Danfoss **Operating Guide**

VLT® Micro Drive FC 51

1 Introduction

This Operating Guide provides necessary information for qualified personnel to install and commission the AC drive. Read and follow the instructions to use the drive safely and professionally.
VLT® is a registered trademark for Danfoss A/S.

Do not dispose of equipment containing electrical components together with domestic waste. Collect it separately in accordance with local and currently valid legislation.

2 Safety

Pay particular attention to the safety instructions and general warnings to avoid the risk of death, serious injury, and equipment or property damage.

⚠ WARNING ⚠

HIGH VOLTAGE
AC drives contain high voltage when connected to AC mains input, DC supply, or load sharing.

UNINTENDED START
The motor may start from LCP, I/O inputs, fieldbus, or MCT 10 Set-up software at any time, when the drive is connected to the AC mains, DC supply, or load sharing.

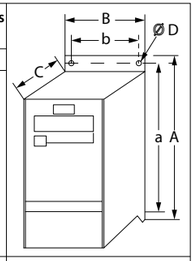
DISCHARGE TIME
The drive contains DC-link capacitors, which can remain charged even when the drive is not powered. High voltage can be present even when the warning indicator lights are off.
- Stop the motor, and disconnect AC mains, permanent magnet type motors, and remote DC-link supplies, including battery back-ups, UPS, and DC-link connections to other drives.
- Wait for the capacitors to discharge fully and measure it before performing any service or repair work.
- The minimum waiting time is 4 minutes for M1, M2, and M3 drives, and 15 minutes for M4 and M5 drives.

LEAKAGE CURRENT
Leakage currents of the drive exceed 3.5 mA. Make sure that the drive is properly grounded with at least 10 mm² (8 AWG) grounding wire and use RCDs of type B with an inrush delay.

3 Installation

3.1 Mechanical Dimensions

Enclosure size	Height [mm (in)]			Width [mm (in)]		Depth [mm (in)][2]	Mounting holes [mm (in)]
	A	A[1]	a	B	b	C	D
M1	150 (5.9)	205 (8.1)	140.4 (5.5)	70 (2.8)	55 (2.2)	148 (5.8)	7 (0.28)
M2	176 (6.9)	230 (9.1)	166.4 (6.6)	75 (3.0)	59 (2.3)	168 (6.6)	7 (0.28)
M3	239 (9.4)	294 (11.6)	226 (8.9)	90 (3.5)	69 (2.7)	194 (7.6)	5.5 (0.22)
M4	292 (11.5)	347.5 (13.7)	272.4 (10.7)	125 (4.9)	97 (3.8)	241 (9.5)	4.5 (0.18)
M5	335 (13.2)	387.5 (15.3)	315 (12.4)	165 (6.5)	140 (5.5)	248 (9.8)	4.5 (0.18)



Enclosure size	Power [kW (hp)]			Maximum weight [kg (lb)]
	1x200–240 V	3x200–240 V	3x380–480 V	
M1	0.18–0.75 (0.24–1.0)	0.25–0.75 (0.34–1.0)	0.37–0.75 (0.5–1.0)	1.1 (2.4)
M2	1.5 (2.0)	1.5 (2.0)	1.5–2.2 (2.0–3.0)	1.6 (3.5)
M3	2.2 (3.0)	2.2–3.7 (3.0–5.0)	3.0–7.5 (4.0–10)	3.0 (6.6)
M4	–	–	11.0–15.0 (15–20)	6.0 (13.2)
M5	–	–	18.5–22.0 (25–30)	9.5 (20.9)

(1) Including decoupling plate. (2) For LCP with potentiometer, add 7.6 mm (0.3 in).

3.2 Connecting to Mains and Motor

• Mount the ground wires to the PE terminal.
• Connect motor to terminals U, V, and W.
• Mount mains supply to terminals L1/L, L2, and L3/N (3-phase) or L1/L and L3/N (single-phase) and tighten.

