

GE Consumer & Industrial
Electrical Distribution

AF-60 LP™ Micro Drive

Installation & Set-up Quick Guide



a product of
ecomagination



1 Quick Guide

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1.1.1 Warnings

**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.

**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 (such as external DC bus power supplies). 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 frequency converter, wait at least 4 minutes for all M1, M2 and M3 sizes. Wait at least 15 minutes for all M4 and M5 sizes.

**Leakage Current:**

The earth leakage current from the frequency converter exceeds 3.5 mA. According to IEC 61800-5-1 a reinforced Protective Earth connection must be ensured by means of a min. 10mm² Cu or an additional PE wire - with the same cable cross section as the Mains wiring - must be terminated separately.

Residual Current Device:

This product can cause a DC current in the protective conductor. Where a residual current device (RCD) is used for extra protection, only an RCD of Type B (time delayed) shall be used on the supply side of this product. Protective earthing of the frequency converter and the use of RCDs must always be

**Motor Thermal Protection:**

Motor overload protection is possible by setting Parameter 1-90 Motor thermal protection to the value Electronic overload trip. For the North American market: Electronic overload functions provide class 20 motor overload protection, in accordance with NEC.

**Installation in high altitudes:**

For altitudes above 2 km, please contact GE .



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 Available Literature

NB!

This quick guide contains the basic information necessary for installing and running the drive.

If more information is needed, the literature below can be downloaded from: www.geelectrical.com/drives

1.1.4 Approvals



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, GE 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 drive Keypad.

- 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.

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1.1.8 Before Commencing Repair Work

1. Disconnect AF-60 LP™ Micro Drive from mains (and external DC supply, if present.)
2. Wait for 4 minutes (M1, M2 and M3) and 15 minutes (M4 and M5) for discharge of the DC-link.
3. Disconnect DC bus terminals and brake terminals (if present)
4. Remove motor cable

1.1.9 Side-by-Side Installation

The frequency converter can be mounted side-by-side for IP 20 rating units and requires 100 mm clearance above and below for cooling. Please refer to the specifications near the end of this document for details on environmental ratings of the frequency converter.

1.1.10 Mechanical Dimensions

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

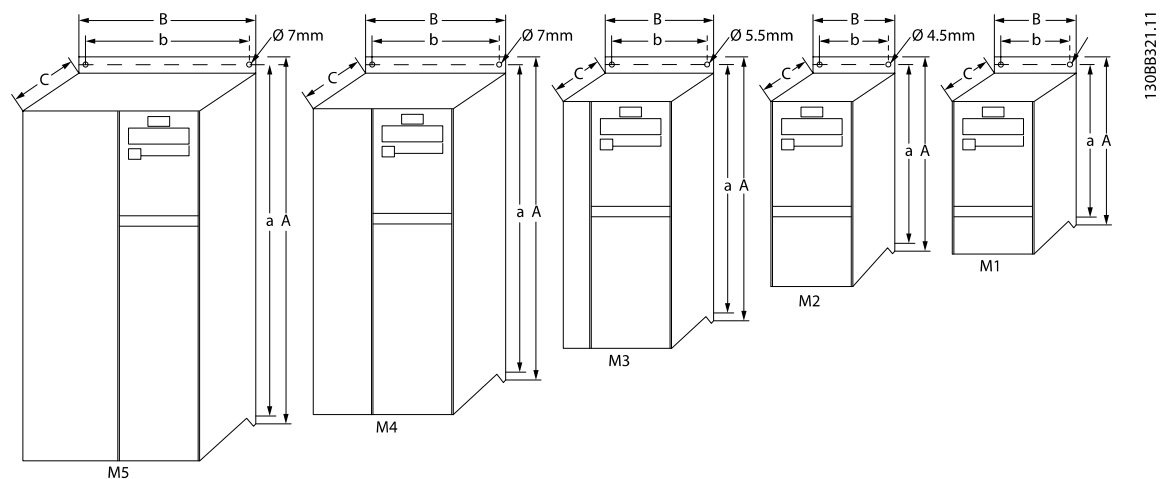


Illustration 1.1: Mechanical dimensions.

Unit Size	Power (kW)			Height (mm)			Width (mm)		Depth ¹⁾ (mm)	Max. Weight
	1 X 200-240 V	3 X 200 -240 V	3 X 380-480 V	A	A (incl. decoupling plate)	a	B	b	C	Kg
M1	0.18 - 0.75	0.25 - 0.75	0.37 - 0.75	150	205	140.4	70	55	148	1.1
M2	1.5	1.5	1.5 - 2.2	176	230	166.4	75	59	168	1.6
M3	2.2	2.2 - 3.7	3.0 - 7.5	239	294	226	90	69	194	3.0
M4			11.0-15.0	292	347.5	272.4	125	97	241	6.0
M5			18.5-22.0	335	387.5	315	165	140	248	9.5

¹⁾ For Keypad with potentiometer, please add 7.6 mm.

Table 1.1: Mechanical Dimensions



1.1.11 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.

Details of terminal tightening torques.

Unit Size	Power (kW)			Torque (Nm)					
	1 x 200-240 V	3 x 200-240 V	3 x 380-480 V	Line	Motor	DC connection/Brake	Control Terminals	Earth	Relay
M1	0.18 - 0.75	0.25 - 0.75	0.37 - 0.75	1.4	0.7	Spade ¹⁾	0.15	3	0.5
M2	1.5	1.5	1.5 - 2.2	1.4	0.7	Spade ¹⁾	0.15	3	0.5
M3	2.2	2.2 - 3.7	3.0 - 7.5	1.4	0.7	Spade ¹⁾	0.15	3	0.5
M4			11.0-15.0	1.3	1.3	1.3	0.15	3	0.5
M5			18.5-22.0	1.3	1.3	1.3	0.15	3	0.5
¹⁾ Spade connectors (6.3 mm Faston plugs)									

Table 1.2: Tightening of terminals.

1.1.12 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:

GE Drive is suitable for a circuit capable of supplying a maximum of 100,000 A_{rms} (symmetrical), 480 V maximum.

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.

Non UL compliance:

If UL/cUL is not to be complied with, GE recommends using the fuses mentioned in the below table, which will ensure compliance with EN50178/IEC61800-5-1: In case of malfunction, not following the fuse recommendation may result in damage to the frequency converter.



