td>
<td></td>
<td>X</td>
<td></td>
<td>Brake resistor is short-circuited, thus brake function is disconnected.</td>
</tr>
<tr>
<td>27</td>
<td>Brake chopper short-circuited</td>
<td></td>
<td></td>
<td>X</td>
<td>Brake transistor is short-circuited, thus brake function is disconnected.</td>
</tr>
<tr>
<td>28</td>
<td>Brake check</td>
<td></td>
<td></td>
<td>X</td>
<td>Brake resistor is not connected/working</td>
</tr>
<tr>
<td>29</td>
<td>Power board over temp</td>
<td></td>
<td></td>
<td>X</td>
<td>Heat-sink cut-out temperature has been reached.</td>
</tr>
<tr>
<td>30</td>
<td>Motor phase U missing</td>
<td></td>
<td></td>
<td>X</td>
<td>Motor phase U is missing. Check the phase.</td>
</tr>
<tr>
<td>31</td>
<td>Motor phase V missing</td>
<td></td>
<td></td>
<td>X</td>
<td>Motor phase V is missing. Check the phase.</td>
</tr>
<tr>
<td>32</td>
<td>Motor phase W missing</td>
<td></td>
<td></td>
<td>X</td>
<td>Motor phase W is missing. Check the phase.</td>
</tr>
<tr>
<td>38</td>
<td>Internal fault</td>
<td></td>
<td></td>
<td>X</td>
<td>Contact local Danfoss supplier.</td>
</tr>
<tr>
<td>47</td>
<td>Control Voltage Fault</td>
<td></td>
<td></td>
<td>X</td>
<td>24 V DC may be overloaded.</td>
</tr>
<tr>
<td>51</td>
<td>AMT check U_nom and I_nom</td>
<td></td>
<td></td>
<td></td>
<td>Wrong setting for motor voltage, motor current and motor voltage.</td>
</tr>
<tr>
<td>52</td>
<td>AMT Low I_nom</td>
<td></td>
<td></td>
<td></td>
<td>Motor current is too low. Check settings.</td>
</tr>
<tr>
<td>59</td>
<td>Current limit</td>
<td></td>
<td></td>
<td></td>
<td>VLT overload.</td>
</tr>
<tr>
<td>63</td>
<td>Mechanical Brake Low</td>
<td></td>
<td></td>
<td></td>
<td>Actual motor current has not exceeded “release brake” current within “start delay” time window.</td>
</tr>
<tr>
<td>80</td>
<td>Drive Initialised to Default Value</td>
<td></td>
<td></td>
<td>X</td>
<td>All parameter settings are initialized to default settings.</td>
</tr>
</tbody>
</table>

1) These faults may be caused by mains distortions. Installing Danfoss Line Filter may rectify this problem.