3.3 Load Sharing/Brake

Use 6.3 mm (0.25 in) insulated Faston plugs designed for high voltage for DC (load sharing and brake).
Contact Danfoss or see Load sharing instruction VLT® 5000 for load sharing and VLT® 2800/5000/5000 FLUX/FCD 300 Brake for brake.

Load sharing: Connect terminals -UDC and +UDC/+BR.
Brake: Connect terminals -BR and +UDC/+BR (not applicable to enclosure size M1).

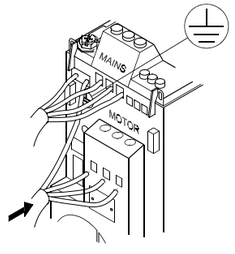


Illustration 1: Mounting of Ground Cable, Mains, and Motor Wires

NOTICE

Voltage levels of up to 850 V DC may occur between terminals +UDC/+BR and -UDC. Not short-circuit protected.

3.4 Control Terminals

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

NOTICE

- See the back of the terminal cover for outlines of control terminals and switches.
- Do not operate switches with power on the drive.
- Set *parameter 6-19 Terminal 53 Mode* according to Switch 4 position.

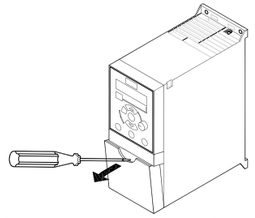


Illustration 2: Removing Terminal Cover

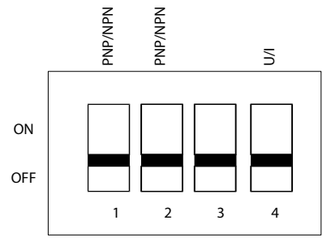


Illustration 3: S200 Switches 1–4

Switch 1	Off=PNP terminals 29[1] On=NPN terminals 29
Switch 2	Off=PNP terminal 18, 19, 27, and 33[1] On=NPN terminal 18, 19, 27, and 33
Switch 3	No function
Switch 4	Off=Terminal 53 0–10 V[1] On=Terminal 53 0/4-20 mA
(1) This is the default setting.	

Table 1: Settings for S200 Switches 1–4

The following illustration shows all control terminals of the drive. Applying start (terminal 18) and an analog reference (terminal 53 or 60) make the drive run.

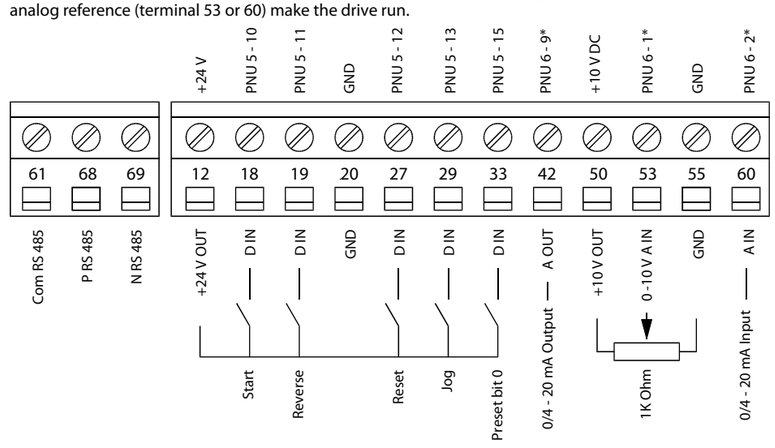


Illustration 4: Overview of Control Terminals in PNP Configuration with Factory Setting

