GE

AF-60 LP™ Micro Drive

Programming Guide

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Contents

1 Safety

1.1.1 High Voltage Warning

⚠WARNING

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

1.1.2 Safety Instructions

CAUTION

Before using functions directly or indirectly influencing personal safety (e.g., Fire mode or other functions either forcing the motor to stop or attempting to keep it functioning), a thorough risk analysis and system test must be carried out. The system tests must include testing failure modes regarding the control signaling (analog and digital signals and serial communication).

- Make sure the adjustable frequency drive is properly grounded.
- Do not remove AC line input connections, motor connections or other power connections while the adjustable frequency drive is connected to line power.
- Protect users against supply voltage.
- Protect the motor against overloading according to national and local regulations.
- The ground leakage current exceeds 3.5 mA.
- The [Off] key is not a safety switch. It does not disconnect the adjustable frequency drive from line power.

1.1.3 Software Version and Approvals

Software Version Programming Guide AF-60 LP™ Micro Drive
This Programming Guide can be used for all AF-60 LP™ Micro Drive adjustable frequency drives with software version 2.7X. The software version number can be read in *15-43 Software Version*.

Table 1.1

1.1.4 General Warning

⚠WARNING

ELECTRICAL SHOCK HAZARD

Touching the electrical parts may be fatal - even after the equipment has been disconnected from line power.
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 adjustable frequency drive, wait at least four minutes for all sizes.
Shorter time is allowed only if indicated on the nameplate for the specific unit.

⚠CAUTION

Leakage Current
The Ground leakage current from the adjustable frequency drive exceeds 3.5 mA. According to IEC 61800-5-1, a reinforced protective ground connection must be ensured by means of a min. 0.016 in² [10 mm²] Cu or an additional PE wire - with the same cable cross-section as the line power 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 grounding of the adjustable frequency drive and the use of RCDs must always follow national and local regulations.

⚠CAUTION

Motor overload protection is possible by setting *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.

⚠WARNING

Installation at high altitudes:
For altitudes above 6,600 feet [2 km], please contact GE.

1.1.5 IT Lines

⚠CAUTION

IT Lines
Installation on isolated line power source, i.e., IT lines. Max. supply voltage allowed when connected to line power: 440 V.

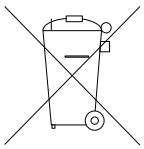
As an option, GE offers line filters for improved harmonics performance.

1.1.6 Avoiding Unintended Start

While the adjustable frequency drive is connected to line power, the motor can be started/stopped using digital commands, bus commands, references or via the drive keypad.

- Disconnect the adjustable frequency drive from line power to avoid unintended start of any motors.
- To avoid unintended start, always press the [Off] key before changing parameters.

1.1.7 Disposal Instruction



Equipment containing electrical components may 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.

Table 1.2

1.1.8 Before Commencing Repair Work

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

2 Introduction

2.1.1 Drive Identification

The nameplate sticker is located on the top of each adjustable frequency drive and shows the ratings, serial number, warnings catalog number, and other relevant data for each unit. See *Table 2.1* for details on how to read the type code string.

Figure 2.1 This Example Shows the Nameplate Sticker

2.1.2 AF-60 LP Micro Drive Model Number System Diagram

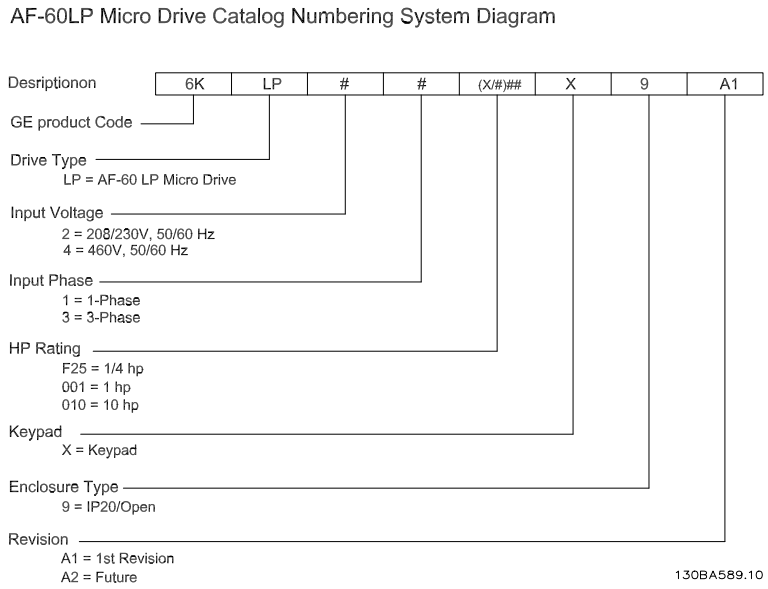


Figure 2.2

2

2.1.3 Warnings and Approvals

Symbols used in this Programming Guide.

Symbols
The following symbols are used in this manual.

⚠WARNING

Indicates a potentially hazardous situation which, if not avoided, could result in death or serious injury.

⚠CAUTION

Indicates a potentially hazardous situation which, if not avoided, may result in minor or moderate injury. It may also be used to alert against unsafe practices.

CAUTION

Indicates a situation that may result in equipment or property damage-only accidents.

2.1.4 Abbreviations and Standards

Abbreviations:	Terms:	SI units:	I-P units:
a	Acceleration	m/s^2	ft/s^2
AWG	American wire gauge		
Auto Tune	Automatic Motor Tuning		
°C	Celsius		
I	Current	A	Amp
I_{LIM}	Current limit		
DCT	Drive Control Tool		
Joule	Energy	J=N·m	ft-lb, Btu
°F	Fahrenheit		
f	Frequency	Hz	Hz
kHz	Kilohertz	kHz	kHz
mA	Milliampere		
ms	Millisecond		
min	Minute		
M-TYPE	Motor Type Dependent		
Nm	Newton meters		in-lbs
$I_{M,N}$	Nominal motor current		
$f_{M,N}$	Nominal motor frequency		
$P_{M,N}$	Nominal motor power		
$U_{M,N}$	Nominal motor voltage		
PELV	Protective Extra Low Voltage		
Watt	Power	W	Btu/hr, hp
Pascal	Pressure	$Pa=N/m^2$	psi, psf, ft of water
I_{INV}	Rated Drive Output Current		
RPM	Revolutions Per Minute		
SR	Size Related		
T	Temperature	C	F
t	Time	s	s, hr
T_{LIM}	Torque limit		
U	Voltage	V	V

Table 2.1 Abbreviation and Standards table

3 Programming

3.1 How to Program

3.1.1 Programming with DCT-10 Set-up Software

The adjustable frequency drive can be programmed from a PC via RS-485 COM port by installing the DCT-10 Set-up Software.

This software can be downloaded from the GE website: www.geelectrical.com/drives

3.1.2 Programming with the keypad

The keypad is divided into four functional groups:

1. Numeric display.
2. Menu key.
3. Navigation keys.
4. Operation keys and LEDs.

NOTE!

Parameters should be changed in numerical order. Certain parameter values are affected by the preceding changes.

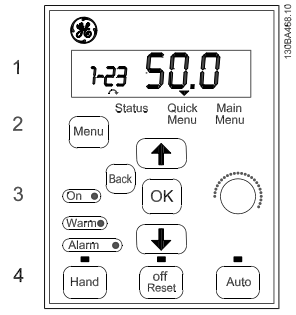


Figure 3.1 Keypad with Potentiometer

The display
Different information can be read from the display.

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

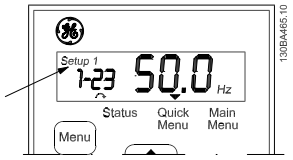


Figure 3.2 Indicating the Set-up

The small digits to the left are the selected parameter number.

Figure 3.3 Indicating Selected Parameter Number

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

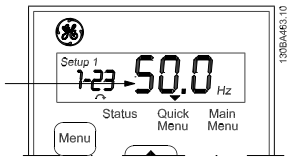


Figure 3.4 Indicating Value of Selected Parameter

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

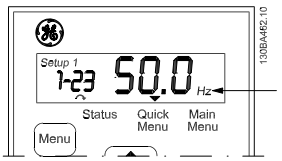


Figure 3.5 Indicating Unit of Selected Parameter

3

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

Figure 3.6 Indicating Motor Direction

Press the [Menu] key to select one of the following menus

Status Menu
The Status Menu is either in *Read-out Mode* or *Hand Mode*. In *Read-out Mode*, the value of the currently selected readout parameter is shown in the display.

In *Hand Mode,* the local keypad reference is displayed.

Quick Menu
Displays quick menu parameters and their settings. Parameters in the quick menu can be accessed and edited from here. Most applications can be run by setting the parameters in the quick menus.

Main Menu
Displays main menu parameters and their settings. All parameters can be accessed and edited here.

LEDs:

- Green LED: The adjustable frequency drive is on.
- Yellow LED: Indicates a warning. See *6 Trouble-shooting*.
- Flashing red LED: Indicates an alarm. See *6 Troubleshooting*.

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

Pressing [OK] for more than 1 s enters 'Adjust' mode. In 'Adjust' mode, it is possible to make fast adjustment by pressing [▲] [▼] combined with [OK].

Press [▲] [▼] to change value. Press [OK] to shift between digits quickly.

To exit 'Adjust' mode, press [OK] more than 1 s again to save changes or press [Back] to not save changes.

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

3.2 Status Menu

After power-up, the status menu is active. Press [Menu] to toggle between Status, Quick Menu and Main Menu.

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

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

Figure 3.7 Indicating Status Mode

3.3 Quick Menu

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

1. To enter the Quick Menu, press [Menu] key until indicator in display is placed above *Quick Menu*.
2. Press [▲] [▼] to select either QM1 or QM2, then press [OK].
3. Press [▲] [▼] to browse through the parameters in the Quick Menu.
4. Press [OK] to select a parameter.
5. Press [▲] [▼] 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*.

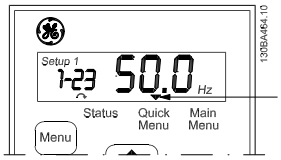


Figure 3.8 Indicating Quick Menu Mode

3.4 Main Menu

The main menu gives access to all parameters.

1. To enter the Main Menu, press [Menu] key until indicator in display is placed above *Main Menu*.
2. Press [▲] [▼] to browse through the parameter groups.
3. Press [OK] to select a parameter group.
4. Press [▲] [▼] to browse through the parameters in the specific group.
5. Press [OK] to select the parameter.
6. Press [▲] [▼] 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*.

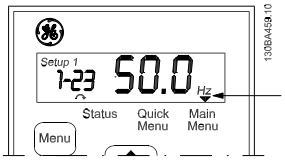


Figure 3.9 Indicating Main Menu Mode

4 Parameter Descriptions

4.1 Parameter Group 0: Operation/Display

0-03 Regional Settings

Option:		Function:
		In order to meet the needs for different default settings in different parts of the world, *0-03 Regional Settings* has been implemented in the adjustable frequency drive. The selected setting influences the default setting of the motor nominal frequency.
[0]	Interna-tional	Sets default of *1-23 Motor Frequency*, to 50 Hz, shows *1-20 Motor Power* in kW.
[1] *	US	Sets default of *1-23 Motor Frequency*, to 60 Hz, shows *1-20 Motor Power* in HP. **NOTE!** **This parameter cannot be changed while the motor is running.**

0-04 Operating State at Power-up (Hand Mode)

Option:		Function:
		This parameter controls whether or not the adjustable frequency drive starts running the motor when powering up after a power-down in Hand mode. **NOTE!** **If the keypad with potentiometer is mounted, the reference is set according to the actual potentiometer value.**
[0]	Resume	The adjustable frequency drive starts in same hand or off state as when powered off. The local reference is stored and used after power-up.
[1] *	Forced Stop, Ref=Old	The adjustable frequency drive powers up in off state meaning that the motor is stopped after power-up. The local reference is stored and used after power-up.
[2]	Forced Stop, Ref=0	The adjustable frequency drive powers up in off state meaning that the motor is stopped after power-up. The Local reference is set to 0. Thus the motor will not start running before the local reference has been increased.

4.1.1 0-1* Set-up Handling

User-defined parameters and miscellaneous external inputs (e.g., bus, keypad, analog/digital inputs, feedback, etc.) controls the functionality of the adjustable frequency drive.

A complete set of all parameters controlling the adjustable frequency drive is called a set-up. The adjustable frequency drive contains two set-ups, *Set-up 1* and *Set-up 2*. Furthermore, a fixed set of factory settings can be copied into one or more set-ups.

Some of the advantages of having more than one set-up in the adjustable frequency drive are

- Run motor in one set-up (Active Set-up) while updating parameters in another set-up (Edit Set-up)
- Connect various motors (one at a time) to the adjustable frequency drive. Motor data for various motors can be placed in different set-ups.
- Rapidly change settings of the adjustable frequency drive and/or motor while motor is running (e.g., ramp time or preset references) via bus or digital inputs.

The *Active Set-up* can be set as *Multi Set-up* where the active set-up is selected via input on a digital input terminal and/or via the bus control word.

NOTE!

***Factory Set-up* cannot be used as *Active Set-up*.**

0-10 Active Set-up

Option:		Function:
		Active Set-up controls the motor. Shifts between set-ups can only happen when • the motor is coasted OR • the set-ups between which the shift happens are linked to each other (see *0-12 Linked Set-ups*). When changing between set-ups that are not linked, the change will not happen before the motor is coasted.

4

0-10 Active Set-up

Option:		Function:
		NOTE! **The motor is only considered stopped when it is coasted.**
[1] *	Set-up 1	*Set-up 1* is active.
[2]	Set-up 2	*Set-up 2* is active.
[9]	Multi Set-up	Select the active set-up via digital input and/or bus, see *5-1* Digital Inputs* choice [23].

0-11 Edit Set-up

Option:		Function:
		The *Edit Set-up* is for updating parameters in the adjustable frequency drive from either keypad or bus. It can be identical to or different from the *Active Set-up*. All set-ups can be edited during operation, independently of the active set-up.
[1] *	Set-up 1	Update parameters in *Set-up 1*.
[2]	Set-up 2	Update parameters in *Set-up 2*.
[9]	Active Set-up	Update parameters in set-up selected as *Active Set-up* (see *0-10 Active Set-up*).

0-12 Link Set-ups

Option:		Function:
		The link ensures synchronizing of the "not changeable during operation" parameter values enabling shift from one set-up to another during operation. If the set-ups are not linked, a change between them is not possible while the motor is running. Thus the set-up change does not occur until the motor is coasted.
[0]	Not linked	Leaves parameters unchanged in both set-ups and cannot be changed while the motor is running.
[1] *	Linked	Copy parameter's "not changeable during operation" parameter values into currently selected *Edit Set-up*. **NOTE!** **This parameter cannot be changed while the motor is running.**

0-31 Custom Readout Min Scale

Range:		Function:
0.00 *	[0.00– 9999.00]	It is possible to create a customized readout related to the output frequency of the unit. The value entered in *0-31 Custom Readout Min Scale* will be shown at 0 Hz. The readout can be shown in the keypad display when in Status Mode or it can be read in *16-09 Custom Readout*

0–32 Custom Readout Max Scale

Range:		Function:
100.0*	[0.00– 9999.00]	It is possible to create a customized readout related to the output frequency of the unit. The value entered in *0-32 Custom Readout Max Scale* will be shown at the frequency programmed in *4-14 Motor Speed High Limit*. The readout can be shown in the keypad display when in Status Mode or it can be read in *16-09 Custom Readout*

4.1.2 0-4* Keypad

The adjustable frequency drive can operate in the following three modes: *Hand*, *Off* and *Auto*.
Hand: The adjustable frequency drive is locally operated and does not allow any remote control. By activating Hand, a start signal is given.
OFF: The adjustable frequency drive stops with a normal stop ramp. When Off is chosen, the adjustable frequency drive can only be started by pressing either Hand or Auto on the keypad.
Auto: In Auto mode, the adjustable frequency drive can be remote controlled (bus/digital).

0-40 [Hand] Key on Keypad

Option:		Function:
[0]	Disabled	[Hand] key has no function.
[1] *	Enabled	[Hand] key is functional.

0-41 [Off/Reset] Key on Keypad

Option:		Function:
[0]	Disable Off/Reset	[Off/Reset] key has no function.
[1] *	Enable Off/Reset	Stop signal and reset of any faults.
[2]	Enable Reset Only	Reset only. Stop (Off) function is disabled.

0-42 [Auto] Key on Keypad

Option:		Function:
[0]	Disabled	[Auto] key has no function.
[1] *	Enabled	[Auto] key is functional.

4.1.3 0-5* Copy/Save

0-50 Keypad Copy

Option:		Function:
		The detachable keypad of the adjustable frequency drive can be used for storing set-ups, and thus for transferring data when moving parameter settings from one adjustable frequency drive to another.

0-50 Keypad Copy

Option:		Function:
		NOTE! ***Keypad Copy* can only be activated from the keypad and ONLY when the motor is coasted.**
[1]	All to keypad	Copy all set-ups from the adjustable frequency drive into the keypad.
[2]	All from keypad	Copy all set-ups from keypad to adjustable frequency drive.
[3]	Size independent from keypad	Copy non-motor size-dependent data from keypad to adjustable frequency drive.

0-51 Set-up Copy

Option:		Function:
		Use this function to copy set-up content into the *Edit Set-up*. In order to be able to make a set-up copy, make sure that • the motor is coasted • *0-10 Active Set-up*, *Active Set-up*, is set to either *[1] Set-up 1* or *[2] Set-up 2* **NOTE!** **The keyboard/parameter database are blocked while Set-up Copy is running.**
[0] *	No Copy	Copy function is inactive
[1]	Copy from Set-up 1	Copy from *Set-up 1* to edit set-up chosen in *0-11 Edit Set-up*.
[2]	Copy from Set-up 2	Copy from *Set-up 2* to edit set-up chosen in *0-11 Edit Set-up*.
[9]	Copy from Factory Set-up	Copy from Factory Settings to edit set-up chosen in *0-11 Edit set-up*.

4.1.4 0-6* Password

0-60 (Main) Menu Password

Range:		Function:
		Use a password to prevent unintentionally changing sensitive parameters, e.g., motor parameters.
0 *	[0–999]	Enter the password for access to the main menu via the [Main Menu] key. Select the number that allows other parameter values to be changed. *0* means there is no password.

NOTE!

A password has affect on the keypad - not on the bus communication.

NOTE!

Pressing [Menu], [OK] and [▼] will unlock the password. This will automatically open the parameter editing shield in the quick menu or main menu.

0-61 Access to Main/Quick Menu w/o Password

Option:		Function:
[0] *	Full access	Select *[0] Full Access* to disable the password in *0-60 (Main) Menu Password*.
[1]	Keypad: Read Only	Select *[1] Read Only* to block unauthorized editing of Main/Quick menu parameter.
[2]	keypad: No Access	Select *[2] No Access* to block unauthorized editing and viewing of Main/Quick menu parameter.

4

4

4.2 Parameter Group 1: Load/Motor

1-00 Configuration Mode

Option:		Function:
		Use this parameter for selecting the application control principle to be used when a remote reference is active. **NOTE!** **Changing this parameter will reset *3-00 Reference Range*, *3-02 Minimum Reference* and *3-03 Maximum Reference* to their default values.** **NOTE!** **This parameter cannot be adjusted while the motor is running.**
[0] *	Speed Open-loop	For normal speed control (References).
[3]	Process Closed-loop	Enables process closed-loop control. See parameter group *7-3* Process PI Control* for further information on PI controller.

1-01 Motor Control Principle

Option:		Function:
[0]	U/f	Is used for parallel connected motors and/or special motor applications. The U/f settings are set in *1-55 U/f Characteristic -U* and *1-56 U/f Characteristic -F*. **NOTE!** **When running U/f, control slip and load compensations are not included.**
[1] *	Advanced Vector Control	Normal running mode, including slip and load compensations.

1-03 Torque Characteristics

Option:		Function:
		With more torque characteristics, it is possible to run low energy consuming applications, as well as high torque applications.
[0] *	Constant Torque	Motor shaft output provides constant torque under variable speed control.
[2]	Energy Savings	This function automatically optimizes energy consumption in centrifugal pump and fan applications. See *14-41 Energy Savings Minimum Magnetization*.

1-05 Hand Mode Configuration

Option:		Function:
		This parameter is only relevant when *1-00 Configuration Mode* is set to *[3] Process Closed-loop*. The parameter is used for determining the reference or setpoint handling when changing from Auto mode to Hand mode on the keypad.
[0]	Speed Open-loop	In Hand mode, the drive always runs in Open-loop configuration regardless of setting in *1-00 Configuration Mode*. Local potentiometer (if present) or Arrow up/down determines output frequency limited by Motor Speed High/Low Limit (*4-14 Motor Speed High Limit* and *4-12 Motor Speed Low Limit*).
[2] *	As configuration in *1-00 Configuration Mode*.	If *1-00 Configuration Mode* is set to *[1] Open-loop,* the function is as described above. If *1-00 Configuration Mode* is set to *[3] Process Closed-loop,* changing from Auto mode to Hand mode results in a setpoint change via local potentiometer or Arrow up/down. The change is limited by Reference Max/Min (*3-02 Minimum Reference* and *3-03 Maximum Reference*).

4.2.1 1-2* Motor Data

Enter the correct motor nameplate data (power, voltage, frequency, current and speed).
Run Auto Tune, see *1-29 Auto Tune*.
Factory settings for advanced motor data, parameter group *1-3* Adv. Motor Data*, are automatically calculated.

NOTE!

Parameters in parameter group *1-2* Motor Data* cannot be adjusted while the motor is running.

1-20 Motor Power [kW]/[HP] ($P_{m,n}$)

Option:		Function:
		Enter the motor power from the nameplate data. Two sizes down, one size up from nominal AF-60 LP™ rating.
[1]	0.09 kW/0.12 HP	
[2]	0.12 kW/0.16 HP	
[3]	0.18 kW/0.25 HP	
[4]	0.25 kW/0.33 HP	
[5]	0.37kW/0.50 HP	
[6]	0.55 kW/0.75 HP	
[7]	0.75 kW/1.00 HP	
[8]	1.10 kW/1.50 HP	
[9]	1.50 kW/2.00 HP	
[10]	2.20 kW/3.00 HP	
[11]	3.00 kW/4.00 HP	
[12]	3.70 kW/5.00 HP	
[13]	4.00 kW/5.40 HP	

1-20 Motor Power [kW]/[HP] ($P_{m.n}$)

Option:		Function:
[14]	5.50 kW/7.50 HP	
[15]	7.50 kW/10.0 HP	
[16]	11.00 kW/15.00 HP	
[17]	15.00 kW/20.00 HP	
[18]	18.50 kW/25.00 HP	
[19]	22.00 kW/29.50 HP	
[20]	30.00 kW/40.00 HP	

NOTE!

Changing this parameter affects parameters *1-22 Motor Voltage* to *1-25 Motor Frequency*, *1-30 Stator Resistance*, *1-33 Stator Leakage Reactance* and *1-35 Main Reactance*.

1-22 Motor Voltage ($U_{m.n}$)

Range:		Function:
230/400 V	[50–999 V]	Enter the motor voltage from the nameplate data.

1-23 Motor Frequency ($f_{m.n}$)

Range:		Function:
60 Hz*	[20–400 Hz]	Enter the motor frequency from the nameplate data.

1-24 Motor Current ($I_{m.n}$)

Range:		Function:
M-type dependent*	[0.01–100.00 A]	Enter the motor current from the nameplate data.