**Table 6.1: Code list**
# 7. Specifications

## 7.1. Mains Supply

### 7.1.1. Mains Supply 1 x 200 - 240 VAC

<table>
<thead>
<tr>
<th>Normal overload 150% for 1 minute</th>
</tr>
</thead>
<tbody>
<tr>
<td>Frequency converter</td>
</tr>
<tr>
<td>Typical Shaft Output [kW]</td>
</tr>
<tr>
<td>P0K18</td>
</tr>
<tr>
<td>P0K37</td>
</tr>
<tr>
<td>P0K75</td>
</tr>
<tr>
<td>P1K5</td>
</tr>
<tr>
<td>P2K2</td>
</tr>
<tr>
<td>Typical Shaft Output [HP]</td>
</tr>
<tr>
<td>0.25</td>
</tr>
<tr>
<td>0.5</td>
</tr>
<tr>
<td>1</td>
</tr>
<tr>
<td>2</td>
</tr>
<tr>
<td>3</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Output current</th>
</tr>
</thead>
<tbody>
<tr>
<td>Continuous (3 x 200-240 V) [A]</td>
</tr>
<tr>
<td>1.2</td>
</tr>
<tr>
<td>2.2</td>
</tr>
<tr>
<td>4.2</td>
</tr>
<tr>
<td>6.8</td>
</tr>
<tr>
<td>TBD</td>
</tr>
<tr>
<td>Intermittent (3 x 200-240 V) [A]</td>
</tr>
<tr>
<td>1.8</td>
</tr>
<tr>
<td>3.3</td>
</tr>
<tr>
<td>6.3</td>
</tr>
<tr>
<td>10.2</td>
</tr>
<tr>
<td>TBD</td>
</tr>
<tr>
<td>Max. cable size:</td>
</tr>
<tr>
<td>(mains, motor) [mm² /AWG]</td>
</tr>
<tr>
<td>4/10</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Max. input current</th>
</tr>
</thead>
<tbody>
<tr>
<td>Continuous (3 x 200-240 V) [A]</td>
</tr>
<tr>
<td>3.3</td>
</tr>
<tr>
<td>6.1</td>
</tr>
<tr>
<td>11.6</td>
</tr>
<tr>
<td>18.7</td>
</tr>
<tr>
<td>TBD</td>
</tr>
<tr>
<td>Intermittent (3 x 200-240 V) [A]</td>
</tr>
<tr>
<td>4.5</td>
</tr>
<tr>
<td>8.3</td>
</tr>
<tr>
<td>15.6</td>
</tr>
<tr>
<td>26.4</td>
</tr>
<tr>
<td>TBD</td>
</tr>
<tr>
<td>Max. pre-fuses [A]</td>
</tr>
<tr>
<td>See Section Fuses</td>
</tr>
<tr>
<td>Environment</td>
</tr>
<tr>
<td>Estimated power loss at rated load [W], Best case/Typical[1)</td>
</tr>
<tr>
<td>12.5/20.0/36.5/61.0</td>
</tr>
<tr>
<td>15.5/25.0/44.0/67.0</td>
</tr>
<tr>
<td>Weight enclosure IP20 [kg]</td>
</tr>
<tr>
<td>1.1</td>
</tr>
<tr>
<td>1.1</td>
</tr>
<tr>
<td>1.1</td>
</tr>
<tr>
<td>1.6</td>
</tr>
<tr>
<td>TBD</td>
</tr>
<tr>
<td>Efficiency</td>
</tr>
<tr>
<td>95.6/96.5/96.6/97.0</td>
</tr>
<tr>
<td>94.5/95.6/96.0/96.7</td>
</tr>
<tr>
<td>Best case/Typical[1)</td>
</tr>
</tbody>
</table>

| Table 7.1: Mains supply 1 x 200 - 240 VAC |

## 7.1.2. Mains Supply 3 x 200 - 240 VAC

<table>
<thead>
<tr>
<th>Normal overload 150% for 1 minute</th>
</tr>
</thead>
<tbody>
<tr>
<td>Frequency converter</td>
</tr>
<tr>
<td>Typical Shaft Output [kW]</td>
</tr>
<tr>
<td>P0K25</td>
</tr>
<tr>
<td>P0K37</td>
</tr>
<tr>
<td>P0K75</td>
</tr>
<tr>
<td>P1K5</td>
</tr>
<tr>
<td>P2K2</td>
</tr>
<tr>
<td>P3K7</td>
</tr>
<tr>
<td>Typical Shaft Output [HP]</td>
</tr>
<tr>
<td>0.33</td>
</tr>
<tr>
<td>0.5</td>
</tr>
<tr>
<td>1</td>
</tr>
<tr>
<td>2</td>
</tr>
<tr>
<td>3</td>
</tr>
<tr>
<td>5</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Output current</th>
</tr>
</thead>
<tbody>
<tr>
<td>Continuous (3 x 200-240 V) [A]</td>
</tr>
<tr>
<td>1.5</td>
</tr>
<tr>
<td>2.2</td>
</tr>
<tr>
<td>4.2</td>
</tr>
<tr>
<td>6.8</td>
</tr>
<tr>
<td>TBD</td>
</tr>
<tr>
<td>Intermittent (3 x 200-240 V) [A]</td>
</tr>
<tr>
<td>2.3</td>
</tr>
<tr>
<td>3.3</td>
</tr>
<tr>
<td>6.3</td>
</tr>
<tr>
<td>10.2</td>
</tr>
<tr>
<td>TBD</td>
</tr>
<tr>
<td>Max. cable size:</td>
</tr>
<tr>
<td>(mains, motor) [mm² /AWG]</td>
</tr>
<tr>
<td>4/10</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Max. input current</th>
</tr>
</thead>
<tbody>
<tr>
<td>Continuous (3 x 200-240 V) [A]</td>
</tr>
<tr>
<td>2.4</td>
</tr>
<tr>
<td>3.5</td>
</tr>
<tr>
<td>6.7</td>
</tr>
<tr>
<td>10.9</td>
</tr>
<tr>
<td>TBD</td>
</tr>
<tr>
<td>Intermittent (3 x 200-240 V) [A]</td>
</tr>
<tr>
<td>3.2</td>
</tr>
<tr>
<td>4.6</td>
</tr>
<tr>
<td>8.3</td>
</tr>
<tr>
<td>14.4</td>
</tr>
<tr>
<td>TBD</td>
</tr>
<tr>
<td>Max. pre-fuses [A]</td>
</tr>
<tr>
<td>See Section Fuses</td>
</tr>
<tr>
<td>Environment</td>
</tr>
<tr>
<td>Estimated power loss at rated load [W], Best case/Typical[1)</td>
</tr>
<tr>
<td>14.0/20.0/31.5/51.0</td>
</tr>
<tr>
<td>20.0/24.0/39.5/57.0</td>
</tr>
<tr>
<td>Weight enclosure IP20 [kg]</td>
</tr>
<tr>
<td>1.1</td>
</tr>
<tr>
<td>1.1</td>
</tr>
<tr>
<td>1.1</td>
</tr>
<tr>
<td>1.6</td>
</tr>
<tr>
<td>TBD</td>
</tr>
<tr>
<td>Efficiency</td>
</tr>
<tr>
<td>96.4/96.7/97.1/97.4</td>
</tr>
<tr>
<td>94.9/95.8/96.3/97.2</td>
</tr>
<tr>
<td>Best case/Typical[1)</td>
</tr>
</tbody>
</table>