4 Programming

4.1 Local Control Panel (LCP)

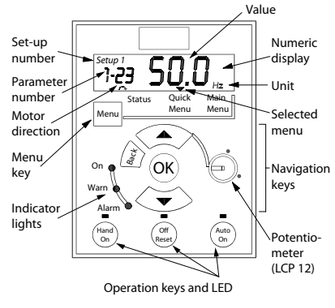


Illustration 5: Description of LCP Keys and Display

Press **[Menu]** to select 1 of the following menus:	
Status	For readouts only.
Quick Menu	For access to Quick Menus 1 and 2.
Main Menu	For access to all parameters.
Navigation keys	
[Back]	For moving to the previous step or layer in the navigation structure.
[▲] [▼]	For manoeuvring between parameter groups, parameters, and within parameters.
[OK]	For selecting a parameter and for accepting changes to parameter settings.
Operation keys	
[Hand On]	Starts the motor and enables control of drive via LCP.
[Off/Reset]	The motor stops. If in alarm mode, the motor resets.
[Auto On]	The drive is controlled either via control terminals or serial communication.
LCP12 is another LCP with potentiometer.	

4.2 Programming on Automatic Motor Tuning (AMT)

Run AMT to optimize compatibility between the drive and the motor in VVC+ mode. The drive builds a mathematical model of the motor for regulating output motor current thus enhancing motor performance.
1. Enter the main menu.
2. Set *parameter group 1-** Load and Motor*, *parameter group 1-2* Motor Data*, and *parameter 1-29 Automatic Motor Tuning (AMT)*.
3. Press [OK]. The test runs automatically and indicates when it is complete.

