YASKAWA

YASKAWA AC Drive A1000

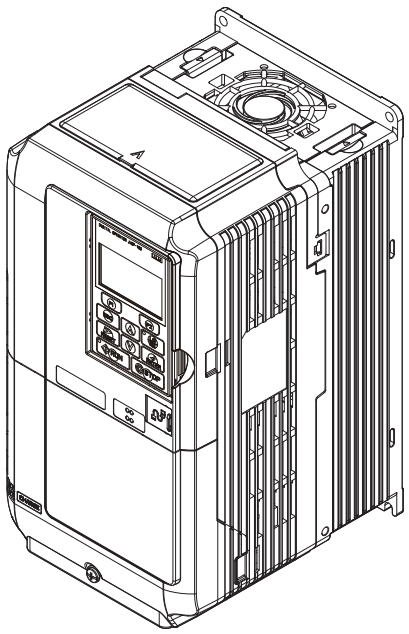
Crane Software Application Manual

Software No. VSA90507X

Type: CIMR-AC ☐☐☐☐

Models: 200 V Class: 0.4 to 110 kW (1.2 to 160 kVA)
400 V Class: 0.4 to 300 kW (1.4 to 460 kVA)

To properly use the product, read this manual thoroughly and retain for easy reference, inspection, and maintenance. Ensure the end user receives this manual.



MANUAL NO. YEG-EZZ021069.1

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1. General Specifications

This document contains the basic specifications for the Custom A1000 AC Drive for Crane Applications, and supplements the technical manual for the standard A1000 drive (SIEP C710616 27).

① For directions on how to execute the Auto-Tuning procedure using the digital operator, refer the technical manual for the standard A1000 drive (SIEP C710616 27).

② Brake Sequence Errors SE1 to SE4 are specific to the Crane Custom Software.
If errors SE1 through SE4 occur, refer to section 7.1 to calculate the correct values for parameters S1-01 through S1-15, and to setup the external brake sequence properly.

2. Electrical Specifications

2.1 Equipment Design

Standard General-Purpose A1000 AC Frequency Inverter

2.2 Compatible Option Cards

(1) Additional Inputs (using port CN5-A)

DI-A3 (Digital Input x16)
AI-A3 (High-Resolution Analog Input x3)

(2) Monitor Outputs (using ports CN5-A, B, C)

AO-A3 (Analog Output x2)
DO-A3 (Digital Output x8)

(3) Encoder Feedback (using ports CN5-B, C)

PG-B3 (Single Encoder, Open-Collector)
PG-X3 (Single Encoder, Line Driver)

2.3 Custom Model

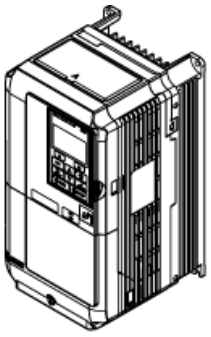
The physical form and software number of the Custom A1000 AC Drive for Crane Applications are described below.

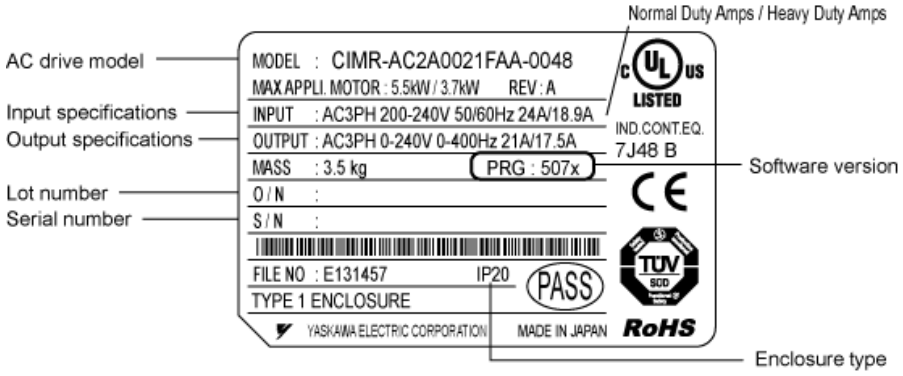
(1) Physical Form

The physical form of the drive is the same as the standard general-purpose A1000 drive. To differentiate the custom drives, the special production instruction sheet number VAJ920048 is printed on the nameplate.

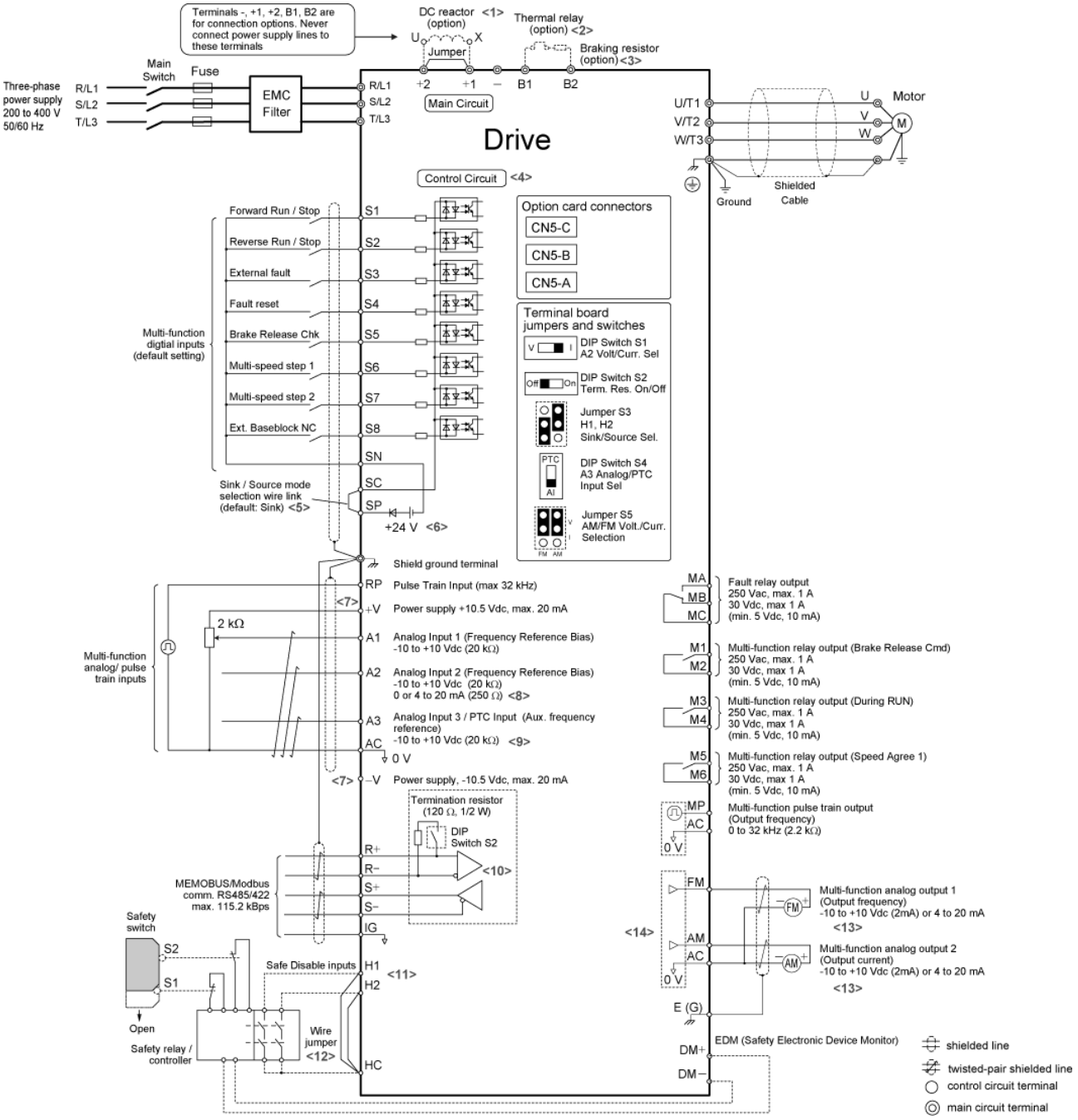
(2) Software No.

The software number for the Custom A1000 Drive for Crane Applications is VSA90507.





3. Connection Diagram



<1> Remove the jumper when installing a DC reactor. Models CIMR-AC2A0110 through 2A0415 and 4A0058 through 4A1200 come with a built-in DC reactor.
<1> When installing a dynamic braking option, a thermal relay sequence should also be set up to shut off power to the drive in case overheat occurs.
<2> The drive's protection function for the internal braking transistor needs to be disabled (L8-55 = 0) if using a regen unit such as a regen converter or some type of dynamic braking options (and therefore not the internal braking transistor). If left enabled, a braking resistor fault (rF) may result. Make sure Stall Prevention is disabled (L3-04 = 0) whenever using a regenerative converter, a regenerative unit or a dynamic braking option. If left enabled, the drive may not stop within the specified deceleration time.
<3> Supplying power to the control circuit separately from the main circuit requires a 24 V power supply (option).
<4> This figure shows an example of a sequence input to S1 through S8 using a non-powered relay or an NPN transistor. Install the wire link between terminals SC-SP for Sink mode and SC-SN for Source mode. Leave it out for external power supply. Never short terminals SP and SN as doing so will damage the drive.
<5> The maximum current supplied by this voltage source is 150 mA if no digital input option card DI-A3 is used.
<6> The maximum output current capacity for the +V and -V terminals on the control circuit is 20 mA. Never short terminals +V, -V, and AC, as this can cause erroneous operation or damage the drive.
<7> Set DIP switch S1 to select between a voltage or current input signal to terminal A2. The default setting is for current input.
<8> Set DIP switch S4 to select between analog or PTC input for terminal A3.
<9> Enable the termination resistor in the last drive in a MEMOBUS network by setting DIP switch S2 to the ON position.
<10> Use jumper S3 to select between Sink mode, Source mode or external power supply for the Safe Disable inputs.
<11> Disconnect the wire jumper between H1 - HC and H2 - HC when utilizing the Safe Disable input.
<12> Monitor outputs work with devices such as analog frequency meters, ammeters, voltmeters, and wattmeters. They are not intended for use as a feedback-type of signal.
<13> Use jumper S5 to selection between voltage or current output signals at terminal AM and FM. Set parameters H4-07 and H4-08 accordingly

4. Software Differences from Standard A1000 Drive

This section lists the functions and parameters that differ between the standard and crane versions of the A1000 drive.

4.1 Functions

The following table lists new, deleted, and modified functions on the custom A1000 drive for crane applications.

New Functions
Brake sequence and brake signal observation function
Run Command Timers
Impact Stop Detection
Low Load Ultra Lift
Overload Detection
Overtravel Limit Function

Removed Functions
PM Control
LOCAL/REMOTE Key
3 –wire Operation
Timer Function
PID Control
Speed Search
Energy Saving Function
Torque Control
Power Loss Ride-Thru / KEB
Automatic Fault Restart
Speed Limit Detection
Frequency Lower Limit
Magnetic Field Weakening
High Slip Braking

Modified Functions
Behavior when an external Baseblock (BB) command is entered during run. See section 7.11.
The DC Braking function when triggered through a digital input was changed to prevent UV1, UV2 faults.
Defaults and setting ranges modified for certain parameters. See the parameter table in section 5.
Current level setting changed from the drive rated current to the motor rated current: B2-02 (DC Braking Current)

4.2 Parameter Group Changes

The addition and removal of some functions on the custom A1000 drive for crane applications made it necessary to add, remove, or modify some parameter groups. The following table lists the parameter groups that have been changed from the standard set.

Parameter Group	A1000 Standard Drive	A1000 Crane Drive	Changes
A1	Initialization	←	A1-00 Only English and Japanese Language Options A1-02 Removed PM Motor Control, Default V/f Control A1-03 Removed 3-Wire Init, oPE04 Fault Reset A1-06, -07 Parameters deleted
b1	Sequence	←	b1-02, -16 Removed MEMOBUS/Modbus and Option PCB RUN command selection b1-07, -08 Parameters deleted
b2	DC Braking	←	b2-02 DC Brake Current as a % of motor current b2-04 Default value changed, depends on A1-02
b3	Speed Search	N/A	Parameter group deleted
b4	Timer Function	N/A	Parameter group deleted
b5	PID Control	N/A	Parameter group deleted
b6	Dwell Function	N/A	Parameter group deleted
b8	Energy Saving	N/A	Parameter group deleted
C4	Torque Compensation	←	C4-03, -04, -05 Parameters deleted
C6	Carrier Frequency	←	C6-01 Removed Normal Duty (ND) setting C6-02 Default 2.0 kHz Carrier Frequency
d4	Frequency Reference Hold		d4-11 Parameter deleted
d5	Torque Control	N/A	Parameter group deleted
E3	V/f Pattern Motor 2	←	E3-01 Default Open Loop Vector Control
F1	PG Card Settings	←	F1-18, -19 Parameters deleted
H1	Digital Inputs	←	H1-05 through -08 Defaults changed (see section 0) Some digital input functions replaced or deleted
H2	Digital Outputs	←	H2-01, -02 Defaults changed (see section 0) Some digital output functions replaced or deleted
H3	Analog Inputs	←	Some analog input functions deleted
H6	Pulse Train I/O	←	H6-01 Pulse Train input only as frequency reference
L2	Momentary Power Loss Ride-Thru / KEB	←	All group parameters except L2-03 and -05 deleted.
L3	Stall Prevention Function	←	L3-04 Default changed, now disabled during deceleration
L5	Automatic Fault Restart	N/A	Parameter group deleted
L6	Torque Detection	N/A	Parameter group deleted
L8	Hardware Protection	←	L8-07 Default changed, output phase loss fault enabled L8-08 New parameter, output phase loss detection level
n3	High Slip Braking (HSB)	←	n3-01 through -04 Parameters deleted
o2	Digital Op Functions	←	o2-01 Parameter deleted (LO/RE key function)
S1	N/A	Brake Sequence	Parameter group added
S2	N/A	Run Command Timers	Parameter group added
S3	N/A	Impact Stop Detection	Parameter group added
S4	N/A	Low Load Ultra Lift	Parameter group added
S5	N/A	Overload Detection	Parameter group added
S6	N/A	Overtorque Detection	Parameter group added
U2	Fault Trace Monitors	←	U2-21, -22 Monitors added
U4	Maintenance Monitors	←	U4-15 Monitor added
U5	PID Monitors	←	Monitor group deleted

4.2.1 Default Function Changes for Digital Inputs and Outputs

Default settings for some of H1-┤ and H2-┤ parameters have been modified for the A1000 drive for crane applications. The changes are summarized in the following tables. Shaded cells show changes from standard A1000 drive.