	Max. fuses UL						Max. fuses non UL
	Bussmann	Bussmann	Bussmann	Littel fuse	Ferraz-Shawmut	Ferraz-Shawmut	
1 X 200-240 V							
	Type RK1	Type J	Type T	Type RK1	Type CC	Type RK1	Type gG
1/4 - 1/2	KTN-R15	JKS-15	JJN-15	KLN-R15	ATM-R15	A2K-15R	16A
1	KTN-R25	JKS-25	JJN-25	KLN-R25	ATM-R25	A2K-25R	25A
2	KTN-R35	JKS-35	JJN-35	KLN-R35	-	A2K-35R	35A
3	KTN-R50	JKS-50	JJN-50	KLN-R50	-	A2K-50R	50A
3 x 200-240 V							
1/3	KTN-R10	JKS-10	JJN-10	KLN-R10	ATM-R10	A2K-10R	10A
1/2	KTN-R15	JKS-15	JJN-15	KLN-R15	ATM-R15	A2K-15R	16A
1	KTN-R20	JKS-20	JJN-20	KLN-R20	ATM-R20	A2K-20R	20A
2	KTN-R25	JKS-25	JJN-25	KLN-R25	ATM-R25	A2K-25R	25A
3	KTN-R40	JKS-40	JJN-40	KLN-R40	ATM-R40	A2K-40R	40A
5	KTN-R40	JKS-40	JJN-40	KLN-R40	-	A2K-40R	40A
3 x 380-480 V							
1/2 - 1	KTS-R10	JKS-10	JJS-10	KLS-R10	ATM-R10	A6K-10R	10A
2	KTS-R15	JKS-15	JJS-15	KLS-R15	ATM-R15	A2K-15R	16A
3	KTS-R20	JKS-20	JJS-20	KLS-R20	ATM-R20	A6K-20R	20A
4	KTS-R40	JKS-40	JJS-40	KLS-R40	ATM-R40	A6K405R	40A
5	KTS-R40	JKS-40	JJS-40	KLS-R40	ATM-R40	A6K-40R	40A
7.5	KTS-R40	JKS-40	JJS-40	KLS-R40	-	A6K-40R	40A
10	KTS-R40	JKS-40	JJS-40	KLS-R40	-	A6K-40R	40A
15	KTS-R60	JKS-60	JJS-60	KLS-R60	-	A6K-60R	63A
20	KTS-R60	JKS-60	JJS-60	KLS-R60	-	A6K-60R	63A
25	KTS-R60	JKS-60	JJS-60	KLS-R60	-	A6K-60R	80A
30	KTS-R60	JKS-60	JJS-60	KLS-R60	-	A6K-60R	80A

Table 1.3: Fuses



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1.1.13 Connecting to Mains and Motor

The frequency converter is designed to operate all standard three-phased asynchronous motors.

The frequency converter is designed to accept mains/motor cables with a maximum cross-section of 4 mm²/10 AWG (M1, M2 and M3) and maximum cross-section 16 mm²/6 AWG (M4 and M5).

- 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.
- Also see EMC-Correct Installation in Operating Instruction MG.02.AX.YY.

Step 1: First, mount the earth wires to earth terminal.

Step 2: Connect motor to terminals U, V and W.

Step 3: Mount mains supply to terminals L1/L, L2 and L3/N (3-phase) or L1/L and L3/N (single-phase) and tighten.

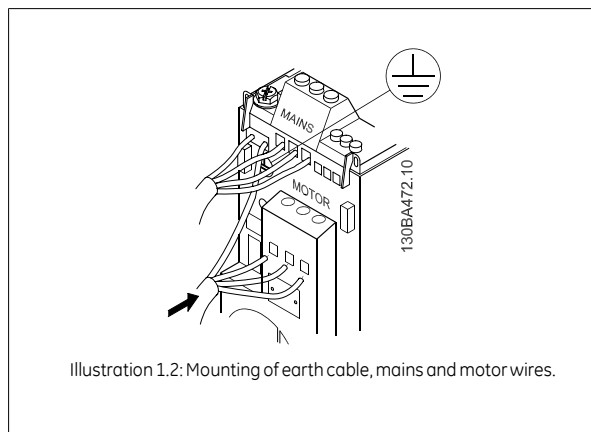


Illustration 1.2: Mounting of earth cable, mains and motor wires.



1.1.14 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.

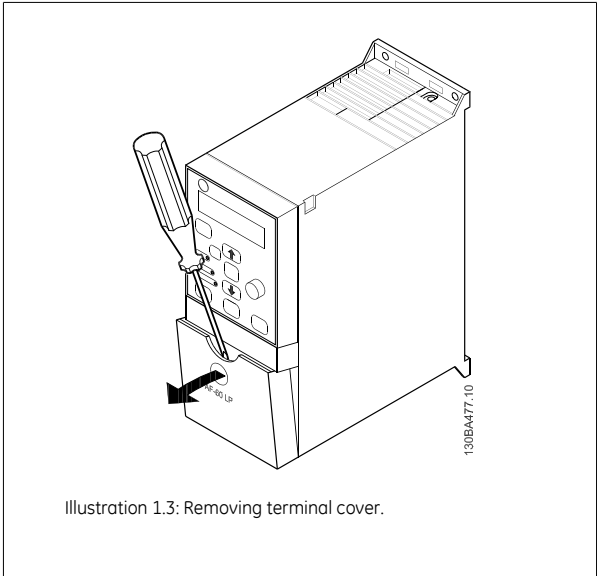


Illustration 1.3: Removing terminal cover.

The illustration below shows all control terminals of the frequency converter. Applying Start (term. 18) and an analog reference (term. 53 or 60) make the frequency converter run.