1-25 Motor Nominal Speed ($n_{m.n}$)

Range:		Function:
M-type Dependent*	[100–9,999 RPM]	Enter motor nominal speed from nameplate data.

1-29 Auto Tune

Option:		Function:
		Use Auto Tune to optimize motor performance. **NOTE!** **This parameter cannot be changed while the motor is running.** 1. Stop the adjustable frequency drive - make sure motor is at standstill. 2. Choose *[2] Enable Auto Tune* 3. Apply start signal. - Via keypad: Press [Hand] - Or in Remote On mode: Apply start signal on terminal 18.
[0] *	Off	Auto Tune function is disabled.

1-29 Auto Tune

Option:		Function:
[2]	Enable Auto Tune	Auto Tune function starts running. **NOTE!** **To gain optimum tuning of the adjustable frequency drive, run Auto Tune on a cold motor.**

4.2.2 1-3* Adv. Motor Data

Adjust advanced motor data using one of these methods:

1. Run Auto Tune on cold motor. The adjustable frequency drive measures value from motor.
2. Enter the X_1 value manually. Obtain the value from the motor supplier.
3. Use R_s, X_1, and X_2 default setting. The adjustable frequency drive establishes setting based on motor nameplate data.

NOTE!

These parameters cannot be changed while the motor runs.

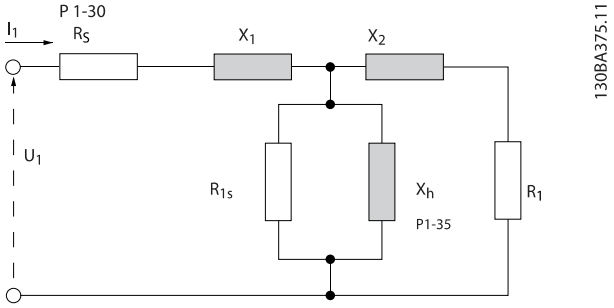


Figure 4.1

1-30 Stator Resistance (R_s)

Range:		Function:
Depending on motor data*	[Ohm]	Set the stator resistance value.

1-33 Stator Leakage Reactance (X_1)

Range:		Function:
Depending on motor data*	[Ohm]	Set the stator leakage reactance of the motor.

1-35 Main Reactance (X_2)

Range:		Function:
Depending on motor data*	[Ohm]	Set the motor main reactance.

4

4.2.3 1-5* Load Independent Setting

This parameter group is for setting the load-independent motor settings.

1-50 Motor Magnetization at Zero Speed

Range:		Function:
		This parameter enables different thermal loads on the motor when running at low speed.
100%*	[0–300%]	Enter a percentage of rated magnetizing current. If the setting is too low, the motor shaft torque may be reduced.

1-52 Min. Speed Normal Magnetizing [Hz]

Range:		Function:
		Use this parameter along with *1-50 Motor Magnetizing at Zero Speed*.
0.0 Hz*	[0.0–10.0 Hz]	Set frequency required for normal magnetizing current. If frequency is set lower than motor slip frequency, *1-50 Motor Magnetizing at Zero Speed* is inactive.

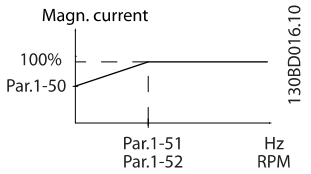


Figure 4.2

1-55 U/f Characteristic - U

Range:		Function:
		This parameter is an array parameter [0–5] and is only functional when *1-01 Motor Control Principle* is set to *[0] U/f*.
0.0 V*	[0.0–999.9 V]	Enter voltage at each frequency point to manually form a U/f characteristic matching motor. Frequency points are defined in *1-56 U/f characteristics - F*.

1-56 U/f Characteristic - F

Range:		Function:
		This parameter is an array parameter [0-5] and is only functional when *1-01 Motor Control Principle* is set to *[0] U/f*.
0.0 Hz*	[0.0–1,000.0 Hz]	Enter frequency points to manually form a U/f characteristic matching motor. Voltage at each point is defined in *1-55 U/f Characteristic - U*. Make a U/f characteristic based on six definable voltages and frequencies, see *Figure 4.3*.

1-56 U/f Characteristic - F

Range:		Function:
		Simplify U/f characteristics by merging 2 or more points (voltages and frequencies), respectively, are set equal.

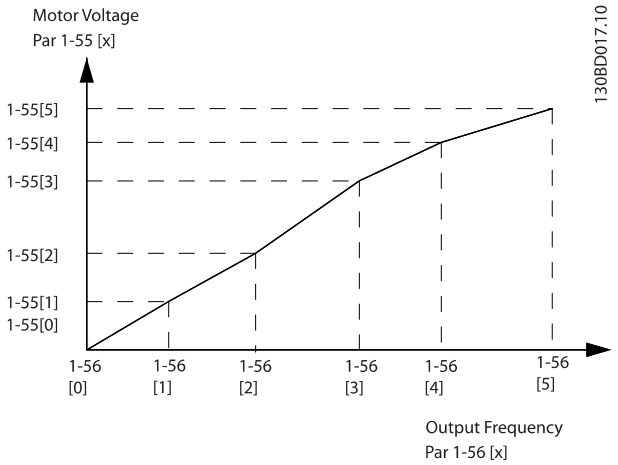


Figure 4.3 U/f Characteristics

NOTE!

For *1-56 U/f characteristics - F* the following applies
[0] ≦ [1] ≦ [2] ≦ [3] ≦ [4] ≦ [5]

4.2.4 1-6* Load Dependent Setting

Parameters for adjusting the load-dependent motor settings.

1-60 Low Speed Load Compensation

Range:		Function:
		Use this parameter to gain an optimum U/f characteristic when running at low speed.
100%*	[0–199%]	Enter the percentage in relation to the load when the motor is running at low speed. The changeover point is automatically calculated based on motor size.

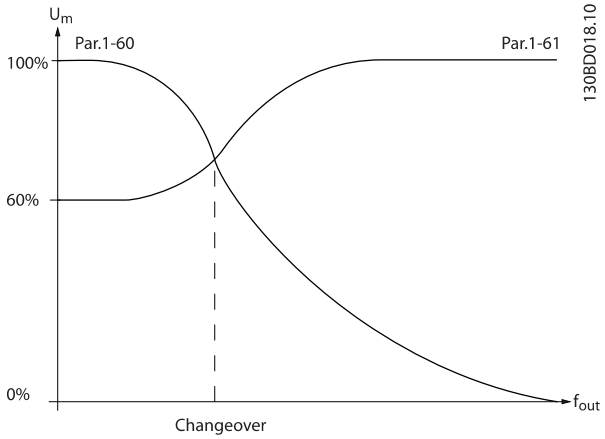


Figure 4.4

1-61 High Speed Load Compensation

Range:		Function:
		Use this parameter to obtain an optimum load compensation when running at high speed.
100%*	[0–199%]	Enter the percentage to compensate in relation to the load when motor is running at high speed. The changeover point is automatically calculated based on motor size.

1-62 Slip Compensation

Range:		Function:
100%*	[-400–399%]	Compensation for load-dependent motor slip. The slip compensation is calculated automatically based on the rated motor speed, $n_{M,N}$. Example: if *1-62 Slip Compensation* is set to 100% and the 4-pole 1,800 RPM motor has an actual nameplate RPM of 1,750 RPM, then 50 RPM is added to the output frequency by the drive. **NOTE! This function is only active when *1-00 Configuration Mode*, is set to *[0] Speed Open-loop* and when *1-01 Motor Control Principle*, is set to *[1] Advanced Vector Control***

1-63 Slip Compensation Time

Range:		Function:
0.10 s	[0.05–5.00 s]	Enter the slip compensation reaction speed. A high value results in a slow reaction whereas a low value results in a quick reaction. If low-frequency resonance problems arise, use a longer time setting.

4.2.5 1-7* Start Adjustments

Considering the need for various start functions in different applications, it is possible to select a number of functions in this parameter group.

1-71 Start Delay

Range:		Function:
		The start delay defines the time to pass from a start command is given until the motor starts accelerating. Setting start delay to 0.0 s disables *1-72 Start Function*, when start command is given.
0.0 s*	[0.0–10.0 s]	Enter the time delay required before commencing acceleration. *1-72 Start Function* is active during *Start delay time*.

1-72 Start Function

Option:		Function:
[0]	DC Hold/Delay Time	Motor is energized with DC holding current (*2-00 DC Hold Current*) during start delay time.
[1]	DC Brake/Delay Time	Motor is energized with DC braking current (*2-01 DC Brake Current*) during start delay time.
[2] *	Coast/Delay Time	Drive is coasted during start delay time (Driveoff).

1-73 Start Mode

Option:		Function:
		The Start Mode parameter is used to catch a spinning motor after, e.g., line drop-out. **NOTE! This function is not suitable for hoisting applications.**
[0] *	Disabled	Catch a spinning load disabled.
[1]	Enabled	Adjustable frequency drive enabled to catch a spinning motor. **NOTE! When flying start is enabled *1-71 Start Delay*, and *1-72 Start Function*, have no function.**

4.2.6 1-8* Stop Adjustments

To meet the need for various stop functions in different applications, these parameters offer some special stop features for the motor.

1-80 Function at Stop

Option:		Function:
		The selected function at stop is active in following situations:

4

1-80 Function at Stop		
Option:		**Function:**
		• Stop command is given and output speed is ramped down to *Min. Speed for Function at Stop*. • Start command is removed (standby), and output speed is ramped down to *Min. Speed for Function at Stop*. • DC brake command is given, and DC brake time has passed. • While running and calculated output speed is below *Min. Speed for Function at Stop*.
[0] *	Coast	The drive is coasted.
[1]	DC hold	The motor is energized with DC current. See *2-00 DC Hold Current* for more information.

1-82 Min. Speed For Function at Stop [Hz]		
Range:		**Function:**
0.0 Hz*	[0.0–20.0 Hz]	Set the speed at which to activate *1-80 Function at Stop*.

4.2.7 1-9* Motor Temperature

With an estimated motor temperature monitor the adjustable frequency drive is able to estimate motor temperature without having a thermistor mounted. It is therefore possible to receive a warning or an alarm if the motor temperature exceeds the upper operational limit.

1-90 Motor Thermal Protection		
Option:		**Function:**
		Using Electronic Overload the motor temperature is calculated based on frequency, speed and time. GE recommends using the Electronic Overload function, if a thermistor is not present. **NOTE!** **calculation is based on motor data from parameter group *1-2* Motor Data*.**
[0] *	No Protection	Disables temperature monitoring.
[1]	Thermistor Warning	A thermistor connected to either digital or analog input gives a warning if upper limit of motor temperature range is exceeded, (see *1-93 Thermistor Resource)*.
[2]	Thermistor Trip	A thermistor connected to either digital or analog input gives an alarm and makes the adjustable frequency drive trip if upper limit of motor temperature range is exceeded, (see *1-93 Thermistor Resource)*.

1-90 Motor Thermal Protection		
Option:		**Function:**
[3]	Electronic Overload Warning	If the calculated upper limit of the motor temperature range is exceeded, a warning is issued.
[4]	Electronic Overload Trip	If 90% of calculated upper limit of motor temperature range is exceeded, an alarm occurs and the adjustable frequency drive trips.

NOTE!

When the electronic overload function has been selected, the drive stores the recorded temperature at power-down; this temperature is resumed at power-up regardless of the elapsed time. Changing *1-90 Motor Thermal Protection* back to *[0] No Protection* will reset the recorded temperature.

1-93 Thermistor Resource		
Option:		**Function:**
		Select the thermistor input terminal.
[0] *	None	No thermistor is connected.
[1]	Analog Input 53	Connect the thermistor to analog input terminal 53. **NOTE!** **Analog input 53 cannot be selected for other purposes when selected as the thermistor resource.**
[6]	Digital input 29	Connect the thermistor to digital input terminal 29. While this input functions as thermistor input, it will not respond to the function chosen in *5-13 Digital Input 29*. The value of *5-13 Digital Input 29* remains however unchanged in parameter database while function is inactive.
		Input Digital/ Analog: Digital; Supply Voltage: 10 V; Threshold Cut-out Values: <800 Ω ⇒ 2.9 kohm Input Digital/ Analog: Analog; Supply Voltage: 10 V; Threshold Cut-out Values: <800 Ω ⇒ 2.9 kohm

Table 4.1

4.3 Parameter Group 2: Brakes

4.3.1 2-** Brakes

4.3.2 2-0* DC Brake

The purpose of the DC brake function is to brake a rotating motor by applying DC current to the motor.

2-00 DC Hold Current

Range:		Function:
		This parameter either holds the motor (holding torque) or pre-heats the motor. The parameter is active if *DC Hold* has been selected in either *1-72 Start Function* or *1-80 Function at Stop*.
50%*	[0–100%]	Enter a value for holding current as a percentage of the rated motor current set in *1-24 Motor Current*. 100% DC holding current corresponds to $I_{M,N}$.

NOTE!

Avoid 100% current for too long as it may overheat the motor.

2-01 DC Brake Current

Range:		Function:
50%*	[0–150%]	Set the DC current needed to brake rotating motor. Activate the DC brake in one of the four following ways: 1. DC brake command, see *5-1* Digital Inputs* choice [5] 2. DC Cut-in function, see *2-04 DC-Brake Cut-in Speed* 3. DC brake selected as start function, see *1-72 Start Function* 4. DC brake in connection with *Flying Start*, *1-73 Flying Start*.

2-02 DC Braking Time

Range:		Function:
		DC braking time defines the period during which *DC brake current* is applied to the motor.
10.0 s*	[0.0–60 s]	Set the time DC braking current, set in *2-01 DC Brake Current*, must be applied.

NOTE!

If DC brake is activated as start function, DC brake time is defined by *holding time*.

2-04 DC Brake Cut-in Speed

Range:		Function:
0.0 Hz*	[0.0–400.0 Hz]	Set DC brake cut-in speed to activate DC braking current, set in *2-01 DC Brake Current*, when ramping down. When set to 0, the function is off.

4.3.3 2-1* Brake Energy Function

Use the parameters in this group for selecting dynamic braking parameters.

2-10 Brake Function

Option:		Function:
		Resistor Brake: The resistor brake limits voltage in the intermediate circuit when the motor acts as a generator. Without the brake resistor, the adjustable frequency drive eventually trips. The resistor brake consumes surplus energy resulting from motor braking. An adjustable frequency drive with brake, stops a motor faster than without a brake, which is used in many applications. Requires the connection of an external brake resistor. An alternative to the resistor brake is the AC brake. **NOTE!** **A resistor brake is only functional in adjustable frequency drives with an integrated dynamic brake. An external resistor must be connected.** **AC Brake:** The AC brake consumes surplus energy by creating power loss in the motor. It is important to keep in mind that an increase in power loss causes the motor temperature to rise.
[0] *	Off	No brake function.
[1]	Resistor Brake	The resistor brake is active.
[2]	AC Brake	AC brake is active.

2-11 Brake Resistor (Ohm)

Range:		Function:
5 Ω*	[5–5,000 Ω]	Set the brake resistor value.

4

2-16 AC Brake, Max Current

Range:		Function:
100.0%*	[0.0–150.0%]	Enter the max. permissible current for AC braking to avoid overheating the motor. 100% equals motor current set in *1-24 Motor Current*.

2-17 Over-voltage Control

Option:		Function:
		Use Over-voltage Control (OVC) to reduce the risk of the adjustable frequency drive tripping due to an overvoltage on the DC link caused by generative power from the load. An overvoltage occurs, e.g., if the ramp-down time is set too short compared to the actual load inertia.
[0] *	Disabled	The OVC is not active/required.
[1]	Enabled, not at stop	OVC is running unless a stop signal is active.
[2]	Enabled	OVC is running, also when a stop signal is active.

NOTE!

If Resistor Brake has been chosen in *2-10 Brake Function*, the OVC is not active even though enabled in this parameter.

4.3.4 2-2* Mechanical Brake

For hoisting applications, an electro-magnetic brake is required. The brake is controlled by a relay, which releases the brake when activated.

The brake activates if the adjustable frequency drive trips or a coast command is given. Furthermore, it activates when motor speed is ramped down below the speed set in *2-22 Active Brake Speed*.

2-20 Release Brake Current

Range:		Function:
0.00 A*	[0.00–100 A]	Select the motor current at which the mechanical brake releases. **⚠CAUTION** **If start delay time has passed, and the motor current is below *Release brake current*, the adjustable frequency drive trips.**

2-22 Activating Mechanical Brake

Range:		Function:
		If the motor is stopped using ramp, the mechanical brake is activated when motor speed is less than *Active Brake Speed*. The motor is ramped down to stop in the following situations: • A start command is removed (stand by) • A stop command is activated • Quick-stop is activated (Q-stop ramp is used)
0 Hz*	[0–400 Hz]	Select motor speed at which mechanical brake activates when ramping down. The mechanical brake automatically activates if the adjustable frequency drive trips or reports an alarm.

4.4 Parameter Group 3: Reference/Ramps

4.4.1 3-** Reference/Ramps

Parameters for reference handling, definition of limitations, and configuring the adjustable frequency drive's reaction to changes

4.4.2 3-0* Reference Limits

Parameters for setting the reference unit, limits and ranges.

3-00 Reference Range

Option:		Function:
		Select the range of reference and feedback signals.
[0] *	Min to Max	Reference setpoint ranges can have positive values only. Select this if running in Process Closed-loop.
[1]	-Max to +Max	Ranges can have both positive and negative values. If potentiometer is used to adjust motor running in both direction, set reference range to –Max Reference to Max Reference by par.=[1] Choose hand on mode by keypad. Adjust the potentiometer to minimum, the motor can run counter-clockwise with max speed. Then adjust the potentiometer to maximum, the motor will ramp down to 0 and run clockwise with max speed.

3-02 Minimum Reference

Range:		Function:
0.00*	[-4,999–4,999]	Enter the value for the minimum reference. The sum of all internal and external references are clamped (limited) to the minimum reference value, *3-02 Minimum Reference*.

3-03 Maximum Reference

Range:		Function:
		Maximum Reference is adjustable in the range Minimum Reference -4,999.
50.00*	[-4,999–4,999]	Enter the value for the maximum reference. The sum of all internal and external references are clamped (limited) to the maximum reference value, *3-03 Maximum Reference*.

4.4.3 3-1* References

Parameters for setting up the reference sources. Select the preset references for the corresponding digital inputs in parameter group, *5-1* Digital Inputs*.

3-10 Preset Reference

Option:		Function:
		Each parameter set-up contains 8 preset references which are selectable via 3 digital inputs or bus.

[18] Bit2	[17] Bit1	[16] Bit0	[16] Bit0
0	0	0	0
0	0	1	1
0	1	0	2
0	1	1	3
1	0	0	4
1	0	1	5
1	1	0	6
1	1	1	7

Table 4.2 Parameter Group 5-1* Digital Inputs Option [16], [17] and [18]

[0.00] *	-100.00–100.00%	Enter the different preset references using array programming. Normally, 100% = value set in *3-03 Maximum Reference*. However, there are exceptions if *3-00 Reference Range* is set to *[0] Min - Max*. Example 1: *3-02 Minimum Reference* is set to 20 and *3-03 Maximum Reference* is set to 50. In this case 0%=0 and 100%=50. Example 2: *3-02 Minimum Reference* is set to -70 and *3-03 Maximum Reference* is set to 50. In this case 0%=0 and 100%=70.

3-11 Jog Speed [Hz]

Range:		Function:
		Jog speed is a fixed output speed and overrules the selected reference speed, see parameter group *5-1* Digital Inputs* option [14]. If the motor is stopped while in jog mode, the jog signal acts as a start signal. Removing the jog signal makes the motor run according to the selected configuration.
5.0 Hz	[0.0–400.0 Hz]	Select speed to function as jog speed.

4

3-12 Catch Up/Slow-down Value

Range:		Function:
0% *	[0–100%]	The *Catch up/Slow-down function* is activated by an input command (see *5-1* Digital Inputs*, choice [28]/[29]). If the command is active, the Catch up/Slow-down value (in %) is added to the reference function as follows: $Reference = Reference + Reference \times \frac{Catch\ up\ Slow\text{-}down}{100}$ $Reference = Reference - Reference \times \frac{Catch\ up\ Slow\text{-}down}{100}$ When the input command is inactivated, the reference returns to its original value i.e., Reference=Reference + 0.

3-14 Preset Relative Reference

Range:		Function:
0.00%	[-100.00–100.00%]	Define fixed value in % to be added to variable value defined in *3-18 Relative Scaling Reference Source*. The sum of fixed and variable values (labeled Y in the figure below) is multiplied with actual reference (labeled X in the figure). This product is added to the actual reference $X + X \times \frac{Y}{100}$

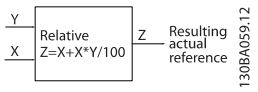


Figure 4.5

3-15 Reference 1 Source

Option:		Function:
		3-15 Reference 1 Source, *3-16 Reference 2 Source* and *3-17 Reference 3 Source* define up to three different reference signals. The sum of these reference signals defines the actual reference.
[0]	No Function	No reference signal is defined.
[1] *	Analog Input 53	Use signals from analog input 53 as reference, see parameter group *6-1* Analog Input 1*.
[2]	Analog Input 60	Use signals from analog input 60 as reference, see parameter group *6-2* Analog Input 2*.
[8]	Pulse input 33	Use signals from pulse input as reference, see parameter group *5-5* Pulse Input*.
[11]	Local Bus Reference	Use signals from local bus as reference, see parameter group *8-9* Bus Feedback*.

3-15 Reference 1 Source

Option:		Function:
[21]	Keypad Potentiometer	Use signals from keypad potentiometer as reference, parameter group *6-8* Keypad Potentiometer*.

3-16 Reference 2 Source

Option:		Function:
		See *3-15 Reference 1 Source* for description.
[0]	No Function	No reference signal is defined.
[1]	Analog Input 53	Use signals from analog input 53 as reference.
[2] *	Analog Input 60	Use signals from analog input 60 as reference.
[8]	Pulse input 33	Use signals from pulse input as reference, see parameter group *5-5* Pulse Input*.
[11]	Local Bus Reference	Use signals from the local bus as reference.
[21]	Keypad Potentiometer	Use signals from keypad potentiometer as reference.

3-17 Reference 3 Source

Option:		Function:
		See *3-15 Reference 2 Source* for description.
[0]	No Function	No reference signal is defined.
[1]	Analog Input 53	Use signals from analog input 53 as reference.
[2]	Analog Input 60	Use signals from analog input 60 as reference.
[8]	Pulse input 33	Use signals from pulse input as reference, see parameter group *5-5* Pulse Input*.
[11] *	Local Bus Reference	Use signals from the local bus as reference.
[21]	Keypad Potentiometer	Use signals from keypad potentiometer as reference.

3-18 Relative Scaling Reference Source

Option:		Function:
		Select the source for a variable value to be added to the fixed value defined in *3-14 Preset Relative Reference*.
[0] *	No Function	The function is disabled
[1]	Analog Input 53	Select analog input 53 as the relative scaling reference source.
[2]	Analog Input 60	Select analog input 60 as relative scaling reference source.
[8]	Pulse Input 33	Select pulse input 33 as the relative scaling reference source.

3-18 Relative Scaling Reference Source		
Option:		**Function:**
[11]	Local Bus Reference	Select local bus ref. as the relative scaling reference source.
[21]	Keypad Potenti-ometer	Select keypad potentiometer as relative scaling reference source.