Digital Inputs

Parameter No.	Description	A1000 Standard Drive	A1000 Crane Drive
H1-03	Terminal S3 Function	24 – External Fault	24 – External Fault
H1-04	Terminal S4 Function	14 – Fault Reset	14 – Fault Reset
H1-05	Terminal S5 Function	3 – Multi-Step Speed Reference 1	0 – Brake release Check
H1-06	Terminal S6 Function	4 – Multi-Step Speed Reference 2	3 – Multi-Step Speed Reference 1
H1-07	Terminal S7 Function	6 – Jog Frequency Reference Select	4 – Multi-Step Speed Reference 2
H1-08	Terminal S8 Function	8 – External Baseblock N.O.	9 – External Baseblock N.C.

Digital Outputs

Parameter No.	Description	A1000 Standard Drive	A1000 Crane Drive
H2-01	Terminal M1-M2 Function	0 – During RUN	21 – Brake Release Command
H2-02	Terminal M3-M4 Function	1 – Zero Speed	0 – During RUN
H2-03	Terminal M5-M6 Function	2 – Speed Agree	2 – Speed Agree

Some digital input, digital output, and analog input functions were replaced with new ones or deleted. For a complete list of the I/O functions that are available in the A1000 crane drive see section 5.6.

4.3 Operating Without a Brake Sequence

The A1000 crane drive is configured by default to operate with an external brake sequence. If you wish to operate the drive without an external brake sequence, the following parameters should be changed from their default values to those listed below.

Parameter No.	Description (units)	Default	New Value	Comments
S1-03	Brake Delay Frequency (Hz)	3.0	0.0	Closed Loop Vector default: 0.0 Hz
S1-04	Brake Delay Time (s)	0.30	0.00	Closed Loop Vector default: 0.00 s
S1-09	FWD Torque Compensation (%)	50	0	Parameter in OLV and CLV only. Closed Loop Vector default: 0 %
S1-14	Slip Prevention Frequency (Hz)	3.0	0.0	Closed Loop Vector default: 0.0 Hz
S1-15	Slip Prevention Time (s)	0.30	0.00	Closed Loop Vector default: 0.00 s
S1-16	SE1 Detection Time (s)	0.30	0.00	See Section 7.1.6
S1-17	SE2 Detection Time (s)	1.00	0.00	
S1-18	SE3 Detection Time (s)	0.50	0.00	
S1-19	SE4 Detection Time (s)	0.50	0.00	

Note:

Although the Dwell function was deleted from the A1000 crane drive software, it is possible to implement it using the parameters in the S1 group as listed below. Be aware that it may be necessary to modify other parameters in the S1 group in addition to those listed below in order to avoid an oPE22 parameter setting fault. For more information on this fault see section 8 of this manual.

S1-03 Dwell Reference at Start
S1-04 Dwell Time at Start
S1-14 Dwell Reference at Stop
S1-15 Dwell Time at Stop

When implementing the Dwell function in this manner, the Brake Release Check function should not be set to any of the multi-function digital inputs. It is also important to note that if the output frequency is less than the level set in S1-14, the

Dwell function will still be triggered (contrary to the Dwell function behavior in the A1000 standard drive). For more information on how this function works, refer to section 5.2 of the standard A1000 AC frequency inverter Technical Manual (SIEP C710616 27).

5. Parameters

5.1 Parameter Groups

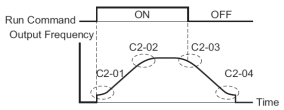
Group	Description	Function No.	Function Description	Access Level		Differences w/ Standard A1000
				Q	A	
A	Environmental Settings	A1A1A1A1	Initialization	○	○	<3>
		A2	User Parameters		○	
b	Application	b1	Operation Mode Selection	○	○	<1>
		b2	DC Braking		○	<2>
		b3 – b6	—			Deleted
		b7	Droop Control		○	
		b8	—			Deleted
		b9	Zero Servo		○	
C	Tuning	C1	Accel/ Decel Time	○	○	
		C2	S-Curve Characteristics		○	
		C3	Slip Compensation		○	
		C4	Torque Compensation		○	<1>
		C5	Automatic Speed Regulation (ASR)		○	
		C6	Carrier Frequency	○	○	<2>
d	Reference Settings	d1	Multi-step Speed Reference	○	○	
		d2	Frequency Upper/Lower Limit		○	
		d3	Jump Frequency		○	
		d4	Frequency Reference Hold – Up/Down Function		○	
		d5	—			Deleted
		d6	—			Deleted
		d7	Offset Frequency		○	
E	Motor Parameters	E1	V/f Pattern Motor 1	○	○	
		E2	Motor 1 Parameters	○	○	<4>
		E3	V/f Pattern Motor 2		○	<3>
		E4	Motor 2 Parameters		○	
F	Option Card Settings	F1	PG Speed Control Card	○	○	
		F2	Analog Input Card		○	
		F3	Digital Input Card		○	
		F4	Analog Monitor Card		○	<3>
		F5	Digital Output Card		○	
		F6	Communications Option Card		○	
H	Terminal Functions	H1	Multi-Function Digital Inputs		○	<2>
		H2	Multi-Function Digital Outputs		○	
		H3	Multi-Function Analog Inputs		○	
		H4	Multi-Function Analog Outputs	○	○	<3>
		H5	MEMOBUS/Modbus Serial Communication		○	
		H6	Pulse Train I/O		○	<3>
L	Protection Functions	L1	Motor Protection	○	○	
		L2	Power Loss		○	<1>
		L3	Stall Prevention	○	○	<2>
		L4	Speed Detection		○	
		L5, L6	—			Deleted
		L7	Torque Limit		○	
		L8	Drive Protection		○	<2> <4>
n	Special Adjustments	n1	Hunting Prevention		○	<4>
		n2	Speed Feedback Detection Control (AFR)		○	
		n3	Overexcitation Braking		○	<1>
		n5	Feed Forward Control		○	
o	Operator Related Settings	o1	Digital Operator Display Selection		○	<1> <3>
		o2	Digital Operator Keypad Selection		○	<1> <4>
		o3	Copy Function		○	
		o4	Maintenance Monitor Settings		○	
S	Crane Parameters	S1	Brake Sequence		○	Added
		S2	Run Command Timers		○	
		S3	Impact Stop Detection		○	
		S4	Ultra Lift		○	
		S5	Overload Detection		○	
		S6	Overtorque Detection		○	

Access Level – **Q**: Quick Setting Menu **A**: Programming Menu
Differences: **<1>**: Certain parameters deleted **<2>**: Certain default values changed **<3>**: Setting range modified for certain parameters **<4>**: New parameters added

5.2 Standard Parameter Table

	No.	Parameter Name	Setting Range	Units	Default	Description	During Run	Access Level <1>				
								V/f	V/f with PG	OLV	CLV	MEMOBUS Address
Initialization Parameters	A1-00	Language Selection	0,1	-	0 <2>	0: English 1: Japanese (日本語)	●	A	A	A	A	100H
	A1-01	Access Level	0 to 2	-	2	0: Operation Mode 1: User parameters only 2: Advanced	●	A	A	A	A	101H
	A1-02	Control Method Selection	0 to 3	-	0 <2>	Selects the control method of the drive. 0: V/f Control 1: V/f Control with PG 2: Open Loop Vector Control 3: Closed Loop Vector Control		Q,A	Q,A	Q,A	Q,A	102H
	A1-03	Intitalize Parameters	0000 to 5550	-	0000	1110: User Initialize (user parameter values must be stored using parameter o2-03.) 2220: 2-Wire Initialization 5550: oPE4 Error Reset		A	A	A	A	103H
	A1-04	Password Entry	0000 to 9999	-	0000	When the value entered into A1-04 does not match the hidden value set into A1-05, parameters A1-01 through -03, A1-06 and A2-01 through -32 are locked and cannot be modified.		A	A	A	A	104H
	A1-05	Password Setting	0000 to 9999	-	0000			A	A	A	A	105H
User Parameters	A2-01 to A2-32	User Parameters 1 to 32	A1-00 to o4-13	-	-	Parameters that were recently edited are listed here. To user can also select parameters to appear here for quick access.		A	A	A	A	106H to 125H
Application	b1-01	Frequency Reference Source	0 to 4	-	1	0: Digital operator 1: Control circuit terminals 2: MEMOBUS / Modbus Serial Comm 3: Option PCB 4: Pulse Train input		Q,A	Q,A	Q,A	Q,A	180H
	b1-02	Run Command Source Selection	0,1	-	1	0: Digital operator 1: Control circuit terminals		Q,A	Q,A	Q,A	Q,A	181H
	b1-03	Stopping Method Selection	0 to 3	-	0	0: Ramp to stop 1: Coast to stop 2: DC Injection Braking 3: Coast to stop with timer 9: Simple positioning		Q,A	Q,A	Q,A	Q,A <3>	182H
	b1-04	Reverse Operation Selection	0,1	-	0	0: Reverse possible 1: Reverse prohibited		A	A	A	A	183H
	b1-05	Action When Reference is Below Minimum Output Frequency	0 to 3	-	0	0: Operates according to frequency reference 1: Output shuts off (coast to stop) 2: Operates at Min Output Frequency (E1-09) 3: Operates at Zero Speed (Ref = 0.00 Hz)		-	-	-	A	184H
	b1-06	Digital Input Read Method	0,1	-	1	0: Scan once, process immediatly (fast response) 1: Scan twice, compare (better noise immunity)		A	A	A	A	185H
	b1-14	Phase Order Selection	0,1	-	0	0: Standard 1: Switch phase orden		A	A	A	A	1C3H
	b1-15	Frequency Reference Source 2	0 to 4	-	0	0: Digital operator 1: Control circuit terminals 2: MEMOBUS / Modbus Serial Comm 3: Option PCB 4: Pulse Train input		A	A	A	A	1C4H
	b1-16	Run Command Source Selection 2	0,1	-	0	0: Digital operator 1: Control circuit terminals		A	A	A	A	1C5H
	b1-17	Run Command at Power Up	0,1	-	0	0: Disregarded. Run command must me cycled 1: Run command allowed at power up		A	A	A	A	1C6H
DC Injection Braking	b2-01	DC Injection Braking Start Frequency	0.0 to 10.0	0.1 Hz	<4>	Sets the frequency at which DC injection starts when stopping method Ramp to Stop is selected.		A	A	A	A	189H
	b2-02	DC Injection Braking Current	0 to 100	1%	50	Sets the DC Injection Braking current as a percentage of the motor rated current.		A	A	A	-	18AH
	b2-03	DC Injection Braking Time at Start	0.00 to 10.00	0.01 s	0.00	Sets DC injection braking time at start. DC injection braking is disabled when set to 0.00 s.		A	A	A	A	18BH
	b2-04	DC Injection Braking Time at Stop	0.00 to 10.00	0.01 s	<4>	Sets DC injection braking time at stop. DC injection braking is disabled when set to 0.00 s.		A	A	A	A	18CH
	b2-08	Magnetic Flux Compensation Value	0 to 1000	1%	0	Set as a percentage of the no-load current value.		-	-	A	-	190H

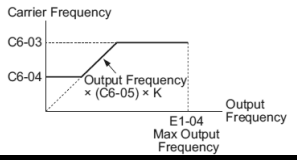
<1> Access Levels: A: Advanced Programming Menu Q: Quick Setting Menu -: N/A in this Control Mode
<2> Value is not reset when the drive is initialized. In the Japanese Spec A1-00 = 1 and A1-02 = 2 are the default values
<3> DC Injection Braking (2) and Coast to Stop w/ Timer (3) are not available when using CLV control method.
<4> Default setting is determined by the control method (A1-02 or E3-01)