5 Parameter Overview

0- Operation/Display**
0-0* Basic Settings
0-03 Regional Settings
0-04 Operating State at Power-up (Hand)
0-1* Set-up Operations
0-10 Active Set-up
0-11 Edit Set-up
0-12 Link Setups
0-3* LCP Readout
0-31 Custom Readout Min Value
0-32 Custom Readout Max Value
0-4* LCP Keypad
0-40 [Hand on] Key on LCP
0-41 [Off/Reset] Key on LCP
0-42 [Auto on] Key on LCP
0-5* Copy/Save
0-50 LCP Copy
0-51 Set-up Copy
0-6* Password
0-60 Main/Quick Menu Password
0-61 Access to Main/Quick Menu w/o Password
1- Load and Motor**
1-0* General Settings
1-00 Configuration Mode
1-01 Motor Control Principle
1-03 Torque Characteristics
1-05 Hand Mode Configuration
1-2* Motor Data
1-20 Motor Power
1-22 Motor Voltage
1-23 Motor Frequency
1-24 Motor Current
1-25 Motor Nominal Speed
1-29 Automatic Motor Tuning (AMT)
1-3* Adv. Motor Data
1-30 Stator Resistance (Rs)
1-33 Stator Leakage Reactance (X1)
1-35 Main Reactance (Xh)
1-5* Load Indep. Setting
1-50 Motor Magnetisation at Zero Speed
1-52 Min Speed Normal Magnetising [Hz]
1-55 U/f Characteristic - U
1-56 U/f Characteristic - F
1-6* Load Depen. Setting
1-60 Low Speed Load Compensation
1-61 High Speed Load Compensation
1-62 Slip Compensation
1-63 Slip Compensation Time Constant
1-7* Start Adjustments
1-71 Start Delay
1-72 Start Function
1-73 Flying Start
1-8* Stop Adjustments
1-80 Function at Stop
1-82 Min Speed for Function at Stop [Hz]
1-9* Motor Temperature
1-90 Motor Thermal Protection
1-93 Thermistor Resource
2- Brakes**
2-0* DC-Brake
2-00 DC Hold Current
2-01 DC Brake Current
2-02 DC Braking Time
2-04 DC Brake Cut In Speed
2-1* Brake Energy Funct.
2-10 Brake Function
2-11 Brake Resistor (ohm)
2-14 Brake Voltage Reduce
2-16 AC Brake, Max Current
2-17 Overvoltage Control
2-2* Mechanical Brake
2-20 Release Brake Current
2-22 Activate Brake Speed [Hz]
3- Reference/Ramps**
3-0* Reference Limits
3-00 Reference Range
3-02 Minimum Reference
3-03 Maximum Reference
3-1* References
3-10 Preset Reference
3-11 Jog Speed [Hz]
3-12 Catch Up/Slow Down Value
3-14 Preset Relative Reference
3-15 Reference Resource 1
3-16 Reference Resource 2
3-17 Reference Resource 3
3-18 Relative Scaling Reference Resource
3-4* Ramp 1
3-40 Ramp 1 Type
3-41 Ramp 1 Ramp Up Time
3-42 Ramp 1 Ramp Down Time
3-5* Ramp 2
3-50 Ramp 2 Type
3-51 Ramp 2 Ramp Up Time
3-52 Ramp 2 Ramp Down Time
3-8* Other Ramps
3-80 Jog Ramp Time
3-81 Quick Stop Ramp Time
4- Limits/Warnings**
4-1* Motor Limits
4-10 Motor Speed Direction
4-12 Motor Speed Low Limit [Hz]
4-14 Motor Speed High Limit [Hz]
4-16 Torque Limit Motor Mode
4-17 Torque Limit Generator Mode
4-4* Adj. Warnings 2
4-40 Warning Freq. Low
4-41 Warning Freq. High
4-5* Adj. Warnings
4-50 Warning Current Low
4-51 Warning Current High
4-54 Warning Reference Low
4-55 Warning Reference High
4-56 Warning Feedback Low
4-57 Warning Feedback High
4-58 Missing Motor Phase Function
4-6* Speed Bypass
4-61 Bypass Speed From [Hz]
4-63 Bypass Speed To [Hz]
5- Digital In/Out**
5-1* Digital Inputs
5-10 Terminal 18 Digital Input
5-11 Terminal 19 Digital Input
5-12 Terminal 27 Digital Input
5-13 Terminal 29 Digital Input
5-15 Terminal 33 Digital Input
5-3* Digital Outputs
5-34 On Delay, Terminal 42 Digital Output
5-35 Off Delay, Terminal 42 Digital Output
5-4* Relays
5-40 Function Relay
5-41 On Delay, Relay
5-42 Off Delay, Relay
5-5* Pulse Input
5-55 Terminal 33 Low Frequency
5-56 Terminal 33 High Frequency
5-57 Terminal 33 Low Ref./ Feedb. Value
5-58 Terminal 33 High Ref./ Feedb. Value
6- Analog In/Out**
6-0* Analog I/O Mode
6-00 Live Zero Timeout Time
6-01 Live Zero Timeout Function
6-1* Analog Input 1
6-10 Terminal 53 Low Voltage
6-11 Terminal 53 High Voltage
6-12 Terminal 53 Low Current
6-13 Terminal 53 High Current
6-14 Terminal 53 Low Ref./ Feedb. Value
6-15 Terminal 53 High Ref./ Feedb. Value
6-16 Terminal 53 Filter Time Constant
6-19 Terminal 53 Mode
6-2* Analog Input 2
6-21 Reserved for Testing
6-22 Terminal 60 Low Current
6-23 Terminal 60 High Current
6-24 Terminal 60 Low Ref./ Feedb. Value
6-25 Terminal 60 High Ref./ Feedb. Value
6-26 Terminal 60 Filter Time Constant
6-8* LCP potmeter
6-80 LCP Potmeter Enable
6-81 LCP Potmeter Low Ref.
6-82 LCP Potmeter High Ref.
6-9* Analog Output xx
6-90 Terminal 42 Mode
6-91 Terminal 42 Analog Output
6-92 Terminal 42 Digital Output
6-93 Terminal 42 Output Min Scale
6-94 Terminal 42 Output Max Scale
6-98 Drive Type
7- Controllers**
7-2* Process Ctrl. Feedb
7-20 Process CL Feedback 1 Resource
7-3* Process PI Ctrl.
7-30 Process PI Normal/ Inverse Control
7-31 Process PI Anti Windup
7-32 Process PI Start Speed
7-33 Process PI Proportional Gain
7-34 Process PI Integral Time
7-38 Process PI Feed Forward Factor
7-39 On Reference Bandwidth
8- Comm. and Options**
8-0* Comm. General Settings
8-01 Control Site
8-02 Control Word Source
8-03 Control Word Timeout Time
8-04 Control Word Timeout Function