| Table 7.2: Mains supply 3 x 200 - 240 VAC |

1. Power loss at rated load conditions.
7.1.3. Mains Supply 3 x 380 - 480 VAC

<table>
<thead>
<tr>
<th>Normal overload 150% for 1 minute</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Frequency converter</strong></td>
</tr>
<tr>
<td><strong>Typical Shaft Output [kW]</strong></td>
</tr>
<tr>
<td>P0K37</td>
</tr>
<tr>
<td>0.75</td>
</tr>
<tr>
<td>P1K5</td>
</tr>
<tr>
<td>1.5</td>
</tr>
<tr>
<td>P2K2</td>
</tr>
<tr>
<td>2.2</td>
</tr>
<tr>
<td>P3K0</td>
</tr>
<tr>
<td>3.0</td>
</tr>
<tr>
<td>P4K0</td>
</tr>
<tr>
<td>4.0</td>
</tr>
<tr>
<td>P5K5</td>
</tr>
<tr>
<td>5.5</td>
</tr>
<tr>
<td>P7K5</td>
</tr>
<tr>
<td>7.5</td>
</tr>
<tr>
<td><strong>Typical Shaft Output [HP]</strong></td>
</tr>
<tr>
<td>0.5</td>
</tr>
<tr>
<td>1.0</td>
</tr>
<tr>
<td>2.0</td>
</tr>
<tr>
<td>3.0</td>
</tr>
<tr>
<td>4.0</td>
</tr>
<tr>
<td>5.0</td>
</tr>
<tr>
<td>7.5</td>
</tr>
<tr>
<td>10.0</td>
</tr>
<tr>
<td><strong>IP 20</strong></td>
</tr>
<tr>
<td>Frame M1</td>
</tr>
<tr>
<td>Frame M1</td>
</tr>
<tr>
<td>Frame M2</td>
</tr>
<tr>
<td>Frame M2</td>
</tr>
<tr>
<td>Frame M3</td>
</tr>
<tr>
<td>Frame M3</td>
</tr>
<tr>
<td>Frame M3</td>
</tr>
<tr>
<td>Frame M3</td>
</tr>
<tr>
<td>Frame M3</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Output current</th>
</tr>
</thead>
<tbody>
<tr>
<td>Continuous (3 x 380-440 V) [A]</td>
</tr>
<tr>
<td>1.2</td>
</tr>
<tr>
<td>2.2</td>
</tr>
<tr>
<td>3.7</td>
</tr>
<tr>
<td>5.3</td>
</tr>
<tr>
<td>TBD</td>
</tr>
<tr>
<td>TBD</td>
</tr>
<tr>
<td>TBD</td>
</tr>
<tr>
<td>TBD</td>
</tr>
<tr>
<td>Intermittent (3 x 380-440 V) [A]</td>
</tr>
<tr>
<td>1.8</td>
</tr>
<tr>
<td>3.3</td>
</tr>
<tr>
<td>5.6</td>
</tr>
<tr>
<td>8.0</td>
</tr>
<tr>
<td>TBD</td>
</tr>
<tr>
<td>TBD</td>
</tr>
<tr>
<td>TBD</td>
</tr>
<tr>
<td>TBD</td>
</tr>
<tr>
<td>Continuous (3 x 440-480 V) [A]</td>
</tr>
<tr>
<td>1.1</td>
</tr>
<tr>
<td>2.1</td>
</tr>
<tr>
<td>3.4</td>
</tr>
<tr>
<td>4.8</td>
</tr>
<tr>
<td>TBD</td>
</tr>
<tr>
<td>TBD</td>
</tr>
<tr>
<td>TBD</td>
</tr>
<tr>
<td>TBD</td>
</tr>
<tr>
<td>Intermittent (3 x 440-480 V) [A]</td>
</tr>
<tr>
<td>1.7</td>
</tr>
<tr>
<td>3.2</td>
</tr>
<tr>
<td>5.1</td>
</tr>
<tr>
<td>7.2</td>
</tr>
<tr>
<td>TBD</td>
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<tr>
<td>TBD</td>
</tr>
<tr>
<td>TBD</td>
</tr>
<tr>
<td>TBD</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Max. cable size:</th>