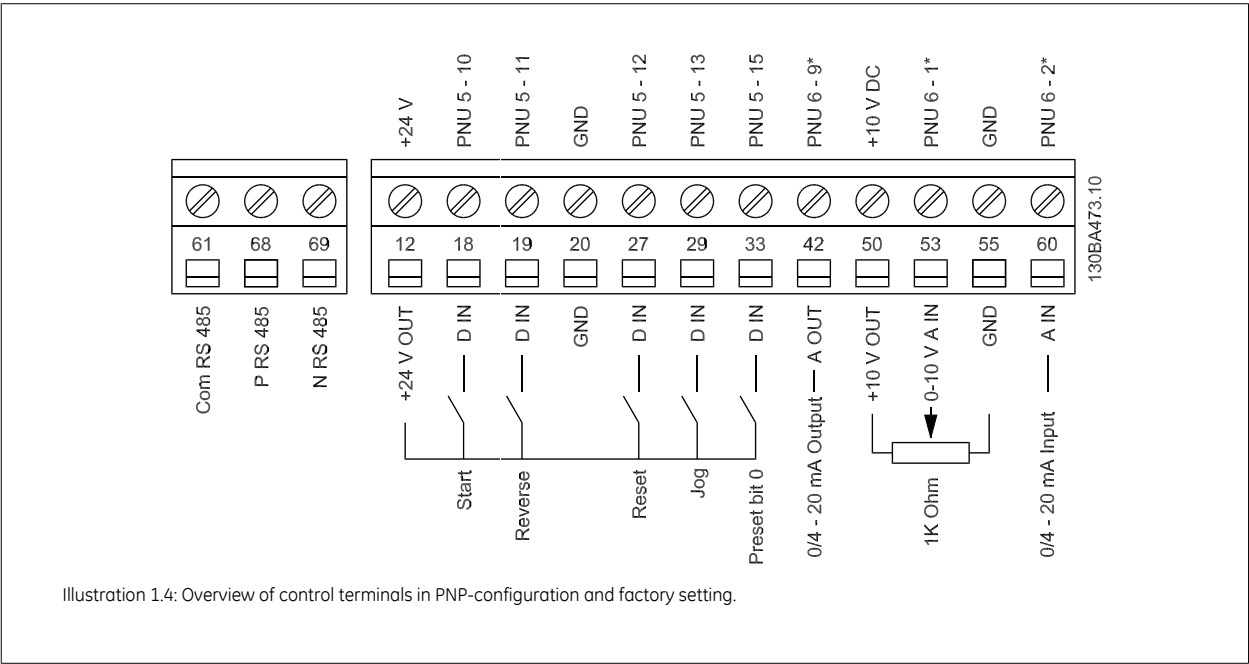


Illustration 1.4: Overview of control terminals in PNP-configuration and factory setting.

1.1.15 Power Circuit - Overview

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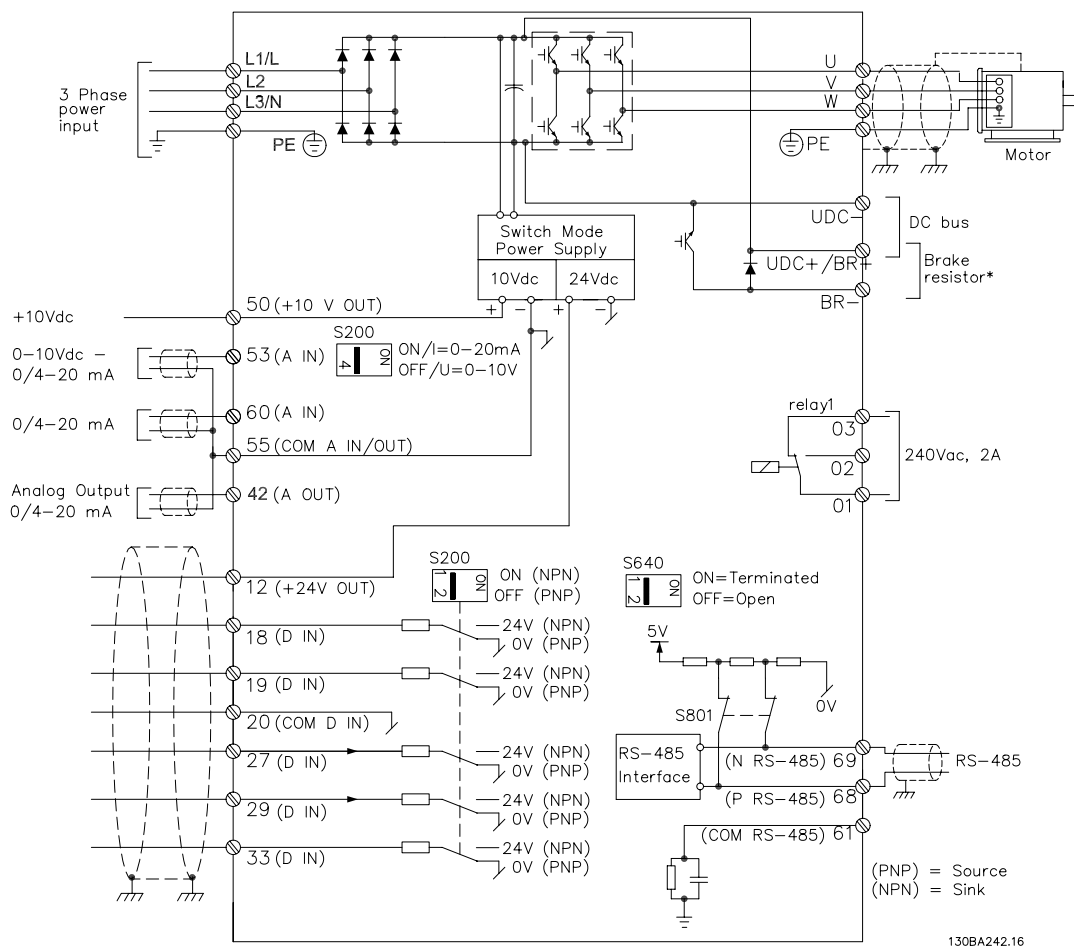


Illustration 1.5: Diagram showing all electrical terminals.

* Brake (BR+ and BR-) are not applicable for Unit Size M1.

Brake resistors are available from GE.

Improved power factor and EMC performance can be achieved by installing optional GE line filters.

GE power filters can also be used for load sharing.

1.1.16 Load sharing/Brake

Use 6.3 mm insulated Faston Plugs designed for high voltage for DC (Load Sharing and brake).

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

Brake: Connect terminals BR- and UDC/BR+ (Not applicable for Unit Size M1).



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



1.1.17 Programming with Keypad

For detailed information on programming, please see *Programming Guide*, AF-60 LP™ Micro Drive.

1**NB!**

The frequency converter can also be programmed from a PC via RS485 com-port by installing the DCT-10 Drive Control Tool.
This software can be downloaded from the GE web site: www.geelectrical.com/drives