8-06 Reset Control Word Timeout	**14-** Special Functions**	**16-0* General Status**
8-3* FC Port Settings	**14-0* Inverter Switching**	16-00 Control Word
8-30 Protocol	14-01 Switching Frequency	16-01 Reference [Unit]
8-31 Address	14-03 Overmodulation	16-02 Reference %
8-32 FC Port Baud Rate	**14-1* Mains Monitoring**	16-03 Status Word
8-33 FC Port Parity	14-12 Function at Mains	16-05 Main Actual Value [%]
8-35 Minimum Response Delay	Imbalance	16-09 Custom Readout
8-36 Max Response Delay	**14-2* Trip Reset**	**16-1* Motor Status**
8-4* FC MC Protocol Set	14-20 Reset Mode	16-10 Power [kW]
8-42 FC Port PCD Write	14-21 Automatic Restart Time	16-11 Power [hp]
Configuration	14-22 Operation Mode	16-12 Motor Voltage
8-43 FC Port PCD Read	14-26 Action at Inverter Fault	16-13 Frequency
Configuration	14-28 Production Settings	16-14 Motor Current
8-5* Digital/Bus	14-29 Service Code	16-15 Frequency [%]
8-50 Coasting Select	**14-4* Energy Optimising**	16-18 Motor Thermal
8-51 Quick Stop Select	14-41 AEO Minimum	**16-3* Drive Status**
8-52 DC Brake Select	Magnetisation	16-30 DC Link Voltage
8-53 Start Select	**14-9* Fault Settings**	16-34 Heatsink Temp.
8-54 Reversing Select	14-90 Fault Level	16-35 Inverter Thermal
8-55 Set-up Select	**15-** Drive Information**	16-36 Inv. Nom. Current
8-56 Preset Reference Select	**15-0* Operating Data**	16-37 Inv. Max. Current
8-8* FC Port Diagnostics	15-00 Operating Time	16-38 SL Controller State
8-80 Bus Message Count	15-01 Running Hours	**16-5* Ref. and Feedb.**
8-81 Bus Error Count	15-02 kWh Counter	16-50 External Reference
8-82 Slave Messages Rcvd	15-03 Power Up's	16-51 Pulse Reference
8-83 Slave Error Count	15-04 Over Temp's	16-52 Feedback
8-9* Bus Jog/Feedback	15-05 Over Volt's	**16-6* Inputs and Outputs**
8-94 Bus Feedback 1	15-06 Reset kWh Counter	16-60 Digital Input 18, 19, 27, 33
13- Smart Logic**	15-07 Reset Running Hours	16-61 Digital Input 29
13-0* SLC Settings	Counter	16-62 Analog Input 53 (V)
13-00 SL Controller Mode	**15-3* Fault Log**	16-63 Analog Input 53 (mA)
13-01 Start Event	15-30 Fault Log: Error Code	16-64 Analog Input 60
13-02 Stop Event	**15-4* Drive Identification**	16-65 Analog Output 42 [mA]
13-03 Reset SLC	15-40 FC Type	16-68 Pulse Input 33
13-1* Comparators	15-41 Power Section	16-71 Relay Output [bin]
13-10 Comparator Operand	15-42 Voltage	16-72 Counter A
13-11 Comparator Operator	15-43 Software Version	16-73 Counter B
13-12 Comparator Value	15-46 Frequency Converter	**16-8* Fieldbus/FC Port**
13-2* Timers	Ordering No	16-86 FC Port REF 1
13-20 SL Controller Timer	15-48 LCP Id No	**16-9* Diagnosis Readouts**
13-4* Logic Rules	15-49 Software ID Control Card	16-90 Alarm Word
13-40 Logic Rule Boolean 1	15-50 Software ID Power Card	16-92 Warning Word
13-41 Logic Rule Operator 1	15-51 Frequency Converter	16-94 Ext. Status Word
13-42 Logic Rule Boolean 2	Serial Number	**18-** Extended Motor Data**
13-43 Logic Rule Operator 2	**15-9* Parameter Info**	**18-8* Motor Resistors**
13-44 Logic Rule Boolean 3	15-92 Parameter List	18-80 Stator Resistance (Rs in
13-5* States	15-97 Application Type	high resolution)
13-51 SL Controller Event	15-98 Drive Identification String	18-81 Stator Leakage Reactance
13-52 SL Controller Action	**16-** Data Readouts**	(X1 in high resolution)