</tr>
</thead>
<tbody>
<tr>
<td>(mains, motor) [mm²/ AWG]</td>
</tr>
<tr>
<td>4/10</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Max. input current</th>
</tr>
</thead>
<tbody>
<tr>
<td>Continuous (3 x 380-440 V) [A]</td>
</tr>
<tr>
<td>1.9</td>
</tr>
<tr>
<td>3.5</td>
</tr>
<tr>
<td>5.9</td>
</tr>
<tr>
<td>8.5</td>
</tr>
<tr>
<td>TBD</td>
</tr>
<tr>
<td>TBD</td>
</tr>
<tr>
<td>TBD</td>
</tr>
<tr>
<td>TBD</td>
</tr>
<tr>
<td>Intermittent (3 x 380-440 V) [A]</td>
</tr>
<tr>
<td>2.6</td>
</tr>
<tr>
<td>4.7</td>
</tr>
<tr>
<td>8.7</td>
</tr>
<tr>
<td>12.6</td>
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<tr>
<td>TBD</td>
</tr>
<tr>
<td>TBD</td>
</tr>
<tr>
<td>TBD</td>
</tr>
<tr>
<td>TBD</td>
</tr>
<tr>
<td>Continuous (3 x 440-480 V) [A]</td>
</tr>
<tr>
<td>1.7</td>
</tr>
<tr>
<td>3.0</td>
</tr>
<tr>
<td>5.1</td>
</tr>
<tr>
<td>7.3</td>
</tr>
<tr>
<td>TBD</td>
</tr>
<tr>
<td>TBD</td>
</tr>
<tr>
<td>TBD</td>
</tr>
<tr>
<td>TBD</td>
</tr>
<tr>
<td>Intermittent (3 x 440-480 V) [A]</td>
</tr>
<tr>
<td>2.3</td>
</tr>
<tr>
<td>4.0</td>
</tr>
<tr>
<td>7.5</td>
</tr>
<tr>
<td>10.8</td>
</tr>
<tr>
<td>TBD</td>
</tr>
<tr>
<td>TBD</td>
</tr>
<tr>
<td>TBD</td>
</tr>
<tr>
<td>TBD</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Max. pre-fuses [A]</th>
</tr>
</thead>
<tbody>
<tr>
<td>See Section Fuses</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Environment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Estimated power loss at rated load [W]</td>
</tr>
<tr>
<td>18.5/25.5</td>
</tr>
<tr>
<td>TBD</td>
</tr>
<tr>
<td>TBD</td>
</tr>
<tr>
<td>TBD</td>
</tr>
<tr>
<td>TBD</td>
</tr>
<tr>
<td>Best case/Typical¹</td>
</tr>
<tr>
<td>28.5/43.5</td>
</tr>
<tr>
<td>41.5/56.5</td>
</tr>
<tr>
<td>57.5/81.5</td>
</tr>
<tr>
<td>TBD</td>
</tr>
<tr>
<td>TBD</td>
</tr>
<tr>
<td>TBD</td>
</tr>
<tr>
<td>TBD</td>
</tr>
<tr>
<td>Weight enclosure IP20 [kg]</td>
</tr>
<tr>
<td>1.1</td>
</tr>
<tr>
<td>1.1</td>
</tr>
<tr>
<td>1.6</td>
</tr>
<tr>
<td>1.6</td>
</tr>
<tr>
<td>TBD</td>
</tr>
<tr>
<td>TBD</td>
</tr>
<tr>
<td>TBD</td>
</tr>
<tr>
<td>TBD</td>
</tr>
<tr>
<td>Efficiency</td>
</tr>
<tr>
<td>96.8/95.5</td>
</tr>
<tr>
<td>97.4/96.0</td>
</tr>
<tr>
<td>98.0/97.2</td>
</tr>
<tr>
<td>97.9/97.1</td>
</tr>
<tr>
<td>TBD</td>
</tr>
<tr>
<td>TBD</td>
</tr>
<tr>
<td>TBD</td>
</tr>
<tr>
<td>TBD</td>
</tr>
</tbody>
</table>