4.4.4 3-4* Accel/Decel 1

A linear ramp is characterized by ramping up at a constant speed until the desired motor speed has been reached. Some overshoot may be experienced when reaching speed, which may cause speed jerks for a short while before stabilizing.
An S-ramp accelerates more smoothly thus compensating for jerks when the speed is reached.

See *Figure 4.6* for a comparison of the two ramp types.

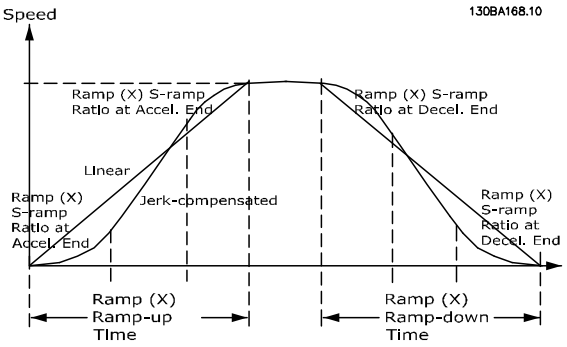


Figure 4.6

Accel/Decel Time
Acceleration time from 0 to nominal motor frequency (*1-23 Motor Frequency*).
Ramp-down: Deceleration time from nominal motor frequency (*1-23 Motor Frequency*) to 0.

Limitation
An Accel time that is too short can result in Torque limit warning (W12) and/or DC overvoltage warning (W7). Ramping is stopped when the adjustable frequency drive has reached Torque limit motor mode (*4-16 Torque Limit in Motor Mode*).
A Decel time that is too short can result in Torque limit warning (W12) and/or DC overvoltage warning (W7). Ramping is stopped when the adjustable frequency drive reaches the Torque limit generator mode (*4-17 Torque Limit in Generator Mode*) and/or the internal DC overvoltage limit.

3-40 Accel/Decel 1 Type		
Option:		**Function:**
[0] *	Linear	Constant acceleration/deceleration.
[2]	S-ramp	Smooth jerk compensated acceleration/ deceleration.

3-41 Accel Time 1		
Range:		**Function:**
Size related*	[0.05–3,600.00 s]	Enter accel time from 0 Hz to rated motor frequency ($f_{M,N}$) set in *1-23 Motor Frequency*. Choose an accel time ensuring that torque limit is not exceeded, see *4-16 Torque Limit in Motor Mode*.

3-42 Decel Time 1		
Range:		**Function:**
Size related*	[0.05–3,600.00 s]	Enter decel time from rated motor frequency ($f_{M,N}$) in *1-23 Motor Frequency* to 0 Hz. Choose a decel time that does not cause overvoltage due to regenerative operation of motor. Furthermore, regenerative torque must not exceed limit set in *4-17 Torque Limit in Generator Mode*.

4.4.5 3-5* Accel/Decel 2

See parameter group *3-4* Ramp 1* for a description of ramp types.

NOTE!

Accel/Decel 2 - alternative ramp times:
Changing from Accel/Decel 1 to Accel/Decel 2 is done via the digital input. See *5-1* Digital Inputs*, option [34].

3-50 Accel/Decel 2 Type		
Option:		**Function:**
[0] *	Linear	Constant acceleration/deceleration.
[2]	S-ramp	Smooth jerk compensated acceleration/ deceleration.

3-51 Accel Time 2		
Range:		**Function:**
Size related*	[0.05–3,600.00 s]	Enter accel time from 0 Hz to rated motor frequency ($f_{M,N}$) set in *1-23 Motor Frequency*. Choose an accel time ensuring that torque limit is not exceeded, see *4-16 Torque Limit in Motor Mode*.

4

3-52 Decel Time 2		
Range:		**Function:**
Size related	[0.05–3,600.00 s]	Enter decel time from rated motor frequency ($f_{M,N}$) in *1-23 Motor Frequency* to 0 Hz. Choose a decel time that does not cause overvoltage due to regenerative operation of motor. Furthermore, regenerative torque must not exceed limit set in *4-17 Torque Limit in Generator Mode*.

4.4.6 3-8* OtherAccel/Decel Ramps

This section contains parameters for Jog and Quick Stop Ramps.

With a Jog Ramp, it is possible to both ramp up and down; it is only possible to ramp down with the Quick Stop Ramp.

3-80 Jog Accel/Decel Time		
Range:		**Function:**
Size related*	[0.05–3,600.00 s]	A linear ramp applicable when Jog is activated. See parameter group *5-1* Digital Inputs*, option [14]. Accel time = Decel time. Jog Ramp time starts upon activation of a jog signal via a selected digital input or serial communication port.

3-81 Quick Stop Decel Time		
Range:		**Function:**
Size related*	[0.05–3,600.00 s]	A linear ramp applicable when Q-stop is activated. See parameter group *5-1* Digital Inputs*, option [4].

4.5 Parameter Group 4: Limits/Warnings

4.5.1 4-** Motor Limits

Parameter group for configuring limits and warning.

4.5.2 4-1* Motor Limits

Use these parameters for defining the speed, torque and current working range for the motor.

4-10 Reverse Lock

Option:		Function:
		If terminals 96, 97 and 98 are connected to U, V and W respectively, the motor runs clockwise when seen from the front. **NOTE!** **This parameter cannot be adjusted while the motor is running.**
[0] *	Reverse Lock	The motor shaft rotates in a forward direction. This setting prevents the motor from running in a reverse direction. If *1-00 Configuration Mode* is set to close-loop control, *4-10 Motor Speed Direction* will be automatically set to clockwise.
[1]	Reverse only	The motor shaft rotates in a reverse direction. This setting prevents the motor from running in a forward direction.
[2] *	Both	With this setting, the motor can run in both directions. However, the output frequency is limited to the range: Motor Speed Low Limit (*4-12 Motor Speed Low Limit*) to Motor Speed High Limit (*4-14 Motor Speed High Limit*). If *1-00 Configuration Mode* is set to open-loop control, *4-10 Motor Speed Direction* will be automatically set to both directions.

4-12 Motor Speed Low Limit

Range:		Function:
0.0 Hz*	[0.0–400.0 Hz]	Set the *Minimum Motor Speed Limit* corresponding to the minimum output frequency of the motor shaft. **NOTE!** **As the minimum output frequency is an absolute value, no deviation can be made from it.**

4-14 Motor Speed High Limit

Range:		Function:
65.0 Hz*	[0.0–400.0 Hz]	Set the *Maximum Motor Speed* corresponding to the maximum output frequency of the motor shaft.

4-14 Motor Speed High Limit

Range:		Function:
		NOTE! **As the maximum output frequency is an absolute value, no deviation can be made from it.**

4-16 Torque Limit in Motor Mode

Range:		Function:
150%*	[0–400%]	Set the torque limit for motor operation. The setting is not automatically reset to default when changing settings in *1-00 Configuration Mode* to *1-25 Load & Motor*.

4-17 Torque Limit in Generator Mode

Range:		Function:
100%*	[0–400%]	Set the torque limit for generator mode operation. The setting is not automatically reset to default when changing settings in *1-00 Configuration Mode* to *1-25 Load & Motor*.

4.5.3 4-4* Adjustable Warnings 2

4-40 Warning Frequency Low

Range:		Function:
0.00 Hz*	[0.0 Hz- Depends on the value of 4-41 Warning Frequency High]	Use this parameter to set a lower limit for the frequency ranges. When the motor speed falls below this limit, the display reads SPEED LOW. Warning bit 10 is set in *16-94 Ext. Status Word*. Output Relay can be configured to indicate this warning. Keypad warning light does not light when this parameter set limit is reached.

4-41 Warning Frequency High

Range:		Function:
400.0 Hz*	[Depend on the value of *4-40 Warning Frequency Low* -400.0 Hz]	Use this parameter to set a higher limit for the frequency ranges. When the motor speed exceeds this limit, the display reads SPEED HIGH. Warning bit 9 is set in *16-94 Ext. Status Word*. Output Relay can be configured to indicate this warning. Keypad warning light does not light when this parameter set limit is reached.

4

4.5.4 4-5* Adjustable Warnings

Parameter group containing adjustable warning limits for current, speed, reference and feedback.

4-50 Warning Current Low

Range:		Function:
		Use this parameter to set a lower limit for the current range. If current drops below the set limit, warning bit 8 is set in *16-94 Ext. Status Word*. Output Relay can be configured to indicate this warning. The keypad warning light does not light when this parameter's set limit is reached.
0.00 A*	[0.00– 26.00 A]	Set the value for the low current limit.

4-51 Warning Current High

Range:		Function:
		Use this parameter to set an upper limit for the current range. If current exceeds the set limit, warning bit 7 is set in *16-94 Ext. Status Word*. Output Relay can be configured to indicate this warning. The keypad warning light does not light when this parameter's set limit is reached.
26.00 A*	[0.00– 26.00 A]	Set the upper current limit.

4-54 Warning Reference Low

Range:		Function:
-4,999.000*	[-4,999.000 - Depends on the value of *4-55 Warning Reference High*]	Use this parameter to set a lower limit for the reference range. When the actual reference falls below this limit, the display reads Reference Low. Warning bit 20 is set in *16-94 Ext. Status Word*. Output Relay can be configured to indicate this warning. Keypad warning light does not light when this parameter set limit is reached.

4-55 Warning Reference High

Range:		Function:
4,999.000*	[Depend on the value of *4-54 Warning Reference Low*- 4,999.000]	Use this parameter to set a higher limit for the reference range. When the actual reference exceeds this limit, the display reads Reference High. Warning bit 19 is set in *16-94 Ext. Status Word*. Output Relay can be configured to indicate this warning. Keypad warning light does not light when this parameter set limit is reached.

4-55 Warning Reference High

Range:		Function:
		indicate this warning. Keypad warning light does not light when this parameter set limit is reached.

4-56 Warning Feedback Low

Range:		Function:
-4,999.000*	[-4,999.000 - Depend on the value of *4-57 Warning Feedback High*]	Use this parameter to set a lower limit for the feedback range. When the feedback falls below this limit, the display reads Feedback Low. Warning bit 6 is set in *16-94 Ext. Status Word*. Output Relay can be configured to indicate this warning. Keypad warning light does not light when this parameter set limit is reached.

4-57 Warning Feedback High

Range:		Function:
4,999.000*	[Depends on the value of *4-56 Warning Feedback Low* -4,999.000]	Use this parameter to set a higher limit for the feedback range. When the feedback exceeds this limit, the display reads Feedback High. Warning bit 5 is set in *16-94 Ext. Status Word*. Output Relay can be configured to indicate this warning. Keypad warning light does not light when this parameter set limit is reached.

4-58 Missing Motor Phase Function

Option:		Function:
		A missing motor phase causes the motor torque to drop. This monitor may be disabled for special purposes (e.g., small motors running in pure U/f mode), but as there is a risk of overheating the motor, GE strongly recommends that the function be *On*. A missing motor phase causes the adjustable frequency drive to trip and report an alarm. **NOTE! This parameter cannot be changed while the motor is running.**
[0]	Off	The function is disabled.
[1] *	On	The function is enabled.

4.5.5 4-6* Jump Frequencies

In some applications, mechanical resonance may occur. Avoid resonance points by creating a Jump frequency. The adjustable frequency drive ramps through the Jump

frequency area thereby passing mechanical resonance points quickly.

4-61 Jump Frequency From [Hz]

Array [2]

Range:		Function:
0.0 Hz*	[0.0–400.0 Hz]	Enter either the lower or upper limit of the speeds to be avoided. It does not matter whether Jump From or Jump To is the upper or lower limit; however, the Jump Frequency function is disabled if the two parameters are set to the same value.

4-63 Jump Frequency To [Hz]

Array [2]

Range:		Function:
0.0 Hz*	[0.0–400.0 Hz]	Enter either the upper or lower limit of the speed area to be avoided. Make sure to enter the **opposite** limit of that in *4-61 Jump Frequency From [Hz]*.

4.6 Parameter Group 5: Digital In/Out

4.6.1 5-** Digital In/Out

The following describes all digital input command functions and signals.

4

4.6.2 5-1* Digital Inputs

Parameters for configuring the functions for the input terminals.
The digital inputs are used for selecting various functions in the adjustable frequency drive. All digital inputs can be set to the following:

[0]	No Operation	The adjustable frequency drive will not react to signals transmitted to the terminal.
[1]	Reset	Reset the adjustable frequency drive after a trip/alarm. Not all alarms can be reset.
[2]	Coast Inverse	Coasting stop, inverted input (NC). The adjustable frequency drive leaves the motor in free mode.
[3]	Coast and reset inv.	Reset and coasting stop inverted input (NC). The adjustable frequency drive resets and leaves the motor in free mode.
[4]	Quick stop inverse	Inverted input (NC). Generates a stop in accordance with the quick-stop ramp time set in *3-81 Quick Stop Ramp Time*. When the motor stops, the shaft is in free mode.
[5]	DC brake inv.	Inverted input for DC braking (NC). Stops motor by energizing it with DC current for a certain time period, see *2-01 DC Brake Current*. Function is only active when value in *2-02 DC Braking Time* is different from 0.
[6]	Stop inv.	Stop inverted function. Generates stop function when the selected terminal goes from logical level "1" to "0". The stop is performed according to the selected ramp time.
[8]	Start	Select start for a start/stop command. 1 = Start, 0 = stop.
[9]	Latched start	The motor starts if a pulse is applied for min. 2 ms. The motor stops when stop inverse is activated.
[10]	Reversing	Change the direction of the motor shaft rotation. Reversing signal only changes the direction of rotation; it does not activate the start function. Select *[2] Both directions* in *4.10 Motor Speed Direction*. 0 = normal, 1 = reversing.
[11]	Start reversing	Use for start/stop and for reversing at the same time. Signals on start [8] are not allowed at the same time. 0 = stop, 1 = start reversing.
[12]	Enable start forward	Use if the motor shaft must rotate clockwise at start.
[13]	Enable start reverse	Use if motor shaft must rotate counter-clockwise at start.
[14]	Jog	Use for activating jog speed. See *3-11 Jog Speed*.
[16]	Preset reference bit 0	Preset reference bit 0, 1 and 2 enables a choice between one of the eight preset references according to below.
[17]	Preset reference bit 1	Same as preset reference bit 0 [16], see *3-10 Preset Reference*.
[18]	Preset reference bit 2	Same as preset reference bit 0 [16].
[19]	Freeze reference	Freeze actual reference. The frozen reference is now the point of enable/condition for Speed up and Slow to be used. If Speed up/down is used, speed change always follows ramp 2 (*3-51 Ramp2 Ramp-up Time* and *3-52 Ramp2 Ramp-down Time*) in the range *3-02 Minimum Reference - 3-03 Maximum Reference*.
[20]	Freeze output	Freeze the actual motor frequency (Hz). The frozen motor frequency is now the point of enable/condition for Speed up and Slow to be used. If Speed up/down is used, the speed change always follows ramp 2 in the range *4-12 Motor Speed Low Limit - 4-14 Motor Speed High Limit*. **NOTE! When freeze output is active, the adjustable frequency drive cannot be stopped via a low *[8] Start* signal. Stop the adjustable frequency drive via a terminal programmed for Coasting Inverse [2] or Coast and reset, inverse [3].**
[21]	Speed up	Select Speed up and Slow if digital control of the up/down speed is desired (motor potentiometer). Activate this function by selecting either Freeze reference or Freeze output. When Speed-up is activated for less than 400 ms, the resulting reference will be increased by 0.1%. If Speed-up is activated for more than 400 ms. the resulting reference will ramp according to ramp 2 in *3-51 Ramp2 Ramp-up Time*.
[22]	Slow	Same as Speed-up [21].
[23]	Set-up select bit 0	Set *0-10 Active set-up* to Multi set-up. Logic 0 = set-up 1, Logic 1 = Set-up 2.

[26]	Precise stop inverse (only terminal 33)	Prolong the stop signal to give a precise stop independent of scan time. The function is available for terminal 33 only.
[27]	Start, precise stop (only terminal 33)	As [26], but including Start.
[28]	Catch up	Select Catch up/Slow-down to increase or reduce the resulting reference value by the percentage set in *3-12 Catch Up/Slow-down Value*
[29]	Slow-down	Same as Catch up [28]
[32]	Pulse input (only terminal 33)	Select Pulse input when using a pulse sequence as either reference or feedback. Scaling is done in parameter group *5-5* Pulse Input*
[34]	Ramp bit 0	Logic 0=Ramp1, see parameter group *3-4* Ramp1* Logic 1=Ramp2, see parameter group *3-5* Ramp2*.
[60]	Counter A (up)	Input for counter A.
[61]	Counter A (down)	Input for counter A.
[62]	Reset counter A	Input for reset of counter A.
[63]	Counter B (up)	Input for counter B.
[64]	Counter B (down)	Input for counter B.
[65]	Reset counter B	Input for reset of counter B.

5-10 Terminal 18 Digital Input

Option:	Function:	
[8] *	Start	Select the function from the available digital input range. See parameter group *5-1* Digital Inputs* for choices.

5-11 Terminal 19 Digital Input

Option:	Function:	
[10] *	Reversing	Select the function from the available digital input range. See parameter group *5-1* Digital Inputs* for choices.

5-12 Terminal 27 Digital Input

Option:	Function:	
[1] *	Reset	Select the function from the available digital input range. See parameter group *5-1* Digital Inputs** for choices.

5-13 Terminal 29 Digital Input

Option:	Function:	
[14] *	Jog	Select the function from the available digital input range. See parameter group *5-1* Digital Inputs* for choices.

5-15 Terminal 33 Digital Input

Option:	Function:	
[16] *	Preset bit 0	Select the function from the available digital input range. See parameter group *5-1* Digital Inputs* for choices.

4.6.3 5-3* Digital Outputs

5-34 On delay, Terminal 42 Digital Output

Range:		Function:
0.01 s*	[0.00–600.00 s]	

5-35 Off delay, Terminal 42 Digital Output

Range:		Function:
0.01 s*	[0.00–600.00 s]	

4.6.4 5-4* Relays

Parameter group for configuring timing and output functions for relays.

[0]	No Operation	Default for all digital and relay outputs.
[1]	Control Ready	The control board receives supply voltage.
[2]	Drive Ready	The adjustable frequency drive is ready for operation and applies supply the signal on the control board.
[3]	Drive Ready, Remote	Adjustable frequency drive is ready for operation in Auto mode.
[4]	Enable/No Warning	The adjustable frequency drive is ready for operation. No start or stop command is given. No warnings are present.
[5]	Drive Running	Motor is running.
[6]	Running/No Warning	Motor runs, and no warning are present.
[7]	Run in Range/No Warning	Motor runs within programmed current ranges, see *4-50 Warning Current Low* and *4-51 Warning Current High*. No warnings are present.
[8]	Run on ref/No Warning	Motor runs at reference speed.
[9]	Alarm	An alarm activates output.
[10]	Alarm on Warning	An alarm or warning activates output.

4

[12]	Out of Current Range	Motor current is outside range set in *4-50 Warning Current Low* and *4-51 Warning Current High*.
[13]	Below Current, low	Motor current is lower than set in *4-50 Warning Current Low*.
[14]	Above Current, high	Motor current is higher than set in *4-51 Warning Current High*.
[16]	Below Frequency, low	Motor speed is lower than set in *4-40 Warning Frequency Low*.
[17]	Above Frequency, high	Motor speed is higher than set in *4-41 Warning Frequency High*.
[19]	Below Feedback, low	Feedback is lower than set in *4-56 Warning Feedback Low*.
[20]	Above Feedback, high	Feedback is higher than set in *4-57 Warning Feedback High*.
[21]	Thermal Warning	A thermal warning is present when the temperature exceeds the limit in the motor, adjustable frequency drive, brake resistor or thermistor.
[22]	Ready, No Thermal Warning	The adjustable frequency drive is ready for operation and no overtemperature warning is present.
[23]	Remote Ready, No Thermal Warning	The adjustable frequency drive is ready for operation in auto mode, and no overtemperature warning is present.
[24]	Ready, Voltage OK	The adjustable frequency drive is ready for operation and AC line voltage is within the specified voltage range.
[25]	Reverse	Motor runs/is ready to run clockwise when logic = 0 and counter-clockwise when logic = 1. Output changes as soon as reversing signal is applied.
[26]	Bus OK	Active communication (no timeout) via serial communication port.
[28]	Brake, No Warn	Brake is active, and no warnings are present.
[29]	Brake Ready/No Fault	Brake is ready for operation, and no faults are present.
[30]	Brake Fault (IGBT)	Protects the adjustable frequency drive if a fault on the brake modules is present. Use the relay to cut out line power voltage from the adjustable frequency drive.
[32]	Mech. Brake Control	Enables control of external mechanical brake, see parameter group *2-2* Mechanical Brake*.
[36]	Control Word Bit 11	Bit 11 in the control word controls the relay.
[41]	Below Reference, low	Reference is lower than set in *4-54 Warning Reference Low*.
[42]	Above Reference, high	Reference is higher than set in *4-55 Warning Reference High*.
[51]	Local Reference Active	
[52]	Remote Reference Active	
[53]	No Alarm	
[54]	Start Cmd Active	
[55]	Running Reverse	
[56]	Drive in Hand Mode	
[57]	Drive in Auto Mode	
[60]	Comparator 0	See parameter group *13-1* Comparators*. If comparator 0 is evaluated as TRUE, output goes high. Otherwise, it is low.
[61]	Comparator 1	See parameter group *13-1* Comparators*. If comparator 1 is evaluated as TRUE, output goes high. Otherwise, it is low.
[62]	Comparator 2	See parameter group *13-1* Comparators*. If comparator 2 is evaluated as TRUE, output goes high. Otherwise, it is low.
[63]	Comparator 3	See parameter group *13-1* Comparators*. If comparator 3 is evaluated as TRUE, output goes high. Otherwise, it is low.
[70]	Logic Rule 0	See parameter group *13-4* Logic Rules*. If logic rule 1 is evaluated as TRUE, output goes high. Otherwise, it is low.
[71]	Logic Rule 1	See parameter group *13-4* Logic Rules*. If logic rule 2 is evaluated as TRUE, output goes high. Otherwise, it is low.
[72]	Logic Rule 2	See parameter group *13-4* Logic Rules*. If logic rule 3 is evaluated as TRUE, output goes high. Otherwise, it is low.
[73]	Logic Rule 3	See parameter group *13-4* Logic Rules*. If logic rule 3 is evaluated as TRUE, output goes high. Otherwise, it is low.
[81]	Logic Controller Digital Output B	See *13-52 Logic Controller Action*. When Logic Controller Action *[39] Set dig. out. A high* is executed, input goes high. When Smart Logic Action *[33] Set dig. out. A low* is executed, input goes low.

5-40 Function Relay

Option:		Function:
[0] *	No Operation	Select function from available relay output range.

5-41 On delay, Relay

Option:		Function:
[0.01 s] *	[0.00–600.00 s]	Enter the delay of the relay cut-in time. If the Selected Event condition changes before the On delay timer expires, the relay output is unaffected. The function to control the relay see *5-40 Function Relay*.

5-42 Off delay, Relay		
Option:		**Function:**
[0.01 s] *	[0.00–600.00 s]	Enter the delay of the relay cut-off time. If the Selected Event condition changes before the off delay timer expires, the relay output is unaffected. The function to control the relay see *5-40 Function Relay*.