Refer to the drive's Programming Guide for more details about parameter descriptions.

6 Troubleshooting

Number	Description	Warning	Alarm	Triplock	Error	Cause of problem
2	Live zero error	X	X	–	–	Signal on terminal 53 or 54 is less than 50% of the value set in: • *Parameter 6-10 Terminal 53 Low Voltage.* • *Parameter 6-12 Terminal 53 Low Current.* • *Parameter 6-22 Terminal 54 Low Current.*
4	Mains phase loss[1]	X	X	X	–	Missing phase on the supply side or too high voltage imbalance. Check the supply voltage.
7	DC overvoltage[1]	X	X	–	–	DC-link voltage exceeds the limit.
8	DC undervoltage[1]	X	X	–	–	DC-link voltage drops below voltage warning low limit.
9	Inverter overload	X	X	–	–	More than 100% load for a long time.
10	Motor ETR overtemperature	X	X	–	–	Motor is too hot due to more than 100% load for a long time.
11	Motor thermistor overtemperature	X	X	–	–	Thermistor or thermistor connection is disconnected.
12	Torque limit	X	–	–	–	Torque exceeds value set in either *parameter 4-16 Torque Limit Motor Mode* or *parameter 4-17 Torque Limit Generator Mode*.
13	Overcurrent	X	X	X	–	Inverter peak current limit is exceeded.
14	Ground fault	X	X	X	–	Discharge from output phases to ground.
16	Short circuit	–	X	X	–	Short circuit in motor or on motor terminals.
17	Control word timeout	X	X	–	–	No communication to drive.
25	Brake resistor short-circuited	–	X	X	–	Brake resistor is short-circuited, thus the brake function is disconnected.
27	Brake chopper short-circuited	–	X	X	–	Brake transistor is short-circuited, thus the brake function is disconnected.
28	Brake check	–	X	–	–	Brake resistor is not connected/working.
29	Power board over temp	X	X	X	–	Heat sink cutout temperature has been reached.
30	Motor phase U missing	–	X	X	–	Motor phase U is missing. Check the phase.
31	Motor phase V missing	–	X	X	–	Motor phase V is missing. Check the phase.
32	Motor phase W missing	–	X	X	–	Motor phase W is missing. Check the phase.
38	Internal fault	–	X	X	–	Contact the local Danfoss supplier.
47	Control voltage fault	–	X	X	–	24 V DC supply is overloaded.
51	AMA check U_{nom} and I_{nom}	–	X	–	–	Wrong setting for motor voltage and/or motor current.
52	AMA low I_{nom}	–	X	–	–	The motor current is too low. Check the settings.
59	Current limit	X	–	–	–	The drive is overloaded.
63	Mechanical brake low	–	X	–	–	Actual motor current has not exceeded the release brake current within the start delay time window.
80	Drive initialized to default value	–	X	–	–	All parameter settings are initialized to default settings.
84	The connection between drive and LCP is lost	–	–	–	X	No communication between LCP and drive.
85	Key disabled	–	–	–	X	See *parameter group 0-4* LCP*.
86	Copy fail	–	–	–	X	An error occurred while copying from drive to LCP, or from LCP to drive.
87	LCP data invalid	–	–	–	X	Occurs when copying from LCP if the LCP contains erroneous data - or if no data was uploaded to the LCP.
88	LCP data not compatible	–	–	–	X	Occurs when copying from LCP if data is moved between drives with major differences in software versions.
89	Parameter read only	–	–	–	X	Occurs when trying to write to a read-only parameter.
90	Parameter database busy	–	–	–	X	LCP and RS485 connections are trying to update parameters simultaneously.
91	Parameter value is not valid in this mode	–	–	–	X	Occurs when trying to write an illegal value to a parameter.
92	Parameter value exceeds the min/max limits	–	–	–	X	Occurs when trying to set a value outside the range.
nw run	Not while running	–	–	–	X	Parameters can only be changed when the motor is stopped.
Err.	A wrong password was entered	–	–	–	X	Occurs when using a wrong password for changing a password-protected parameter.