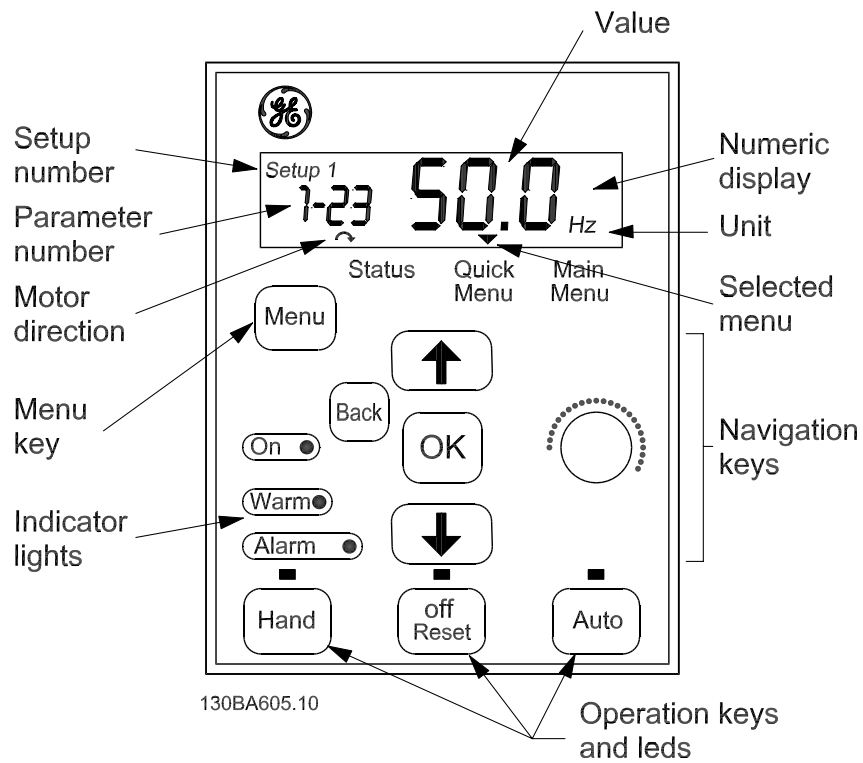


Illustration 1.6: Description of Keypad buttons and display

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

Status:

For readouts only.

Quick Menu:

For access to Quick Menus 1 and 2, respectively.

Main Menu:

For access to all parameters.

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]: Starts the motor and enables control of the frequency converter via the Keypad.



[Off/Reset]: Stops the motor (off). If in alarm mode the alarm will be reset.

[Auto]: The frequency converter is controlled either via control terminals or serial communication.

[Potentiometer]: 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 Mode* the potentiometer controls local reference.

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

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

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*.
2. Use [▲] [▼] to select either QM1 or QM2, then press [OK].
3. Use [▲] [▼] to browse through the parameters in the Quick Menu.
4. Press [OK] to select a parameter.
5. Use [▲] [▼] to change the value of a parameter setting.
6. Press [OK] to accept the change.
7. To exit, press either [Back] twice to enter *Status*, or press [Menu] once to enter *Main Menu*.

No	Name	Range	Default	Function
1-20	Motor Power [kW]/[HP]	[0.09kW/0.12HP - 30kW/40HP]	Unit dependent	Enter motor power from nameplate data
1-22	Motor Voltage	[50 - 999V]	230/400	Enter motor voltage from nameplate data
1-23	Motor Frequency	[20 - 400 Hz]	50	Enter motor frequency from nameplate data
1-24	Motor Current	[0.01 - 100.00 A]	Unit dependent	Enter motor current from nameplate data
1-25	Motor nominal speed	[100 - 9999 RPM]	Unit dependent	Enter motor nominal speed from nameplate data
1-29	Auto Tune	[0] = off [2] = Enable Auto Tune	[0] = off	Use Auto Tune to optimize motor performance. 1. Stop Drive 2. Choose [2] 3. "Hand "
3-02	Minimum reference	[-4999 - 4999]	0	Enter value for minimum reference
3-03	Maximum reference	[-4999 - 4999]	50.00	Enter value for maximum reference
3-41	Accel time 1	[0.05 - 3600s]	3.00 (10.00 ¹⁾)	Accel time from 0 to rated motor frequency par. 1-23
3-42	Decel time 1	[0.05 - 3600s]	3.00 (10.00 ¹⁾)	Decel time from rated motor frequency par. 1-23 to 0

¹⁾ M4 and M5 only

Table 1.4: Basic Settings Quick Menu 1

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*.



Parameter Overview		
0-XX Operation/Display	1-XX Load/Motor	1-XX Stator Leakage Reactance (Xl)
0-0X Basic Settings	1-0X General Settings	[Ohm] * Dep. on motor data
0-03 Regional Settings	1-00 Configuration Mode	[Ohm] * Dep. on motor data
[0] International	*[0] Speed open loop	2-XX Brakes
*[1] US	[3] Process	2-0XDC-Brake
0-04 Oper. State at Power-up (Hand)	1-01 Motor Control Principle	2-00 DC Hold Current
[0] Resume	[0] U/f	0 - 150 % * 50 %
*[1] Forced stop, ref = old	*[1] Adv. Vector Control	2-01 DC Brake Current
[2] Forced stop, ref = 0	1-03 Torque Characteristics	0 - 150 % * 50 %
0-1X Set-up Handling	*[0] Constant torque	2-02 DC Braking Time
0-10 Active Set-up	[2] Energy Saving	0 - 60.0 s * 10.0 s
*[1] Setup 1	1-05 Local Mode Configuration	2-04 DC Brake Cut In Speed
[2] Setup 2	[0] Speed Open Loop	0.0 - 400.0 Hz * 0.0 Hz
[9] Multi Setup	*[2] As config in par. 1-00	2-1X Brake Energy Funct.
0-11 Edit Set-up	1-2X Motor Data	2-10 Brake Function
*[1] Setup 1	1-20 Motor Power [kW] [HP]	*[0] Off
[2] Setup 2	[1] 0.09 kW/0.12 HP	[1] Resistor brake
[9] Active Setup	[2] 0.12 kW/0.16 HP	[2] AC brake
0-12 Link Setups	[3] 0.18 kW/0.25 HP	2-11 Brake Resistor (ohm)
[0] Not Linked	[4] 0.25 kW/0.33 HP	5 - 5000 * 5
*[20] Linked	[5] 0.37 kW/0.50 HP	2-16 AC Brake, Max current
0-31 Custom Readout Min Scale	[6] 0.55 kW/0.75 HP	0 - 150 % * 100 %
0.00 - 9999.00 * 0.00	[7] 0.75 kW/1.00 HP	2-17 Over-voltage Control
0-32 Custom Readout Max Scale	[8] 1.10 kW/1.50 HP	*[0] Disabled
0.00 - 9999.00 * 100.0	[9] 1.50 kW/2.00 HP	[1] Enabled (not at stop)
0-4X Keypad	[10] 2.20 kW/3.00 HP	[2] Enabled
0-40 [Hand] Key on Keypad	[11] 3.00 kW/4.00 HP	2-2* Mechanical Brake
[0] Disabled	[12] 3.70 kW/5.00 HP	2-20 Release Brake Current
*[1] Enabled	[13] 4.00 kW/5.40 HP	0.00 - 100.0 A * 0.00 A
0-41 [Off / Reset] Key on Keypad	[14] 5.50 kW/7.50 HP	2-22 Activate Brake Speed [Hz]
[0] Disable All	[15] 7.50 kW/10.00 HP	0.0 - 400.0 Hz * 0.0 Hz
*[1] Enable All	[16] 11.00 kW/15.00 HP	3-XX Reference / Ramps
[2] Enable Reset Only	[17] 15.00 kW/20.00 HP	3-0X Reference Limits
0-42 [Auto] Key on Keypad	[18] 18.50 kW/25.00 HP	3-00 Reference Range
[0] Disabled	[19] 22.00 kW/29.50 HP	*[0] Min - Max
*[1] Enabled	[20] 30.00 kW/40.00 HP	[1] -Max - +Max
0-5X Copy/Save	1-22 Motor Voltage	3-02 Minimum Reference
0-50 Keypad Copy	50 - 999 V * 230 - 400 V	-4999 - 4999 * 0.000
*[0] No copy	1-23 Motor Frequency	3-03 Maximum Reference
[1] All to Keypad	20 - 400 Hz * 60 Hz	-4999 - 4999 * 50.00
[2] All from Keypad	1-24 Motor Current	3-1X References
[3] Size indep. from Keypad	0.01 - 100.0 A * Motortype dep.	3-10 Preset Reference
0-51 Set-up Copy	1-25 Motor Nominal Speed	-100.0 - 100.0 % * 0.00 %
*[0] No copy	100 - 9999 rpm * Motortype dep.	3-11 Jog Speed [Hz]
[1] Copy from setup 1	1-29 Auto Tune	0.0 - 400.0 Hz * 5.0 Hz
[2] Copy from setup 2	*[0] Off	3-12 Catch up/slow Down Value
[9] Copy from Factory setup	[2] Enable Auto Tune	0.00 - 100.0 % * 0.00 %
0-6X Password	1-3X Adv. Motor Data	
0-60 (Main) Menu Password	1-30 Stator Resistance (Rs)	
0 - 999 * 0	[Ohm] * Dep. on motor data	