	No.	Parameter Name	Setting Range	Units	Default	Description	During Run	Access Level <1>				
								V/f	V/f with PG	OLV	CLV	MEMOBUS Address
Droop Control	b7-01	**Droop Control Gain**	0.0 to 100.0	0.1%	0.0	Sets the speed reduction value (as % of max output frequency) when the torque reference is 100%.	●	-	-	-	A	1CAH
	b7-02	**Droop Control Delay Time**	0.03 to 2.00	0.01 s	0.05	Adjusts the responsiveness of droop control	●	-	-	-	A	1CBH
	b7-03	**Droop Control Limit Selection**	0,1	-	1	0: Disabled 1: Enabled		-	-	-	A	17EH
Zero Servo	b9-01	**Zero Servo Gain**	0 to 100	-	5	Sets position loop gain for the Zero Servo function		-	-	-	A	1DAH
	b9-02	**Zero Servo Completion Width**	0 to 16383	-	10	Sets the output range or allowable deviation of the Zero Servo completion signal		-	-	-	A	1DBH
Acceleration / Deceleration Time	C1-01	**Accel Time 1**	0.0 to 6000.0 <5>	0.1 s	10.0	Sets acceleration and deceleration times. These values always refer to the time it would take for the drive to go from zero to the maximum output frequency or vice versa. The accel and decel times can be switched automatically or through the use of digital input signals.	●	Q,A	Q,A	Q,A	Q,A	200H
	C1-02	**Decel Time 1**					●	Q,A	Q,A	Q,A	Q,A	201H
	C1-03	**Accel Time 2**					●	A	A	A	A	202H
	C1-04	**Decel Time 2**					●	A	A	A	A	203H
	C1-05	**Accel Time 3**					●	A	A	A	A	204H
	C1-06	**Decel Time 3**					●	A	A	A	A	205H
	C1-07	**Accel Time 4**					●	A	A	A	A	206H
	C1-08	**Decel Time 4**					●	A	A	A	A	207H
	C1-09	**Fast Stop Time**						A	A	A	A	208H
	C1-10	**Accel/Decel Time Units**	0,1	-	1	0: 0.01 s units (Range 0.00 – 600.00 s) 1: 0.1 s units (Range 0.0 – 6000.0 s)		A	A	A	A	209H
	C1-11	**Accel/Decel Time Switching Frequency**	0.0 to 400.0	0.1 Hz	0.0	Sets the frequency to switch between accel/decel time settings.		A	A	A	A	20AH
S Curve Characteristics	C2-01	S-Curve Characteristic Time at Acceleration Start	0.00 to 2.50	0.01 s	0.20			A	A	A	A	20BH
	C2-02	S-Curve Characteristic Time at Acceleration End	0.00 to 2.50	0.01 s	0.20			A	A	A	A	20CH
	C2-03	S-Curve Characteristic Time at Deceleration Start	0.00 to 2.50	0.01 s	0.20			A	A	A	A	20DH
	C2-04	S-Curve Characteristic Time at Deceleration End	0.00 to 2.50	0.01 s	0.00			A	A	A	A	20EH
Slip Compensation	C3-01	**Slip Compensation Gain**	0.0 to 2.5	-	<4>	Sets gain for motor speed compensation function	●	A	-	A	A	20FH
	C3-02	**Slip Compensation Primary Delay Time**	0 to 10000	1 ms	<4>	Adjust filter on the output side of the slip compensation function	●	A	-	A	-	210H
	C3-03	**Slip Compensation Limit**	0 to 250	1%	200	Set upper limit for the slip compensation function as a percentage of motor rated slip		A	-	A	-	211H
	C3-04	**Slip Compensation Selection During Regeneration**	0,1	-	0	Determines whether slip compensation is enabled or disabled during regeneration. 0: Disabled 1: Enabled		A	-	A	-	212H
	C3-05	**Output Voltage Limit Operation Selection**	0,1	-	0	Determines if the motor magnetic flux is automatically decreased when output voltage saturation occurs. 0: Disabled 1: Enabled		-	-	A	A	213H
	C3-21	**Motor 2 Slip Compensation Gain**	0.0 to 2.5	-	<4>	Sets gain for motor 2 speed compensation function	●	A	-	A	A	33EH
	C3-22	**Motor 2 Slip Compensation Primary Delay Time Constant**	0 to 10000	1 ms	<4>	Adjust filter on the output side of the slip compensation function on motor 2	●	A	-	A	-	241H
	C3-23	**Motor 2 Slip Compensation Limit**	0 to 250	1%	200	Set upper limit for the slip compensation function as a percentage of motor 2 rated slip		A	-	A	-	242H
	C3-24	**Motor 2 Slip Compensation Selection During Regeneration**	0,1	-	0	Determines whether slip compensation is enabled or disabled during regeneration. 0: Disabled 1: Enabled		A	-	A	-	243H
Torque Compensation	C4-01	**Torque Compensation Gain**	0.00 to 2.50	-	1.00	Sets the gain for the torque compensation function	●	A	A	A	-	215H
	C4-02	**Torque Compensation Primary Delay Time Constant**	0 to 10000	1 ms	<4>	Sets the delay time for application of torque compensation		A	A	A	-	216H
	C4-06	**Torque Compensation Primary Delay Time Constant 2**	0 to 10000	1 ms	150	Sets the delay time 2 for application of torque compensation		-	-	A	-	21AH
	C4-07	**Motor 2 Torque Compensation Gain**	0.00 to 2.50	-	1.00	Sets the gain for the torque compensation function on motor 2	●	A	A	A	-	341H

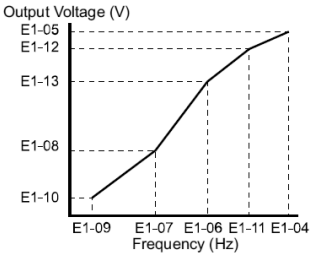
<1> Access Levels A: Advanced Programming Menu Q: Quick Setting Menu -: N/A in this Control Mode
<4> Default setting is determined by the control method (A1-02 or E3-01)
<5> Setting Range can be modified by parameter C1-10

	No.	Parameter Name	Setting Range	Units	Default	Description	During Run	Access Level <1>				
								V/f	V/f with PG	OLV	CLV	MEMOBUS Address
Automatic Speed Regulator	C5-01	**ASR Proportional Gain 1 (P)**	0.00 to 300.00	-	<4>	Sets the proportional gain of the speed control loop	●	-	A	-	A	21BH
	C5-02	**ASR Integral Time 1 (I)**	0.000 to 10.000	0.001 s	<4>	Sets the integral time of the speed control loop	●	-	A	-	A	21CH
	C5-03	**ASR Proportional Gain 2 (P)**	0.00 to 300.00	-	<4>	Sets the proportional gain 2 of the speed control loop	●	-	A	-	A	21DH
	C5-04	**ASR Integral Time 2 (I)**	0.000 to 10.000	0.001 s	<4>	Sets the integral time 2 of the speed control loop	●	-	A	-	A	21EH
	C5-05	**ASR Limit**	0.0 to 20.0	0.1%	5.0	Sets the upper limit of the speed control loop as a % of maximum output frequency.		-	A	-	-	21FH
	C5-06	**ASR Primary Delay Time Constant**	0.000 to 0.500	0.001 s	<4>	Sets the time constant for the filter between speed control loop and torque command output.		-	-	-	A	220H
	C5-07	**ASR Gain Switch Frequency**	0.0 to 400.0	0.1 Hz	0.0	Sets the switching frequency between proportional gain 1,2 and integral time 1,2		-	-	-	A	221H
	C5-08	**ASR Integral Limit**	0 to 400	1%	400	Sets the upper limit for the integral part of the speed control loop as a % of rated torque load.		-	-	-	A	222H
	C5-12	**Integral Operation during Accel/Decel**	0,1	-	0	0: Disabled. Integral functions are enabled only during constant speed. 1: Enabled. Integral functions are always enabled, during accel/decel and during constant speed.		-	A	-	-	386H
	C5-17	**Motor Inertia**	0.0001 to 600.00	0.0001 kgm^2	<6>	Sets motor inertia. This value is set automatically during ASR or Inertia Auto-Tuning		-	-	-	A	276H
	C5-18	**Load Inertia Ratio**	0.0 to 6000.0	-	1.0	Sets the ratio between the motor and load inertia. This value is set automatically during ASR or Inertia Auto-Tuning.		-	-	-	A	277H
	C5-21	**Motor 2 ASR Proportional Gain 1 (P)**	0.00 to 300.00	-	<4>	Sets the proportional gain of the speed control loop for motor 2	●	-	A	-	A	356H
	C5-22	**Motor 2 ASR Integral Time 1 (I)**	0.000 to 10.000	0.001 s	<4>	Sets the integral time of the speed control loop for motor 2	●	-	A	-	A	357H
	C5-23	**Motor 2 ASR Proportional Gain 2 (P)**	0.00 to 300.00	-	<4>	Sets the proportional gain 2 of the speed control loop for motor 2	●	-	A	-	A	358H
	C5-24	**Motor 2 ASR Integral Time 2 (I)**	0.000 to 10.000	0.001 s	<4>	Sets the integral time 2 of the speed control loop for motor 2	●	-	A	-	A	359H
	C5-25	**Motor 2 ASR Limit**	0.0 to 20.0	0.1%	5.0	Sets the upper limit of the speed control loop as a % of maximum output frequency for motor 2		-	A	-	-	35AH
	C5-26	**Motor 2 ASR Primary Delay Time Constant**	0.000 to 0.500	0.001 s	<4>	Sets the time constant for the filter between speed control loop and torque command output for motor 2		-	-	-	A	35BH
	C5-27	**Motor 2 ASR Gain Switch Frequency**	0.0 to 400.0	0.1 Hz	0.0	Sets the switching frequency between proportional gain 1,2 and integral time 1,2 for motor 2		-	-	-	A	35CH
	C5-28	**Motor 2 ASR Integral Limit**	0 to 400	1%	400	Sets the upper limit for the integral part of the speed control loop as a % of rated torque load for motor 2		-	-	-	A	35DH
	C5-32	**Integral Operation during Accel/Decel for Motor 2**	0,1	-	0	0: Disabled. Integral functions for motor 2 are enabled only during constant speed 1: Enabled. Integral functions are always enabled for motor 2.		-	A	-	-	361H
	C5-37	**Motor 2 Inertia**	0.0001 to 600.00	0.0001 kgm^2	<4> <6>	Sets motor 2 inertia. This value is set automatically during ASR or Inertia Auto-Tuning		-	-	-	A	278H
	C5-38	**Motor 2 Load Inertia Ratio**	0.0 to 6000.0	-	1.0	Sets the ratio between the motor 2 and load inertia. This value is set automatically during ASR or Inertia Auto-Tuning.		-	-	-	A	279H

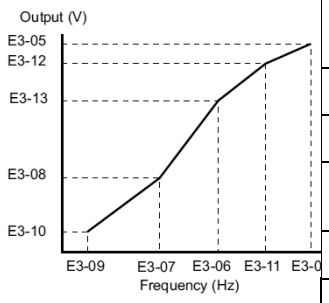
<1> Access Levels A: Advanced Programming Menu Q: Quick Setting Menu -: N/A in this Control Mode
<4> Default setting is determined by the control method (A1-02 or E3-01)
<6> Default Setting and/or Setting Range is determined by drive capacity rating