(1) These faults are caused by mains distortions. Install a Danfoss line filter to rectify this problem.

7 Specifications

Table 2: Mains Supply 1x200–240 V AC

Normal overload 150% for 1 minute					
Drive	**PK18**	**PK37**	**PK75**	**P1K5**	**P2K2**
Typical shaft output [kW (hp)]	**0.18 (0.25)**	**0.37 (0.5)**	**0.75 (1)**	**1.5 (2)**	**2.2 (3)**
Enclosure protection rating IP20	M1	M1	M1	M2	M3
Output current					
Continuous (3x200–240 V) [A]	1.2	2.2	4.2	6.8	9.6
Intermittent (3x200–240 V) [A]	1.8	3.3	6.3	10.2	14.4
Maximum cable size (Mains, motor) [mm²/AWG]	4/10				
Maximum input current					
Continuous (1x200–240 V) [A]	3.3	6.1	11.6	18.7	26.4
Intermittent (1x200–240 V) [A]	4.5	8.3	15.6	26.4	37
Environment					
Estimated power loss [W], Best case/typical[1]	12.5/15.5	20/25	36.5/44	61/67	81/85.1

Table 3: Mains Supply 3x200–240 V AC

Normal overload 150% for 1 minute						
Drive	**PK25**	**PK37**	**PK75**	**P1K5**	**P2K2**	**P3K7**
Typical shaft output [kW (hp)]	**0.25 (0.33)**	**0.37 (0.5)**	**0.75 (1)**	**1.5 (2)**	**2.2 (3)**	**3.7 (5)**
Enclosure protection rating IP20	M1	M1	M1	M2	M3	M3
Output current						
Continuous (3x200–240 V) [A]	1.5	2.2	4.2	6.8	9.6	15.2
Intermittent (3x200–240 V) [A]	2.3	3.3	6.3	10.2	14.4	22.8
Maximum cable size (Mains, motor) [mm²/AWG]	4/10					
Maximum input current						
Continuous (3x200–240 V) [A]	2.4	3.5	6.7	10.9	15.4	24.3
Intermittent (3x200–240 V) [A]	3.2	4.6	8.3	14.4	23.4	35.3
Environment						
Estimated power loss [W], Best case/typical[1]	14/20	19/24	31.5/39.5	51/57	72/77.1	115/122.8