[illegible]



6-13 Terminal 53 High Current 0.01 - 20.00 mA * 20.00 mA	6-93 Terminal 42 Output Min Scale 0.00 - 200.0 % * 0.00 %	8-9X Bus Jog / Feedback
6-14 Term. 53 Low Ref./Feedb. Value -4999 - 4999 * 0.000	6-94 Term. 42 Output Max Scale 0.00 - 200.0 % * 100.0 %	8-94 Bus feedback 1 0x8000 - 0x7FFF * 0
6-15 Term. 53 High Ref./Feedb. Value -4999 - 4999 * 50.000	7-XX Controllers	13-XX Controller Logic
6-16 Terminal 53 Filter Time Constant 0.01 - 10.00 s * 0.01 s	7-2X Process Ctrl. Feedb	13-0X Logic Controller Settings
6-19 Terminal 53 mode * [0] Voltage mode [1] Current mode	7-20 Process CL Feedback 1 Resource * [0] NoFunction [1] Analog input 53 [2] Analog input 60 [8] Pulseinput33 [11] LocalBusRef	13-00 Logic Controller Mode * [0] Off [1] On
6-2X Analog Input 2	7-3X Process PI	13-01 Start Event [0] False [1] True
6-22 Terminal 60 Low Current 0.00 - 19.99 mA * 0.14 mA	Ctrl. 7-30 Process PI Normal/ Inverse Ctrl	[2] Running [3] InRange
6-23 Terminal 60 High Current 0.01 - 20.00 mA * 20.00 mA	* [0] Normal [1] Inverse	[4] OnReference [7] OutOfCurrentRange [8] BelowLow [9] AboveHigh
6-24 Term. 60 Low Ref./Feedb. Value -4999 - 4999 * 0.000	7-31 Process PI Anti Windup	[16] ThermalWarning [17] MainOutOfRange [18] Reversing [19] Warning [20] Alarm_Trip
6-25 Term. 60 High Ref./Feedb. Value -4999 - 4999 * 50.00	[0] Disable * [1] Enable	[22-25] Comparator 0-3 [26-29] LogicRule0-3 [33] DigitalInput_18 [34] DigitalInput_19 [35] DigitalInput_27 [36] DigitalInput_29 [38] DigitalInput_33 * [39] StartCommand [40] DriveStopped
6-26 Terminal 60 Filter Time Constant 0.01 - 10.00 s * 0.01 s	7-32 Process PI Start Speed 0.0 - 200.0 Hz * 0.0 Hz	13-02 Stop Event See par. 13-01 * [40] DriveStopped
6-8X Keypad potentiometer	7-33 Process PI Proportional Gain 0.00 - 10.00 * 0.01	13-03 Reset Logic Controller * [0] Do not reset [1] Reset Logic Controller
6-81 Keypad potm. Low Reference -4999 - 4999 * 0.000	7-34 Process PI Integral Time 0.10 - 9999 s * 9999 s	
6-82 Keypad potm. High Reference -4999 - 4999 * 50.00	7-38 Process PI Feed Forward Factor 0 - 400 % * 0 % 0 - 200 % * 5 %	
6-9X Analog Output xx	7-39 On Reference Bandwidth	
6-90 Terminal 42 Mode * [0] 0-20 mA [1] 4-20 mA	8-XX Comm. and Options	
[2] Digital Output	8-01 Control Site	
6-91 Terminal 42 Analog Output * [0] No operation [10] Output Frequency [11] Reference [12] Feedback [13] Motor Current [16] Power	* [0] Digital and ControlWord [1] Digital only [2] ControlWord only	
6-92 Terminal 42 Digital Output See par. 5-40 * [0] No Operation [80] Logic Controller Digital Output A	8-02 Control Word Source [0] None * [1] GE Drive RS485 8-03 Control Word Timeout Time 0.1 - 6500 s * 1.0 s	
	8-04 Control Word Timeout Function * [0] Off [1] Freeze Output [2] Stop [3] Jogging	