	No.	Parameter Name	Setting Range	Units	Default	Description	During Run	Access Level <1>				
								V/f	V/f with PG	OLV	CLV	MEMOBUS Address
Carrier Frequency	C6-01	**Drive Duty Selection**	0	-	0	Crane Software Allows only Heavy Duty (HD) setting		Q,A	Q,A	Q,A	Q,A	223H
	C6-02	**Carrier Frequency Selection**	1 to F	-	1	1: 2.0 kHz 2: 5.0 kHz 3: 8.0 kHz 4: 10.0 kHz 5: 12.5 kHz 6: 15.0 kHz F: User Defined (Determined by C6-03 – C6-05)		Q,A	Q,A	Q,A	Q,A	224H
	C6-03	**Carrier Frequency Upper Limit**	1.0 to 15.0	0.1 kHz	2.0			A	A	A	A	225H
	C6-04	**Carrier Frequency Lower Limit**	1.0 to 15.0	0.1 kHz	2.0			A	A	-	-	226H
	C6-05	**Carrier Frequency Proportional Gain**	0 to 99	-	0			A	A	-	-	227H
Multi-Step Frequency Reference	d1-01	Frequency Reference 1	0.00 to 400.00	0.01 Hz	0.00	The setting range and setting units are determined by parameters E1-04 and o1-03. For more information on how this function works, refer to section 5.4 of the A1000 standard drive technical manual (SIEP C710616 27)	●	Q,A	Q,A	Q,A	Q,A	280H
	d1-02	Frequency Reference 2	0.00 to 400.00	0.01 Hz	0.00		●	Q,A	Q,A	Q,A	Q,A	281H
	d1-03	Frequency Reference 3	0.00 to 400.00	0.01 Hz	0.00		●	Q,A	Q,A	Q,A	Q,A	282H
	d1-04	Frequency Reference 4	0.00 to 400.00	0.01 Hz	0.00		●	Q,A	Q,A	Q,A	Q,A	283H
	d1-05	Frequency Reference 5	0.00 to 400.00	0.01 Hz	0.00		●	A	A	A	A	284H
	d1-06	Frequency Reference 6	0.00 to 400.00	0.01 Hz	0.00		●	A	A	A	A	285H
	d1-07	Frequency Reference 7	0.00 to 400.00	0.01 Hz	0.00		●	A	A	A	A	286H
	d1-08	Frequency Reference 8	0.00 to 400.00	0.01 Hz	0.00		●	A	A	A	A	287H
	d1-17	Jog Frequency Reference	0.00 to 400.00	0.01 Hz	6.00		●	Q,A	Q,A	Q,A	Q,A	292H
Frequency Limit	d2-01	Frequency Reference Upper Limit	0.0 to 110.0	0.1%	100.0	Sets frequency reference upper limit as a % of maximum output frequency.		A	A	A	A	289H
	d2-02	Frequency Reference Lower Limit	0.0 to 110.0	0.1%	0.0	Sets frequency reference lower limit asa % of maximum output frequency.		A	A	A	A	28AH
	d2-03	Master Speed Reference Lower Limit	0.0 to 110.0	0.1%	0.0	Sets lower limit for frquency references from analog inputs as a % of maximum output frequency.		A	A	A	A	293H
Jump Frequency	d3-01	Jump Frequency 1	0.0 to 400.0	0.1 Hz	0.0	Can be used to prevent the drive from operating at certain frequencies that cause motor/machine resonance. d3-01 ≥ d3-02 ≥ d3-03		A	A	A	A	294H
	d3-02	Jump Frequency 2	0.0 to 400.0	0.1 Hz	0.0			A	A	A	A	295H
	d3-03	Jump Frequency 3	0.0 to 400.0	0.1 Hz	0.0			A	A	A	A	296H
	d3-04	Jump Frequency Width	0.0 20.0	0.1 Hz	1.0	Sets the dead-band width around each prohibited frequency point.		A	A	A	A	297H
Sequence	d4-01	Frequency Reference Hold Function Selection	0,1	-	0	0: Disabled. Drive starts from zero when powered 1: Enabled. Drive starts from saved Hold Frequency		A	A	A	A	298H
	d4-03	Frequency Reference Bias Step (Up/Down 2)	0.00 to 99.99	0.01 Hz	0.00	Sets the bias added to the frequency reference when Up 2 and Down 2 inputs are enabled.	●	A	A	A	A	2AAH
	d4-04	Frequency Reference Bias Accel/Decel (Up/Down 2)	0,1	-	0	0: Use selected accel/decel time. 1: Use accel/decel time 4 (C1-07 and C1-08).	●	A	A	A	A	2ABH
	d4-05	Frequency Reference Bias Operation Mode Selection (Up/Down 2)	0,1	-	0	0: Bias value is held if both Up 2 and Down 2 inputs are disabled or enabled. 1: Bias value is reset to zero if both Up 2 and Down 2 inputs are disabled or enabled	●	A	A	A	A	2ACH
	d4-06	Frequency Reference Bias Value (Up/Down 2)	-99.9 to 100.0	0.1%	0.0	Up/Down 2 bias value as a % of maximum output frequency. Saved only when frequency reference is not input through the digital operator.		A	A	A	A	2ADH
	d4-07	Analog Frequency Reference Change Limit Level (Up/Down 2)	1.0 to 100.0	0.1%	1.0	Limits how much the frequency reference can change when Up/Down 2 input is enabled.	●	A	A	A	A	2AEH
	d4-08	Frequency Reference Bias Upper Limit Value (Up/Down 2)	0.0 to 100.0	0.1%	100.0	Sets the upper limit for the bias as a % of maximum output frequency.	●	A	A	A	A	2AFH
	d4-09	Frequency Reference Bias Lower Limit Value (Up/Down 2)	-99.9 to 0.0	0.1%	0.0	Sets the lower limit for the bias as a % of maximum output frequency.	●	A	A	A	A	2B0H
	d4-10	Up/Down Lower Limit Selection	0,1		0	0: Lower limit determined by d2-02 or analog input 1: Lower limit determined by d2-02		A	A	A	A	2B6H

<1> Access Levels A: Advanced Programming Menu Q: Quick Setting Menu -: N/A in this Control Mode

	No.	Parameter Name	Setting Range	Units	Default	Description	During Run	Access Level <1>				
								V/f	V/f with PG	OLV	CLV	MEMOBUS Address
Offset Frequency	d7-01	Offset Frequency 1	-100.0 to 100.0	0.1%	0.0	Added to the frequency reference if the digital input Offset Frequency 1 is enabled.	•	A	A	A	A	2B2H
	d7-02	Offset Frequency 2	-100.0 to 100.0	0.1%	0.0	Added to the frequency reference if the digital input Offset Frequency 2 is enabled.	•	A	A	A	A	2B3H
	d7-03	Offset Frequency 3	-100.0 to 100.0	0.1%	0.0	Added to the frequency reference if the digital input Offset Frequency 3 is enabled.	•	A	A	A	A	2B4H
V/f Characteristics	E1-01	Input Voltage Setting	155 to 255 <7>	1 VAC	200 <7>	Drive Input Voltage		Q,A	Q,A	Q,A	Q,A	300H
	E1-03	V/f Pattern Selection	0 to FF	-	F	0 – E: Select from 15 preset fixed patterns. See section 5.5 of the A1000 standard drive technical manual (SIEP C710616 27) for further details. F, FF: Custom Patterns		Q,A	Q,A	Q,A	-	302H
	E1-04	Max Output Frequency (Fmax)	40.0 to 400.0	0.1 Hz	50.0			Q,A	Q,A	Q,A	Q,A	303H
	E1-05	Max Voltage (Vmax)	0.0 to 255.0 <7>	0.1 VAC	200.0 <7>			Q,A	Q,A	Q,A	Q,A	304H
	E1-06	Base Frequency (Fa)	0.0 to 400.0	0.1 Hz	50.0			Q,A	Q,A	Q,A	Q,A	305H
	E1-07	Mid Output Frequency (Fb)	0.0 to 400.0	0.1 Hz	<4>			A	A	A	A	306H
	E1-08	Mid Output Frequency Voltage (Vc)	0.0 to 255.0 <7>	0.1 VAC	<4>			A	A	A	A	307H
	E1-09	Minimum Output Frequency (Fmin)	0.0 to 400.0	0.1 Hz	<4>			Q,A	Q,A	Q,A	Q,A	308H
	E1-10	Minimum Output Frequency Voltage (Vmin)	0.0 to 255.0 <7>	0.1 VAC	<4>			A	A	A	A	309H
	E1-11	Mid Output Frequency 2	0.0 to 400.0	0.1 Hz	0.0	If these parameters are set to 0.0 they are ignored in the V/f pattern.		A	A	A	A	30AH
	E1-12	Mid Output Frequency Voltage 2	0.0 to 255.0 <7>	0.1 VAC	0.0			A	A	A	A	30BH
	E1-13	Base Voltage (Vbase)	0.0 to 255.0 <7>	0.1 VAC	0.0	If set to 0.0 the base voltage will be the maximum voltage (E1-05)		Q,A	Q,A	Q,A	Q,A	30CH
Motor Parameters	E2-01	Motor Rated Current	<6>	<6>	<6>	Motor nameplate full load current.		Q,A	Q,A	Q,A	Q,A	30EH
	E2-02	Motor Rated Slip	0.00 to 20.00	0.01 Hz	<6>	Motor rated slip		A	A	A	A	30FH
	E2-03	Motor No-Load Current	<6>	<6>	<6>	Motor no-load current. Set during Auto-Tuning		A	A	A	A	310H
	E2-04	Number of Motor Poles	2 to 48	2 pole	4	Set the number of motor poles		A	A	A	A	311H
	E2-05	Motor Line to Line Resistance	0.000 to 65.000	0.001 Ω	<6>	Motor line to line resistance. Set during Auto-Tuning		A	A	A	A	312H
	E2-06	Motor Leakage Inductance	0.0 to 40.0	0.1%	<6>	Motor leakage inductance. Set during Auto-Tuning		A	A	A	A	313H
	E2-07	Motor Iron Core Saturation Co-Efficient 1	0.00 to 0.50	-	0.50	Motor iron saturation coefficient at 50% of magnetic flux. Set during Auto-tuning		-	-	A	A	314H
	E2-08	Motor Iron Core Saturation Co-Efficient 2	0.00 to 0.75	-	0.75	Motor iron saturation coefficient at 75% of magnetic flux. Set during Auto-tuning		-	-	A	A	315H
	E2-09	Motor Mechanical Loss	0.0 to 10.0	0.1%	0.0	Motor mechanical loss as a % of motor rated power		-	-	A	A	316H
	E2-10	Motor Iron Loss for Torque Compensation	0 to 65535	1 W	<6>	Motor Iron Loss		A	A	-	-	317H
	E2-11	Motor Rated Power	0.00 to 650.00	0.01 kW	<6>	Motor nameplate rated power		Q,A	Q,A	Q,A	Q,A	318H

<1> Access Levels A: Advanced Programming Menu Q: Quick Setting Menu -: N/A in this Control Mode
<4> Default Setting is determined by the control method (A1-02 or E3-01)
<6> Default Setting and/or Setting Range is determined by drive capacity rating
<7> Values shown are for 200 VAC class drives. For 400 VAC class drives these values are doubled.

	No.	Parameter Name	Setting Range	Units	Default	Description	During Run	Access Level <1>				
								V/f	V/f with PG	OLV	CLV	MEMOBUS Address
Motor 2 V/f Characteristics	E3-01	Motor 2 Control Method	0 to 3	-	2	0: V/f Control 1: V/f Control with PG 2: Open Loop Vector Control 3: Closed Loop Vector Control		A	A	A	A	319H
	E3-04	Motor 2 Max Output Frequency	40.0 to 400.0	0.1 Hz	50.0			A	A	A	A	31AH
	E3-05	Motor 2 Max Voltage	0.0 to 255.0 <7>	0.1 VAC	200.0 <7>			A	A	A	A	31BH
	E3-06	Motor 2 Base Frequency	0.0 to 400.0	0.1 Hz	50.0			A	A	A	A	31CH
	E3-07	Motor 2 Mid Output Freq.	0.0 to 400.0	0.1 Hz	<4>			A	A	A	-	31DH
	E3-08	Motor 2 Mid Output Freq. Voltage	0.0 to 255.0 <7>	0.1 VAC	<4>			A	A	A	-	31EH
	E3-09	Motor 2 Min. Output Freq.	0.0 to 400.0	0.1 Hz	<4>			A	A	A	A	31FH
	E3-10	Motor 2 Min. Output Freq. Voltage	0.0 to 255.0 <7>	0.1 VAC	<4>			A	A	A	A	320H
	E3-11	Motor 2 Mid Output Frequency 2	0.0 to 400.0	0.1 Hz	0.0	If these parameters are set to 0.0 they are ignored in the V/f pattern.		A	A	A	A	345H
	E3-12	Motor 2 Mid Output Frequency Voltage 2	0.0 to 255.0 <7>	0.1 VAC	0.0			A	A	A	A	346H
	E3-13	Motor 2 Base Voltage	0.0 to 255.0 <7>	0.1 VAC	0.0	If set to 0.0 the base voltage will be the maximum voltage (E3-05)		Q,A	Q,A	Q,A	Q,A	347H
Motor 2 Parameters	E4-01	Motor 2 Rated Current	<6>	<6>	<6>	Motor nameplate full load current.		A	A	A	A	321H
	E4-02	Motor 2 Rated Slip	0.00 to 20.00	0.01 Hz	<6>	Motor rated slip		A	A	A	A	322H
	E4-03	Motor 2 Rated No-Load Current	<6>	<6>	<6>	Motor no-load current. Set during Auto-Tuning		A	A	A	A	323H
	E4-04	Motor 2 Motor Poles	2 to 48	2 pole	4	Set the number of motor poles		A	A	A	A	324H
	E4-05	Motor 2 Line-to-Line Resistance	0.000 to 65.000	0.001 Ω	<6>	Motor line to line resistance. Set during Auto-Tuning		A	A	A	A	325H
	E4-06	Motor 2 Leakage Inductance	0.0 to 40.0	0.1%	<6>	Motor leakage inductance. Set during Auto-Tuning		A	A	A	A	326H
	E4-07	Motor 2 Motor Iron-Core Saturation Coefficient 1	0.00 to 0.50	-	0.50	Motor iron saturation coefficient at 50% of magnetic flux. Set during Auto-tuning		A	A	A	A	343H
	E4-08	Motor 2 Motor Iron-Core Saturation Coefficient 2	0.00 to 0.75	-	0.75	Motor iron saturation coefficient at 75% of magnetic flux. Set during Auto-tuning		A	A	A	A	344H
	E4-09	Motor 2 Mechanical Loss	0.0 to 10.0	0.1%	0.0	Motor mechanical loss as a % of motor rated power		A	A	A	A	33FH
	E4-10	Motor 2 Iron Loss	0 to 65535	1 W	<6>	Motor Iron Loss		A	A	A	A	340H
	E4-11	Motor 2 Rated Power	0.00 to 650.00	0.01 kW	<6>	Motor nameplate rated power		A	A	A	A	327H
PG Speed Control	F1-01	PG Pulses	0 to 60000	1 ppr	1024	Sets the number of encoder pulses per revolution		-	Q,A	-	Q,A	380H
	F1-02	Operation Selection at PG Open Circuit (PGo) fault	0 to 3	-	1	0: Ramp to stop 1: Coast to stop 2: Fast Stop 3: Continue Running		-	A	-	A	381H
	F1-03	Operation Selection at Overspeed (oS) fault	0 to 3	-	1			-	A	-	A	382H
	F1-04	Operation Selection at Deviation fault	0 to 3	-	3			-	A	-	A	383H
	F1-05	PG 1 Rotation Selection	0,1	-	0	0: Phase A leads with forward run command 1: Phase B leads with forward run command		-	A	-	A	384H
	F1-06	PG 1 Division Rate	1 to 132	-	1	Sets the division ratio for the pulse monitor output of the PG option card		-	A	-	A	385H
	F1-07	Integral Value During Accel/Decel Selection	0,1	-	0	0: Disabled 1: Enabled		-	A	-	-	386H
	F1-08	Overspeed Detection Level	0 to 120	1%	115	Sets the Overspeed detection level as a % of maximum output frequency		-	A	-	A	387H
	F1-09	Overspeed Detection Delay Time	0.0 to 2.0	0.1 s	<4>	Sets the time before an overspeed situatio triggers an Overspeed fault		-	A	-	A	388H

<1> Access Levels A: Advanced Programming Menu Q: Quick Setting Menu -: N/A in this Control Mode
<4> Default Setting is determined by the control method (A1-02 or E3-01)
<6> Default Setting and/or Setting Range is determined by drive capacity rating
<7> Values shown are for 200 VAC class drives. For 400 VAC class drives these values are doubled.