4.6.5 5-5* Pulse Input

Set *5-15 Terminal 33 Digital Input* to choice *[32] pulse input*. Now terminal 33 handles a pulse input in the range from Low frequency, *5-55 Terminal 33 Low Frequency*, to *5-56 Terminal 33 High Frequency*. Scale frequency input via *5-57 Terminal 33 Low Ref./Feedb. Value* and *5-58 Terminal 33 High Ref./Feedb. Value*.

5-55 Terminal 33 Low Frequency		
Range:		**Function:**
20 Hz*	[20-4,999 Hz]	Enter low frequency corresponding to low motor shaft speed (i.e., low reference value) in *5-57 Terminal 33 Low Ref./Feedb. Value*.

5-56 Terminal 33 High Frequency		
Range:		**Function:**
5,000 Hz*	[21-5,000 Hz]	Enter high frequency corresponding to high motor shaft speed (i.e., high reference value) in *5-58 Terminal 33 High Ref./Feedb. Value*.

5-57 Terminal 33 Low Ref./Feedb. Value		
Range:		**Function:**
0.000*	[-4,999–4,999]	Set reference/feedback value corresponding to low pulse frequency value set in *5-55 Terminal 33 Low Frequency*.

5-58 Terminal 33 High Ref./Feedb. Value		
Range:		**Function:**
50.000*	[-4,999–4,999]	Set reference/feedback value corresponding to high pulse frequency value set in *5-56 Terminal 33 High Frequency*.

4.7 Parameter Group 6: Analog In/Out

4.7.1 6-** Analog In/Out

Parameter group for configuring analog inputs and outputs.

4

4.7.2 6-0* Analog I/O Mode

Parameter group for setting up the analog I/O configuration.

6-00 Live Zero Timeout Time

Range:		Function:
		The live zero function is used for monitoring the signal on an analog input. If the signal disappears, a *Live Zero* warning is reported.
10 s*	[1–99 s]	Set delay time before *Live Zero Timeout Function* is applied (*6-01 Live Zero Timeout Time*). If the signal reappears during the set delay, timer will be reset. When live zero is detected, the adjustable frequency drive freezes output frequency and starts *Live Zero Timeout* timer.

6-01 Live Zero Timeout Function

Option:		Function:
		Function is activated if input signal is below 50% of value set in *6-10 Terminal 53 Low Voltage*, *6-12 Terminal 53 Low Current* or *6-22 Terminal 60 Low Current*.
[0] *	Off	The function is disabled.
[1]	Freeze output	Output frequency remains at the value it had when live zero was detected.
[2]	Stop	Adjustable frequency drive decels down to 0 Hz. Remove live zero error condition before restarting the adjustable frequency drive.
[3]	Jogging	Adjustable frequency drive accels to jog speed, see *3-11 Jog Speed*.
[4]	Max Speed	Adjustable frequency drive accels to Motor Speed High Limit, see *4-14 Motor Speed High Limit*.
[5]	Stop and Trip	Adjustable frequency drive decels down to 0 Hz and then trips. Remove live zero condition and activate reset before restarting the adjustable frequency drive.

4.7.3 6-1* Analog Input 1

Parameters for configuring scaling and limits for analog input 1 (terminal 53).

NOTE!

Micro switch 4 in position U:
***6-10 Terminal 53 Low Voltage* and *6-11 Terminal 53 High Voltage* are active.**
Micro switch 4 in position I:
***6-12 Terminal 53 Low Current* and *6-13 Terminal 53 High Current* are active.**

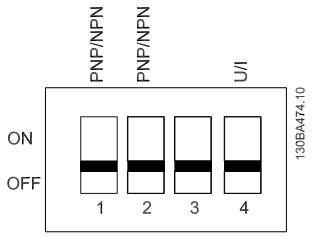


Figure 4.7

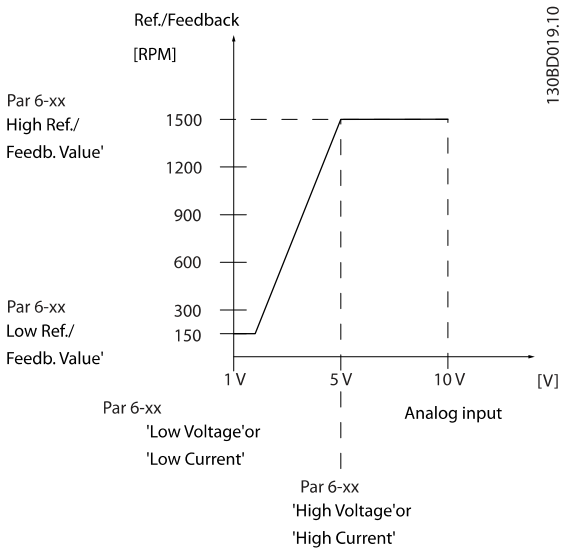


Figure 4.8

6-10 Terminal 53 Low Voltage

Range:		Function:
		This scaling value should correspond to minimum reference value set in *6-14 Terminal 53 Low Ref./Feedb. Value*. See also *4.4 Parameter Group 3: Reference/Ramps*.
0.07 V*	[0.00–9.90 V]	Enter the low voltage value.

ACAUTION

The value must be set to min. 1 V in order to activate the Live Zero Timeout function in *6-01 Live Zero Timeout Function*.

6-11 Terminal 53 High Voltage

Range:		Function:
		This scaling value should correspond to maximum reference value set in *6-15 Terminal 53 High Ref./Feedb. Value*.
10.0 V*	[0.10–10.00 V]	Enter the high voltage value.

6-12 Terminal 53 Low Current

Range:		Function:
		This reference signal should correspond to minimum reference value set in *6-14 Terminal 53 Low Ref./ Feedb. Value*.
0.14 mA*	[0.00–19.90 mA]	Enter the low current value.

CAUTION

The value must be set to min. 2 mA in order to activate the Live Zero Timeout function in *6-01 Live Zero Timeout Function*.

6-13 Terminal 53 High Current

Range:		Function:
		This reference signal should correspond to the maximum reference value set in *6-15 Terminal 53 High Ref./Feedb. Value*.
20.00 mA*	[0.10–20.00 mA]	Enter the high current value.

6-14 Terminal 53 Low Ref./Feedb. Value

Range:		Function:
		The scaling value corresponding to the low voltage/low current set in *6-10 Terminal 53 Low Voltage* and *6-12 Terminal 53 Low Current*.
0.000*	[-4,999–4,999]	Enter the analog input scaling value.

6-15 Terminal 53 High Ref./Feedb. Value

Range:		Function:
		The scaling value corresponding to the high voltage/high current set in *6-11 Terminal 53 High Voltage* and *6-13 Terminal 53 High Current*.
50.000*	[-4,999.000–4,999.000]	Enter the analog input scaling value.

6-16 Terminal 53 Filter Time Constant

Range:		Function:
		A first-order digital low pass filter time constant for suppressing electrical noise in terminal 53. A high time constant value improves dampening but also increases the time delay through the filter.
0.01 s*	[0.01–10.00 s]	Enter the time constant.

6-19 Terminal 53 Mode

Option:		Function:
		Select the input to be present on terminal 53. **CAUTION** ***6-19 Terminal 53 Mode* MUST be set according to Micro switch 4 setting.**
[0] *	Voltage Mode	
[1]	Current Mode	

4.7.4 6-2* Analog Input 2

Parameters for configuring scaling and limits for analog input 2, terminal 60.

6-22 Terminal 60 Low Current

Range:		Function:
		This reference signal should correspond to minimum reference value set in *6-24 Terminal 60 Low Ref./ Feedb. Value*.
0.14 mA*	[0.00–19.90 mA]	Enter the low current value.

CAUTION

The value must be set to min. 2 mA in order to activate the Live Zero Timeout function in *6-01 Live Zero Timeout Time*.

6-23 Terminal 60 High Current

Range:		Function:
		This reference signal should correspond to the high current value set in *6-25 Terminal 60 High Ref./ Feedb. Value*.
20.00 mA*	[0.10–20.00 mA]	Enter the high current value.

6-24 Terminal 60 Low Ref./Feedb. Value

Range:		Function:
		The scaling value corresponding to the low current set in *6-22 Terminal 60 Low Current*.
0.000*	[-4,999–4,999]	Enter the analog input scaling value.

4

6-25 Terminal 60 High Ref./Feedb. Value		
Range:		**Function:**
		The scaling value corresponding to the high current set in *6-23 Terminal 60 High Current*.
50.00*	[-4,999–4,999]	Enter the analog input scaling value.

6-26 Terminal 60 Filter Time Constant		
Range:		**Function:**
		A first-order digital low pass filter time constant for suppressing electrical noise in terminal 60. A high time constant value improves dampening, but also increases the time delay through the filter. **NOTE!** **This parameter cannot be changed while the motor is running.**
0.01 s*	[0.01–10.00 s]	Enter the time constant.

4.7.5 6-8* Keypad Potentiometer

The keypad potentiometer can be selected either as Reference Resource or Relative Reference Resource.

NOTE!

In Hand mode, the keypad potentiometer functions as local reference.

6-80 Keypad Potmeter Enable		
Option:		**Function:**
		If keypad Potmeter is disabled, [▲] [▼] can adjust local reference, and Potmeter value does not give any reference in Auto/Hand mode.
[0]	Disabled	
[1] *	Enable	

6-81 Keypad Potentiometer Low Ref. Value		
Range:		**Function:**
		The scaling value corresponding to 0.
0.000*	[-4,999–4,999]	Enter the low reference value. The reference value corresponding to the potentiometer turned fully counter-clockwise (0 degrees).

6-82 Keypad Potentiometer High Ref. Value		
Range:		**Function:**
		The scaling value corresponding to the maximum reference feedback value set in *3-03 Maximum Reference*.
50.00*	[-4,999–4,999]	Enter the high reference value.

6-82 Keypad Potentiometer High Ref. Value		
Range:		**Function:**
		The reference value corresponding to the potentiometer turned fully clockwise (200 degrees).

4.7.6 6-9* Analog Output

These parameters are for configuring the analog outputs of the adjustable frequency drive.

6-90 Terminal 42 Mode

Option:		Function:
[0] *	0-20 mA	Range for analog outputs is 0-20 mA
[1]	4-20 mA	Range for analog outputs is 4-20 mA
[2]	Digital output	Functions as slow reacting digital output. Set value to either 0 mA (off) or 20 mA (on), see *6-92 Terminal 42 Digital Output*.

6-91 Terminal 42 Analog Output

Option:		Function:
		Select the function for terminal 42 as an analog output.
[0] *	No Operation	
[10]	Output Frequency [0–100 Hz]	
[11]	Reference (REF min-max)	*3-02 Minimum Reference* to *3-03 Minimum Reference*.
[12]	Feedback (FB min-max)	
[13]	Motor Current (0-I_{max})	*16-37 Inv. Max. Current* is I_{max}.
[16]	Power (0-P_{nom})	*1-20 Motor Power* is P_{nom} (motor).
[19]	DC Link Voltage (0–1000 V)	
[20]	Bus Reference [0.0%–100.0%]	The analog output will follow the reference value set on the RS-485 bus.

6-92 Terminal 42 Digital Output

Option:		Function:
		See parameter group *5-4* Relays*, for choices and descriptions.
[0] *	No Operation	
[80]	Logic Controller Digital Output A	See *13-52 Logic Controller Action*. When Logic Controller Action *[38] Set dig. out. A high* is executed, input goes high. When Smart Logic Action *[32] Set dig. out. A low* is executed, input goes low.

4

6-93 Terminal 42 Output Min. Scale

Range:		Function:
0.00%	[0.00–200.0%]	Scale minimum output of selected analog signal at terminal 42 as percentage of maximum signal value, e.g., if 0 mA (or 0 Hz) is desired at 25% of maximum output value, program 25%. Scaling values up to 100% can never be higher than corresponding setting in *6-94 Terminal 42 Output Min. Scale*.

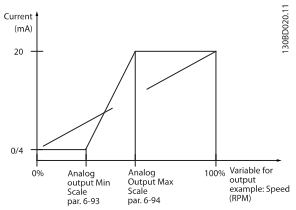


Figure 4.9

6-94 Terminal 42 Output Max. Scale

Range:		Function:
100.00%*	[0.00–200.00%]	Scale the maximum output of the selected analog signal on terminal 42. Set the value to the maximum value of the current signal output. Scale the output to give a current lower than 20 mA at full scale; or 20 mA at an output below 100% of maximum signal value. If 20 mA is the desired output current at a value between 0–100% of the full-scale output, program the percentage value in the parameter, e.g., 50% = 20 mA. If a current between 4 and 20 mA is desired at maximum output (100%), calculate the percentage value as follows: $\frac{20\ mA}{desired\ maximum\ current} \times 100\,\%$ i.e., $10\ mA = \frac{20}{10} \times 100 = 200\,\%$

4.8 Parameter Group 7: Controllers

4.8.1 7-** Controllers

Parameter group for configuring application controls.

4.8.2 7-2* Process Ctrl. Feedback

Select feedback sources and handling for Process PI Control.

NOTE!

Set *3-15 Reference 1 Source* to *[0] No Function* in order to use Analog Input as a feedback signal.
In order to use analog input as a feedback resource, do not use the same resource as reference resource in 3-15, 3-16 and 3-17.

7-20 Process CL Feedback Resources

Option:		Function:
		Select the input to function as a feedback signal.
[0] *	No Function	
[1]	Analog Input 53	
[2]	Analog Input 60	
[8]	Pulse Input 33	
[11]	Local Bus Ref.	

4.8.3 7-3* Process PI Control

7-30 Process PI Normal/Inverse Control

Option:		Function:
[0] *	Normal	Feedback greater than the setpoint results in a speed reduction. Feedback less than the setpoint results in a speed increase.
[1]	Inverse	Feedback greater than the setpoint results in a speed increase. Feedback less than the setpoint results in a speed reduction.

7-31 Process PI Anti Windup

Option:		Function:
[0]	Disable	Regulation of a given error will continue even when the output frequency cannot be increased/ decreased.
[1] *	Enable	PI controller stops regulating a given error when the output frequency cannot be increased/ decreased.

7-32 Process PI Start Speed

Range:		Function:
0.0 Hz*	[0.0–200.0 Hz]	Until the set motor speed has been reached, the adjustable frequency drive operates in open-loop mode.

7-33 Process PI Proportional Gain

Option:		Function:
[0.01] *	0.00–10.00	Enter the value for the P proportional gain, i.e., the multiplication factor of the error between the setpoint and the feedback signal. **NOTE!** **0.00 = Off.**

7-34 Process PI Integral Time

Range:		Function:
9,999.00 s*	[0.10–9,999.00 s]	The integrator provides an increasing gain at a constant error between the setpoint and the feedback signal. The integral time is the time needed by the integrator to reach the same gain as the proportional gain.

7-38 Process Feed Forward Factor

Range:		Function:
0%*	[0–400%]	The FF factor sends a part of the reference signal around the PI controller which then only affects part of the control signal. By activating the FF factor, less overshoot and high dynamics are gained when changing the setpoint. This parameter is always active when *1-00 Configuration Mode* is set to *[3] Process*.

7-39 On Reference Bandwidth

Range:		Function:
5%	[0–200%]	Enter the value for the On Reference Bandwidth. The PI control error is the difference between the setpoint and the feedback and when this is less than the value set in this parameter, the On Reference is active.

4.9 Parameter Group 8: Communication

4.9.1 8-** Communication

Parameter group for configuring communication.

4

4.9.2 8-0* General Settings

Use this parameter group for configuring the general settings for communication.

8-01 Control Site

Option:		Function:
[0] *	Digital and Control Word	Use both the digital input and the control word as control.
[1]	Digital Only	Use the digital input as control.
[2]	Control Word Only	Use control word only as control. **NOTE!** **The setting in this parameter overrules settings in *8-50 Coasting Select* to *8-56 Preset Reference Select*.**

8-02 Control Word Source

Option:		Function:
[0]	None	Function is inactive
[1] *	Drive RS-485	Monitoring control word source is done via serial communication port RS-485.

8-03 Control Word Timeout Time

Range:		Function:
1.0 s*	[0.1–6500 s]	Enter time to pass before control word timeout function (*8-04 Control Word Timeout Function*) must be carried out.

8-04 Control Word Timeout Function

Option:		Function:
		Select the action to be taken in case of a timeout.
[0] *	Off	No function
[1]	Freeze Output	Freeze output until communication resumes.
[2]	Stop	Stop with auto-restart when communication resumes.
[3]	Jogging	Run motor at jog frequency until communication resumes.
[4]	Max. Speed	Run motor at max. frequency until communication resumes.
[5]	Stop and Trip	Stop motor, then reset adjustable frequency drive in order to restart either via keypad or digital input.

8-06 Reset Control Word Timeout

Option:		Function:
		Resetting the control word timeout will remove any timeout function.
[0] *	No Function	Control word timeout is not a reset.
[1]	Do Reset	Control word timeout is reset, and parameter goes into *[0] No Function* state.

4.9.3 8-3* GE Drive Port Settings

Parameters for configuring the GE Drive Port.

8-30 Protocol

Option:		Function:
		Select the protocol to be used. Note that changing the protocol will not be effective until after powering off the adjustable frequency drive.
[0] *	GE Drive Protocol	
[2]	Modbus RTU	

8-31 Address

Range:		Function:
		Select the address for the bus.
1*	[1 - Protocol-dependent]	Drive bus range is 1–126. Modbus range is 1-247.

8-32 Drive Port Baud Rate

Option:		Function:
		Select baud rate for Drive Port. **NOTE!** **Changing the baud rate will be effective after responding to any ongoing bus requests.**
[0]	2,400 Baud	
[1]	4,800 Baud	
[2] *	9,600 Baud	When choosing GE Drive Protocol in 8-30
[3] *	19,200 Baud	When choosing Modbus in 8-30
[4]	38,400 Baud	

8-33 Drive Port Parity

Option:		Function:
		This parameter only affects Modbus as the Drive bus always has even parity.
[0] *	Even Parity (1 stopbit)	
[1]	Odd parity	
[2]	No Parity (1 stopbit)	Select this for Modbus RTU
[3]	No Parity (2 stopbits)	

8-35 Minimum Response Delay

Range:		Function:
0.010 s*	[0.001–0.500 s]	Specify minimum delay time between receiving a request and transmitting a response.

8-36 Max Response Delay

Range:		Function:
5.000 s*	[0.010–10.00 s]	Specify maximum permissible delay time between transmitting a request and receiving a response. Exceeding this time delay causes a control word timeout.

4.9.4 8-4* Drive MC Protocol Set

8-43 Drive Port PCD Read Configuration

Array [16]

Option:		Function:
[0] *	None	
[1]	1500 Operation Hours	
[2]	1501 Running Hours	
[3]	1502 kWh Counter	
[4]	1600 Control Word	
[5]	1601 Reference [Unit]	
[6]	1602 Reference %	
[7]	1603 Status Word	
[8]	1605 Main Actual Value [%]	
[9]	1609 Custom Readout	
[10]	1610 Power [kW]	
[11]	1611 Power [hp]	
[12]	1612 Motor Voltage	
[13]	1613 Frequency	
[14]	1614 Motor Current	
[15]	1615 Frequency [%]	
[16]	1618 Motor Thermal	
[17]	1630 DC Link Voltage	
[18]	1634 Heatsink Temp.	
[19]	1635 Inverter Thermal	
[20]	1638 Logic Controller State	
[21]	1650 External Reference	
[22]	1651 Pulse Reference	
[23]	1652 Feedback [Unit]	
[24]	1660 Digital Input 18,19,27,33	
[25]	1661 Digtial Input 29	
[26]	1662 Analog Input 53(V)	
[27]	1663 Analog Input 53(mA)	
[28]	1664 Analog Input 60	
[29]	1665 Analog Output 42 [mA]	
[30]	1668 Freq. Input 33 [Hz]	
[31]	1671 Relay Output [bin]	
[32]	1672 Counter A	
[33]	1673 Counter B	
[34]	1690 Alarm Word	
[35]	1692 Warning Word	
[36]	1694 Ext. Status Word	
		Select the parameters to be assigned to PCD's of messages. The number of available PCDs depends on the messages. This table is not for *[0] array* and *[1] array*. For these two arrays, index 1 is fixed to [7] and index 2 is fixed to [8]. These two arrays cannot be changed by end user.

4.9.5 8-5* Digital/Bus

Parameters for configuring control word digital/bus merging.

NOTE!

Parameters are only active when *8-01 Control Site*, is set to *[0] Digital and control word*.

8-50 Coasting Select

Option:		Function:
		Select control of the coasting function via digital input and/or bus.
[0]	Digital Input	Activation via a digital input.
[1]	Bus	Activation via serial communication port.
[2]	LogicAnd	Activation via serial communication port and a digital input.
[3] *	LogicOr	Activation via serial communication port or a digital input.

8-51 Quick Stop Select

Option:		Function:
		Select control of the quick stop function via digital input and/or bus.
[0]	Digital Input	Activation via a digital input.
[1]	Bus	Activation via the serial communication port.
[2]	LogicAnd	Activation via the serial communication port and a digital input.
[3] *	LogicOr	Activation via the serial communication port or a digital input.

4

8-52 DC Brake Select

Option:		Function:
		Select control of the DC brake via digital input and/or bus.
[0]	Digital Input	Activation via a digital input.
[1]	Bus	Activation via the serial communication port.
[2]	LogicAnd	Activation via the serial communication port and a digital input.
[3] *	LogicOr	Activation via the serial communication port or a digital input.

8-53 Start Select

Option:		Function:
		Select control of the start function via digital input and/or bus.
[0]	Digital Input	Activation via a digital input.
[1]	Bus	Activation via the serial communication port.
[2]	LogicAnd	Activation via the serial communication port and a digital input.
[3] *	LogicOr	Activation via the serial communication port or a digital input.

8-54 Reversing Select

Option:		Function:
		Select control of the reversing function via digital input and/or bus.
[0]	Digital Input	Activation via a digital input.
[1]	Bus	Activation via the serial communication port.
[2]	LogicAnd	Activation via the serial communication port and a digital input.
[3] *	LogicOr	Activation via the serial communication port or a digital input.

8-55 Set-up Select

Option:		Function:
		Select control of the set-up selection via digital input and/or bus.
[0]	Digital Input	Activation via a digital input.
[1]	Bus	Activation via the serial communication port.
[2]	LogicAnd	Activation via the serial communication port and a digital input.
[3] *	LogicOr	Activation via the serial communication port or a digital input.

8-56 Preset Reference Select

Option:		Function:
		Select control of the Preset Reference selection via digital input and/or bus.
[0]	Digital Input	Activation via a digital input.
[1]	Bus	Activation via serial communication port.
[2]	LogicAnd	Activation via serial communication port and a digital input.
[3] *	LogicOr	Activation via serial communication port or a digital input.

4.9.6 8-8* Bus communication diagnostics

These parameters are used for monitoring the bus communication via the port.

8-80 Bus Message Count

Range:		Function:
0 N/A*	[0–0 N/A]	This parameter shows the number of valid messages detected on the bus.

8-81 Bus Error Count

Range:		Function:
0 N/A*	[0–0 N/A]	This parameter shows the number of messages with faults (e.g., CRC fault), detected on the bus.

8-82 Slave Messages Rcvd

Range:		Function:
0 N/A*	[0–0 N/A]	This parameter shows the number of valid messages addressed to the slave, sent by the adjustable frequency drive.

8-83 Slave Error Count

Range:		Function:
0 N/A*	[0–0 N/A]	This parameter shows the number of error messages, which could be executed by the adjustable frequency drive.

4.9.7 8-9* Bus Feedback

Parameter for configuring bus feedback.