13-1X Comparators	[1] NoAction	14-22 Restore Factory Settings	16-1X Motor Status
13-10 Comparator Operand	[2] SelectSetup1	*[0] Normal Operation	16-10 Power [kW]
*[0] Disabled	[3] SelectSetup2	[2] Restore Factory Settings	16-11 Power [hp]
[1] Reference	[10-17] SelectPresetRef0-7	14-26 Action At Drive Fault	16-12 Motor Voltage [V]
[2] Feedback	[18] Select Accel/Decel 1.	*[0] Trip	16-13 Frequency [Hz]
[3] MotorSpeed	[19] Select Accel/Decel 2.	[1] Warning	16-14 Motor Current [A]
[4] MotorCurrent	[22] Run	14-4X Energy Savings	16-15 Frequency [%]
[6] MotorPower	[23] RunReverse	14-41 Energy Savings Minimum Magnetisation	16-18 Motor Thermal [%]
[7] MotorVoltage	[24] Stop	40 - 75 % * 66 %	16-3X Drive Status
[8] DCLinkVoltage	[25] Qstop	15-XX Drive Information	16-30 DC Link Voltage
[12] AnalogInput53	[26] DCstop	15-0X Operating Data	16-34 Heatsink Temp.
[13] AnalogInput60	[27] Coast	15-00 Operating Days	16-35 Inverter Thermal
[18] PulseInput33	[28] FreezeOutput	15-01 Running Hours	16-36 Drive Nominal current
[20] AlarmNumber	[29] StartTimer0	15-02 kWh Counter	16-37 Drive Maximum Current
[30] CounterA	[30] StartTimer1	15-03 Power Ups	16-38 Logic Controller State
[31] CounterB	[31] StartTimer2	15-04 Over Temps	16-5X Ref. / Feedb.
13-11 Comparator Operator	[32] Set Digital Output A Low	15-05 Over Volts	16-50 External Reference
[0] Less Than	[33] Set Digital Output B Low	15-06 Reset kWh Counter	16-51 Pulse Reference
*[1] Approximately equals	[38] Set Digital Output A High	*[0] Do not reset	16-52 Feedback [Unit]
[2] Greater Than	[39] Set Digital Output B High	[1] Reset counter	16-6X Inputs / Outputs
13-12 Comparator Value	[60] ResetCounterA	15-07 Reset Running Hours Counter	16-60 Digital Input 18,19,27,33
-9999 - 9999 * 0.0	[61] ResetCounterB	*[0] Do not reset	0 - 1111
13-2X Timers	14-XX Special Functions	[1] Reset counter	16-61 Digital Input 29
13-20 LC Controller Timer	14-0X Carrier Frequency	15-3X Fault Log	0 - 1
0.0 - 3600 s * 0.0 s	14-01 Motor Noise	15-30 Fault Log: Error Code	16-62 Analog Input 53 (volt)
13-4X Logic Rules	(Carrier Frequency)	15-4X Drive Identification	16-63 Analog Input 53 (current)
13-40 Logic Rule Boolean 1	[0] 2 kHz	15-40 GE Drive Type	16-64 Analog Input 60
See par. 13-01 * [0] False	*[1] 4 kHz	15-41 Power Section	16-65 Analog Output 42 [mA]
[30] - [32] LC Time-out 0-2	[2] 8 kHz	15-42 Voltage	16-68 Pulse Input [Hz]
13-41 Logic Rule Operator 1	[4] 16 kHz	15-43 Software Version	16-71 Relay Output [bin]
*[0] Disabled	14-03 Overmodulation	15-46 Frequency Converter Order. No	16-72 Counter A
[1] And	[0] Off	15-48 Keypad Id No	16-73 Counter B
[2] Or	*[1] On	15-51 Frequency Converter Serial No	16-8X Fieldbus / GE Drive Port
[3] And not	14-1X Mains monitoring	16-XX Data Readouts	16-86 GE Drive Port REF 1
[4] Or not	14-12 Function at mains imbalance	16-0X General Status	0x8000 - 0x7FFFF
[5] Not and	*[0] Trip	16-00 Control Word	16-9X Diagnosis Readouts
[6] Not or	[1] Warning	0 - 0XFFFF	16-90 Alarm Word
[7] Not and not	[2] Disabled	16-01 Reference [Unit]	0 - 0XFFFFFFF
[8] Not or not	14-2X Trip Reset	-4999 - 4999 * 0.000	16-92 Warning Word
13-42 Logic Rule Boolean 2	14-20 Reset Mode	16-02 Reference %	0 - 0XFFFFFFF
See par. 13-40 * [0] False	*[0] Manual reset	-200.0 - 200.0 % * 0.0%	16-94 Ext. Status Word
13-43 Logic Rule Operator 2	[1-9] AutoReset 1-9	16-03 Status Word	0 - 0XFFFFFFF78-XX Extended Motor Data
See par. 13-41 * [0] Disabled	[10] AutoReset 10	0 - 0XFFFF	18-8X Motor Resistors
13-44 Logic Rule Boolean 3	[11] AutoReset 15	16-05 Main Actual Value [%]	18-80 Stator Resistance (High resolution)
See par. 13-40 * [0] False	[12] AutoReset 20	-200.0 - 200.0 % * 0.0%	0.000 - 99.990 ohm * 0.000 ohm
13-5X States	[13] Infinite auto reset	16-09 Custom Readout	18-81 Stator Leakage Reactance(High resolution)
13-51 LC Controller Event	14-21 Automatic Restart Time	Dep. on par. 0-31, 0-32 and 4-14	0.000 - 99.990 ohm * 0.000 ohm
See par. 13-40 * [0] False	0 - 600 s * 10 s		
13-52 LC Controller Action			
*[0] Disabled			



No.	Description	Warning	Alarm	Trip Lock	Error	Cause of Problem
2	Live zero error	X	X			Signal on terminal 53 or 60 is less than 50% of value set in par. 6-10, 6-12 and 6-22.
4	Mains phase loss ¹⁾	X	X	X		Missing phase on supply side, or too high voltage imbalance. Check supply voltage.
7	DC over voltage ¹⁾	X	X			Intermediate circuit voltage exceeds limit.
8	DC under voltage ¹⁾	X	X			Intermediate circuit voltage drops below "voltage warning low" limit.
9	Driveoverloaded	X	X			More than 100% load for too long.
10	Motor Electronic Overload over temperature	X	X			Motor is too hot due to more than 100% load for too long.
11	Motor thermistor over temperature	X	X			Thermistor or thermistor connection is disconnected.
12	Torque limit	X				Torque exceeds value set in either par. 4-16 or 4-17.
13	Over Current	X	X	X		Drive current limit is exceeded.
14	Earth fault		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 frequency converter.
25	Brake resistor short-circuited		X	X		Brake resistor is short-circuited, thus brake function is disconnected.
27	Brake chopper short-circuited		X	X		Brake transistor is short-circuited, thus brake function is disconnected.
28	Brake check		X			Brake resistor is not connected/working
29	Power board over temp	X	X	X		Heat-sink cut-out 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 local GE supplier.
44	Earth fault		X	X		Discharge from output phases to ground.
47	Control Voltage Fault		X	X		24 V DC may be overloaded.
51	Auto Tune check U _{nom} and I _{nom}		X			Wrong setting for motor voltage and/or motor current.
52	Auto Tune low I _{nom}		X			Motor current is too low. Check settings.
59	Current limit	X				Drive overload.
63	Mechanical Brake Low		X			Actual motor current has not exceeded "release brake" current within "start delay" time window.
80	Drive restored to Factory Settings		X			All parameter settings are restored to factory default settings.
84	The connection between drive and Keypad is lost				X	No communication between Keypad and frequency converter
85	Button disabled				X	See parameter group 0-4* <i>Keypad</i>
86	Copy fail				X	An error occurred while copying from frequency converter to Keypad or vice versa.
87	Keypad data invalid				X	Occurs when copying from Keypad if the Keypad contains erroneous data - or if no data was uploaded to the Keypad.
88	Keypad data not compatible				X	Occurs when copying from Keypad if data are moved between frequency converters 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	Keypad and RS485 connection 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	Parameter 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 may be caused by mains distortions. Installing GE Line Filter may rectify this problem.						