1. Power loss at rated load conditions.

Table 7.3: Mains supply 3 x 380 - 480 VAC
7.2. Other Specifications

Protection and Features:

- Electronic thermal motor protection against overload.
- Temperature monitoring of the heatsink ensures that the frequency converter trips in case of overtemperature.
- The frequency converter is protected against short-circuits on motor terminals U, V, W.
- If a motor phase is missing, the frequency trips and issues an alarm.
- If a mains phase is missing, the frequency converter trips or issues a warning (depending on the load).
- Monitoring of the intermediate circuit voltage ensures that the frequency converter trips if the intermediate circuit voltage is too low or too high.
- The frequency converter is protected against earth faults on motor terminals U, V, W.

Mains supply (L1/L, L2, L3/N):

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Specification</th>
</tr>
</thead>
<tbody>
<tr>
<td>Supply voltage</td>
<td>200-240 V ±10%</td>
</tr>
<tr>
<td>Supply voltage</td>
<td>380-480 V ±10%</td>
</tr>
<tr>
<td>Supply frequency</td>
<td>50/60 Hz</td>
</tr>
<tr>
<td>Max. imbalance temporary between mains phases</td>
<td>3.0 % of rated supply voltage</td>
</tr>
<tr>
<td>True Power Factor (λ)</td>
<td>≥ 0.4 nominal at rated load</td>
</tr>
<tr>
<td>Displacement Power Factor (cosφ)</td>
<td>(&gt; 0.98)</td>
</tr>
<tr>
<td>Switching on input supply (L1/L, L2, L3/N)</td>
<td>maximum 2 times/min.</td>
</tr>
</tbody>
</table>

Environment according to EN60664-1 overvoltage category III/pollution degree 2

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

Motor output (U, V, W):

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Specification</th>
</tr>
</thead>
<tbody>
<tr>
<td>Output voltage</td>
<td>0 - 100% of supply voltage</td>
</tr>
<tr>
<td>Output frequency</td>
<td>0-200 Hz (VVC+), 0-400 Hz (u/f)</td>
</tr>
<tr>
<td>Switching on output</td>
<td>Unlimited</td>
</tr>
<tr>
<td>Ramp times</td>
<td>0.05 - 3600 sec.</td>
</tr>
</tbody>
</table>

Cable lengths and cross sections:

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Specification</th>
</tr>
</thead>
<tbody>
<tr>
<td>Max. motor cable length, screened/armoured (EMC correct installation)</td>
<td>15 m</td>
</tr>
<tr>
<td>Max. motor cable length, unscreened/unarmoured</td>
<td>50 m</td>
</tr>
<tr>
<td>Max. cross section to motor, mains, load sharing and brake *</td>
<td></td>
</tr>
<tr>
<td>Maximum cross section to control terminals, rigid wire</td>
<td>1.5 mm²/16 AWG (2 x 0.75 mm²)</td>
</tr>
<tr>
<td>Maximum cross section to control terminals, flexible cable</td>
<td>1 mm²/18 AWG</td>
</tr>
<tr>
<td>Maximum cross section to control terminals, cable with enclosed core</td>
<td>0.5 mm²/20 AWG</td>
</tr>
<tr>
<td>Minimum cross section to control terminals</td>
<td>0.25 mm²</td>
</tr>
</tbody>
</table>

* See tables for mains supply for more information!