	No.	Parameter Name	Setting Range	Units	Default	Description	During Run	Access Level <1>				
								V/f	V/f with PG	OLV	CLV	MEMOBUS Address
PG Speed Control Card	F1-10	Excessive Speed Deviation Detection Level	0 to 50	1%	10	Speed deviation detection level as a percentage of maximum output frequency		-	A	-	A	389H
	F1-11	Excessive Speed Deviation Detection Delay Time	0.0 to 10.0	0.1 s	0.5	Time before a Speed Deviation situation triggers a fault		-	A	-	A	38AH
	F1-12	Number of PG 1 Gear Teeth 1	0 to 1000		0	Sets the gear ratio between the motor shaft and the encoder (PG). A gear ratio of 1 will be used if either of these values is set to 0.		-	A	-	-	38BH
	F1-13	Number of PG 1 Gear Teeth 2	0 to 1000		0			-	A	-	-	38CH
	F1-14	PG Open-Circuit Detection Time	0.0 to 10.0	0.1 s	2.0	Time required to trigger a PG Open (PGo) fault.		-	A	-	A	38DH
	F1-20	PG Card 1 Disconnect Detection	0,1		1	0: Disabled 1: Enabled		-	A	-	A	3B4H
	F1-21	PG 1 Signal Selection	0,1		0	0: A pulse detection 1: AB pulse detection		-	A	-	-	3BCH
	F1-30	PG Card Option Port for Motor 2 Selection	0,1		1	0: CN5-C 1: CN5-B		-	A	-	A	3AAH
	F1-31	PG 2 Pulses Per Revolution	0 to 60000	1 ppr	1024	Sets the number of pulses per revolution for PG option card 2.		-	A	-	A	3B0H
	F1-32	PG 2 Rotation Selection	0,1		0	0: Pulse A leads 1: Pulse B leads		-	A	-	A	3B1H
	F1-33	PG 2 Gear Teeth 1	0 to 1000		0	Sets the gear ratio between the motor 2 shaft and the encoder (PG 2). A gear ratio of 1 will be used if either of these values is set to 0.		-	A	-	-	3B2H
	F1-34	PG 2 Gear Teeth 2	0 to 1000		0			-	A	-	-	3B3H
	F1-35	PG2 Division Rate for Pulse Monitor	1 to 132		1	Sets the division ratio for the pulse monitor output of the PG 2 option card		-	A	-	A	3BEH
	F1-36	PG2 Option Card Disconnect Detection	0,1		1	0: Disabled 1: Enabled		-	A	-	A	3B5H
	F1-37	PG 2 Signal Selection	0,1		0	0: A pulse detection 1: AB pulse detection		-	A	-	-	3BDH
Analog Input Card	F2-01	Analog Command Option Card Operation Selection	0,1		0	0: Drive AI terminals are replaced by option card AI terminals. 1: Option card AI values are added together to create the frequency reference.		A	A	A	A	38FH
	F2-02	Analog Input Option Card Gain	-999.9 to 999.9	0.1%	100.0	Sets the gain for the input signal to the analog card	●	A	A	A	A	368H
	F2-03	Analog Input Option Card Bias	-999.9 to 999.9	0.1%	0.0	Sets the bias for the input signal to the analog card	●	A	A	A	A	369H
Digital Input Card	F3-01	Digital Input Option Card Input Type Selection	0 to 7		0	0: BCD 1% 1: BCD 0.1% 2: BCD 0.01% 3: BCD 1 Hz 4: BCD 0.1 Hz 5: BCD 0.0 1Hz 6: BCD (5-digit) 0.01 Hz 7: Binary		A	A	A	A	390H
	F3-03	Digital Input Option Card Data Lenght	0 to 2		2	0: 8 bit 1: 12 bit 2: 16 bit		A	A	A	A	3B9H
Analog Output Card	F4-01	Terminal V1 Monitor Selection	000 to 999 <8>		102	Sets the monitor signal for output on terminal V1 as the last 3 digits of the desired $U_{\square}^{\square}$ monitor.		A	A	A	A	391H
	F4-02	Terminal V1 Monitor Gain	-999.9 to 999.9	0.1%	100.0	Sets the gain for output terminal V1	●	A	A	A	A	392H
	F4-03	Terminal V2 Monitor Selection	000 to 999 <8>		103	Sets the monitor signal for output on terminal V2 as the last 3 digits of the desired $U_{\square}^{\square}$ monitor.		A	A	A	A	393H
	F4-04	Terminal V2 Monitor Gain	-999.9 to 999.9	0.1%	50.0	Sets the gain for output terminal V2	●	A	A	A	A	394H
	F4-05	Terminal V1 Monitor Bias	-999.9 to 999.9	0.1%	0.0	Sets the bias for output terminal V1	●	A	A	A	A	395H
	F4-06	Terminal V2 Monitor Bias	-999.9 to 999.9	0.1%	0.0	Sets the bias for output terminal V2	●	A	A	A	A	396H
	F4-07	Terminal V1 Signal Level	0,1		0	0: 0 to 10 Vdc 1: -10 to +10 Vdc		A	A	A	A	397H
	F4-08	Terminal V2 Signal Level	0,1		0			A	A	A	A	398H

<1> Access Levels A: Advanced Programming Menu Q: Quick Setting Menu -: N/A in this Control Mode
<8> Setting Range is determined by the control method (A1-02)

	No.	Parameter Name	Setting Range	Units	Default	Description	During Run	Access Level <1>				
								V/f	V/f with PG	OLV	CLV	MEMOBUS Address
Digital Output Card	F5-01	Terminal M1-M2 Output Function	0 to 192 <9>		0	During RUN		A	A	A	A	399H
	F5-02	Terminal M3-M4 Output Function			1	Zero Speed		A	A	A	A	39AH
	F5-03	Terminal P1-PC Output Function			2	Speed Agree 1		A	A	A	A	39BH
	F5-04	Terminal P2-PC Output Function			4	Frequency Detection 1		A	A	A	A	39CH
	F5-05	Terminal P3-PC Output Function n			6	Drive Ready		A	A	A	A	30DH
	F5-06	Terminal P4-PC Output Function			37	During Frequency Output		A	A	A	A	39EH
	F5-07	Terminal P5-PC Output Function			F	Terminal Not Used		A	A	A	A	39FH
	F5-08	Terminal P6-PC Output Function			F	Termianl Not Used		A	A	A	A	3A0H
	F5-09	DO-A3 Output Mode Selection	0 to 2		0	0: Terminal functions according to default settings 1: Binary code output 2: Terminal functions selected by parameters F5-01 through F5-08.		A	A	A	A	3A1H
Communication Option Card Settings	F6-01	Communications Error Operation Selection	0 to 3		1	0: Ramp to stop 1: Coast to stop 2: Emergency stop 3: Continue running		A	A	A	A	3A2H
	F6-02	Selection of External Fault from Communication Option Board	0,1		0	0: Always detected 1: Detection during run only		A	A	A	A	3A3H
	F6-03	Stopping Method for External Fault from Communication Option Board	0 to 3		1	0: Ramp to stop 1: Coast to stop 2: Emergency stop 3: Continue running		A	A	A	A	3A4H
	F6-04	Trace Sampling from Communications Option Board	0.0 to 5.0	0.1 s	2.0	Delay time for error detection if a bus error occurs		A	A	A	A	3A5H
	F6-06	Torque Reference/Torque Limit Selection from Communications Option	0,1		0	0: Disabled 1: Enabled		-	-	-	A	3A7H
	F6-07	Multi-Step Speed Reference selection with NetRef/ComRef	0,1		0	0: Multi-step reference disabled (same as F7) 1: Multi-step reference enabled (same as V7)		A	A	A	A	3A8H
	F6-08	Reset Communication Parameters	0,1		0	0: Communication-related parameters are not reset when the drive is initialized using A1-03. 1: Reset all communication-related parameters when the drive is initialized using A1-03.		A	A	A	A	36AH
	F6-10 Through F6-	Refer to the technical manual included with the option card										
Digital Inputs	H1-01	Terminal S1 Function Selection	0 to 9F <9>		40	Forward RUN Command		A	A	A	A	438H
	H1-02	Terminal S2 Function Selection			41	Reverse RUN Command		A	A	A	A	439H
	H1-03	Terminal S3 Function Selection			24	External Fault N.O Always Detected		A	A	A	A	400H
	H1-04	Terminal S4 Function Selection			14	Fault Reset		A	A	A	A	401H
	H1-05	Terminal S5 Function Selection			0	Brake Release Check		A	A	A	A	402H
	H1-06	Terminal S6 Function Selection			3	Multi-Step Speed Reference 1		A	A	A	A	403H
	H1-07	Terminal S7 Function Selection			4	Multi-Step Speed Reference 2		A	A	A	A	404H
	H1-08	Terminal S8 Function Selection			9	Baseblock Command N.C.		A	A	A	A	405H
Digital Outputs	H2-01	Terminal M1-M2 Function Selection	00 to 192 <9>		21	Brake Release Command		A	A	A	A	40BH
	H2-02	Terminal M3-M4 Function Selection			0	During RUN		A	A	A	A	40CH
	H2-03	Terminal M5-M6 Function Selection			2	Speed Agree 1		A	A	A	A	40DH
	H2-06	Watt Hour Output Unit Selection	0 to 4		0	0: 0.1 kW units 1: 1 kW units 2: 10 kW units 3: 100 kW units 4: 1000 kW units		A	A	A	A	437H

<1> Access Levels A: Advanced Programming Menu Q: Quick Setting Menu -: N/A in this Control Mode

<9> For more information on available functions for input and output terminals refer to section 5.4 of this document. For a detailed description of each standard function refer to section 5.7 of the A1000 standard drive technical manual (SIEP C710616 27).

	No.	Parameter Name	Setting Range	Units	Default	Description	During Run	Access Level <1>				
								V/f	V/f with PG	OLV	CLV	MEMOBUS Address
Analog Inputs	H3-01	Terminal A1 Signal Level Selection	0,1		0	0: 0 Vdc to +10 Vdc 1: -10 Vdc to +10 Vdc		A	A	A	A	410H
	H3-02	Terminal A1 Function Selection	0 to 31 <9>		0	Frequency Bias	●	A	A	A	A	411H
	H3-03	Terminal A1 Input Gain	-999.9 to 999.9	0.1%	100.0	Sets the input value when 10 Vdc is input at A1	●	A	A	A	A	411H
	H3-04	Terminal A1 Input Bias	-999.9 to 999.9	0.1%	0.0	Sets the input value when 0 Vdc is input at A1	●	A	A	A	A	412H
	H3-05	Terminal A3 Signal Level Selection	0,1		0	0: 0 Vdc to +10 Vdc 1: -10 Vdc to +10 Vdc		A	A	A	A	413H
	H3-06	Terminal A3 Function Selection	0 to 31 <9>		2	Aux Frequency Reference 1 (Multi-Step 2)		A	A	A	A	414H
	H3-07	Terminal A3 Input Gain	-999.9 to 999.9	0.1%	100.0	Sets the input value when 10 Vdc is input at A3	●	A	A	A	A	415H
	H3-08	Terminal A3 Input Bias	-999.9 to 999.9	0.1%	0.0	Sets the input value when 0 Vdc is input at A3	●	A	A	A	A	416H
	H3-09	Terminal A2 Signal Level Selection	0 to 2		2	0: 0 Vdc to +10 Vdc 1: -10 Vdc to +10 Vdc 2: 4 to 20 mA 3: 4 to 20 mA		A	A	A	A	417H
	H3-10	Terminal A2 Function Selection	0 to 31 <9>		0	Frequency Bias		A	A	A	A	418H
	H3-11	Terminal A2 Input Gain	-999.9 to 999.9	0.1%	100.0	Sets the input value when 10 Vdc (20 mA) is input at terminal A2	●	A	A	A	A	419H
	H3-12	Terminal A2 Input Bias	-999.9 to 999.9	0.1%	0.0	Sets the input value when 0 Vdc (4 mA) is input at terminal A2	●	A	A	A	A	41AH
	H3-13	Analog Input Filter Time Constant	0.00 to 2.00	0.01 s	0.03	Primary delay filter time for all analog input terminals. Used to filter noisy signals		A	A	A	A	41BH
	H3-14	Analog Input Terminal Enable Selection	1 to 7		7	Determines which of the analog input terminals will be enabled when H1=C. 1: Terminal A1 only 2: Terminal A2 only 3: Terminals A1 and A2 only 4: Terminal A3 only 5: Terminals A1 and A3 6: Terminals A2 and A3 7: All terminals enabled		A	A	A	A	41CH
	H3-16	Terminal A1 Tuning Offset	-500 to 500		0	Adds an offset when the analog input signal at terminal A1 is 0 Vdc.		A	A	A	A	2F0H
	H3-17	Terminal A2 Tuning Offset	-500 to 500		0	Adds an offset when the analog input signal at terminal A2 is 0 Vdc (4 mA).		A	A	A	A	2F1H
	H3-18	Terminal A3 Tuning Offset	-500 to 500		0	Adds an offset when the analog input signal at terminal A3 is 0 Vdc.		A	A	A	A	2F2H
Analog Outputs	H4-01	Terminal FM Monitor Selection	000 to 999		102	Sets the monitor to be output to terminal FM. For example to output U1-02 enter “102”		A	A	A	A	41DH
	H4-02	Terminal FM Gain	-999.9 to 999.9	0.1%	100.0	Sets the signal level at terminal FM that equals 100% of the selected monitor value.	●	Q,A	Q,A	Q,A	Q,A	41EH
	H4-03	Terminal FM Bias	-999.9 to 999.9	0.1%	0.0	Sets the signal level at terminal FM that equals 0% of the selected monitor value.	●	A	A	A	A	41FH
	H4-04	Terminal AM Monitor	000 to 999		103	Sets the monitor to be output to terminal AM. For example to output U1-02 enter “102”		A	A	A	A	420H
	H4-05	Terminal AM Gain	-999.9 to 999.9	0.1%	50.0	Sets the signal level at terminal AM that equals 100% of the selected monitor value.	●	Q,A	Q,A	Q,A	Q,A	421H
	H4-06	Terminal AM Bias	-999.9 to 999.9	0.1%	0.0	Sets the signal level at terminal AM that equals 0% of the selected monitor value.	●	A	A	A	A	422H
	H4-07	Terminal FM Signal Level Selection	0,1		0	0: 0 Vdc to +10 Vdc 1: -10 Vdc to +10 Vdc		A	A	A	A	423H
	H4-08	Terminal AM Signal Level Selection	0,1		0	0: 0 Vdc to +10 Vdc 1: -10 Vdc to +10 Vdc		A	A	A	A	424H