Table 1.5: Warnings and AlarmsCode list

1.1.18 Mains Supply 1 x 200 - 240 VAC

1

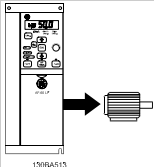
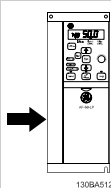
Normal overload 150% for 1 minute						
Frequency converter						
Typical Shaft Output [kW]		0.18	0.37	0.75	1.5	2.2
Typical Shaft Output [HP]		0.25	0.5	1	2	3
		Unit Size M1	Unit Size M1	Unit Size M1	Unit Size M2	Unit Size M3
IP 20						
Output current						
	Continuous (1 x 200-240 V) [A]	1.2	2.2	4.2	6.8	9.6
	Intermittent (1 x 200-240 V) [A]	1.8	3.3	6.3	10.2	14.4
	Max. cable size:					
	(mains, motor) [mm² /AWG]	4/10				
Max. input current						
	Continuous (1 x 200-240 V) [A]	3.3	6.1	11.6	18.7	26.4
	Intermittent (1 x 200-240 V) [A]	4.5	8.3	15.6	26.4	37.0
	Max. mains fuses [A]	See Section Fuses				
	Environment					
	Estimated power loss [W], Best case/Typ-ical ¹⁾	12.5/15.5	20.0/25.0	36.5/44.0	61.0/67.0	81.0/85.1
	Weight enclosure IP20 [kg]	1.1	1.1	1.1	1.6	3.0
	Efficiency [%], Best case/Typical ¹⁾	95.6/94.5	96.5/95.6	96.6/96.0	97.0/96.7	96.9/97.1

Table 1.6: Mains supply 1 x 200 - 240 VAC

1. At rated load conditions.

1.1.19 Mains Supply 3 x 200 - 240 VAC

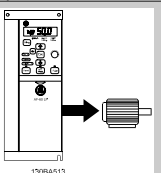
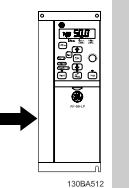
Normal overload 150% for 1 minute							
Frequency converter							
Typical Shaft Output [kW]	0.25	0.37	0.75	1.5	2.2	3.7	
Typical Shaft Output [HP]	0.33	0.5	1	2	3	5	
	Unit Size M1	Unit Size M1	Unit Size M1	Unit Size M2	Unit Size M3	Unit Size M3	
IP 20							
Output current							
	Continuous (3 x 200-240 V) [A]	1.5	2.2	4.2	6.8	15.2	
	Intermittent (3 x 200-240 V) [A]	2.3	3.3	6.3	10.2	14.4	22.8
	Max. cable size:						
	(mains, motor) [mm² /AWG]			4/10			
Max. input current							
	Continuous (3 x 200-240 V) [A]	2.4	3.5	6.7	10.9	15.4	24.3
	Intermittent (3 x 200-240 V) [A]	3.2	4.6	8.3	14.4	23.4	35.3
	Max.mains fuses [A]	See Section Fuses					
	Environment						
	Estimated power loss [W], Best case/Typical ¹⁾	14.0/20.0	19.0/24.0	31.5/39.5	51.0/57.0	72.0/77.1	115.0/122.8
	Weight enclosure IP20 [kg]	1.1	1.1	1.1	1.6	3.0	3.0
	Efficiency [%], Best case/Typical ¹⁾	96.4/94.9	96.7/95.8	97.1/96.3	97.4/97.2	97.2/97.4	97.3/97.4

Table 1.7: Mains supply 3 x 200 - 240 VAC

1. At rated load conditions.



1.1.20 Mains Supply 3 x 380 - 480 VAC

1

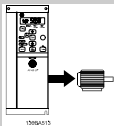
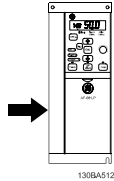
Normal overload 150% for 1 minute						
Frequency converter	0.37	0.75	1.5	2.2	3.0	4.0
Typical Shaft Output [kW]						
Typical Shaft Output [HP]	0.5	1	2	3	4	5
IP 20	Unit Size M1	Unit Size M1	Unit Size M2	Unit Size M2	Unit Size M3	Unit Size M3
Output current						
	Continuous (3 x 380-440 V) [A]	1.2	2.2	3.7	5.3	7.2
	Intermittent (3 x 380-440 V) [A]	1.8	3.3	5.6	8.0	10.8
	Continuous (3 x 440-480 V) [A]	1.1	2.1	3.4	4.8	6.3
	Intermittent (3 x 440-480 V) [A]	1.7	3.2	5.1	7.2	9.5
	Max. cable size: (mains, motor) [mm²/ AWG]	4/10				
Max. input current						
	Continuous (3 x 380-440 V) [A]	1.9	3.5	5.9	8.5	11.4
	Intermittent (3 x 380-440 V) [A]	2.6	4.7	8.7	12.6	16.8
	Continuous (3 x 440-480 V) [A]	1.7	3.0	5.1	7.3	9.9
	Intermittent (3 x 440-480 V) [A]	2.3	4.0	7.5	10.8	14.4
	Max. mains fuses [A]	See Section Fuses				
	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	75.0/ 101.6
Weight enclosure IP20 [kg]	1.1	1.1	1.6	1.6	3.0	3.0
Efficiency [%], Best case/ Typical ^[1]	96.8/ 95.5	97.4/ 96.0	98.0/ 97.2	97.9/ 97.1	98.0/ 97.2	98.0/ 97.3

