

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.

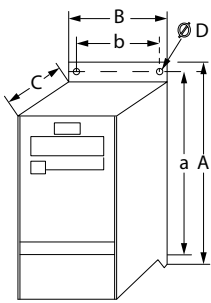
2 Safety

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/FC 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).

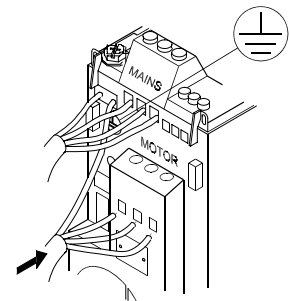


Illustration 1: Mounting of Ground Cable, Mains, and Motor Wires

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.

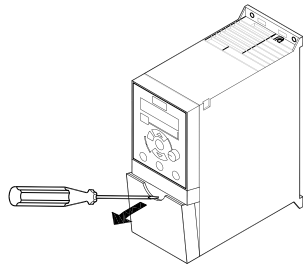


Illustration 2: Removing Terminal Cover

ON OFF	PNP/NPN	PNP/NPN	U/I	Switch 1	Off=PNP terminals 29 ⁽¹⁾ On=NPN terminals 29
ON OFF	PNP/NPN	PNP/NPN	U/I	Switch 2	Off=PNP terminal 18, 19, 27, and 33 ⁽¹⁾ On=NPN terminal 18, 19, 27, and 33
ON OFF	PNP/NPN	PNP/NPN	U/I	Switch 3	No function
ON OFF	PNP/NPN	PNP/NPN	U/I	Switch 4	Off=Terminal 53 0–10 V ⁽¹⁾ On=Terminal 53 0/4-20 mA

Illustration 3: S200 Switches 1–4

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.

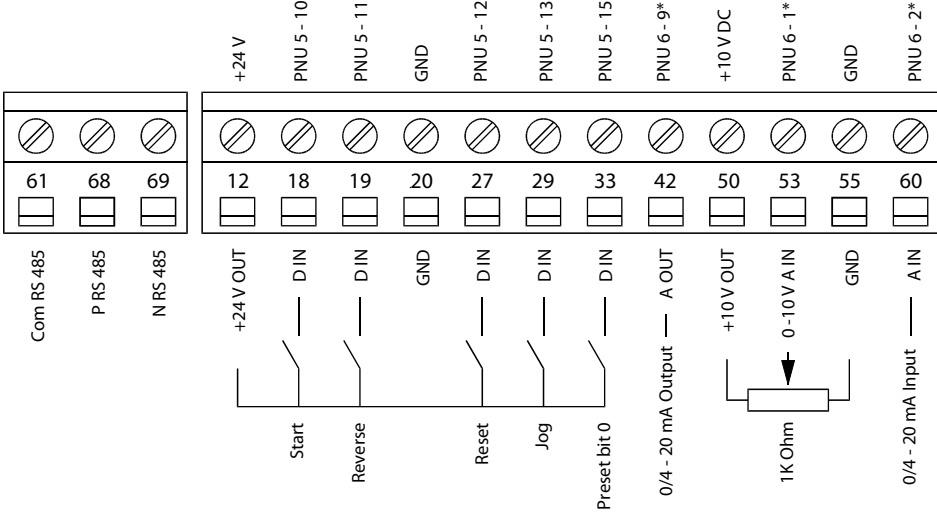


Illustration 4: Overview of Control Terminals in PNP Configuration with Factory Setting

4 Programming

4.1 Local Control Panel (LCP)

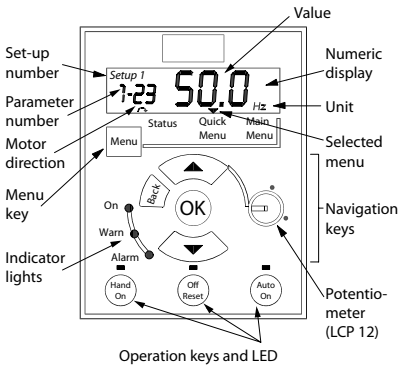


Illustration 5: Description of LCP Keys and Display

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.

- Enter the main menu.
- Set *parameter group 1-** Load and Motor, parameter group 1-2* Motor Data, and parameter 1-29 Automatic Motor Tuning (AMT)*.
- Press [OK]. The test runs automatically and indicates when it is complete.