<1> Access Levels A: Advanced Programming Menu Q: Quick Setting Menu -: N/A in this Control Mode

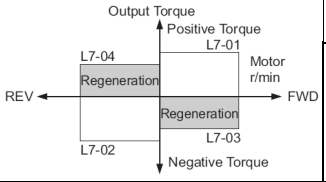
<9> For more information on available functions for input and output terminals refer to section 5.4 of this document. For a detailed description of each standard function refer to section 5.7 of the A1000 standard drive technical manual (SIEP C710616 27).

	No.	Parameter Name	Setting Range	Units	Default	Description	During Run	Access Level <1>				
								V/f	V/f with PG	OLV	CLV	MEMOBUS Address
MEMOBUS Comm.	H5-01	Node Address	0 to FF (Hex)		1F	MEMOBUS / Modbus Address.		A	A	A	A	425H
	H5-02	Communication Speed Selection	0 to 8		3	0: 1200 bps 5: 38400 bps 1: 2400 bps 6: 57600 bps 2: 4800 bps 7: 76800 bps 3: 9600 bps 8: 115200 bps 4: 19200 bps		A	A	A	A	426H
	H5-03	Communication Parity Selection	0 to 2		0	0: Parity disabled 1: Odd parity 2: Even Parity		A	A	A	A	427H
	H5-04	Stopping Method After Communication Error (CE)	0 to 3		3	0: Ramp to stop 1: Coast to stop 2: Emergency stop 3: Continue running		A	A	A	A	428H
	H5-05	Communication Error Detection Selection	0,1		1	0: Disabled 1: Enabled. If communication is lost for more than H5-09 seconds, a CE fault will occur		A	A	A	A	429H
	H5-06	Drive Transmit Wait Time	5 to 65	1 ms	5	Wait time between receiving and sending data		A	A	A	A	42AH
	H5-07	RTS Control Selection	0,1		1	0: Disabled. RTS is always on 1: Enabled. RTS turns on only when sending		A	A	A	A	42BH
	H5-09	Communication Error Detection Time	0.0 to 10.0	0.1 s	2.0	Time required to detect a Communication Error		A	A	A	A	435H
	H5-10	Unit Selection for MEMOBUS/Modbus Register 0025H	0,1		0	0: 0.1 V units 1: 1 V units		A	A	A	A	436H
	H5-11	Communications ENTER Function Selection	0,1		0	0: Drive requires an Enter command before accepting any changes to parameter settings 1: Parameter changes are activated immediately without the Enter command		A	A	A	A	43CH
	H5-12	Run Command Method Selection	0,1		0	0: FWD/Stop, REV/Stop 1: Run/Stop, FWD/REV		A	A	A	A	43DH
Pulse Train I/O	H6-01	Pulse Train Input Function Selection	0		0	0: Frequency reference		A	A	A	A	42CH
	H6-02	Pulse Train Input Scaling	1000 to 32000	1 Hz	1440	Sets the input signal frequency that is equal to 100% of the function set in H6-01	●	A	A	A	A	42DH
	H6-03	Pulse Train Input Gain	0.0 to 1000.0	0.1%	100.0	Sets the level of the function selected in H6-01 when a frequency of H6-02 is input	●	A	A	A	A	42EH
	H6-04	Pulse Train Input Bias	-100.0 to 100.0	0.1%	0.0	Sets the level of the function set in H6-01 when 0 Hz is input	●	A	A	A	A	42FH
	H6-05	Pulse Train Input Filter Time	0.00 to 2.00	0.01 s	0.10	Pulse train input filter time constant	●	A	A	A	A	430H
	H6-06	Pulse Train Monitor Selection	000 to 809		102	Used to select the monitor that the pulse train output should use	●	A	A	A	A	431H
	H6-07	Pulse Train Monitor Scaling	0 to 32000	1 Hz	1440	Sets the pulse train output frequency when the monitor value is 100%	●	A	A	A	A	432H
	H6-08	Pulse Train Input Minimum Frequency	0.1 to 1000	0.1 Hz	0.5	Minimum input frequency for pulse train detection		A	A	A	A	43FH
Motor Protection	L1-01	Motor Protection Function Selection	0 to 6		1	0: Disabled 1: General purpose motor (standard fan cooled) 2: Drive dedicated motor with a speed range of 1:10 3: Vector motor with a speed range of 1:100 6: Standard motor (50 Hz)		Q,A	Q,A	Q,A	Q,A	480H
	L1-02	Motor Protection Operation Time	0.1 to 5.0	0.1 min	1.0	Motor thermal overload protection (oL1) time		A	A	A	A	481H
	L1-03	Motor Overheat Alarm Operation Selection (PTC input)	0 to 3		3	0: Ramp to stop 1: Coast to stop 2: Emergency stop 3: Alarm only (oH3 will flash)		A	A	A	A	482H
	L1-04	Motor Overheat Fault Operation Selection (PTC input)	0 to 2		1	0: Ramp to stop 1: Coast to stop 2: Emergency stop		A	A	A	A	483H
	L1-05	Motor Temperature Input Filter Time Constant	0.00 to 10.00	0.01 s	0.20	Filter time constant for PTC analog input		A	A	A	A	484H
	L1-13	Continuous Electrothermal Operation Selection	0,1		1	0: Enabled 1: Disabled		A	A	A	A	46DH

<1> Access Levels A: Advanced Programming Menu Q: Quick Setting Menu -: N/A in this Control Mode

	No.	Parameter Name	Setting Range	Units	Default	Description	During Run	Access Level <1>				
								V/f	V/f with PG	OLV	CLV	MEMOBUS Address
Power Loss	L2-05	DC Bus Undervoltage Detection Level	150 to 210 <7>	1 Vdc	190 <7>	DC Bus voltage level at which an undervoltage fault is triggered.		A	A	A	A	489H
Stall Prevention	L3-01	Stall Prevention Selection during Acceleration	0 to 2		1	0: Disabled 1: General Purpose 2: Intelligent		A	A	A	-	48FH
	L3-02	Stall Prevention Level during Acceleration	0 to 200	1%	150	Stall prevention level as a % of drive rated current		A	A	A	-	490H
	L3-03	Stall Prevention Limit during Acceleration	0 to 100	1%	50	Stall prevention lower limit during acceleration as a % of drive rated current.		A	A	A	-	491H
	L3-04	Stall Prevention Selection during Deceleration	0 to 6 <10>		0	0: Disabled 1: General Purpose 2: Intelligent 3: Stall Prevention Function with braking resistor 4: Overexcitation Deceleration 1 5: Overxcitation Deceleration 2		Q,A	Q,A	Q,A	Q,A	492H
	L3-05	Stall Prevention Selection during Run	0 to 2		1	0: Disabled 1: Enabled (decel time C1-02) 2: Enabled (decel time C1-04)		A	A	-	-	493H
	L3-06	Stall Prevention Level during Run	30 to 200	1%	160	Stall prevention level as a % of drive rated current		A	A	-	-	494H
	L3-11	Overvoltage Suppression Function Selection	0,1		0	0: Disabled 1: Enabled		A	A	A	A	4C7H
	L3-17	DC Bus Voltage for Overvoltage Suppression and Stall Prevention	150 to 400 <7>	1 Vdc	375 <7>	DC Bus voltage level at which overvoltage suppression and stall prevention are triggered during deceleration.		A	A	A	A	462H
	L3-20	DC Bus Voltage Adjustment Gain	0.00 to 5.00		0.30	Proportional gain for KEB, Overvoltage Suppression and Stall Prevention		A	A	A	A	465H
	L3-21	Accel/Decel Rate Calculation Gain	0.00 to 200.00		1.00	Proportional gain used to calculate decel rate when KEB, Overvoltage Suppression and Stall Prevention are triggered during deceleration		A	A	A	A	466H
	L3-23	Automatic Reduction Selection for Stall Prevention during Run	0,1		0	0: Sets the Stall Prevention level set in L3-06 that is used throughout the entire frequency range. 1: Automatic Stall Prevention level reduction in the constant output range.		A	A	-	-	4FDH
	L3-24	Motor Acceleration Time for Inertia Calculations	0.001 to 10.000	0.001 s	0.178	Time needed to accelerate the uncoupled motor at rated torque from zero de maximum frequency		A	A	A	A	46EH
	L3-25	Load Inertia Ratio	1.0 to 1000.0		1.0	Ratio between motor and machine inertia		A	A	A	A	46FH
	L3-26	Additional DC Bus Capacitors	0 to 65000	1µf	0	Equivalent capacitance value when additional capacitors have been added to the DC Bus.		A	A	A	A	455H
	L3-27	Stall Prevention Detection Time	0 to 5000	1 ms	50	Time that current must exceed the stall prevention level before stall prevention is triggered.		A	A	-	-	456H
Speed Detection	L4-01	Speed Agreement Detection Level	0.0 to 400.0	0.1 Hz	0.0	Frequency detection level for digital output functions H2-02 through H2-05		A	A	A	A	499H
	L4-02	Speed Agreement Detection Width	0.0 to 20.0	0.1 Hz	2.0	Hysteresis or margin for speed agreement in L4-01		A	A	A	A	49AH
	L4-03	Speed Agreement Detection Level (+/-)	-400.0 to 400.0	0.1 Hz	0.0	Frequency detection level for digital output functions H2-13 through H2-16		A	A	A	A	49BH
	L4-04	Speeed Agreement Detection Width (+/-)	0.0 to 20.0	0.1 Hz	2.0	Hysteresis or margin for speed agreement in L4-04		A	A	A	A	49CH
	L4-05	Frequency Reference Loss Detection Selection	0,1		0	0: Enabled 1: Disabled		A	A	A	A	49DH
	L4-06	Frequency Reference at Reference Loss	0.0 to 100.0	0.1%	80.0	Percentage of last frequency reference that the drive should run at when the reference is lost		A	A	A	A	4C2H
	L4-07	Speed Agreement Detection Selection	0,1		0	0: Disabled during baseblock 1: Always enabled		A	A	A	A	470H

<1> Access Levels A: Advanced Programming Menu Q: Quick Setting Menu -: N/A in this Control Mode
<7> Values shown are for 200 VAC class drives. For 400 VAC class drives these values are doubled.
<10> Set to 3 (Stall Prevention w/ Braking Resistor) when in Closed Loop Vector (CLV) control