8-94 Bus Feedback 1

Range:		Function:
0*	[0x8000–0x7FFF]	Bus feedback is delivered via Drive or Modbus by writing the feedback value into this parameter.

4.10 Parameter Group 13: Logic Controller

4.10.1 13-** Programming Features

Logic Controller is a sequence of user-defined actions (*13-52 Logic Controller Action* [X]) executed by the Logic Controller when the associated user-defined event (*13-51 Logic Controller Event* [X]) is set to *True*.

Events and actions are linked in pairs, meaning that when an event is true, the linked action is carried out. After this, the next event is evaluated and its associated action carried out and so on. Only one event is evaluated at a time.

If an event is evaluated as *False*, the Logic Controller takes no action during the scan interval and no other events are evaluated.

It is possible to program from 1 to 20 events and actions. When the last event/action has been executed, the sequence starts again from event/action [0].

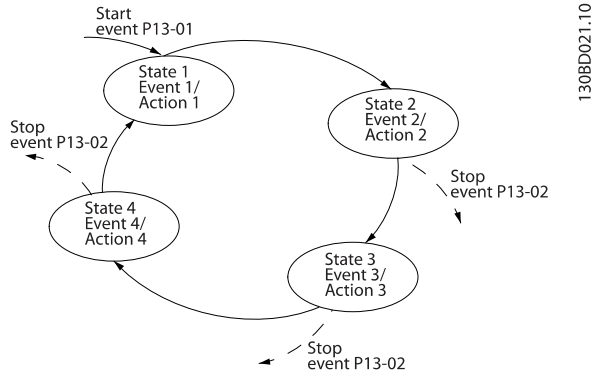


Figure 4.10 Example with Three Events/Actions

Starting and stopping the Logic Controller
Start the Logic Controller by selecting *[1] On* in *13-00 Logic Controller Mode,* The Logic Controller starts evaluating Event 0, and if this is evaluated as TRUE, the Logic Controller continues its cycle.

The Logic Controller stops when the *Stop Event*, *13-02 Stop Event*, is TRUE. The Logic Controller can also be stopped by selecting *[0] Off* in *13-00 Logic Controller Mode*.

To reset all Logic Controller parameters select *[1] Reset Logic Controller* in *13-03 Reset Logic Controller* and start programming from scratch.

4.10.2 13-0* Logic Controller Settings

Use Logic Controller settings to activate, deactivate and reset the Logic Controller.

13-00 Logic Controller Mode

Option:		Function:
[0] *	Off	The function is disabled.
[1]	On	Logic Controller is active.

13-01 Start Event

Option:		Function:
		Select input to activate Logic Controller.
[0]	False	Enters *False* in the logic rule.
[1]	True	Enters *True* in the logic rule.
[2]	Running	See parameter group *5-4* Relays* [5] for description.
[3]	InRange	See parameter group *5-4* Relays* [7] for description.
[4]	OnReference	See parameter group *5-4* Relays* [8] for description.
[7]	Out of Current Range	See parameter group *5-4* Relays* [12] for description.
[8]	BelowILow	See parameter group *5-4* Relays* [13] for description.
[9]	AboveIHigh	See parameter group *5-4* Relays* [14] for description.
[16]	ThermalWarning	See parameter group *5-4* Relays* [21] for description.
[17]	MainsOutOfRange	AC line voltage is outside the specified voltage range.
[18]	Reversing	See parameter group *5-4* Relays* [25] for description.
[19]	Warning	A warning is active.
[20]	Alarm_Trip	A trip alarm is active.
[21]	Alarm_TripLock	A trip lock alarm is active.
[22]	Comparator 0	Use result of comparator 0 in the logic rule.
[23]	Comparator 1	Use result of comparator 1 in the logic rule.
[24]	Comparator 2	Use result of comparator 2 in the logic rule.
[25]	Comparator 3	Use result of comparator 3 in the logic rule.
[26]	LogicRule 0	Use result of logic rule 0 in the logic rule.
[27]	LogicRule 1	Use result of logic rule 1 in the logic rule.
[28]	LogicRule 2	Use result of logic rule 2 in the logic rule.
[29]	LogicRule 3	Use result of logic rule 3 in the logic rule.

4

13-01 Start Event

Option:		Function:
[33]	DigitalInput_18	Use value of DI 18 in the logic rule.
[34]	DigitalInput_19	Use value of DI 19 in the logic rule.
[35]	DigitalInput_27	Use value of DI 27 in the logic rule.
[36]	DigitalInput_29	Use value of DI 29 in the logic rule.
[38]	DigitalInput_33	
[39] *	StartCommand	This event is *True* if the adjustable frequency drive is started by any means (digital input or other).
[40]	DriveStopped	This event is *True* if the adjustable frequency drive is stopped or coasted by any means (digital input or other).

13-02 Stop Event

Option:		Function:
		Select input to activate Logic Controller.
[0]	False	Enters *False* in the logic rule.
[1]	True	Enters *True* in the logic rule.
[2]	Running	See parameter group *5-4* Relays* [5] for description.
[3]	InRange	See parameter group *5-4* Relays* [7] for description.
[4]	OnReference	See parameter group *5-4* Relays* [8] for description.
[7]	Out of Current Range	See parameter group *5-4* Relays* [12] for description.
[8]	BelowILow	See parameter group *5-4* Relays* [13] for description.
[9]	AboveIHigh	See parameter group *5-4* Relays* [14] for description.
[16]	ThermalWarning	See parameter group *5-4* Relays* [21] for description.
[17]	MainsOutOfRange	AC line voltage is outside the specified voltage range.
[18]	Reversing	See parameter group *5-4* Relays* [25] for description.
[19]	Warning	A warning is active.
[20]	Alarm_Trip	A trip alarm is active.
[21]	Alarm_TripLock	A trip lock alarm is active.
[22]	Comparator 0	Use result of comparator 0 in the logic rule.
[23]	Comparator 1	Use result of comparator 1 in the logic rule.
[24]	Comparator 2	Use result of comparator 2 in the logic rule.
[25]	Comparator 3	Use result of comparator 3 in the logic rule.
[26]	LogicRule 0	Use result of logic rule 0 in the logic rule.

13-02 Stop Event

Option:		Function:
[27]	LogicRule 1	Use result of logic rule 1 in the logic rule.
[28]	LogicRule 2	Use result of logic rule 2 in the logic rule.
[29]	LogicRule 3	Use result of logic rule 3 in the logic rule.
[30]	LC Timeout0	Use result of timer 0 in the logic rule.
[31]	LC Timeout1	Use result of timer 1 in the logic rule.
[32]	LC Timeout2	Use result of timer 2 in the logic rule.
[33]	DigitalInput_18	Use value of DI 18 in the logic rule.
[34]	DigitalInput_19	Use value of DI 19 in the logic rule.
[35]	DigitalInput_27	Use value of DI 27 in the logic rule.
[36]	DigitalInput_29	Use value of DI 29 in the logic rule.
[38]	DigitalInput_33	
[39]	StartCommand	This event is *True* if the adjustable frequency drive is started by any means (digital input or other).
[40] *	DriveStopped	This event is *True* if the adjustable frequency drive is stopped or coasted by any means (digital input or other).

13-03 Reset the Logic Controller

Option:		Function:
[0] *	Do Not Reset	Retains all settings programmed in parameter group 13.
[1]	Reset the Logic Controller	Reset all group 13 parameters to default settings.

4.10.3 13-04 Comparators

Comparators are used for comparing continuous variables (i.e., output frequency, output current, analog input, etc.) to fixed preset values.

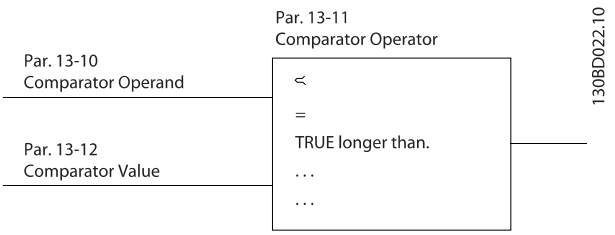


Figure 4.11

In addition, there are digital values that will be compared to fixed time values. See explanation in *13-10 Comparator Operand*. Comparators are evaluated once in each scan interval. Use the result (TRUE or FALSE) directly. All parameters in this parameter group are array parameters with index 0 to 5. Select index 0 to program Comparator 0, select index 1 to program Comparator 1, and so on.

4

13-10 Comparator Operand

Array [4]

Option:		Function:
		Select variable to be monitored by the comparator.
[0] *	Disabled	Comparator is disabled.
[1]	Reference	Resulting remote reference (not local) as a percentage.
[2]	Feedback	Feedback in [Hz].
[3]	MotorSpeed	Motor speed in Hz.
[4]	MotorCurrent	Motor current in [A].
[6]	MotorPower	Motor power in either [kW] or [hp].
[7]	MotorVoltage	Motor voltage in [V].
[8]	DCLinkVoltage	DC link voltage in [V].
[12]	AnalogInput53	Expressed as actual value.
[13]	AnalogInput60	Expressed as actual value.
[18]	PulseInput33	Expressed as actual value.
[20]	AlarmNumber	Shows number of the alarm.
[30]	CounterA	Number of counts.
[31]	CounterB	Number of counts.

13-11 Comparator Operator

Array [4]

Option:		Function:
		Select operator to be used in the comparison.
[0]	Less Than <	Result of evaluation is *True* if variable selected in *13-10 Comparator Operand* is smaller than fixed value in *13-12 Comparator Value*. Result is *False* if variable selected in *13-10 Comparator Operand* is greater than fixed value in *13-12 Comparator Value*.
[1] *	Approxi-mately equals ≈	Result of evaluation is *True* if variable selected in *13-10 Comparator Operand* is approximately equal to fixed value in *13-12 Comparator Value*.
[2]	Greater Than >	Inverse logic of option [0].

13-12 Comparator Value

Array [4]

Range:		Function:
0.0*	[-9,999–9,999]	Enter "trigger level" for the variable monitored by this comparator.

4.10.4 13-2* Timers

Use the timer results to define an event (*13-51 Logic Controller Action*) or as Boolean input in a logic rule (*13-40 Logic Rule Boolean 1*, *13-42 Logic Rule Boolean 2* or *13-44 Logic Rule Boolean 3*).

When the timer value has elapsed, the timer changes the state from *False* to *True*.

13-20 Logic Controller Controller Timer

Array [3]

Range:		Function:
0.0 s*	[0.0–3,600 s]	Enter the value to define the duration of the *False* output from the programmed timer. A timer is only *False* if it is started by an action and until the given timer value has elapsed.

4.10.5 13-4* Logic Rules

Combine up to three Boolean inputs (TRUE/FALSE inputs) from timers, comtors, digital inputs, status bits and events using the logical operators AND, OR, and NOT. Select Boolean inputs for the calculation in *13-40 Logic Rule Boolean 1*, *13-42 Logic Rule Boolean 2* and *13-44 Logic Rule Boolean 3*. Define the operators used to logically combine the selected inputs in *13-41 Logic Rule Operator 1* and *13-43 Logic Rule Operator 2*.

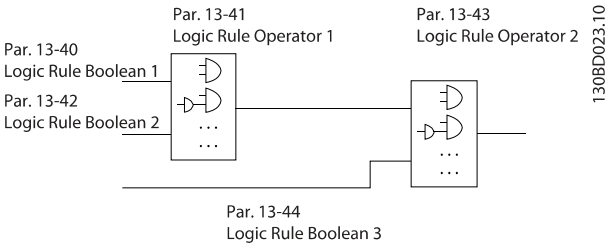


Figure 4.12

Priority of calculation

The results of *13-40 Logic Rule Boolean 1*, *13-41 Logic Rule Operator 1* and *13-42 Logic Rule Boolean 2* are calculated first. The outcome (TRUE/FALSE) of this calculation is combined with the settings of *13-43 Logic Rule Operator 2* and *13-44 Logic Rule Boolean 3*, yielding the final result (TRUE/FALSE) of the logic rule.

13-40 Logic Rule Boolean 1

Array [4]

Option:		Function:
		Select the first Boolean input for the selected logic rule.
[0] *	False	Enters *False* in the logic rule.
[1]	True	Enters *True* in the logic rule.
[2]	Running	See parameter group *5-4* Relays* [5] for description.
[3]	InRange	See parameter group *5-4* Relays* [7] for description.
[4]	OnReference	See parameter group *5-4* Relays* [8] for description.
[7]	Out of Current Range	See parameter group *5-4* Relays* [12] for description.
[8]	BelowILow	See parameter group *5-4* Relays* [13] for description.
[9]	AboveIHigh	See parameter group *5-4* Relays* [14] for description.
[16]	ThermalWarning	See parameter group *5-4* Relays* [21] for description.
[17]	MainsOutOfRange	AC line voltage is outside the specified voltage range.
[18]	Reversing	See parameter group *5-4* Relays* [25] for description.
[19]	Warning	A warning is active.
[20]	Alarm_Trip	A trip alarm is active.
[21]	Alarm_TripLock	A trip lock alarm is active.
[22]	Comparator 0	Use result of comparator 0 in the logic rule.
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[24]	Comparator 2	Use result of comparator 2 in the logic rule.
[25]	Comparator 3	Use result of comparator 3 in the logic rule.
[26]	LogicRule 0	Use result of logic rule 0 in the logic rule.
[27]	LogicRule 1	Use result of logic rule 1 in the logic rule.
[28]	LogicRule 2	Use result of logic rule 2 in the logic rule.
[29]	LogicRule 3	Use result of logic rule 3 in the logic rule.
[30]	LC Timeout0	Use result of timer 0 in the logic rule.
[31]	LC Timeout1	Use result of timer 1 in the logic rule.
[32]	LC Timeout2	Use result of timer 2 in the logic rule.
[33]	DigitalInput_18	Use value of DI 18 in the logic rule.
[34]	DigitalInput_19	Use value of DI 19 in the logic rule.
[35]	DigitalInput_27	Use value of DI 27 in the logic rule.
[36]	DigitalInput_29	Use value of DI 29 in the logic rule.
[38]	DigitalInput_33	Use value of DI 33 in logic rule

13-40 Logic Rule Boolean 1

Array [4]

Option:		Function:
[39]	StartCommand	This event is *True* if the adjustable frequency drive is started by any means (digital input or other).
[40]	DriveStopped	This event is *True* if the adjustable frequency drive is stopped or coasted by any means (digital input or other).

13-41 Logic Rule Operator 1

Array [4]

Option:		Function:
		Select first logical operator to use on Boolean inputs from *13-40 Logic Rule Boolean 1* and *13-42 Logic Rule Boolean 2*.
[0] *	Disabled	Ignores *13-42 Logic Rule Boolean 2*, *13-43 Logic Rule Operator 2* and *13-44 Logic Rule Boolean 3*.
[1]	And	Evaluates expression [13-40] AND [13-42].
[2]	Or	Evaluates expression [13-40] OR [13-42].
[3]	And not	Evaluates expression [13-40] AND NOT [13-42].
[4]	Or not	Evaluates expression [13-40] OR NOT [13-42].
[5]	Not and	Evaluates expression NOT [13-40] and [13-42].
[6]	Not or	Evaluates expression NOT [13-40] OR [13-42].
[7]	Not and not	Evaluates expression NOT [13-40] AND NOT [13-42].
[8]	Not or not	Evaluates expression NOT [13-40] OR NOT [13-42].

13-42 Logic Rule Boolean 2

Array [4]

Option:		Function:
		Select the second Boolean input for the selected logic rule. See *13-40 Logic Rule Boolean 1* for choices and descriptions.

13-43 Logic Rule Operator 2

Array [4]

Option:		Function:
		Select second logical operator to use on Boolean inputs calculated in *13-40 Logic Rule Boolean 1*, *13-41 Logic Rule Operator 1*, and *13-42 Logic Rule Boolean 2* and the Boolean input from *13-42 Logic Rule Boolean 2*.
[0] *	Disabled	Ignores *13-44 Logic Rule Boolean 3*.
[1]	And	Evaluates expression [13-40/13-42] AND [13-44].
[2]	Or	Evaluates expression [13-40/13-42] OR [13-44].
[3]	And not	Evaluates expression [13-40/13-42] AND NOT [13-44].

4

13-43 Logic Rule Operator 2

Array [4]

Option:		Function:
[4]	Or not	Evaluates expression [13-40/13-42] OR NOT [13-44].
[5]	Not and	Evaluates expression NOT [13-40/13-42] and [13-44].
[6]	Not or	Evaluates expression NOT [13-40/13-42] OR [13-44].
[7]	Not and not	Evaluates expression NOT [13-40/13-42] AND NOT [13-44].
[8]	Not or not	Evaluates expression NOT [13-40/13-42] OR NOT [13-44].

13-44 Logic Rule Boolean 3

Array [4]

Option:		Function:
		Select the third Boolean input for the selected logic rule. See *13-40 Logic Rule Boolean 1* for choices and descriptions.

4.10.6 13-5* States

13-51 Logic Controller Event

Array [20]

Option:		Function:
		Select Boolean input to define Logic Controller Event. See *13-40 Logic Rule Boolean 1* for choices and descriptions.

13-52 LC Controller Action

Array [20]

Option:		Function:
		Select action corresponding to LC event. Actions are executed when corresponding event (*13-51 Logic Controller Event*) is evaluated as *True*.
[0] *	Disabled	The function is disabled.
[1]	No Action	No action is taken.
[2]	Select Set-up1	Changes active set-up to Set-up 1.
[3]	Select Set-up2	Changes active set-up to Set-up 2.
[10]	SelectPresetRef0	Selects preset reference 0
[11]	SelectPresetRef1	Selects preset reference 1
[12]	SelectPresetRef2	Selects preset reference 2
[13]	SelectPresetRef3	Selects preset reference 3
[14]	SelectPresetRef4	Selects preset reference 4
[15]	SelectPresetRef5	Selects preset reference 5
[16]	SelectPresetRef6	Selects preset reference 6
[17]	SelectPresetRef7	Selects preset reference 7
[18]	SelectRamp1	Selects ramp 1

13-52 LC Controller Action

Array [20]

Option:		Function:
[19]	SelectRamp2	Selects ramp 2
[22]	Run	Issues a start command to the adjustable frequency drive.
[23]	RunReverse	Issues a start reverse command to the adjustable frequency drive.
[24]	Stop	Issues a stop command to the adjustable frequency drive.
[25]	Qstop	Issues a quick stop command to the adjustable frequency drive.
[26]	DCstop	Issues a DC stop command to the adjustable frequency drive.
[27]	Coast	adjustable frequency drive coasts immediately. All stop commands including coast command stop the Logic Controller.
[28]	Freeze Output	Freezes output frequency.
[29]	StartTimer0	Starts timer 0.
[30]	StartTimer1	Starts timer 1
[31]	StartTimer2	Starts timer 2
[32]	SetDO42Low	Set Digital output 42 low.
[33]	SetRelayLow	Set Relay low.
[38]	SetDO42High	Set Digital output 42 high.
[39]	SetRelayHigh	Set Relay high.
[60]	ResetCounterA	Resets counter A to 0.
[61]	ResetCounterB	Resets counter B to 0.

4.11 Parameter Group 14: Special Functions

4.11.1 14-** Special Functions

Parameter group for configuring special adjustable frequency drive functions.

4.11.2 14-0* Carrier Frequency

14-01 Motor Noise (Carrier Frequency)

Option:		Function:
		Select the carrier frequency in order, for example, to minimize acoustic noise and power loss or maximize efficiency.
[0]	2 kHz	
[1] *	4 kHz	
[2]	8 kHz	
[4]	16 kHz	

NOTE!

For 25 hp [18.5 kW] and 30 hp [22 kW] adjustable frequency drive, option [4] is not available.

14-03 Overmodulation

Option:		Function:
		This feature allows more accurate speed control near and over nominal speed (50/60 Hz). Another advantage with overmodulation is the ability to stay at a constant speed even though line power is dropping.
[0]	Off	Disables the overmodulation function to avoid torque ripple on the motor shaft.
[1] *	On	Connects the overmodulation function to obtain an output voltage of up to 15% greater than AC line voltage.

4.11.3 14-1* Line Power Monitoring

This parameter group supplies functions for handling imbalance on line power.

14-12 Functions at Line Imbalance

Option:		Function:
		Operation under severe line imbalance conditions reduces drive lift time. Select the function to take place when a severe line imbalance is detected.
[0] *	Trip	Adjustable frequency drive trips.
[1]	Warning	adjustable frequency drive issues a warning.
[2]	Disabled	No action taken.

Parameters for configuring auto reset handling, special trip handling and control card self test or restore.

14-20 Reset Mode

Option:		Function:
		Select the reset function after tripping. Once reset, the adjustable frequency drive can be restarted.
[0] *	Manual Reset	Perform reset via [Reset] or digital inputs.
[1]	AutoReset 1	Performs one automatic reset after tripping.
[2]	AutoReset 2	Performs two automatic resets after tripping.
[3]	AutoReset 3	Performs three automatic resets after tripping.
[4]	AutoReset 4	Performs four automatic resets after tripping.
[5]	AutoReset 5	Performs five automatic resets after tripping.
[6]	AutoReset 6	Performs six automatic resets after tripping.
[7]	AutoReset 7	Performs seven automatic resets after tripping.
[8]	AutoReset 8	Performs eight automatic resets after tripping.
[9]	AutoReset 9	Performs nine automatic resets after tripping.
[10]	AutoReset 10	Performs ten automatic resets after tripping.
[11]	AutoReset 15	Performs fifteen automatic resets after tripping.
[12]	AutoReset 20	Performs twenty automatic resets after tripping.
[13]	Infinite auto reset	Performs an infinite number of automatic resets after tripping.
[14]	Reset at power-up	Trip-lock alarm can be reset at power-up. **⚠CAUTION** **The motor may start without warning.**

14-21 Automatic Restart Time

Range:		Function:
10 s*	[0–600 s]	Enter the time interval from the trip to the start of the automatic reset function. This parameter is active when *14-20 Reset Mode*, is set to *[1] to [13] Automatic Reset*.

14-22 Operation Mode

Option:		Function:
		Use this parameter for specifying normal operation or to initialize all parameters, except *15-03 Power Ups*, *15-04 Over Temps* and *15-05 Over Volts*.
[0] *	Normal Operation	Adjustable frequency drive runs normal operation.

4

14-22 Operation Mode		
Option:		**Function:**
[2]	Restore Factory Settings	Resets all parameters to default settings, except for *15-03 Power Ups*, *15-04 Over Temps* and *15-05 Over Volts*. The adjustable frequency drive resets during the next power-up. *14-22 Operation Mode* also reverts to default setting *[0] Normal Operation*.

14-26 Action at Inverter Fault		
Option:		**Function:**
[0]	Trip	When the adjustable frequency drive detects an overvoltage, it will trip immediately. **NOTE! It is recommended to choose [0] Trip in hoisting applications.**
[1] *	Warning	When the adjustable frequency drive detects an overvoltage, it will give warning immediately. After protection filter, it will trip. **NOTE! It is recommended to disable *protection mode* in hoisting applications.**

4.11.4 14-4* Drive Identification

Parameters containing read-only information about the hardware and software configuration of the adjustable frequency drive.

14-41 Energy Savings Minimum Magnetization		
Range:		**Function:**
66%*	[40–75%]	Enter the minimum allowable magnetization for energy savings. Selecting a low value reduces energy loss in the motor, but may also reduce resistance to sudden load changes.

4.12 Parameter Group 15: Drive Information

Parameter group containing information on operating data, hardware configuration, software version, etc.