5 Parameter Overview

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

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 Configuration	14-21 Automatic Restart Time	16-11 Power [hp]
8-43 FC Port PCD Read Configuration	14-22 Operation Mode	16-12 Motor Voltage
8-5* Digital/Bus	14-26 Action at Inverter Fault	16-13 Frequency
8-50 Coasting Select	14-28 Production Settings	16-14 Motor Current
8-51 Quick Stop Select	14-29 Service Code	16-15 Frequency [%]
8-52 DC Brake Select	14-4* Energy Optimising	16-18 Motor Thermal
8-53 Start Select	14-41 AEO Minimum Magnetisation	16-3* Drive Status
8-54 Reversing Select	14-9* Fault Settings	16-30 DC Link Voltage
8-55 Set-up Select	14-90 Fault Level	16-34 Heatsink Temp.
8-56 Preset Reference Select	15-** Drive Information	16-35 Inverter Thermal
8-8* FC Port Diagnostics	15-0* Operating Data	16-36 Inv. Nom. Current
8-80 Bus Message Count	15-00 Operating Time	16-37 Inv. Max. Current
8-81 Bus Error Count	15-01 Running Hours	16-38 SL Controller State
8-82 Slave Messages Rcvd	15-02 kWh Counter	16-5* Ref. and Feedb.
8-83 Slave Error Count	15-03 Power Up's	16-50 External Reference
8-9* Bus Jog/Feedback	15-04 Over Temp's	16-51 Pulse Reference
8-94 Bus Feedback 1	15-05 Over Volt's	16-52 Feedback
13-** Smart Logic	15-06 Reset kWh Counter	16-6* Inputs and Outputs
13-0* SLC Settings	15-07 Reset Running Hours Counter	16-60 Digital Input 18, 19, 27, 33
13-00 SL Controller Mode	15-3* Fault Log	16-61 Digital Input 29
13-01 Start Event	15-30 Fault Log: Error Code	16-62 Analog Input 53 (V)
13-02 Stop Event	15-4* Drive Identification	16-63 Analog Input 53 (mA)
13-03 Reset SLC	15-40 FC Type	16-64 Analog Input 60
13-1* Comparators	15-41 Power Section	16-65 Analog Output 42 [mA]
13-10 Comparator Operand	15-42 Voltage	16-68 Pulse Input 33
13-11 Comparator Operator	15-43 Software Version	16-71 Relay Output [bin]
13-12 Comparator Value	15-46 Frequency Converter Ordering No	16-72 Counter A
13-2* Timers	15-48 LCP Id No	16-73 Counter B
13-20 SL Controller Timer	15-4* Logic Rules	16-8* Fieldbus/FC Port
13-41 Logic Rule Boolean 1	15-49 Software ID Control Card	16-86 FC Port REF 1
13-42 Logic Rule Boolean 2	15-50 Software ID Power Card	16-9* Diagnosis Readouts
13-43 Logic Rule Operator 2	15-51 Frequency Converter Serial Number	16-90 Alarm Word
13-44 Logic Rule Boolean 3	15-9* Parameter Info	16-92 Warning Word
13-5* States	15-92 Parameter List	16-94 Ext. Status Word
13-51 SL Controller Event	15-97 Application Type	18-** Extended Motor Data
13-52 SL Controller Action	15-98 Drive Identification String	18-8* Motor Resistors
	16-** Data Readouts	18-80 Stator Resistance (Rs in high resolution)
		18-81 Stator Leakage Reactance (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: • <i>Parameter 6-10 Terminal 53 Low Voltage.</i> • <i>Parameter 6-12 Terminal 53 Low Current.</i> • <i>Parameter 6-22 Terminal 54 Low Current.</i>
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 overtem- perature	X	X	–	–	Motor is too hot due to more than 100% load for a long time.
11	Motor thermistor over- temperature	X	X	–	–	Thermistor or thermistor connection is disconnected.
12	Torque limit	X	–	–	–	Torque exceeds value set in either <i>parameter 4-16 Torque Limit Motor Mode</i> or <i>parameter 4-17 Torque Limit Generator Mode</i> .
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.

Number	Description	Warning	Alarm	Triplock	Error	Cause of problem
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 betw- een drive and LCP is lost	–	–	–	X	No communication between LCP and drive.
85	Key disabled	–	–	–	X	See <i>parameter group 0-4* LCP</i> .
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 compa- tible	–	–	–	X	Occurs when copying from LCP if data is moved betw- een 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 param- eters 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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