`* 1 3 0 R 1 2 2 6 *`

`* M Q Q 3 3 9 0 1 *`

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.

⚠ W A R N I N G ⚠

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)][a]	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.
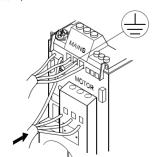**Brake:** Connect terminals -BR and +UDC/+BR (not applicable to enclosure size M1).

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

N O T I C E

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.

Illustration 2: Removing Terminal Cover

N O T I C E

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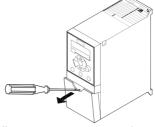- Set *parameter 6-19 Terminal 53 Mode* according to Switch 4 position.

Illustration 3: S200 Switches 1–4
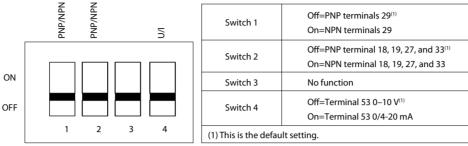
Switch 1	Off=PNP terminals 29[(1)]	
	On=NPN terminals 29	
Switch 2	Off=PNP terminal 18, 19, 27, and 33[(1)]	
	On=NPN terminal 18, 19, 27, and 33	
Switch 3	No function	
Switch 4	Off=Terminal 53 0–10 V[(1)]	
	On=Terminal 53 0/4-20 mA	
(1) This is the default setting.		

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.
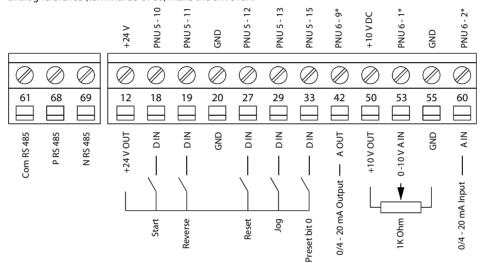

Illustration 4: Overview of Control Terminals in PNP Configuration with Factory Setting
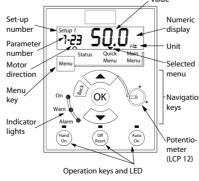
4 Programming

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

8-06 Reset Control Word Timeout
8-3* FC Port Settings
8-30 Protocol
8-31 Address
8-32 FC Port Baud Rate
8-33 FC Port Parity
8-35 Minimum Response Delay
8-36 Max Response Delay
8-4* FC MC Protocol Set
8-42 FC Port PCD Write Configuration
8-43 FC Port PCD Read Configuration
8-5* Digital/Bus
8-50 Coasting Select
8-51 Quick Stop Select
8-52 DC Brake Select
8-53 Start Select
8-54 Reversing Select
8-55 Set-up Select
8-56 Preset Reference Select
8-8* FC Port Diagnostics
8-80 Bus Message Count
8-81 Bus Error Count
8-82 Slave Messages Rcvd
8-83 Slave Error Count
8-9* Bus Jog/Feedback
8-94 Bus Feedback 1
13-** Smart Logic
13-0* SLC Settings
13-00 SL Controller Mode
13-01 Start Event
13-02 Stop Event
13-03 Reset SLC
13-1* Comparators
13-10 Comparator Operand
13-11 Comparator Operator
13-12 Comparator Value
13-2* Timers
13-20 SL Controller Timer
13-4* Logic Rules
13-40 Logic Rule Boolean 1
13-41 Logic Rule Operator 1
13-42 Logic Rule Boolean 2
13-43 Logic Rule Operator 2
13-44 Logic Rule Boolean 3
13-5* States
13-51 SL Controller Event
13-52 SL Controller Action

14-** Special Functions
14-0* Inverter Switching
14-01 Switching Frequency
14-03 Overmodulation
14-1* Mains Monitoring
14-12 Function at Mains Imbalance
14-2* Trip Reset
14-20 Reset Mode
14-21 Automatic Restart Time
14-22 Operation Mode
14-26 Action at Inverter Fault
14-28 Production Settings
14-29 Service Code
14-4* Energy Optimising
14-41 AEO Minimum Magnetisation
14-9* Fault Settings
14-90 Fault Level
15-** Drive Information
15-0* Operating Data
15-00 Operating Time
15-01 Running Hours
15-02 kWh Counter
15-03 Power Up's
15-04 Over Temp's
15-05 Over Volt's
15-06 Reset kWh Counter
15-07 Reset Running Hours Counter
15-3* Fault Log
15-30 Fault Log: Error Code
15-4* Drive Identification
15-40 FC Type
15-41 Power Section
15-42 Voltage
15-43 Software Version
15-46 Frequency Converter Ordering No
15-48 LCP Id No
15-49 Software ID Control Card
15-50 Software ID Power Card
15-51 Frequency Converter Serial Number
15-9* Parameter Info
15-92 Parameter List
15-97 Application Type
15-98 Drive Identification String
16-** Data Readouts

16-0* General Status
16-00 Control Word
16-01 Reference [Unit]
16-02 Reference %
16-03 Status Word
16-05 Main Actual Value [%]
16-09 Custom Readout
16-1* Motor Status
16-10 Power [kW]
16-11 Power [hp]
16-12 Motor Voltage
16-13 Frequency
16-14 Motor Current
16-15 Frequency [%]
16-18 Motor Thermal
16-3* Drive Status
16-30 DC Link Voltage
16-34 Heatsink Temp.
16-35 Inverter Thermal
16-36 Inv. Nom. Current
16-37 Inv. Max. Current
16-38 SL Controller State
16-5* Ref. and Feedb.
16-50 External Reference
16-51 Pulse Reference
16-52 Feedback
16-6* Inputs and Outputs
16-60 Digital Input 18, 19, 27, 33
16-61 Digital Input 29
16-62 Analog Input 53 (V)
16-63 Analog Input 53 (mA)
16-64 Analog Input 60
16-65 Analog Output 42 [mA]
16-68 Pulse Input 33
16-71 Relay Output [bin]
16-72 Counter A
16-73 Counter B
16-8* Fieldbus/FC Port
16-86 FC Port REF 1
16-9* Diagnosis Readouts
16-90 Alarm Word
16-92 Warning Word
16-94 Ext. Status Word
18-** Extended Motor Data
18-8* Motor Resistors
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: • Parameter 6-10 Terminal 53 Low Voltage. • Parameter 6-12 Terminal 53 Low Voltage. • 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 over-temperature	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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