15-00 Operating Time

Range:		Function:
0 days*	[0-65,535 days]	View how many days the adjustable frequency drive has been powered up. The value is saved at power-off and cannot be reset.

15-01 Running Hours

Range:		Function:
0*	[0–2,147,483,647]	View running hours of motor. The value is saved at power off and can be reset in *15-07 Reset Running Hours Counter*.

15-02 kWh Counter

Range:		Function:
0	[0–65,535]	View power consumption in kWh as a mean value over one hour. Reset counter in *15-06 Reset kWh Counter*.

15-03 Power-ups

Range:		Function:
0	[0–2,147,483,647]	View the number of times the adjustable frequency drive has been powered up. Counter cannot be reset.

15-04 Overtemps

Range:		Function:
0	[0–65,535]	View the number of times the adjustable frequency drive has tripped due to overtemperature. Counter cannot be reset.

15-05 Overvolts

Range:		Function:
0*	[0–65,535]	View the number of times the adjustable frequency drive has tripped due to overvoltage. Counter cannot be reset.

15-06 Reset kWh Counter

Option:		Function:
[0] *	Do Not Reset	Counter is not reset.
[1]	Reset Counter	Counter is reset.

15-07 Reset Running Hours Counter

Option:		Function:
[0] *	Do Not Reset	Counter is not reset.
[1]	Reset Counter	Counter is reset.

4.12.1 15-3* Fault Log

This parameter group contains a fault log showing the reasons for the last ten trips.

15-30 Fault Log: Error Code

Range:		Function:
0	[0–255]	View error code and look it up in *GE AF-60 LP Micro Quick Guide*.

4.12.2 15-4# Drive Identification

Parameters containing read-only information about the hardware and software configuration of the .

15-40 Drive Type

Option:		Function:
		View the Drive type.

15-41 Power Section

Option:		Function:
		View the power section of the adjustable frequency drive.

15-42 Voltage

Option:		Function:
		View the voltage of the adjustable frequency drive.

15-43 Software Version

Option:		Function:
		View the software version of the adjustable frequency drive.

15-46 Adjustable Frequency Drive Ordering Number

Option:		Function:
		View the ordering number for re-ordering the adjustable frequency drive in its original configuration.

15-48 Keypad ID

Option:		Function:
		View keypad ID number.

15-51 Adjustable Frequency Drive Serial Number

Option:		Function:
		View the adjustable frequency drive serial number.

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4.13 Parameter Group 16: Data Readouts

16-00 Control Word

Range:		Function:
0*	[0–65,535]	View latest valid control word sent to adjustable frequency drive via serial communication port.

16-01 Reference [Unit]

Range:		Function:
0.000*	[-4,999.000–4,999.000]	View the total remote reference. Total reference is sum of pulse, analog, preset, keypad potentiometer, local bus and freeze reference.

16-02 Reference %

Range:		Function:
0.0*	[-200.0–200.0%]	View the total remote reference in percent. Total reference is sum of pulse, analog, preset, keypad potentiometer, local bus and freeze reference.

16-03 Status Word

Range:		Function:
0*	[0–65,535]	View the status word sent to the adjustable frequency drive via the serial communication port.

16-05 Main Actual Value %

Range:		Function:
0.00*	[-100.00–100.00%]	View the two-byte word sent with the status word to the bus master reporting the main actual value.

16-09 Custom Readout

Range:		Function:
0.00*	[0.00–9999.00%]	
		Customized readout based on the settings of *0-31 Custom Readout Min Scale*, *0-32 Custom Readout Max Scale* and *4-14 Motor Speed High Limit*

4.13.1 16-1* Motor Status

16-10 Power [kW]

Range:		Function:
0 kW*	[0–99 kW]	View output power in kW.

16-11 Power [hp]

Range:		Function:
0 hp	[0–99 hp]	View the output power in hp.

16-12 Motor Voltage

Range:		Function:
0.0*	[0.0–999.9 V]	View motor phase voltage.

16-13 Frequency

Range:		Function:
0.0 Hz*	[0.0–400.0 Hz]	View the output frequency in Hz.

16-14 Motor Current

Range:		Function:
0.00 A*	[0.00–655 A]	View the motor phase current.

16-15 Frequency [%]

Range:		Function:
0.00*	[-100.00–100.00%]	View a 2-byte word reporting actual motor frequency as a percentage of *4-14 Motor Speed High Limit*

16-18 Motor Thermal

Range:		Function:
0%*	[0–100%]	View the calculated thermal motor load as a percentage of the estimated thermal motor load.

4.13.2 16-3* Drive Status

16-30 DC Link Voltage

Range:		Function:
0 V*	[0–10000 V]	View the DC link voltage.

16-34 Heatsink Temp.

Range:		Function:
0*	[32–491° F [0–255°C]]	View the heatsink temperature of the adjustable frequency drive.

16-35 Drive Thermal

Range:		Function:
0%*	[0–100%]	View calculated thermal load on adjustable frequency drive in relation to estimated thermal load on adjustable frequency drive.

16-36 Drive Nom. Current

Range:		Function:
0.00 A*	[0.01–655A]	View continuous nominal drive current.

16-37 Drive Max. Current

Range:		Function:
0.00 A*	[0.1–655A]	View intermittent maximum drive current (150%).

16-38 Logic Controller State

Range:		Function:
0*	[0–255]	View number of active Logic state.

4.13.3 16-5* Ref. & Feedb.

16-50 External Reference

Range:		Function:
0.0%*	[-200.0–200.0%]	View the sum of all the external references in percent.

16-51 Pulse Reference

Range:		Function:
0.0%*	[-200.0–200.0%]	View the actual pulse input converted to a reference in percent.

16-52 Feedback

Range:		Function:
0.000*	[-4,999.000–4,999.000]	View the analog or pulse feedback in Hz.

4.13.4 16-6* Inputs and Outputs

16-60 Digital Input 18, 19, 27, 33

Range:		Function:
0*	[0–1111]	View the signal states from active digital inputs.

16-61 Digital Input 29

Range:		Function:
0*	[0–1]	View the signal state on digital input 29.

16-62 Analog Input 53 (volt)

Range:		Function:
0.00*	[0.00–10.00 V]	View the input voltage on the analog input terminal.

16-63 Analog Input 53 (current)

Range:		Function:
0.00*	[0.00–20.00 mA]	View the input current on the analog input terminal.

16-64 Analog Input 60

Range:		Function:
0.00*	[0.00–20.00 mA]	View the actual value at input 60 either as a reference or a protection value.

16-65 Analog Output 42 [mA]

Range:		Function:
0.00 mA*	[0.00–20.00 mA]	View the output current on analog output 42.

16-68 Pulse Input

Range:		Function:
20 Hz*	[20-5,000 Hz]	View the input frequency on the pulse input terminal.

16-71 Relay Output [bin]

Range:		Function:
0*	[0–1]	View the relay setting.

16-72 Counter A

Range:		Function:
0*	[-32,768–32,767]	View the present value of Counter A.

16-73 Counter B

Range:		Function:
0*	[-32,768–32,767]	View the present value of Counter B.

4.13.5 16-8* GE Drive Port

Parameter for viewing references from GE Drive Port.

16-86 GE Drive Port REF 1

Range:		Function:
0*	[0x8000–0x7FFF]	View currently received reference from GE Drive Port.

4.13.6 16-9* Diagnosis Readouts

16-90 Alarm Word

Range:		Function:
0*	[0–0xFFFFFFFF]	Via alarm word sent via serial communication port in hex code.

16-92 Warning Word

Range:		Function:
0*	[0–0xFFFFFFFF]	View the warning word sent via the serial communication port in hex code.

16-94 Ext. Status Word

Range:		Function:
0*	[0–0xFFFFFFFF]	View the extended warning word sent via the serial communication port in hex code.

5 Parameter Lists

Parameter Overview			
*0-** Operation/Display*	**0-51 Set-up Copy**	**[18] 18.50 kW/25.00 HP**	**1-71 Holding Time**
0-0/ Basic Settings	*[0] No copy	**[19] 22.00 kW/29.50 HP**	0.0–10.0 s * 0.0 s
0-03 Regional Settings	[1] Copy from set-up 1	**[20] 30.00 kW/40.00 HP**	**1-72 Start Function**
[0] International	[2] Copy from set-up 2	**1-22 Motor Voltage**	[0] DC Hold/delay time
*[1] US	[9] Copy from Factory set-up	50–999 V * 230–400 V	[1] DC brake/delay time
0-04 Oper. State at Power-up (Hand)	*0-6* Password*	**1-23 Motor Frequency**	*[2] Coast/delay time
[0] Resume	**0-60 (Main) Menu Password**	20–400 Hz *60 Hz	**1-73 Start Mode**
[1] Forced stop, ref=f"old	0–999 *0	**1-24 Motor Current**	*[0] Disabled
[2] Forced stop, re=0	**0-61 Access to Main/Quick Menu w/o Password**	0.01–100.00 A *Motortype dep.	[1] Enable - Catch Spinning Load
0-1 Set-up Handling*	*[0] Full access	**1-25 Motor Nominal Speed**	*1-8* Stop Adjustments*
0-10 Active Set-up	[1] Keypad: Read Only	100–9,999 rpm * Motortype dep.	**1-80 Function at Stop**
*[1] Set-up 1	[2] Keypad: No Access	**1-29 Auto Tune**	*[0] Coast
[2] Set-up 2	*1-** Load/Motor*	*[0] Off	[1] DC hold
[9] Multi Set-up	*1-0* General Settings*	[2] EnableAuto Tune	**1-82 Min Speed for Funct. at Stop [Hz]**
0-11 Edit Set-up	**1-00 Configuration Mode**	*1-3* Adv. Motor Data*	0.0–20.0 Hz *0.0 Hz
*[1] Set-up 1	*[0] Speed open-loop	**1-30 Stator Resistance (Rs)**	*1-9* Motor Temperature*
[2] Set-up 2	[3] Process	[Ohm] * Dep. on motor data	**1-90 Motor Thermal Protection**
[9] Active Set-up	**1-01 Motor Control Principle**	**1-33 Stator Leakage Reactance (X1)**	*[0] No protection
0-12 Link Set-ups	[0] U/f	[Ohm] * Dep. on motor data	[1] Thermistor warning
[0] Not Linked	*[1] Adv.Vector Control	**1-35 Main Reactance (Xh)**	[2] Thermistor trip
*[20] Linked	**1-03 Torque Characteristics**	[Ohm] * Dep. on motor data	[3] Electronic Overload warning
0-31 Custom Readout Min Scale	*[0] Constant torque	*1-5* Load Indep. Setting*	[4] Electronic Overload trip
0.00–9,999.00	[2] Energy Saving	**1-50 Motor Magnetization at 0 Speed**	**1-93 Thermistor Resource**
*0.00	**1-05 Local Mode Configuration**	0–300% *100%	*[0] None
0-32 Custom Readout Max Scale	[0] Speed Open-loop	**1-52 Min Speed Norm. Magnet. [Hz]**	[1] Analog input 53
0.00–9,999.00	*[2] As config in par. 1-00	0.0–10.0 Hz *0.0 Hz	[6] Digital input 29
*100.0	*1-2* Motor Data*	**1-55 U/f Characteristic - U**	*2-** Brakes*
0-4 Keypad*	**1-20 Motor Power [kW] [HP]**	0–999.9 V	*2-0* DC Brake*
0-40 [Hand] Key on Keypad	[1] 0.09 kW/0.12 HP	**1-56 U/f Characteristic - F**	**2-00 DC Hold Current**
[0] Disabled	[2] 0.12 kW/0.16 HP	0–400 Hz	0–150% *50%
*[1] Enabled	[3] 0.18 kW/0.25 HP	*1-6* Load Depen. Setting*	**2-01 DC Brake Current**
0-41 [Off / Reset] Key on Keypad	[4] 0.25 kW/0.33 HP	**1-60 Low Speed Load Compensation**	0–150% *50%
[0] Disable All	[5] 0.37 kW/0.50 HP	0–199% Load CompensationLoad	**2-02 DC Braking Time**
*[1] Enable All	[6] 0.55 kW/0.75 HP	Compensation *100%	0.0–60.0 s *10.0 s
[2] Enable Reset Only	[7] 0.75 kW/1.00 HP	**1-61 High Speed Load Compensation**	**2-04 DC Brake Cut-in Speed**
0-42 [Auto] Key on Keypad	[8] 1.10 kW/1.50 HP	0–199% *100%	0.0–400.0 Hz * 0.0 Hz
[0] Disabled	[9] 1.50 kW/2.00 HP	**1-62 Slip Compensation**	*2-1* Brake Energy Funct.*
*[1] Enabled	[10] 2.20 kW/3.00 HP	-400–399% *100%	**2-10 Brake Function**
0-5 Copy/Save*	[11] 3.00 kW/4.00 HP	**1-63 Slip Compensation Time Constant**	*[0] Off
0-50 Keypad Copy	[12] 3.70 kW/5.00 HP	0.05–5.00 s *0.10 s	[1] Resistor brake
*[0] No copy	[13] 4.00 kW/5.40 HP	*1-7* Start Adjustments*	[2] AC brake
[1] All to keypad	[14] 5.50 kW/7.50 HP		**2-11 Brake Resistor (ohm)**
[2] All from keypad	[15] 7.50 kW/10.00 HP		5–5,000 *5
[3] Size indep. from keypad	[16] 11.00 kW/15.00 HP		**2-16 AC Brake, Max current**
	[17] 15.00 kW/20.00 HP		0–150% *100%

Table 5.1

5

2-17 Over-voltage Control
*[0] Disabled
[1] Enabled (not at stop)
[2] Enabled
2-2* Mechanical Brake
2-20 Release Brake Current
0.00–100.0 A *0.00 A
2-22 Activate Brake Speed [Hz]
0.0–400.0 Hz * 0.0 Hz
3-** Reference / Ramps
3-0* Reference Limits
3-00 Reference Range
*[0] Min to Max
[1] -Max to+Max
3-02 Minimum Reference
-4,999–4,999 *0.000
3-03 Maximum Reference
-4,999–4,999 *50.00
3-1* References
3-10 Preset Reference
-100.0–100.0% *0.00%
3-11 Jog Speed [Hz]
0.0–400.0 Hz *5.0 Hz
3-12 Catch up/Slow-down Value
0.00–100.0% *0.00%
3-14 Preset Relative Reference
-100.0–100.0% *0.00%
3-15 Reference Resource 1
[0] No function
*[1] Analog Input 53
[2] Analog input 60
[8] Pulse input 33
[11] Local bus ref
[21] Keypad Potentiometer
3-16 Reference Resource 2
[0] No function
[1] Analog Input 53
*[2] Analog input 60
[8] Pulse input 33
*[11] Local bus ref
[21] Keypad Potentiometer
3-17 Reference Resource 3
[0] No function
[1] Analog Input 53
[2] Analog input 60
[8] Pulse input 33
*[11] Local bus ref
[21] Keypad Potentiometer

3-18 Relative Scaling Ref. Resource
*[0] No function
[1] Analog Input 53
[2] Analog input 60
[8] Pulse input 33
[11] Local bus ref
[21] Keypad Potentiometer
3-4* Accel/Decel 1
3-40 Accel/Decel 1 Pattern
*[0] Linear
[2] S-Shape
3-41 Accel Time 1
0.05–3,600 s *3.00 s (10.00 s[1])
3-42 Decel Time 1
0.05–3,600 s *3.00 s (10.00 s [1])
3-5* Accel/Decel 2
3-50 Accel/Decel 2 Pattern
*[0] Linear
[2] S-Shape
3-51 Accel Time 2
0.05–3,600 s *3.00 s (10.00 s [1])
3-52 Decel Time 2
0.05–3,600 s *3.00 s (10.00 s[1])
3-8* Other Ramps
3-80 Jog Accel and Decel Time
0.05–3,600 s *3.00 s (10.00 s[1])
3-81 Quick Stop Decel Time
0.05–3,600 s *3.00 s (10.00 s[1])
4-** Limits/Warnings
4-1* Motor Limits
4-10 Reverse Lock
[0] Reverse Lock if Par. 1-00 is set to [3]
[1] Reverse
*[2] Both if Par. 1-00 is set to [0]
4-12 Motor Speed Low Limit [Hz]
0.0–400.0 Hz * 0.0 Hz
4-14 Motor Speed High Limit [Hz]
0.1–400.0 Hz *65.0 Hz
4-16 Torque Limit Motor Mode
0–400% *150%
4-17 Torque Limit Generator Mode
0–400% *100%
4-4* Adj. Warnings 2
4-40 Warning Frequency Low
0.00–Value of 4-41 Hz *0.0 Hz
4-41 Warning Frequency High
Value of 4–40–400.0 Hz *400.0 Hz

4-5* Adj. Warnings
4-50 Warning Current Low
0.00–100.00 A *0.00 A
4-51 Warning Current High
0.00–100.00 A *100.00 A
4-54 Warning Reference Low
-4,999.000-Value of 4-55
*-4,999.000
4-55 Warning Reference High
Value of 4-54-4,999.000
*4,999.000
4-56 Warning Feedback Low
-4,999.000-Value of 4-57
*-4,999.000
4-57 Warning Feedback High
Value of 4-56-4,999.000
*4,999.000
4-58 Missing Motor Phase Function
[0] Off
*[1] On
4-6* Jump Frequencies
4-61 Jump Frequency From [Hz]
0.0–400.0 Hz * 0.0 Hz
4-63 Jump FrequencyTo [Hz]
0.0–400.0 Hz * 0.0 Hz
5-1* Digital Inputs
5-10 Terminal 18 Digital Input
[0] No function
[1] Reset
[2] Coast inverse
[3] Coast and reset inv.
[4] Quick stop inverse
[5] DC brake inv.
[6] Stop inv
*[8] Start
[9] Latched start
[10] Reversing
[11] Start reversing
[12] Enable start forward
[13] Enable start reverse
[14] Jog
[16-18] Preset ref bit 0-2
[19] Freeze reference
[20] Freeze output
[21] Speed up
[22] Slow
[23] Set-up select bit 0
[28] Catch up
[29] Slow-down
[34] Ramp bit 0

[60] Counter A (up)
[61] Counter A (down)
[62] Reset counter A
[63] Counter B (up)
[64] Counter B (down)
[65] ResetCounter B
5-11 Terminal 19 Digital Input
See par. 5-10. *[10] Reversing
5-12 Terminal 27 Digital Input
See par. 5-10. * [1] Reset
5-13 Terminal 29 Digital Input
See par. 5-10. * [14] Jog
5-15 Terminal 33 Digital Input
See par. 5-10. * [16] Preset ref bit 0
[26] Precise Stop Inverse
[27] Start, Precise Stop
[32] Pulse Input
***5-3* Digital Outputs* 5-34 On Delay, Terminal 42 Digital Output**
0.00–600.00 s *0.01 s
5-35 Off Delay, Terminal 42 Digital Output
0.00–600.00 s *0.01 s
5-4* Relays
5-40 Function Relay
*[0] No operation
[1] Control ready
[2] Drive ready
[3] Drive ready, Remote
[4] Enable/No warning
[5] Drive running
[6] Running/No warning
[7] Run in range/No warning
[8] Run on ref/No warning
[9] Alarm
[10] Alarm or warning
[12] Out of current range
[13] Below current, low
[14] Above current, high
[16] Below frequency, low
[17] Above frequency, high
[19] Below feedback, low
[20] Above feedback, high
[21] Thermal warning
[22] Ready, No thermal warning
[23] Remote ready, No thermal warning
[24] Ready, Voltage ok
[25] Reverse

[1] M4 and M5 only

Table 5.2

[26] Bus ok
[28] Brake, NoWarn
[29] Brake ready/NoFault
[30] BrakeFault (IGBT)
[32] Mech.brake control
[36] Control word bit 11
[41] Below reference, low
[42] Above reference, high
[51] Local ref. active
[52] Remote ref. active
[53] No alarm
[54] Start cmd active
[55] Running reverse
[56] Drive in hand mode
[57] Drive in auto mode
[60-63] Comparator 0-3
[70-73] Logic rule 0-3
[81] Logic Controller digital output B

5-41 On Delay, Relay
0.00–600.00 s *0.01 s

5-42 Off Delay, Relay
0.00–600.00 s *0.01 s

5-5* Pulse Input

5-55 Terminal 33 Low Frequency
20–4,999 Hz * 20 Hz

5-56 Terminal 33 High Frequency
21–5,000 Hz *5,000 Hz

5-57 Term. 33 Low Ref./Feedb. Value
-4,999–4,999 *0.000

5-58 Term. 33 High Ref./Feedb. Value
-4,999–4,999 *50.000

6-** Analog In/Out

6-0* Analog I/O Mode

6-00 Live Zero Timeout Time
1–99 s *10 s

6-01 Live Zero TimeoutFunction
*[0] Off
[1] Freeze output
[2] Stop
[3] Jogging
[4] Max speed
[5] Stop and trip

6-1* Analog Input 1

6-10 Terminal 53 Low Voltage
0.00–9.99 V *0.07 V

6-11 Terminal 53 High Voltage
0.01–10.00 V *10.00 V

6-12 Terminal 53 Low Current
0.00–19.99 mA *0.14 mA

6-13 Terminal 53 High Current
0.01–20.00 mA *20.00 mA

6-14 Term. 53 Low Ref./Feedb. Value
-4,999–4,999 *0.000

6-15 Term. 53 High Ref./Feedb. Value
-4,999–4,999 *50.000

6-16 Terminal 53 Filter Time Constant
0.01–10.00 s *0.01 s

6-19 Terminal 53 mode
*[0] Voltage mode
[1] Current mode

6-2* Analog Input 2

6-22 Terminal 60 Low Current
0.00–19.99 mA *0.14 mA

6-23 Terminal 60 High Current
0.01–20.00 mA *20.00 mA

6-24 Term. 60 Low Ref./Feedb. Value
-4,999–4,999 *0.000

6-25 Term. 60 High Ref./Feedb. Value
-4,999–4,999 *50.00

6-26 Terminal 60 Filter Time Constant
0.01–10.00 s *0.01 s

6-8* Keypad potentiometer

6-80 Keypad Keypad Potmeter Enable
[0] Disabled
[1] * Enable

6-81 keypad potm. Low Reference
-4,999–4,999 *0.000

6-82 Keypad potm. High Reference
-4,999–4,999 *50.00

6-9* Analog Output xx

6-90 Terminal 42 Mode
*[0] 0-20 mA
[1] 4-20 mA
[2] Digital Output

6-91 Terminal 42 Analog Output
*[0] No operation
[10] Output Frequency
[11] Reference
[12] Feedback
[13] Motor Current
[16] Power
[20] Bus Reference

6-92 Terminal 42 Digital Output
See par. 5-40
*[0] No Operation
[80] Logic Controller Digital Output A

6-93 Terminal 42 Output Min Scale
0.00–200.0%
*0.00%

6-94 Terminal 42 Output Max Scale
0.00–200.0% *100.0%

7-** Controllers

7-2* Process Ctrl. Feedb

7-20 Process CL Feedback 1 Resource
*[0] NoFunction
[1] Analog Input 53
[2] Analog input 60
[8] PulseInput33
[11] LocalBusRef

7-3* Process PI

Ctrl. 7-30 Process PI Normal/ Inverse Ctrl
*[0] Normal
[1] Inverse

7-31 Process PI Anti Windup
[0] Disable
*[1] Enable

7-32 Process PI Start Speed
0.0–200.0 Hz *0.0 Hz

7-33 Process PI Proportional Gain
0.00–10.00 *0.01

7-34 Process PI Integral Time
0.10–9999 s *9999 s

7-38 Process PI Feed Forward Factor
0–400% *0%

7-39 On Reference Bandwidth
0–200% *5%

8-** Comm. and Options

8-0* General Settings

8-01 Control Site
*[0] Digital and ControlWord
[1] Digital only
[2] ControlWord only