Table 1.8: Mains supply 3 x 380 - 480 VAC

1. At rated load conditions.

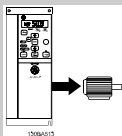
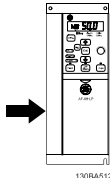
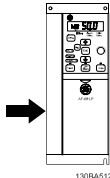
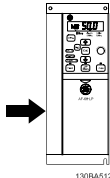
Normal overload 150% for 1 minute							
Frequency converter		5.5	7.5	11	15	18.5	22
Typical Shaft Output [kW]							
Typical Shaft Output [HP]		7.5	10	15	20	25	30
IP 20		Unit Size M3	Unit Size M3				
Output current							
	Continuous (3 x 380-440 V) [A]	12.0	15.5	23.0	31.0	37.0	43.0
	Intermittent (3 x 380-440 V) [A]	18.0	23.5	34.5	46.5	55.5	64.5
	Continuous (3 x 440-480 V) [A]	11.0	14.0	21.0	27.0	34.0	40.0
	Intermittent (3 x 440-480 V) [A]	16.5	21.3	31.5	40.5	51.0	60.0
	Max. cable size: (mains, motor) [mm²/ AWG]	4/10			16/6		
Max. input current							
	Continuous (3 x 380-440 V) [A]	19.2	24.8	33.0	42.0	34.7	41.2
	Intermittent (3 x 380-440 V) [A]	27.4	36.3	47.5	60.0	49.0	57.6
	Continuous (3 x 440-480 V) [A]	16.6	21.4	29.0	36.0	31.5	37.5
	Intermittent (3 x 440-480 V) [A]	23.6	30.1	41.0	52.0	44.0	53.0
	Max. mains fuses [A]	See Section Fuses					
Environment							
	Estimated power loss [W], Best case/ Typical ^[1]	131.0/ 166.8	175.0/ 217.5	290.0/ 342.0	387.0/ 454.0	395.0/ 428.0	467.0/ 520.0
	Weight enclosure IP20 [kg]	3.0	3.0				
	Efficiency [%], Best case/ Typical ^[1]	98.0/ 97.5	98.0/ 97.5	97.8/ 97.4	97.7/ 97.4	98.1/ 98.0	98.1/ 97.9

Table 1.9: Mains supply 3 x 380 - 480 VAC

1. At rated load conditions.



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 between 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):

Supply voltage	200-240 V $\pm 10\%$
Supply voltage	380-480 V $\pm 10\%$
Supply frequency	50/60 Hz
Max. imbalance temporary between mains phases	3.0 % of rated supply voltage
True Power Factor (λ)	≥ 0.4 nominal at rated load
Displacement Power Factor ($\cos\phi$) near unity	(> 0.98)
Switching on input supply L1/L, L2, L3/N (power-ups)	maximum 2 times/min.
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):

Output voltage	0 - 100% of supply voltage
Output frequency	0-200 Hz (VVC+), 0-400 Hz (u/f)
Switching on output	Unlimited
Ramp times	0.05 - 3600 sec.

Cable lengths and cross sections:

Max. motor cable length, screened/armoured (EMC correct installation)	15 m
Max. motor cable length, unscreened/unarmoured	50 m
Max. cross section to motor, mains*	
Connection to load sharing/brake (M1, M2, M3)	6.3 mm insulated Faston Plugs
Max. cross section to load sharing/brake (M4, M5)	16 mm ² /6AWG
Maximum cross section to control terminals, rigid wire	1.5 mm ² /16 AWG (2 x 0.75 mm ²)
Maximum cross section to control terminals, flexible cable	1 mm ² /18 AWG
Maximum cross section to control terminals, cable with enclosed core	0.5 mm ² /20 AWG
Minimum cross section to control terminals	0.25 mm ²

** See tables for mains supply for more information!*

Digital inputs (Pulse/enocder inputs):

Programmable digital inputs (Pulse/encoder)	5 (1)
Terminal number	18, 19, 27, 29, 33,
Logic	PNP or NPN
Voltage level	0 - 24 V DC
Voltage level, logic '0' PNP	< 5 V DC
Voltage level, logic '1' PNP	> 10 V DC
Voltage level, logic '0' NPN	> 19 V DC
Voltage level, logic '1' NPN	< 14 V DC
Maximum voltage on input	28 V DC
Input resistance, R_i	approx. 4 k
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 mode (Terminal 53)	Switch S200=OFF(U)
Current mode (Terminal 53 and 60)	Switch S200=ON(I)
Voltage level	0 - 10 V
Input resistance, R_i	approx. 10 k Ω



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
Max. voltage at analog output	17 V
Accuracy on analog output	Max. error: 0.8 % of full scale
Resolution on analog output	8 bit

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

Control card, 24 V DC output:

Terminal number	12
Max. load (M1 and M2)	160 mA
Max. load (M3)	30 mA
Max. load (M4 and M5)	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, 0.1A
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, 0.2A
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:

Terminal number	50
Output voltage	10.5 V $\pm$ 0.5 V
Max. load	25 mA

NB!

All inputs, outputs, circuits, DC supplies and relay contacts are galvanically isolated from the supply voltage (PELV) and other high-voltage terminals.



1

Surroundings:

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

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

Safety standards	EN/IEC 61800-5-1, UL 508C
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,
EMC standards, Immunity	EN 61000-4-4, EN 61000-4-5, EN 61000-4-6

See section on special conditions



1.1.21 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 frequency converter 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.

1.1.22 Derating for Low Air Pressure

The cooling capability of air is decreased at low air pressure.

For altitudes above 2000 m, please contact GE .

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

1.1.23 Derating for Running at Low Speeds

When a motor is connected to at 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).

Ordering No	Description
KYPDACL1	Keypad with potentiometer
RMKYPDACL1	Remote Mounting Kit for Keypad incl. 3 m cable , IP21 rated
NEMA1ACL1	Nema Type 1 kit for Unit Size M1
NEMA1ACL2	Type 1 kit for Unit Size M2
NEMA1ACL3	Type 1 kit for Unit Size M3
DEPLTACL1	De-coupling plate kit for Unit Sizes M1 and M2
DEPLTACL2	De-coupling plate kit for Unit Size M3 for M1 frame
RMAACL1	DIN rail mounting kit for M1 Unit Size
NEMA1ACL4	Type 1 kit for Unit Size M4
NEMA1ACL5	Type 1 kit for Unit Size M5
DEPLTACL3	De-coupling plate kit for M4 and M5 frames

GE Line Filters and brake resistors are available upon request.

The instructions do not purport to cover all details or variations in equipment nor to provide for every possible contingency to be met in connection with installation, operation or maintenance. Should further information be desired or should particular problems arise which are not covered sufficiently for the purchaser's purposes, the matter should be referred to the GE company.

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GE Consumer & Industrial
41 Woodford Avenue
Plainville, CT 06062

www.geelectrical.com/drives



132R0038



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