Table 4: Mains Supply 3x380–480 V AC

Normal overload 150% for 1 minute						
Drive	**PK37**	**PK75**	**P1K5**	**P2K2**	**P3K0**	**P4K0**
Typical shaft output [kW (hp)]	**0.37 (0.5)**	**0.75 (1)**	**1.5 (2)**	**2.2 (3)**	**3.0 (4)**	**4.0 (5.5)**
Enclosure protection rating IP20	M1	M1	M2	M2	M3	M3
Output current						
Continuous (3x380–440 V) [A]	1.2	2.2	3.7	5.3	7.2	9.0
Intermittent (3x380–440 V) [A]	1.8	3.3	5.6	8.0	10.8	13.7
Continuous (3x440–480 V) [A]	1.1	2.1	3.4	4.8	6.3	8.2
Intermittent (3x440–480 V) [A]	1.7	3.2	5.1	7.2	9.5	12.3
Maximum cable size (Mains, motor) [mm²/AWG]	4/10					
Maximum input current						
Continuous (3x380–440 V) [A]	1.9	3.5	5.9	8.5	11.5	14.4
Intermittent (3x380–440 V) [A]	2.6	4.7	8.7	12.6	16.8	20.2
Continuous (3x440–480 V) [A]	1.7	3.0	5.1	7.3	9.9	12.4
Intermittent (3x440–480 V) [A]	2.3	4.0	7.5	10.8	14.4	17.5
Environment						
Estimated power loss [W], Best case/typical[1]	18.5/25.5	28.5/43.5	41.5/56.5	57.5/81.5	75/101.6	98.5/133.5
Normal overload 150% for 1 minute						
Drive	**P5K5**	**P7K5**	**P11K**	**P15K**	**P18K**	**P22K**
Typical shaft output [kW (hp)]	**5.5 (7.5)**	**7.5 (10)**	**11 (15)**	**15 (20)**	**18.5 (25)**	**22 (30)**
Enclosure protection rating IP20	M3	M3	M4	M4	M5	M5
Output current						
Continuous (3x380–440 V) [A]	12	15.5	23	31	37	43
Intermittent (3x380–440 V) [A]	18	23.5	34.5	46.5	55.5	64.5
Continuous (3x440–480 V) [A]	11	14	21	27	34	40
Intermittent (3x440–480 V) [A]	16.5	21.3	31.5	40.5	51	60
Maximum cable size (Mains, motor) [mm²/AWG]	4/10		16/6			
Maximum input current						
Continuous (3x380–440 V) [A]	19.2	24.8	33	42	34.7	41.2
Intermittent (3x380–440 V) [A]	27.4	36.3	47.5	60	49	57.6
Continuous (3x440–480 V) [A]	16.6	21.4	29	36	31.5	37.5
Intermittent (3x440–480 V) [A]	23.6	30.1	41	52	44	53
Environment						
Estimated power loss [W], Best case/typical[1]	131/166.8	175/217.5	290/342	387/454	395/428	467/520

(1) Applies to dimensioning of drive cooling. If the switching frequency is higher than the default setting, the power losses may increase. LCP and typical control card power consumptions are included. For power loss data according to EN 50598-2, refer to Danfoss MyDrive® ecoSmart™ website.

8 Special Conditions

8.1 Derating for Ambient Temperature

The ambient temperature measured over 24 hours should be at least 5 °C (9 °F) lower than the maximum ambient temperature. If the drive is operated at high ambient temperature, decrease the continuous output current.
The drive has been designed for operation at maximum 50 °C (122 °F) ambient temperature with 1 motor size smaller than nominal. Continuous operation at full load at 50 °C (122 °F) ambient temperature reduces the lifetime of the drive.

8.2 Derating for Low Air Pressure

The cooling capability of air is decreased at low air pressure. Below 1000 m (3280 ft) altitude, no derating is necessary, but above 1000 m (3280 ft), decrease the ambient temperature or the maximum output current. For altitudes above 2000 m (6560 ft), contact Danfoss regarding PELV.
Decrease the output by 1% per 100 m (328 ft) altitude above 1000 m (3280 ft), or reduce the maximum ambient temperature by 1 °C (1.8 °F) per 200 m (656 ft).

8.3 Derating for Running at Low Speeds

When a motor is connected to a drive, 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 - less than half the nominal motor speed - may require extra air cooling.
Alternatively, select a larger motor (1 size up).

9 Technical Documentation

Scan the QR code to access more technical literatures for FC 51. Or, after scanning the QR code, click **Global English** on the website to select your local region's website, search **FC 51** to find the documents with your own languages.

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