8-02 Control Word Source
[0] None
*[1] GE Drive RS-485

8-03 Control Word Timeout Time
0.1–6,500 s *1.0 s

8-04 Control Word Timeout Function
*[0] Off
[1] Freeze Output
[2] Stop
[3] Jogging
[4] Max. Speed
[5] Stop and trip

8-06 Reset Control Word Timeout
*[0] No Function
[1] Do reset

8-3* GE Drive Port Settings

8-30 Protocol
*[0] GE Drive
[2] Modbus RTU

8-31 Address
1–247 *1

8-32 GE Drive Port Baud Rate
[0] 2,400 Baud
[1] 4,800 Baud
*[2] 9,600 Baud For choosing GE Drive in 8-30
* [3] 19,200 Baud For choosing GE Drive in 8-30
*[4] 38,400 Baud

8-33 GE Drive Port Parity
*[0] Even Parity, 1 Stop Bit
[1] Odd Parity, 1 Stop Bit
[2] No Parity, 1 Stop Bit
[3] No Parity, 2 Stop Bits

8-35 Minimum Response Delay
0.001–0.5 *0.010 s

8-36 Max Response Delay
0.100–10.00 s *5.000 s

8-4* Drive MC protocol set

8-43 Drive Port PCD Read Configuration
*[0] None Expressionlimit
[1] [1500] Operation Hours [8] [1605] Main Actual Value [%]
[9] [1609] Custom Readout
[10] [1610] Power [kW]
[11] [1611] Power [hp]
[12] [1612] Motor Voltage
[13] [1613] Frequency
[14] [1614] Motor Current
[15] [1615] Frequency [%]
[16] [1618] Motor Thermal
[17] [1630] DC Link Voltage
[18] [1634] Heatsink Temp.
[19] [1635] Inverter Thermal
[20] [1638] Logic Controller State
[21] [1650] External Reference
[22] [1651] Pulse Reference
[23] [1652] Feedback [Unit]
[24] [1660] Digital Input 18,19,27,33
[25] [1661] Digital Input 29
[26] [1662] Analog Input 53(V)
[27] [1663] Analog Input 53 (mA)
[28] [1664] Analog Input 60

Table 5.3

[29] [1665] Analog Output 42 [mA]
[30] [1668] Freq. Input 33 [Hz]
[31] [1671] Relay Output [bin]
[32] [1672] Counter A
[33] [1673] Counter[34] [1690] Alarm Word
[34] [1690] Alarm Word
[35] [1692] Warning Word
[36] [1694] Ext. Status Word

8-5* Digital/Bus

8-50 Coasting Select
[0] DigitalInput
[1] Bus
[2] LogicAnd
*[3] LogicOr

8-51 Quick Stop Select
See par. 8-50 * [3] LogicOr

8-52 DC Brake Select
See par. 8-50 * [3] LogicOr

8-53 Start Select
See par. 8-50 * [3] LogicOr

8-54 Reversing Select
See par. 8-50 * [3] LogicOr

8-55 Set-up Select
See par. 8-50 * [3] LogicOr

8-56 Preset Reference Select
See par. 8-50 * [3] LogicOr

8-8X Bus communication Diagnostics

8-80 Bus Message Count
0–0 N/A *0 N/A

8-81 Bus Error Count
0–0 N/A *0 N/A

8-82 Slave Messages Rcvd
0–0 N/A *0 N/A

8-83 Slave Error Count
0–0 N/A *0 N/A

8-9* Bus Jog / Feedback

8-94 Bus feedback 1
0x8000–0x7FFF *0

13-** Controller Logic

13-0* Logic Controller Settings

13-00 Logic Controller Mode
*[0] Off
[1] On

13-01 Start Event
[0] False
[1] True
[2] Running
[3] InRange
[4] OnReference
[7] OutOfCurrentRange
[8] BelowILow
[9] AboveIHigh
[16] ThermalWarning
[17] MainOutOfRange
[18] Reversing
[19] Warning
[20] Alarm_Trip
[21] Alarm_TripLock
[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

13-02 Stop Event
See par. 13-01 * [40] DriveStopped

13-03 Reset Logic Controller
*[0] Do not reset
[1] Reset Logic Controller

13-1* Comparators

13-10 Comparator Operand
*[0] Disabled
[1] Reference
[2] Feedback
[3] MotorSpeed
[4] MotorCurrent
[6] MotorPower
[7] MotorVoltage
[8] DCLinkVoltage
[12] AnalogInput53
[13] AnalogInput60
[18] PulseInput33
[20] AlarmNumber
[30] CounterA
[31] CounterB

13-11 Comparator Operator
[0] Less Than
*[1] Approximately equals
[2] Greater Than

13-12 Comparator Value
-9999–9999 *0.0

13-2* Timers

13-20 LC Controller Timer
0.0–3,600 s *0.0 s

13-4* Logic Rules

13-40 Logic Rule Boolean 1
See par. 13-01 * [0] False
[30]-[32] LC Timeout 0-2

13-41 Logic Rule Operator 1
*[0] Disabled
[1] And
[2] Or
[3] And not
[4] Or not
[5] Not and
[6] Not or
[7] Not and not
[8] Not or not

13-42 Logic Rule Boolean 2
See par. 13-40

13-43 Logic Rule Operator 2
See par. 13-41 * [0] Disabled

13-44 Logic Rule Boolean 3
See par. 13-40

13-5* States

13-51 LC Controller Event
See par. 13-40

13-52 LC Controller Action
*[0] Disabled
[1] NoAction
[2] SelectSetup1
[3] SelectSetup2
[10-17] SelectPresetRef0-7
[18] Select Accel/Decel 1.
[19] Select Accel/Decel 2.
[22] Run
[23] RunReverse
[24] Stop
[25] Qstop
[26] DCstop
[27] Coast
[28] FreezeOutput
[29] StartTimer0
[30] StartTimer1
[31] StartTimer2
et Digital Output B High
[32] Set Digital Output A Low
[33] Set Digital Output B Low
[38] Set Digital Output A High
[39] Set Digital Output B High
[60] ResetCounterA
[61] ResetCounterB

14-** Special Functions

14-0* Carrier Frequency

14-01 Motor Noise (Carrier Frequency)
[0] 2 kHz
*[1] 4 kHz
[2] 8 kHz
[4] 16 kHz not available for M5

14-03 Overmodulation
[0] Off
*[1] On

14-1* Line power monitoring

14-12 Function at line imbalance
*[0] Trip
[1] Warning
[2] Disabled

14-2* Trip Reset

14-20 Reset Mode
*[0] Manual reset
[1-9] AutoReset 1-9
[10] AutoReset 10
[11] AutoReset 15
[12] AutoReset 20
[13] Infinite auto reset
[14] Reset at power-up

14-21 Automatic Restart Time
0–600 s * 10 s

14-22 Restore Factory Settings
*[0] Normal Operation
[2] Restore Factory Settings

14-26 Action At Drive Fault
*[0] Trip
[1] Warning

14-4* Energy Savings

14-41 Energy Savings Minimum Magnetization
40–75% *66%

15-** Drive Information 15-0* Operating Data

15-00 Operating Days

15-01 Running Hours

15-02 kWh Counter

15-03 Power-ups

15-04 Over Temps

15-05 Over-volts

15-06 Reset kWh Counter
*[0] Do not reset
[1] Reset counter

15-07 Reset Running Hours Counter
*[0] Do not reset
[1] Reset counter

15-3* Fault Log

15-30 Fault Log: Error Code *15-4* Drive Identification*

15-40 GE Drive Type

15-41 Power Section

15-42 Voltage

15-43 Software Version

15-46 Adjustable Frequency Drive Order. Number

15-48 LCP ID #

15-51 Adj Freq Drive Serial #

16-** Data Readouts

16-0* General Status

16-00 Control Word
0–0XFFFF

16-01 Reference [Unit]
-4,999–4,999

16-02 Reference %
-200.0–200.0%

Table 5.4

16-03 Status Word	**16-34 Heatsink Temp.**	**16-62 Analog Input 53 (volt)**	**16-90 Alarm Word**
0–0XFFFF	**16-35 Inverter Thermal**	**16-63 Analog Input 53 (current)**	0–0xFFFFFFFF
16-05 Main Actual Value [%]	**16-36 Inv.Nom. Current**	**16-64 Analog Input 60**	**16-92 Warning Word**
-200.0–200.0%	**16-37 Inv. Max. Current**	**16-65 Analog Output 42 [mA]**	0–0XFFFFFFFF
16-09 Custom Readout	**16-38 Logic Controller State**	**16-68 Pulse Input [Hz]16-71 Relay**	**16-94 Ext. Status Word**
Dep. on par. 0-31, 0-32 and 4-14	***16-5* Ref. / Feedb.***	**Output [bin]**	0–0xFFFFFFFF
16-1* Motor Status	**16-50 External Reference**	**16-72 Counter A**	***18-** Extended Motor Data***
16-10 Power [kW]	**16-51 Pulse Reference**	**16-73 Counter B**	***18-8* Motor Resistors***
16-11 Power [hp]	**16-52 Feedback [Unit]**	***16-8* GE Drive Port***	**18-80 Stator Resistance (High**
16-12 Motor Voltage [V]	***16-6* Inputs/Outputs***	**16-86 GE Drive Port REF 1**	**resolution)**
16-13 Frequency [Hz]	**16-60 Digital Input 18,19,27,33**	0x8000–0x7FFF	0.000–99.990 ohm *0.000 ohm
16-14 Motor Current [A]	0–1111	***16-9* Diagnosis Readouts***	**18-81 Stator Leakage Reactance**
16-15 Frequency [%]	**16-61 Digital Input 29**		**(High resolution)**
16-18 Motor Thermal [%]	0-1		0.000–99.990 ohm *0.000 ohm
16-3* Drive Status			
16-30 DC Link Voltage			

Table 5.5

5.1.1 Conversion Index

The various attributes of each parameter are displayed in the section *Factory Settings*. Parameter values are transferred as whole numbers only. Conversion factors are therefore used to transfer decimals according to *Table 5.6*.

1-24 Motor Current has a conversion index of -2 (i.e., conversion factor of 0.01 according to *Table 5.6*). To set the parameter to 2.25 A, transfer the value 225 via Modbus. The conversion factor of 0.01 means that the value transferred is multiplied by 0.01 in the adjustable frequency drive. The value 225 transferred on the bus is thus perceived as 2.25 A in the adjustable frequency drive.

Example:

Conversion index	Conversion factor
2	10
1	100
0	1
-1	0.1
-2	0.01
-3	0.001
-4	0.0001
-5	0.00001

Table 5.6 Conversion Table

5.1.2 Change during operation

"TRUE" means that the parameter can be changed while the adjustable frequency drive is in operation and "FALSE" means that the adjustable frequency drive must be stopped before a change can be made.

5.1.3 2-set-up

"All set-up": The parameter can be set individually in each of the two set-ups, i.e., one single parameter can have two different data values.
"1 set-up": Data value will be the same in both set-ups.

5.1.4 Type

Data Type	Description	Type
2	Integer 8	Int8
3	Integer 16	Int16
4	Integer 32	Int32
5	Unsigned 8	Uint8
6	Unsigned 16	Uint16
7	Unsigned 32	Uint32
9	Visible string	VisibleString

Table 5.7

5.1.5 0-** Operation/Display

Parameter Number	Parameter Description	Default Value	2 set-up	Change During Operation	Conversion Index	Type
0 03	Regional Settings	[1] US	1 set-up	FALSE	-	Uint8
0-04	Operating State at Power-up (Hand)	[1] Forced stop ref=old	All set-ups	TRUE	-	Uint8
0-10	Active Set-up	[1] Set-up 1	1 set-up	TRUE	-	Uint8
0-11	Edit Set-up	[1] Set-up 1	1 set-up	TRUE	-	Uint8
0-12	Link Set-ups	[20] Linked	All set-ups	FALSE	-	Uint8
0-40	[Hand] Key on keypad	[1] Enabled	All set-ups	TRUE	-	Uint8
0-41	[Off / Reset] Key on keypad	[1] Enable All	All set-ups	TRUE	-	Uint8
0-42	[Auto] Key on keypad	[1] Enabled	All set-ups	TRUE	-	Uint8
0-50	Keypad Copy	[0] No copy	1 set-up	FALSE	-	Uint8
0-51	Set-up Copy	[0] No copy	1 set-up	FALSE	-	Uint8
0-60	Main Menu Password	0	1 set-up	TRUE	0	Uint16

Table 5.8

5.1.6 1-** Load/Motor

Parameter Number	Parameter Description	Default Value	2 set-up	Change During Operation	Conversion Index	Type
1-00	Configuration Mode	[0] Speed open-loop	All set-ups	TRUE	-	Uint8
1-01	Motor Control Principle	[1] Adv. Vector Control	All set-ups	FALSE	-	Uint8
1-03	Torque Characteristics	[0] Constant torque	All set-ups	TRUE	-	Uint8
1-05	Hand Mode Configuration	[2] As mode par 1-00	All set-ups	TRUE	-	Uint8
1-20	Motor Power		All set-ups	FALSE	-	Uint8
1-22	Motor Voltage		All set-ups	FALSE	0	Uint16
1-23	Motor Frequency		All set-ups	FALSE	0	Uint16
1-24	Motor Current		All set-ups	FALSE	-2	Uint16
1-25	Motor Nominal Speed		All set-ups	FALSE	0	Uint16
1-29	Auto Tune	[0] Off	1 set-up	FALSE	-	Uint8
1-30	Stator Resistance (Rs)		All set-ups	FALSE	-2	Uint16
1-33	Stator Leakage Reactance (X1)		All set-ups	FALSE	-2	Uint32
1-35	Main Reactance (Xh)		All set-ups	FALSE	-2	Uint32
1-50	Motor Magnetization at Zero Speed	100%	All set-ups	TRUE	0	Uint16
1-52	Min Speed Normal Magnetizing [Hz]	0 Hz	All set-ups	TRUE	-1	Uint16
1-55	U/f Characteristic - U		All set-ups	TRUE	0	Uint16
1-56	U/f Characteristic - F		All set-ups	TRUE	0	Uint16
1-60	Low Speed Load Compensation	100%	All set-ups	TRUE	0	Uint16
1-61	High Speed Load Compensation	100%	All set-ups	TRUE	0	Uint16
1-62	Slip Compensation	100%	All set-ups	TRUE	0	Int16
1-63	Slip Compensation Time Constant	0.1 s	All set-ups	TRUE	-2	Uint16
1-71	Holding Time	0 s	All set-ups	TRUE	-1	Uint8
1-72	Start Function	[2] Coast/delay time	All set-ups	TRUE	-	Uint8
1-73	Start Mode	[0] Disabled	All set-ups	FALSE	-	Uint8
1-80	Function at Stop	[0] Coast	All set-ups	TRUE	-	Uint8
1-82	Min. Speed for Function at Stop [Hz]	0 Hz	All set-ups	TRUE	-1	Uint16
1-90	Motor Thermal Protection	[0] No protection	All set-ups	TRUE	-	Uint8
1-93	Thermistor Resource	[0] None	All set-ups	FALSE	-	Uint8

Table 5.9

5.1.7 2-** Brakes

Parameter Number	Parameter Description	Default Value	2 set-up	Change During Operation	Conversion Index	Type
2-00	DC Hold Current	50%	All set-ups	TRUE	0	Uint16
2-01	DC Brake Current	50%	All set-ups	TRUE	0	Uint16
2-02	DC Braking Time	10 s	All set-ups	TRUE	-1	Uint16
2-04	DC Brake Cut-in Speed	0 Hz	All set-ups	TRUE	-1	Uint16
2-10	Brake Function	[0] Off	All set-ups	TRUE	-	Uint8
2-11	Brake Resistor (ohm)		All set-ups	TRUE	0	Uint16
2-16	AC Brake, Max current	100%	All set-ups	TRUE	0	Uint16
2-17	Overvoltage Control	[0] Disabled	All set-ups	TRUE	-	Uint8
2-20	Release Brake Current	0 A	All set-ups	TRUE	-2	Uint32
2-22	Activate Brake Speed [Hz]	0 Hz	All set-ups	TRUE	-1	Uint16

Table 5.10

5.1.8 3-** Reference/Ramps

Parameter Number	Parameter Description	Default Value	2 set-up	Change During Operation	Conversion Index	Type
3-00	Reference Range	[0] Min - Max	All set-ups	TRUE	-	Uint8
3-02	Minimum Reference	0	All set-ups	TRUE	-3	Int32
3-03	Maximum Reference	50	All set-ups	TRUE	-3	Int32
3-10	Preset Reference	0%	All set-ups	TRUE	-2	Int16
3-11	Jog Speed [Hz]	5 Hz	All set-ups	TRUE	-1	Uint16
3-12	Catch up/slow-down value	0%	All set-ups	TRUE	-2	Int16
3-14	Preset Relative Reference	0%	All set-ups	TRUE	-2	Int16
3-15	Reference Resource 1	[1] Analog in 53	All set-ups	TRUE	-	Uint8
3-16	Reference Resource 2	[2] Analog in 60	All set-ups	TRUE	-	Uint8
3-17	Reference Resource 3	[11] Local bus reference	All set-ups	TRUE	-	Uint8
3-18	Relative Scaling Reference Resource	[0] No function	All set-ups	TRUE	-	Uint8
3-40	Accel/Decel 1 Pattern	[0] Linear	All set-ups	TRUE	-	Uint8
3-41	Accel Time 1	3 s	All set-ups	TRUE	-2	Uint32
3-42	Decel Time 1	3 s	All set-ups	TRUE	-2	Uint32
3-50	Accel/Decel 2 Pattern	[0] Linear	All set-ups	TRUE	-	Uint8
3-51	Accel Time 2	3 s	All set-ups	TRUE	-2	Uint32
3-52	Decel Time 2	3 s	All set-ups	TRUE	-2	Uint32
3-80	Jog Accel/Decel Time	3 s	All set-ups	TRUE	-2	Uint32
3-81	Quick Stop Ramp Time	3 s	1 set-up	TRUE	-2	Uint32

Table 5.11

5.1.9 4-** Limits/Warnings

Parameter Number	Parameter Description	Default Value	2 set-up	Change During Operation	Conversion Index	Type
4-10	Reverse Lock	[2] Both directions	All set-ups	FALSE	-	Uint8
4-12	Motor Speed Low Limit [Hz]	0 Hz	All set-ups	FALSE	-1	Uint16
4-14	Motor Speed High Limit [Hz]	65 Hz	All set-ups	FALSE	-1	Uint16
4-16	Torque Limit Motor Mode	150%	All set-ups	TRUE	0	Uint16
4-17	Torque Limit Generator Mode	100%	All set-ups	TRUE	0	Uint16
4-50	Warning Current Low	0 A	All set-ups	TRUE	-2	Uint32
4-51	Warning Current High	26 A	All set-ups	TRUE	-2	Uint32
4-58	Missing Motor Phase Function	[1] On	All set-ups	FALSE	-	Uint8
4-61	Jump Frequency From [Hz]	0 Hz	All set-ups	TRUE	-1	Uint16
4-63	Jump Frequency To [Hz]	0 Hz	All set-ups	TRUE	-1	Uint16

Table 5.12

5.1.10 5-** Digital In/Out

Parameter Number	Parameter Description	Default Value	2 set-up	Change During Operation	Conversion Index	Type
5-10	Terminal 18 Digital Input	[8] Start	All set-ups	TRUE	-	Uint8
5-11	Terminal 19 Digital Input	[10] Reversing	All set-ups	TRUE	-	Uint8
5-12	Terminal 27 Digital Input	[1] Reset	All set-ups	TRUE	-	Uint8
5-13	Terminal 29 Digital Input	[14] Jog	All set-ups	TRUE	-	Uint8
5-15	Terminal 33 Digital Input	[16] Preset ref bit 0	All set-ups	TRUE	-	Uint8
5-40	Function Relay	[0] No operation	All set-ups	TRUE	-	Uint8
5-55	Terminal 33 Low Frequency	20 Hz	All set-ups	TRUE	0	Uint16
5-56	Terminal 33 High Frequency	5000 Hz	All set-ups	TRUE	0	Uint16
5-57	Terminal 33 Low Ref./Feedb. Value	0	All set-ups	TRUE	-3	Int32
5-58	Terminal 33 High Ref./Feedb. Value	50	All set-ups	TRUE	-3	Int32

Table 5.13

5.1.11 6-** Analog In/Out

Parameter Number	Parameter Description	Default Value	2 set-up	Change During Operation	Conversion Index	Type
6-00	Live Zero Timeout Time	10 s	All set-ups	TRUE	0	Uint8
6-01	Live Zero TimeoutFunction	[0] Off	All set-ups	TRUE	-	Uint8
6-10	Terminal 53 Low Voltage	0.07 V	All set-ups	TRUE	-2	Uint16
6-11	Terminal 53 High Voltage	10 V	All set-ups	TRUE	-2	Uint16
6-12	Terminal 53 Low Current	0.14 mA	All set-ups	TRUE	-2	Uint16
6-13	Terminal 53 High Current	20 mA	All set-ups	TRUE	-2	Uint16
6-14	Terminal 53 Low Ref./Feedb. Value	0	All set-ups	TRUE	-3	Int32
6-15	Terminal 53 High Ref./Feedb. Value	50	All set-ups	TRUE	-3	Int32
6-16	Terminal 53 Filter Time Constant	0.01 s	All set-ups	TRUE	-2	Uint16
6-19	Terminal 53 mode	[0] Voltage mode	1 set-up	TRUE	-	Uint8
6-22	Terminal 60 Low Current	0.14 mA	All set-ups	TRUE	-2	Uint16
6-23	Terminal 60 High Current	20 mA	All set-ups	TRUE	-2	Uint16
6-24	Terminal 60 Low Ref./Feedb. Value	0	All set-ups	TRUE	-3	Int32
6-25	Terminal 60 High Ref./Feedb. Value	50	All set-ups	TRUE	-3	Int32
6-26	Terminal 60 Filter Time Constant	0.01 s	All set-ups	TRUE	-2	Uint16
6-81	Keypad potentiometer Low Ref.	0	All set-ups	TRUE	-3	Int32
6-82	Keypad potentiometer High Ref.	50	All set-ups	TRUE	-3	Int32
6-90	Terminal 42 Mode	[0] 0–20 mA	All set-ups	TRUE	-	Uint8
6-91	Terminal 42 Analog Output	[0] No operation	All set-ups	TRUE	-	Uint8
6-92	Terminal 42 Digital Output	[0] No operation	All set-ups	TRUE	-	Uint8
6-93	Terminal 42 Output Min Scale	0%	All set-ups	TRUE	-2	Uint16
6-94	Terminal 42 Output Max Scale	100%	All set-ups	TRUE	-2	Uint16