Digital inputs (Pulse/encoder inputs):

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Specification</th>
</tr>
</thead>
<tbody>
<tr>
<td>Programmable digital inputs (Pulse/encoder)</td>
<td>5 (1)</td>
</tr>
<tr>
<td>Terminal number</td>
<td>18, 19, 27, 29, 33,</td>
</tr>
<tr>
<td>Logic</td>
<td>PNP or NPN</td>
</tr>
<tr>
<td>Voltage level, logic ‘0’ PNP</td>
<td>0 - 24 V DC</td>
</tr>
<tr>
<td>Voltage level, logic ‘0’ NPN</td>
<td>&lt; 5 V DC</td>
</tr>
<tr>
<td>Voltage level, logic ‘1’ PNP</td>
<td>&gt; 10 V DC</td>
</tr>
<tr>
<td>Voltage level, logic ‘1’ NPN</td>
<td>&gt; 19 V DC</td>
</tr>
<tr>
<td>Voltage level, logic ‘1’ NPN</td>
<td>&gt; 14 V DC</td>
</tr>
</tbody>
</table>
Maximum voltage on input: 28 V DC
Input resistance, $R_i$: approx. 4 kΩ
Max. pulse frequency at terminal 33: 5000 Hz
Min. pulse frequency at terminal 33: 20 Hz

Analog inputs:
Number of analog inputs: 2
Terminal number: 53, 60
Voltage level: 0 - 10 V
Input resistance, $R_i$: approx. 10 kΩ
Max. voltage: 20 V
Current level: 0/4 to 20 mA (scaleable)
Input resistance, $R_i$: approx. 200 Ω
Max. current: 30 mA

Analog output:
Number of programmable analog outputs: 1
Terminal number: 42
Current range at analog output: 0/4 - 20 mA
Max. load to common at analog output: 500 Ω
Accuracy on analog output: Max. error: 0.8 % of full scale
Resolution on analog output: 8 bit

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

Control card, RS-485 serial communication:
Terminal number: 68 (P, TX+, RX+), 69 (N, TX-, RX-)
Terminal number 61: Common for terminals 68 and 69

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

Control card, 24 V DC output:
Terminal number: 12
Max. load: 200 mA

Relay output:
Programmable relay output: 1
Relay 01 Terminal number: 01-03 (break), 01-02 (make)
Max. terminal load (AC-1)\(^1\) on 01-02 (NO) (Resistive load): 250 V AC, 2 A
Max. terminal load (AC-15)\(^1\) on 01-02 (NO) (Inductive load @ cos $\phi$ 0.4): 250 V AC, 0.2 A
Max. terminal load (DC-1)\(^1\) on 01-02 (NO) (Resistive load): 30 V DC, 2 A
Max. terminal load (DC-13)\(^1\) on 01-02 (NO) (Inductive load): 24 V DC, 0.1 A
Max. terminal load (AC-1)\(^1\) on 01-03 (NC) (Resistive load): 250 V AC, 2 A
Max. terminal load (AC-15)\(^1\) on 01-03 (NC) (Inductive load @ cos $\phi$ 0.4): 250 V AC, 0.2 A
Max. terminal load (DC-1)\(^1\) on 01-03 (NC) (Resistive load): 30 V DC, 2 A
Min. terminal load on 01-03 (NC), 01-02 (NO): 24 V DC 10 mA, 24 V AC 20 mA

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

\(^1\) IEC 60947 part 4 and 5
Control card, 10 V DC output:

<table>
<thead>
<tr>
<th>Terminal number</th>
<th>50</th>
</tr>
</thead>
<tbody>
<tr>
<td>Output voltage</td>
<td>10.5 V ±0.5 V</td>
</tr>
<tr>
<td>Max. load</td>
<td>25 mA</td>
</tr>
</tbody>
</table>

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

Surroundings:

<table>
<thead>
<tr>
<th>Enclosure</th>
<th>IP 20</th>
</tr>
</thead>
<tbody>
<tr>
<td>Enclosure kit available</td>
<td>IP 21</td>
</tr>
<tr>
<td>Enclosure kit available</td>
<td>TYPE 1</td>
</tr>
<tr>
<td>Vibration test</td>
<td>1.0 g</td>
</tr>
<tr>
<td>Max. relative humidity</td>
<td>5% - 95% (IEC 60721-3-3; Class 3K3 (non-condensing) during operation</td>
</tr>
<tr>
<td>Aggressive environment (IEC 60721-3-3), coated</td>
<td>class 3C3</td>
</tr>
<tr>
<td>Test method according to IEC 60068-2-43 H2S (10 days)</td>
<td></td>
</tr>
<tr>
<td>Ambient temperature</td>
<td>Max. 40 °C</td>
</tr>
</tbody>
</table>

Derating for high ambient temperature, see section on special conditions

Minimum ambient temperature during full-scale operation | 0 °C |
Minimum ambient temperature at reduced performance | -10 °C |
Temperature during storage/transport | -25 - +65/70 °C |
Maximum altitude above sea level without derating | 1000 m |
Maximum altitude above sea level with derating | 3000 m |

Derating for high altitude, see section on special conditions

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

See section on special conditions

7.3. Special Conditions

7.3.1. The Purpose of Derating

Derating must be taken into account when using the frequency converter at low air pressure (heights), at low speeds or at high ambient temperature. The required action is described in this section.

7.3.2. Derating for Ambient Temperature

The ambient temperature measured over 24 hours should be at least 5 °C lower than the max. ambient temperature.

If the frequency converter is operated at high ambient temperature, the continuous output current should be decreased.

The VLT Micro Drive FC 51 has been designed for operation at max 50 °C ambient temperature with one motor size smaller than nominal. Continuous operation at full load at 50 °C ambient temperature will reduce the lifetime of the frequency converter.

7.3.3. Derating for Low Air Pressure

The cooling capability of air is decreased at low air pressure.
For altitudes above 2000 m, please contact Danfoss Drives regarding PELV.

Below 1000 m altitude no de-rating is necessary but above 1000 m the ambient temperature or the maximum output current should be decreased. Decrease the output by 1% per 100 m altitude above 1000 m or reduce the max. ambient temperature by 1 degree per 200 m.

### 7.3.4. Derating for Running at Low Speeds

When a motor is connected to a frequency converter, it is necessary to check that the cooling of the motor is adequate. A problem may occur at low speeds in constant torque applications. Running continuously at low speeds – below half the nominal motor speed – may require additional air cooling. Alternatively, choose a larger motor (one size up).
### 7.4. Options for VLT Micro Drive FC 51

#### 7.4.1. Options for VLT Micro Drive FC 51

<table>
<thead>
<tr>
<th>Ordering No</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>132B0100</td>
<td>VLT Control Panel LCP 11 w/o potentiometer</td>
</tr>
<tr>
<td>132B0101</td>
<td>VLT Control Panel LCP 12 with potentiometer</td>
</tr>
<tr>
<td>132B0102</td>
<td>Remote Mounting Kit for LCP incl. 3 m cable IP55 with LCP 11, IP21 with LCP 12</td>
</tr>
<tr>
<td>132B0103</td>
<td>Nema Type 1 kit for M1 frame</td>
</tr>
<tr>
<td>132B0104</td>
<td>Nema Type 1 kit for M2 frame</td>
</tr>
<tr>
<td>132B0105</td>
<td>Nema Type 1 kit for M3 frame</td>
</tr>
<tr>
<td>132B0106</td>
<td>De-coupling plate kit for M1 and M2 frames</td>
</tr>
<tr>
<td>132B0107</td>
<td>De-coupling plate kit for M3 frame</td>
</tr>
<tr>
<td>132B0108</td>
<td>IP21 for M1 frame</td>
</tr>
<tr>
<td>132B0109</td>
<td>IP21 for M2 frame</td>
</tr>
<tr>
<td>132B0110</td>
<td>IP21 for M3 frame</td>
</tr>
<tr>
<td>132B0111</td>
<td>DIN rail mounting kit for M1</td>
</tr>
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</table>

Danfoss Line Filters and brake resistors are available upon request.
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