	No.	Parameter Name	Setting Range	Units	Default	Description	During Run	Access Level <1>				
								V/f	V/f with PG	OLV	CLV	MEMOBUS Address
Torque Limit	L7-01	Forward Torque Limit	0 to 300	1%	200	Torque limit as a percetage of motor rated torque. 		-	-	A	A	4A7H
	L7-02	Reverse Torque Limit	0 to 300	1%	200			-	-	A	A	4A8H
	L7-03	Forward Regenerative Torque Limit	0 to 300	1%	200			-	-	A	A	4A9H
	L7-04	Reverse Regenerative Torque Limit	0 to 300	1%	200			-	-	A	A	4AAH
	L7-06	Torque Limit Integral Time Constant	5 to 10000	1 ms	200	Integral time constant for torque limit		-	-	A	-	4ACH
	L7-07	Torque Limit Control Method Selection during Accel/Decel	0,1		0	0: Proportional control (changes to integral control at constant speed) 1: Integral control		-	-	A	-	4C9H
	L7-16	Torque Limit Control at Start	0,1		1	0: Disabled 1: Enabled		-	-	A	A	44DH
Hardware Protection	L8-01	Internal Dynamic Braking Resistor Protection Selection (ERF type)	0,1		0	0: Disabled 1: Enabled		A	A	A	A	4ADH
	L8-02	Overheat Alarm Level	50 to 150	1 °C	115 <6>	Temperature at which overheat alarm is triggered		A	A	A	A	4AEH
	L8-03	Overheat Pre-Alarm Operation Selection	0 to 3		3	0: Ramp to stop 1: Coast to stop 2: Emergency stop 3: Continue running (alarm only) 4: Continue running at level set in L8-19		A	A	A	A	4AFH
	L8-05	Input Phase Protection Selection	0,1		1	0: Disabled 1: Enabled		A	A	A	A	4B1H
	L8-07	Output Phase Loss Protection	0 to 2		1	0: Disabled 1: Enabled (triggered by a single phase loss) 2: Enabled (triggered when two phases are lost)		A	A	A	A	4B3H
	L8-08	Output Phase Loss Detection Level	0.0 to 20.0	0.1%	5.0	Tunes Phase Loss Protection so the fault is accurately detected when running a motor much smaller than the drive.		A	A	A	A	4B4H
	L8-09	Ground Protection Selection	0,1		1	0: Disabled 1: Enabled		A	A	A	A	4B5H
	L8-10	Heatsink Cooling Fan Operation Selection	0,1		0	0: Fan operation only when Run command is present 1: Fan operation whenever the power supply is on		A	A	A	A	4B6H
	L8-11	Heatsink Cooling Fan Off Delay Time	0 to 300	1 s	60	Delay time before fan is turned off after Run command is removed if L8-10 = 0		A	A	A	A	4B7H
	L8-12	Ambient Temperature Setting	-10 to 50	1 °C	40	Ambien temperature		A	A	A	A	4B8H
	L8-15	oL2 Detection at Low Speeds	0,1		1	0: No oL2 level reduction below 6 Hz 1: oL2 level reduced linearly below 6 Hz. At 0 Hz it is halved		A	A	A	A	4BBH
	L8-18	Software Current Limit	0,1		0	0: Disabled 1: Enabled		A	A	A	A	4BEH
	L8-19	Frequency Reduction Rate during Overheat Pre-Alarm	0.1 to 0.9		0.8	Frequency reduction factor when L8-03 = 4		A	A	A	A	4BFH
	L8-32	Main Contactor, Fan Power Supply Fault Selection	0 to 4		1	0: Ramp to stop 1: Coast to stop 2: Emergency stop 3: Continue running (alarm only) 4: Continue running at level set in L8-19		A	A	A	A	4E2H
	L8-35	Installation Method Selection	0 to 3		<2> <6>	0: IP00 enclosure drive 1: Side-by-Side mounting 2: NEMA Type 1 enclosure 3: Finless model drive or external heatsink installation		A	A	A	A	4ECH
	L8-38	Carrier Frequency Reduction Selection	0 to 2		2	0: Disabled 1: Enabled below 6 Hz 2: Enabled for the entire speed range		A	A	A	A	4EFH
	L8-40	Carrier Frequency Reduction Off Delay Time	0.00 to 2.00	0.01 s	0.50 <4>	Time to continue running with reduced carrier frequency after carrier reduction is gone		A	A	A	A	4F1H
	L8-41	High Current Alarm Selection	0,1		1	0: Disabled 1: Enabled (triggered at 150% of drive rated current)		A	A	A	A	4F2H
	L8-55	Internal Braking Transistor Protection	0,1		1	0: Disabled 1: Enabled		A	A	A	A	45FH

<1> Access Levels A: Advanced Programming Menu Q: Quick Setting Menu -: N/A in this Control Mode
<2> Value is not reset when the drive is initialized.
<4> Default Setting is determined by the control method (A1-02 or E3-01)
<6> Default Setting and/or Setting Range is determined by drive capacity rating

	No.	Parameter Name	Setting Range	Units	Default	Description	During Run	Access Level <1>				
								V/f	V/f with PG	OLV	CLV	MEMOBUS Address
Hunting Prevention	n1-01	Hunting Prevention Function Selection	0,1		1	0: Disabled 1: Enabled		A	A	-	-	580H
	n1-02	Hunting Prevention Gain	0.00 to 2.50		1.00	Hunting Prevention gain. Used to reduce motor vibration when lightly loaded.		A	A	-	-	581H
	n1-03	Hunting Prevention Time Constant	0 to 500	1 ms	10	Time constant for Hunting Prevention function		A	A	-	-	582H
	n1-05	Hunting Prevention Gain While in Reverse	0.00 to 2.50		0.00	Hunting Prevention gain when in reverse operation. If set to 0, gain set in n1-02 will be used.		A	A	-	-	582H
AFR Tuning	n2-01	Speed Feedback Detection Suppression (AFR) Gain	0.00 to 10.00		1.00	Internal speed feedback detection control gain		-	-	A	-	584H
	n2-02	Speed Feedback Detection Suppression (AFR) Time Constant	0 to 2000	1 ms	50	Time constant used for speed feedback detection (AFR) control		-	-	A	-	585H
	n2-03	Speed Feedback Detection Suppression (AFR) Time Constant 2	0 to 2000	1 ms	750	Time constant used for speed feedback detection (AFR) control during regen		-	-	A	-	586H
Overexcitation Braking	n3-13	Overexcitation Deceleration Gain	1.00 to 1.40		1.10	Gain applied to V/f pattern during Overexcitation		A	A	A	A	531H
	n3-14	High Frequency Injection during Overexcitation Deceleration	0,1		0	0: Disabled 1: Enabled		A	A	A	-	532H
	n3-21	High-Slip Suppression Current Level	0 to 150	1%	100	Output current at which the drive reduces overexcitation gain to prevent excess motor slip		A	A	A	A	579H
	n3-23	Overexcitation Operation Selection	0 to 2		0	0: Enabled in both directions 1: Enabled only when rotating forward 2: Enabled only when in reverse		A	A	A	A	57BH
Feed Forward Control	n5-01	Feed Forward Control Selection	0,1		0	0: Disabled 1: Enabled		-	-	-	A	5B0H
	n5-02	Motor Accel Time	0.001 to 10.000	0.001 s	0.178 <6>	Time required to accelerate motor at rated torque from standstill to rated speed.		-	-	-	A	5B1H
	n5-03	Feed Forward Control Proportional Gain	0.00 to 100.00		1.00	Ratio between motor and load inertia		-	-	-	A	5B2H
Online Tuning	n6-01	Online Tuning Selection	0 to 2		0	0: Disabled 1: Line-to-line resistance tuning 2: Voltage correction		-	-	A	-	570H
	n6-05	Online Tuning Gain	0.1 to 5.0		1.0	Online Tuning gain. Decrease for motors with a large rotor time constant.		-	-	A	-	5C7H
Operator Display Settings	o1-01	Drive Mode Unit Monitor Selection	104 to 809		106	Content of the last monitor that is shown when scrolling through Drive Mode display	●	A	A	A	A	500H
	o1-02	User Monitor Selection after Power Up	1 to 4		1	1: Frequency reference (U1-01) 2: Direction 3: Output frequency (U1-02) 4: Output current (U1-03) 5: User-selected monitor (set by o1-01)	●	A	A	A	A	501H
	o1-03	Digital Operator Display Units Selection	0 to 3		0	0: 0.01 Hz 1: 0.01 % 2: r/min (using # of motor poles) 3: User-selected units (set with o1-10 and o1-11)		A	A	A	A	502H
	o1-04	V/f Pattern Display Unit	0,1		0	0: Hz 1: r/min		-	-	-	A	503H
	o1-10	User-Set Display Units Maximum Value	1 to 60000		5000	Display value that is equal to max output frequency		A	A	A	A	520H
	o1-11	User-Set Display Units Decimal Display	0 to 3		2	Position of the decimal point for o1-10		A	A	A	A	521H
Digital Operator Keypad Functions	o2-02	STOP Key Function Selection	0,1		1	0: Disabled in REMOTE operation 1: Always Enabled		A	A	A	A	506H
	o2-03	User Parameter Default Value	0 to 2		0	0: No change 1: Set defaults. Saves parameter settings as default values for a User Initialization 2: Clear all		A	A	A	A	507H
	o2-04	Drive Model Selection	0 to FF		<6>	Enter Drive Model when replacing control board		A	A	A	A	508H
	o2-05	Frequency Reference Setting Method Selection	0,1		0	0: ENTER key must be pressed to enter a frequency reference. 1: ENTER key is not required		A	A	A	A	509H
	o2-06	Operation Selection when Digital Operator is Disconnected	0,1		0	0: No fault when digital operator is disconnected 1: oPr fault is triggered when disconnected		A	A	A	A	50AH
	o2-07	Motor Direction at Power Up when Using Operator	0,1		0	0: Forward 1: Reverse		A	A	A	A	527H

<1> Access Levels A: Advanced Programming Menu Q: Quick Setting Menu -: N/A in this Control Mode
<6> Default Setting and/or Setting Range is determined by drive capacity rating

	No.	Parameter Name	Setting Range	Units	Default	Description	During Run	Access Level <1>				
								V/f	V/f with PG	OLV	CLV	MEMOBUS Address
Copy Function	o3-01	Copy Function Selection	0 to 3		0	0: No action 1: Read parameters from the drive, saving them onto the digital operator 2: Copy parameters from the digital operator, writing them to the drive 3: Verify parameter settings on the drive to check if they match the data saved on the operator		A	A	A	A	515H
	o3-02	Copy Allowed Selection	0,1		0	0: Read operation prohibited 1: Read operation allowed		A	A	A	A	516H
Maintenance	o4-01	Cumulative Operation Time Setting	0 to 9999	10 h	0	Cumulative operation time of the drive		A	A	A	A	50BH
	o4-02	Cumulative Operation Time Selection	0,1		0	0: Logs power-on time 1: Logs operation time when the drive output is active (output operation time).		A	A	A	A	50CH
	o4-03	Cooling Fan Operation Time Setting	0 to 9999	10 h	0	Value of fan operation time (U4-03)		A	A	A	A	50EH
	o4-05	Capacitor Maintenance Setting	0 to 150	1%	0	Value of maintenance monitor for capacitors		A	A	A	A	51DH
	o4-07	DC Bus Soft-charge Relay Maintenance Setting	0 to 150	1%	0	Value of maintenance monitor for the soft-charge bypass relay		A	A	A	A	523H
	o4-09	IGBT Maintenance Setting	0 to 150	1%	0	Value of maintenance monitor for the IGBTs		A	A	A	A	525H
	o4-11	U2,U3 Monitor Initialization	0,1		0	0: U2-¦ and U3-¦ monitor data is not reset when the drive is initialized 1: U2-¦ and U3-¦ monitor data is reset when the drive is initialized		A	A	A	A	510H
	o4-12	kWh Monitor Initialization	0,1		0	0: U4-10 and U4-11 monitor data is not reset when the drive is initialized 1: U4-10 and U4-11 monitor data is reset when the drive is initialized		A	A	A	A	512H
	o4-13	Number of Run Commands Counter Initialization	0,1		0	0: Number of Run commands counter is not reset when the drive is initialized 1: Number of Run commands counter is reset when the drive is initialized		A	A	A	A	528H

<1> Access Levels A: Advanced Programming Menu Q: Quick Setting Menu -: N/A in this Control Mode