Table 5.14

5.1.12 7-** Controllers

Parameter Number	Parameter Description	Default Value	2 set-up	Change During Operation	Conversion Index	Type
7-20	Process CL Feedback 1 Resource	[0] No function	All set-ups	TRUE	-	Uint8
7-30	Process PI Normal/ Inverse Control	[0] Normal	All set-ups	TRUE	-	Uint8
7-31	Process PI Anti Windup	[1] Enabled	All set-ups	TRUE	-	Uint8
7-32	Process PI Start Speed	0 Hz	All set-ups	TRUE	-1	Uint16
7-33	Process PI Proportional Gain	0.01	All set-ups	TRUE	-2	Uint16
7-34	Process PI Integral Time	9999 s	All set-ups	TRUE	-2	Uint32
7-38	Process PI Feed Forward Factor	0%	All set-ups	TRUE	0	Uint16
7-39	On Reference Bandwidth	5%	All set-ups	TRUE	0	Uint8

Table 5.15

5.1.13 8-** Comm. and Options

Parameter Number	Parameter Description	Default Value	2 set-up	Change During Operation	Conversion Index	Type
8-01	Control Site	[0] Digital and ctrl.word	All set-ups	TRUE	-	Uint8
8-02	Control Word Source	[1] GE Drive RS485	All set-ups	TRUE	-	Uint8
8-03	Control Word Timeout Time	1 s	1 set-up	TRUE	-1	Uint16
8-04	Control Word Timeout Function	[0] Off	1 set-up	TRUE	-	Uint8
8-06	Reset Control Word Timeout	[0] No function	1 set-up	TRUE	-	Uint8
8-30	Protocol	[0] GE Drive	1 set-up	TRUE	0	Uint8
8-31	Address	1	1 set-up	TRUE	0	Uint8
8-32	GE Drive Port Baud Rate	[2] 9600 Baud	1 set-up	TRUE	-	Uint8
8-33	GE Drive Port Parity	[0] Even Parity 1 Stop Bit	1 set-up	TRUE	-	Uint8
8-35	Minimum Response Delay	0.01 s	1 set-up	TRUE	-3	Uint16
8-36	Max Response Delay	5 s	1 set-up	TRUE	-3	Uint16
8-50	Coasting Select	[3] Logic OR	All set-ups	TRUE	-	Uint8
8-51	Quick Stop Select	[3] Logic OR	All set-ups	TRUE	-	Uint8
8-52	DC Brake Select	[3] Logic OR	All set-ups	TRUE	-	Uint8
8-53	Start Select	[3] Logic OR	All set-ups	TRUE	-	Uint8
8-54	Reversing Select	[3] Logic OR	All set-ups	TRUE	-	Uint8
8-55	Set-up Select	[3] Logic OR	All set-ups	TRUE	-	Uint8
8-56	Preset Reference Select	[3] Logic OR	All set-ups	TRUE	-	Uint8
8-94	Bus feedback 1	0	All set-ups	TRUE	0	Int16

Table 5.16

5.1.14 13-** Logic Controller

Parameter Number	Parameter Description	Default Value	2 set-up	Change During Operation	Conversion Index	Type
13-00	Logic Controller Mode	[0] Off	1 set-up	TRUE	-	Uint8
13-01	Start Event	[39] Start command	1 set-up	TRUE	-	Uint8
13-02	Stop Event	[40] Drive stopped	1 set-up	TRUE	-	Uint8
13-03	Reset Logic Controller	[0] Do not reset	1 set-up	TRUE	-	Uint8
13-10	Comparator Operand	[0] Disabled	1 set-up	TRUE	-	Uint8
13-11	Comparator Operator	[1] ApproxEqual	1 set-up	TRUE	-	Uint8
13-12	Comparator Value	0	1 set-up	TRUE	-1	Int32
13-20	Logic Controller Controller Timer	0 s	1 set-up	TRUE	-1	Uint32
13-40	Logic Rule Boolean 1	[0] False	1 set-up	TRUE	-	Uint8
13-41	Logic Rule Operator 1	[0] Disabled	1 set-up	TRUE	-	Uint8
13-42	Logic Rule Boolean 2	[0] False	1 set-up	TRUE	-	Uint8
13-43	Logic Rule Operator 2	[0] Disabled	1 set-up	TRUE	-	Uint8
13-44	Logic Rule Boolean 3	[0] False	1 set-up	TRUE	-	Uint8
13-51	Logic Controller Event	[0] False	1 set-up	TRUE	-	Uint8
13-52	Logic Controller Action	[0] Disabled	1 set-up	TRUE	-	Uint8

Table 5.17

5.1.15 14-** Special Functions

Parameter Number	Parameter Description	Default Value	2 set-up	Change During Operation	Conversion Index	Type
14-01	Motor Noise (Carrier Freq.)	[1] 4.0 kHz	All set-ups	TRUE	-	Uint8
14-03	Overmodulation	[1] On	All set-ups	FALSE	-	Uint8
14-12	Function at Line Imbalance	[0] Trip	All set-ups	TRUE	-	Uint8
14-20	Reset Mode	[0] Manual reset	All set-ups	TRUE	-	Uint8
14-21	Automatic Restart Time	10 s	All set-ups	TRUE	0	Uint16
14-22	Restore Factory Settings	[0] Normal operation	1 set-up	TRUE	-	Uint8
14-26	Action At Inverter Fault	[0] Trip	All set-ups	TRUE	-	Uint8
14-41	Energy Savings Minimum Magnetization	66 %	All set-ups	TRUE	0	Uint8

Table 5.18

5.1.16 15-** Drive Information

Parameter Number	Parameter Description	Default Value	2 set-up	Change During Operation	Conversion Index	Type
15-00	Operating Time	0	1 set-up	TRUE	0	Uint32
15-01	Running Hours	0	1 set-up	TRUE	0	Uint32
15-02	kWh Counter	0	1 set-up	TRUE	0	Uint32
15-03	Power-ups	0	1 set-up	TRUE	0	Uint32
15-04	Overtemps	0	1 set-up	TRUE	0	Uint16
15-05	Overvolts	0	1 set-up	TRUE	0	Uint16
15-06	Reset kWh Counter	[0] Do not reset	1 set-up	TRUE	-	Uint8
15-07	Reset Running Hours Counter	[0] Do not reset	1 set-up	TRUE	-	Uint8
15-30	Fault Log: Error Code	0	1 set-up	TRUE	0	Uint8
15-40	GE Drive Type		1 set-up	FALSE	0	Visible-String
15-41	Power Section		1 set-up	FALSE	0	Visible-String
15-42	Voltage		1 set-up	FALSE	0	Visible-String
15-43	SW ID Control Card		1 set-up	FALSE	0	Visible-String
15-46	Adjustable Frequency Drive Ordering No.		1 set-up	FALSE	0	Visible-String
15-48	Keypad ID No		1 set-up	FALSE	0	Visible-String
15-51	Adjustable Frequency Drive Serial Number		1 set-up	FALSE	0	Visible-String

Table 5.19

5.1.17 16-** Data Readouts

Parameter Number	Parameter Description	Default Value	2 set-up	Change During Operation	Conversion Index	Type
16-00	Control Word	0	1 set-up	TRUE	0	Uint16
16-01	Reference [Unit]	0	1 set-up	TRUE	-3	Int32
16-02	Reference %	0	1 set-up	TRUE	-1	Int16
16-03	Status Word	0	1 set-up	TRUE	0	Uint16
16-05	Main Actual Value [%]	0	1 set-up	TRUE	-2	Int16
16-10	Power [kW]	0	1 set-up	TRUE	-3	Uint16
16-11	Power [hp]	0	1 set-up	TRUE	-3	Uint16
16-12	Motor Voltage	0	1 set-up	TRUE	0	Uint16
16-13	Frequency	0	1 set-up	TRUE	-1	Uint16
16-14	Motor Current	0	1 set-up	TRUE	-2	Uint16
16-15	Frequency [%]	0	1 set-up	TRUE	-1	Uint16
16-18	Motor Thermal	0	1 set-up	TRUE	0	Uint8
16-30	DC-Link Voltage	0	1 set-up	TRUE	0	Uint16
16-34	Heatsink Temp.	0	1 set-up	TRUE	0	Uint8
16-35	Inverter Thermal	0	1 set-up	TRUE	0	Uint8
16-36	Inv. Nom. Current	0	1 set-up	TRUE	-2	Uint16
16-37	Inv. Max. Current	0	1 set-up	TRUE	-2	Uint16
16-38	Logic Controller State	0	1 set-up	TRUE	0	Uint8
16-50	External Reference	0	1 set-up	TRUE	-1	Int16
16-51	Pulse Reference	0	1 set-up	TRUE	-1	Int16
16-52	Feedback [Unit]	0	1 set-up	TRUE	-3	Int32
16-60	Digital input 18,19,27,33	0	1 set-up	TRUE	0	Uint16
16-61	Digital input 29	0	1 set-up	TRUE	0	Uint8
16-62	Analog Input 53 (V)	0	1 set-up	TRUE	-2	Uint16
16-63	Analog Input 53 (mA)	0	1 set-up	TRUE	-2	Uint16
16-64	Analog Input 60	0	1 set-up	TRUE	-2	Uint16
16-65	Analog Output 42 [mA]	0	1 set-up	TRUE	-2	Uint16
16-68	Pulse input 33	20	1 set-up	TRUE	0	Uint16
16-71	Relay Output [bin]	0	1 set-up	TRUE	0	Uint8
16-72	Counter A	0	1 set-up	TRUE	0	Int16
16-73	Counter B	0	1 set-up	TRUE	0	Int16
16-86	GE Drive Port REF 1	0	1 set-up	TRUE	0	Int16
16-90	Alarm Word	0	1 set-up	TRUE	0	Uint32
16-92	Warning Word	0	1 set-up	TRUE	0	Uint32
16-94	Ext. Status Word	0	1 set-up	TRUE	0	Uint32

Table 5.20

6 Troubleshooting

A warning or an alarm is signaled by the relevant LED on the front of the adjustable frequency drive and indicated by a code on the display.

A warning remains active until its cause is no longer present. Under certain circumstances operation of the motor may still be continued. Warning messages may be critical, but are not necessarily so.

In the event of an alarm, the adjustable frequency drive will have tripped. Alarms must be reset to restart operation once their cause has been rectified.

This may be done in four ways:

1. By pressing [Reset].
2. Via a digital input with the "Reset" function.
3. Via serial communication.

NOTE!

After a manual reset press [Reset], [Auto] or [Hand] to restart the motor.

If an alarm cannot be reset, the reason may be that its cause has not been rectified, or the alarm is trip-locked (see also *Table 6.1*).

⚠CAUTION

Alarms that are trip-locked offer additional protection, means that the line power supply must be switched off before the alarm can be reset. After being switched back on, the adjustable frequency drive is no longer blocked and may be reset as described above, once the cause has been rectified.
Alarms that are not trip-locked can also be reset using the automatic reset function in *14-20 Reset Mode* (Warning: automatic wake-up is possible!)
If a warning and alarm is marked against a code in the *Table 6.1*, this means that either a warning occurs before an alarm, or it can be specified whether it is a warning or an alarm that is to be displayed for a given fault.
This is possible, for instance, in *1-90 Motor Thermal Protection*. After an alarm or trip, the motor carries on coasting, and the alarm and warning flash on the adjustable frequency drive. Once the problem has been rectified, only the alarm continues flashing.

6

Number	Description	Warning	Alarm	Trip Lock	Error	Parameter Reference
2	Live zero error	(X)	(X)			6-01
4	Line power phase loss	(X)	(X)	(X)		14-12
7	DC over-voltage	X	X			
8	DC undervoltage	X	X			
9	Inverter overloaded	X	X			
10	Motor overload temperature	(X)	(X)			1-90
11	Motor thermistor overtemperature	(X)	(X)			1-90
12	Torque limit	(X)				4-16, 4-17
13	Overcurrent	X	X	X		
14	Ground fault	X	X	X		
16	Short-circuit		X	X		
17	Control word timeout	(X)	(X)			8-04
25	Brake resistor short-circuited		X	X		
27	Brake chopper short-circuited		X	X		
28	Brake Check		X			
29	Power board overtemp		X	X		
30	Motor phase U missing		(X)	(X)		4-58
31	Motor phase V missing		(X)	(X)		4-58
32	Motor phase W missing		(X)	(X)		4-58
38	Internal fault		X	X		

Number	Description	Warning	Alarm	Trip Lock	Error	Parameter Reference
44	Ground fault 2		X	X		
47	Control Voltage Fault		X	X		
51	Auto tune check U_{nom} and I_{nom}		X			
52	Auto tune low I_{nom}		X			
53	Auto tune motor too big		X			
54	Auto tune motor too small		X			
55	Auto tune Parameter out of range		X			
59	Current limit	X				
63	Mechanical Brake Low		X			
80	Drive Initialized to Default Value		X			
84	The connection between drive and keypad is lost				X	
85	Button disabled				X	
86	Copy fail				X	
87	Keypad data invalid				X	
88	Keypad data not compatible				X	
89	Parameter read-only				X	
90	Parameter database busy				X	
91	Parameter value is not valid in this mode				X	
92	Parameter value exceeds the min/max limits				X	

Table 6.1 Alarm/Warning Code List

(X) Dependent on parameter

A trip is the action when an alarm has appeared. The trip will coast the motor and can be reset by pressing [Reset] or make a reset by a digital input (parameter group 5-1* [1]). The original event that caused an alarm cannot damage the adjustable frequency drive or cause dangerous conditions. A trip lock is an action that occurs in conjunction with an alarm, which may cause damage to the adjustable frequency drive or connected parts. A trip lock situation can only be reset by power cycling.

LED indication	
Warning	yellow
Alarm	flashing red

Table 6.2

The alarm words, warning words and extended status words can be read out via serial bus or optional serial communication bus for diagnosis. See also *16-90 Alarm Word*, *16-92 Warning Word* and *16-94 Ext. Status Word*.

6.1.1 Alarm, Warning and Extended Status Word

			Par. 16-90	Par. 16-92	Par. 16-94
Bit	Hex	Dec	AlarmWord	WarningWord	ExtendedStatusWord
0	1	1	Brake check		Ramping
1	2	2	Pwr.card temp	Pwr.card temp	Auto tune running
2	4	4	Ground Fault		Start CW/CCW
3	8	8			Slow-down
4	10	16	Ctrl.word TO	Ctrl.word TO	Catch up
5	20	32	Overcurrent	Overcurrent	Above Feedback High
6	40	64		Torque limit	Below Feedback Low
7	80	128	Motor Thermistor Over	Motor Thermistor Over	Output current high
8	100	256	Electronic Overload Over	Electronic Overload Over	Output current low
9	200	512	Inverter overload	Inverter overload	Above Frequency High
10	400	1,024	DC under-volt	DC under-volt	Below Frequency Low
11	800	2,048	DC over-volt	DC over-volt	
12	1,000	4,096	Short-circuit		
13	2,000	8,192			Braking
14	4,000	16,384	Mains phs. loss	Line power phs. loss	
15	8,000	32,768	"Auto Tune Not OK"		OVC active
16	10,000	65,536	Live zero error	Live zero error	AC brake
17	20,000	131,072	Internal fault		
18	40,000	262,144			
19	80,000	524,288	U phase loss		Above Reference High
20	100,000	1,048,576	V phase loss		Below Reference Low
21	200,000	2,097,152	W phase loss		Local Ref./Remote Ref.
22	400,000	4,194,304			
23	800,000	8,388,608	Control Voltage Fault		
24	1,000,000	16,777,216			
25	2,000,000	33,554,432		Current limit	
26	4,000,000	67,108,864	Brake resistor short-circuit		
27	8,000,000	134,217,728	Brake IGBT short-circuit		
28	10,000,000	268,435,456	M4/M5: Ground Fault (Desat)	MotorPhaseMissing	
29	20,000,000	536,870,912	Drive restored		
30	40,000,000	1,073,741,824		Undefined	
31	80,000,000	2,147,483,648	Mech. brake low		DatabaseBusy

Table 6.3

The alarm words, warning words and extended staus words can be read out via serial bus for diagnosis. See also *16-94 Ext. Status Word*.

WARNING/ALARM 2, Live zero error
Signal on terminal 53 or 60 is less than 50% of value set in *6-10 Terminal 53 Low Voltage*, *6-12 Terminal 53 Low Current* and *6-22 Terminal 60 Low Current*.

WARNING/ALARM 4, Mains phase loss
A phase is missing on the supply side, or the line voltage imbalance is too high. This message also appears for a fault in the input rectifier on the adjustable frequency drive.

Troubleshooting: Check the supply voltage and supply currents to the adjustable frequency drive. The fault may be caused by line power distortions. Installing a GE line filter may rectify this problem.

WARNING/ALARM 7, DC over-voltage
If the intermediate circuit voltage exceeds the limit, the adjustable frequency drive trips after a time.

Troubleshooting

Connect a brake resistor

Extend the ramp time

Change the ramp type

Activate the functions in *2-10 Brake Function*

Increase *14-26 Trip Delay at Inverter Fault*

The fault may be caused by line power distortions. Installing a GE line filter may rectify this problem.

WARNING/ALARM 8, DC undervoltage

If the intermediate circuit voltage (DC link) drops below the under voltage limit, the adjustable frequency drive checks if a 24 V DC backup supply is connected. If no 24 V DC backup supply is connected, the adjustable frequency drive trips after a fixed time delay. The time delay varies with unit size.

Troubleshooting

Make sure that the supply voltage matches the adjustable frequency drive voltage.

Perform input voltage test.

Perform soft charge circuit test.

WARNING/ALARM 9, Inverter overload

The adjustable frequency drive is about to cut out because of an overload (current too high for too long). The counter for electronic, thermal inverter protection issues a warning at 98% and trips at 100%, while giving an alarm. The adjustable frequency drive *cannot* be reset until the counter is below 90%.

The fault is that the adjustable frequency drive has run with more than 100% overload for too long.

Troubleshooting

Compare the output current shown on the keypad with the adjustable frequency drive rated current.

Compare the output current shown on the keypad with measured motor current.

Display the Thermal Drive Load on the keypad and monitor the value. When running above the adjustable frequency drive continuous current rating, the counter increases. When running below the adjustable frequency drive continuous current rating, the counter decreases.

WARNING/ALARM 10, Motor overload temperature

According to the electronic thermal protection, the motor is too hot. Select whether the adjustable frequency drive gives a warning or an alarm when the counter reaches 100% in *1-90 Motor Thermal Protection*. The fault occurs when the motor is overloaded by more than 100% for too long.

Troubleshooting

Check for motor overheating.

Check if the motor is mechanically overloaded.

Check that the motor current set in *1-24 Motor Current* is correct.

Ensure that Motor data in parameters 1-20 through 1-25 are set correctly.

Running Auto tune in 1-29 Auto Tune. The inverter peak current limit (approx. 200% of the rated current) is exceeded. The warning will last approx. 8-12 s, then the adjustable frequency drive trips and issues an alarm. Turn off the adjustable frequency drive and check if the motor shaft can be turned and if the motor size matches the adjustable frequency drive. If extended mechanical brake control is selected, trip can be reset externally. May tune the adjustable frequency drive to the motor more accurately and reduce thermal loading.

WARNING/ALARM 11, Motor thermistor over temp

The thermistor might be disconnected. Select whether the adjustable frequency drive gives a warning or an alarm in *1-90 Motor Thermal Protection*.

Troubleshooting

Check for motor overheating.

Check if the motor is mechanically overloaded.

WARNING/ALARM 13, Overcurrent

The inverter peak current limit (approx. 200% of the rated current) is exceeded. The warning will last approx. 8-12 s, then the adjustable frequency drive trips and issues an alarm. Turn off the adjustable frequency drive and check if the motor shaft can be turned and if the motor size matches the adjustable frequency drive. If extended mechanical brake control is selected, trip can be reset externally.

Troubleshooting:

Remove power and check if the motor shaft can be turned.

Make sure that the motor size matches the adjustable frequency drive.

Check parameters 1-20 through 1-25. for correct motor data.

ALARM 14, Ground fault

There is current from the output phases to ground, either in the cable between the adjustable frequency drive and the motor or in the motor itself.

Troubleshooting:

Remove power to the adjustable frequency drive and repair the ground fault.

Check for ground faults in the motor by measuring the resistance to ground of the motor leads and the motor with a megohmmeter.

ALARM 16, Short-circuit
There is short-circuiting in the motor or motor wiring.

Remove power to the adjustable frequency drive and repair the short circuit.

WARNING/ALARM 17, Control word timeout
There is no communication to the adjustable frequency drive.
The warning is only active when *8-04 Control Word Timeout Function* is NOT set to OFF.
If *8-04 Control Word Timeout Function* is set to *Stop* and *Trip*, a warning appears and the adjustable frequency drive ramps down until it trips, while giving an alarm.
8-03 Control Timeout Time could possibly be increased.

Troubleshooting:

Check connections on the serial communication cable.

Increase *8-03 Control Word Timeout Time*

Check the operation of the communication equipment.

Verify a proper installation based on EMC requirements.

ALARM 29, Heatsink temp
The maximum temperature of the heatsink has been exceeded. The temperature fault will not reset until the temperature falls below a defined heatsink temperature. The trip and reset points are different based on the adjustable frequency drive power size.

Troubleshooting
Check for the following conditions.

Ambient temperature too high.

Motor cable too long.

Incorrect airflow clearance above and below the adjustable frequency drive.

Blocked airflow around the adjustable frequency drive.

Damaged heatsink fan.

Dirty heatsink.

ALARM 30, Motor phase U missing
Motor phase U between the adjustable frequency drive and the motor is missing.

Remove power from the adjustable frequency drive and check motor phase U.

ALARM 31, Motor phase V missing
Motor phase V between the adjustable frequency drive and the motor is missing.

Remove power from the adjustable frequency drive and check motor phase V.

ALARM 32, Motor phase W missing
Motor phase W between the adjustable frequency drive and the motor is missing.

Remove power from the adjustable frequency drive and check motor phase W.

ALARM 38, Internal fault

Troubleshooting

Cycle power

Check that the option is properly installed

Check for loose or missing wiring

It may be necessary to contact the local GE supplier or service department. Note the code number for further troubleshooting directions.

WARNING 47, 24 V supply low
The 24 V DC is measured on the control card. The external 24 V DC backup power supply may be overloaded, otherwise contact the GE supplier.

ALARM 51, Auto tune check U_{nom} and I_{nom}
The settings for motor voltage, motor current, and motor power are wrong. Check the settings in parameters 1-20 to 1-25.

ALARM 55, Auto Tune parameter out of range
The parameter values of the motor are outside of the acceptable range. Auto tune does not run.

ALARM 63, Mechanical brake low
The actual motor current has not exceeded the “release brake” current within the “Start delay” time window.

ALARM 80, Drive restored to default value
Parameter settings are restored to factory settings after a manual reset. Reset the unit to clear the alarm.

ALARM 84, The connection between drive and keypad is lost
Try to reassemble the keypad gently.

ALARM 85, Button disabled
See parameter group *0-4* Keypad*

ALARM 86, Copy fail
An error occurred while copying from adjustable frequency drive to keypad or vice versa.

ALARM 87, Keypad data invalid
Occurs when copying from keypad if the keypad contains erroneous data or if no data was uploaded to the keypad.

ALARM 88,Keypad data not compatible
Occurs when copying from keypad if data are moved between adjustable frequency drives with major differences in software versions.

WARNING 89, Parameter read-only
Occurs when trying to write to a read-only parameter.

ALARM 90, Parameter database busy
Keypad and RS-485 connection are trying to update parameters simultaneously.

ALARM 91, Parameter value is not valid in this mode
Occurs when trying to write an illegal value to a parameter.

ALARM 92, Parameter value exceeds the min/max limits
Occurs when trying to set a value outside the range. Parameter can only be changed when the motor is stopped. Err. A wrong password was entered, occurs when using a wrong password for changing a password-protected parameter.

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