5.3 Crane Parameters

	No.	Parameter Name	Setting Range	Units	Default	Description	During Run	Access Level <1>				
								V/f	V/f with PG	OLV	CLV	MEMOBUS Address
Brake Sequence	S1-01	Brake Release Frequency (FWD) <**FRF**>	0.0 to 20.0	0.1 Hz	2.0	Output frequency in FWD direction at which the brake release output is activated <11>		A	A	A	A	680H
	S1-02	Brake Release Frequency (REV) <**RRF**>	0.0 to 20.0	0.1 Hz	2.0	Output frequency in REV direction at which the brake release output is activated <11>		A	A	A	A	681H
	S1-03	Brake Delay Frequency <**BF**>	0.0 to 400.0	0.1 Hz	<4>	Initial frequency to which the drive accelerates when a RUN command is entered.		A	A	A	A	682H
	S1-04	Brake Delay Time <**BT**>	0.00 to 10.00	0.01 s	<4>	Time between the reception of the Brake Release Check signal and the actual opening of the brake		A	A	A	A	683H
	S1-05	Brake Release Current (FWD) <**IF**>	0 to 200	1%	50	Sets the current in FWD direction at which the brake release output is activated as a % of motor rated current		A	A	A	A	684H
	S1-06	Brake Release Current (REV) <**IR**>	0 to 200	1%	30	Sets the current in REV direction at which the brake release output is activated as a % of motor rated current		A	A	A	A	685H
	S1-07	Brake Release Torque (FWD) <**TF**>	0 to 200	1%	100	Sets the torque in FWD direction at which the brake release output is activated as a % of motor rated torque		-	-	A	A	686H
	S1-08	Brake Release Torque (REV) <**TR**>	0 to 200	1%	0	Sets the torque in REV direction at which the brake release output is activated as a % of motor rated torque		-	-	A	A	687H
	S1-09	Torque Compensation (FWD) <**TCF**>	<8>	1%	<4>	Torque Compensation amount at FWD start as a % of motor rated torque		-	-	A	A	688H
	S1-10	Torque Compensation (REV) <**TCR**>	<8>	1%	0%	Torque Compensation amount at REV start as a % of motor rated torque		-	-	A	A	689H
	S1-11	Torque Compensation Delay Time <**TCDT**>	0 to 200	1 ms	50	Torque compensation ramp time at start.		-	-	A	A	68AH
	S1-12	Brake Hold Frequency (FWD) <**FHF**>	0.0 to 20.0	0.1 Hz	3.0	Frequency in the FWD direction at which the brake is closed during deceleration when a STOP command in entered <11>		A	A	A	A	68BH
	S1-13	Brake Hold Frequency (REV) <**RHF**>	0.0 to 20.0	0.1 Hz	3.0	Frequency in the REV direction at which the brake is closed during deceleration when a STOP command in entered <11>		A	A	A	A	68CH
	S1-14	Slip Prevention Frequency <**HF**>	0.0 to 20.0	0.1 Hz	<4>	Frequency at which the drive will hold after closing the brake at STOP		A	A	A	A	68DH
	S1-15	Slip Prevention Time <**HT**>	0.00 to 10.00	0.01 s	<4>	Time during which the drive will hold the frequency entered in S1-14 after closing the brake at STOP		A	A	A	A	68EH
	S1-16	Sequence Fault SE1 Detection Time	0.00 to 2.00	0.01 s	0.30	Time before SE1 fault is detected <12>		A	A	A	A	68FH
	S1-17	Sequence Fault SE2 Detection Time	0.00 to 2.00	0.01 s	1.00	Time before SE2 fault is detected <12>		A	A	A	A	690H
	S1-18	Sequence Fault SE3 Detection Time	0.00 to 2.00	0.01 s	0.50	Time before SE3 fault is detected <12>		A	A	A	A	691H
	S1-19	Sequence Fault SE4 Detection Time	0.00 to 2.00	0.01 s	0.50	Time before SE4 fault is detected <12>		A	A	A	A	692H
	S1-20	Operation in Reverse	0,1	-	0 <13>	0: Normal motoring operations 1: Regen operation in reverse		-	-	A	-	693H
	S1-22	DB Phase Fix	0,1	-	0	0: Disabled 1: Enabled		A	A	A	A	6BFH
Run Cmd Tuning	S2-01	Run Cmd Minimum On Time (FWD)	0.00 to 10.00	0.01 s	0.00	Minimum time that the drive will run when a FWD RUN command is entered		A	A	A	A	694H
	S2-02	Run Cmd Minimum On Time (REV)	0.00 to 10.00	0.01 s	0.00	Minimum time that the drive will run when a REV RUN command is entered		A	A	A	A	695H
	S2-03	Run Cmd Delay Timer (FWD / REV)	0.00 to 10.00	0.01 s	0.00	Delay time between successive lowering and hoisting operations. Possible with motor 1 only		A	A	A	-	696H
Impact Stop	S3-01	Impact Stop Creep Frequency <**SCR**>	0.0 to 20.0	0.1 Hz	<4>	Frequency to which the drive decelerates after an Impact Stop input is activated and a STOP command is entered		A	A	A	A	697H
	S3-02	Impact Stop Creep Time <**TCR**>	0.0 to 20.0	0.1 s	10.0	Time during which the drive holds the frequency set to S3-01 before closing the brake		A	A	A	A	698H

<1> Access Levels A: Advanced Programming Menu Q: Quick Setting Menu -: N/A in this Control Mode
<4> Default Setting is determined by the control method (A1-02 or E3-01)
<8> Setting Range is determined by the control method (A1-02)
<11> When the frequency reference is reduced just below S4-01, -02, -12, -13 and no STOP command is entered, the drive will continue to run using the FWD frequency reference of S4-01 or -12, whichever is larger, or the REV frequency reference of S4-02 or -13, whichever is larger.
<12> For a more detailed description of the Crane Software sequence faults, see section 7.1.6.
<13> When operating in OLV control mode without a counter weight, be sure to set S1-20 parameter to 1.

	No.	Parameter Name	Setting Range	Units	Default	Description	During Run	Access Level <1>				
								V/f	V/f with PG	OLV	CLV	MEMOBUS Address
Impact Stop	S3-03	Impact Stop Detection Torque (FWD) <**IFOT**>	0 to 200	1%	100	Torque at which impact stop is detected in the FWD direction when drive is running at creep frequency		A	A	A	A	699H
	S3-04	Impact Stop Detection Torque (REV) <**IROT**>	0 to 200	1%	100	Torque at which impact stop is detected in the REV direction when drive is running at creep frequency		A	A	A	A	69AH
	S3-05	Impact Stop Detection Time <**TIOT**>	0.0 to 2.0	0.1 s	0.3	Time during which torque reference must be above FWD / REV detection torque for impact stop to be detected and activated.		A	A	A	A	69BH
Ultra Lift	S4-01	Ultra Lift Control Selection	0 to 2	-	0	0: Ultra Lift Control disabled 1: Ultra Liftt Control 1 enabled 2: Ultra Lift Control 2 enabled		A	A	A	A	69CH
	S4-02	Ultra Lift 1 Max. Frequency (FWD) <**FAMF**>	40.0 to 200.0	0.1 Hz	60.0	Maximum output frequency in FWD direction when Ultra Lift 1 function is activated		A	A	A	A	69DH
	S4-03	Ultra Lift 1 Max. Frequency (REV) <**FAMR**>	40.0 to 200.0	0.1 Hz	60.0	Maximum output frequency in REV direction when Ultra Lift 1 function is activated		A	A	A	A	69EH
	S4-04	Ultra Lift 1 Detection Torque (FWD) <**IFAT**>	0 to 200	1%	50	Torque threshold in the FWD direction for activation of Ultra Lift 1 function as a % of motor rated torque		A	A	A	A	69FH
	S4-05	Ultra Lift 1 Detection Torque (REV) <**IRAT**>	0 to 200	1%	50	Torque threshold in the REV direction for activation of Ultra Lift 1 function as a % of motor rated torque		A	A	A	A	6A0H
	S4-06	Ultra Lift 1 Detection Frequency <**FAD**>	40.0 to 60.0	0.1 Hz	60.0	Output frequency at which the Ultra Lift 1 torque threshold detection is activated		A	A	A	A	6A1H
	S4-07	Ultra Lift 1 Detection Time <**TA**>	0.0 to 10.0	0.1 s	1.0	Time during which the torque reference must be below the torque threshold (FWD / REV) for Ultra Lift 1 function to be activated.		A	A	A	A	6A2H
	S4-08	Ultra Lift 2 Activation Frequency <**FAM2**>	0 to 200	1 Hz	50	Output frequency from which Ultra Lift 2 function can be activated.		-	-	A	A	6A3H
	S4-09	Ultra Lift 2 Motoring Limit Start Level <**LGS**>	0 to 200	1%	50	Output power at which the acceleration rate is reduced, set as a % of the motor rated power		-	-	A	A	6A4H
	S4-10	Ultra Lift 2 Motoring Hold Level <**LGH**>	0 to 200	1%	100	Output power at which acceleration is stopped, set as a % of motor rated power		-	-	A	A	6A5H
	S4-11	Ultra Lift 2 Regen Limit Start Level <**LRS**>	0 to 200	1%	10	Output power during regeneration at which the acceleration rate is reduced, set as a % of the motor rated power		-	-	A	A	6A6H
	S4-12	Ultra Lift 2 Regen Hold Level <**LRH**>	0 to 200	1%	100	Output power during regeneration at which acceleration is stopped, set as a % of motor rated power		-	-	A	A	6A7H
	S4-13	Ultra Lift 2 Limit Timer <**TA2**>	0.1 to 10.0	0.1 s	1.0	Timer that limits acceleration reduction or hold during Ultra Lift 2 function		-	-	A	A	6A8H
	S4-14	Ultra Lift 2 Fault Operation Selection	0 to 3	-	2	0: Ramp to stop 1: Coast to stop 2: Emergency stop 3: Acceleration Prohibited		-	-	A	A	6A9H
	S4-15	Ultra Lift 2 Fault Detection Level <**LEA2**>	0 to 200	1%	150	Ouput power threshold to trigger an oL6 fault during Ultra Lift 2 function, set as a % of motor rated power		-	-	A	A	6AAH
	S4-16	Ultra Lift 2 Fault Detection Time <**TEA2**>	0.0 to 10.0	0.1 s	0.1	Time during which ouput power must be above the output power threshold before an oL6 fault is triggered.		-	-	A	A	6ABH
	S4-17	Ultra Lift 2 Accel Time Gain <**GAT**>	1.0 to 10.0		2.0	Acceleration time gain factor. When Ultra Lift 2 is enabled, acceleration time becomes C1-01 * S4-17		-	-	A	A	6ACH
	S4-18	Ultra Lift 2 Operation Selection during Regeneration	0, 1	-	0	0: Disabled 1: Enabled		-	-	A	A	6ADH
	S4-19	Ultra Lift 1 Torque Bias (FWD)	-50.0 to 50.0	0.1%	0.0	Sets the mechanical losses for the crane in the FWD rotating direction as a % of motor rated torque		-	-	A	-	6AEH
	S4-20	Ultra Lift 1 Torque Bias (REV)	-50.0 to 50.0	1.0%	0.0	Sets the mechanical losses for the crane in the REV rotating direction as a % of motor rated torque		-	-	A	-	6AFH
	S4-21	Ultra Lift 2 Deceleration Width for oL6	0.0 to 10.0	0.1 Hz	0.0	Frequency width for deceleration when oL6 fault occurs		-	-	A	-	6BDH

<1> Access Levels A: Advanced Programming Menu Q: Quick Setting Menu -: N/A in this Control Mode

	No.	Parameter Name	Setting Range	Units	Default	Description	During Run	Access Level <1>				
								V/f	V/f with PG	OLV	CLV	MEMOBUS Address
Overload Detection	S5-01	Overload Detection Operation Selection 1	0 to 6	-	0	0: Disabled 1: Detection only during Speed Agree, acceleration prohibited (continue running). Alarm only 2: Detection during run, acceleration prohibited (continue running). Alarm only 3: Detection only during Speed Agree. Decelerate to stop at Fast Stop time (C1-09). Alarm only 4: Detection during run. Decelerate to stop at Fast Stop time (C1-09). Alarm only 5: Detection only during Speed Agree. Interrupt output current. Fault 6: Detection during run. Interrupt output current. Fault		A	A	A	A	6B0H
	S5-02	Overload Detection Level 1	0 to 300	1%	150	Sets Motor Overload 1 detection threshold <14>		A	A	A	A	6B1H
	S5-03	Overload Detection Time 1	0.0 to 10.0	0.1 s	0.1	Time during which Overload Detection level 1 must be surpassed to trigger Overload Detection output		A	A	A	A	6B2H
	S5-04	Overload Detection Operation Selection 2	0 to 6	-	0	0: Disabled 1: Detection only during Speed Agree, acceleration prohibited (continue running). Alarm only. 2: Detection during run, acceleration prohibited (continue running). Alarm only. 3: Detection only during Speed Agree. Decelerate to stop at Fast Stop time (C1-09). Alarm only. 4: Detection during run. Decelerate to stop at Fast Stop time (C1-09). Alarm only. 5: Detection only during Speed Agree. Interrupt output current. Fault 6: Detection during run. Interrupt output current. Fault		A	A	A	A	6B3H
	S5-05	Overload Detection Torque 2	0 to 300	1%	150	Sets Motor Overload 2 detection threshold <14>		A	A	A	A	6B4H
	S5-06	Overload Detection Time 2	0.0 to 10.0	0.1 s	0.1	Time during which Overload Detection level 2 must be surpassed to trigger Overload Detection output		A	A	A	A	6B5H
Overtorque Detection	S6-01	Overtorque Detection Operation Selection 1	0 to 6		0	0: Disabled 1: Detection only during Speed Agree, acceleration prohibited (continue running). Alarm only 2: Detection during run, acceleration prohibited (continue running). Alarm only 3: Detection only during Speed Agree. Interrupt output current. Fault 4: Detection during run. Interrupt output current. Fault 5: Detection only during Speed Agree (continue running), but maintain multi-function digital output until stopped. Alarm only 6: Detection duuing run, but maintain Multi-Function Digital output until stopped. Alarm only		A	A	A	A	6B6H
	S6-02	Overtorque Detection Level 1	0 to 300	1%	150	Sets motor Overtorque Detection Level 1 <14>		A	A	A	A	6B7H
	S6-03	Overtorque Detection Time 1	0.0 to 10.0	0.1 s	0.1	Time during which Overtorque Detection level 1 must be surpassed to trigger Overload Detection output		A	A	A	A	6B8H
	S6-04	Overtorque Detection Operation Selection 2	0 to 6		0	0: Disabled 1: Detection only during Speed Agree, acceleration prohibited (continue running). Alarm only 2: Detection during run, acceleration prohibited (continue running). Alarm only 3: Detection only during Speed Agree. Interrupt output current. Fault 4: Detection during run. Interrupt output current. Fault 5: Detection only during Speed Agree (continue running), but maintain multi-function digital output until stopped. Alarm only 6: Detection duuing run, but maintain multi-function digital output until stopped. Alarm only		A	A	A	A	6B9H
	S6-05	Overtorque Detection Level 2	0 to 300	1%	150	Sets motor Overtorque Detection Level 2 <14>		A	A	A	A	6BAH
	S6-06	Overtorque Detection Time 2	0.0 to 10.0	0.1 s	0.1	Time during which Overtorque Detection level 2 must be surpassed to trigger Overload Detection output		A	A	A	A	6BBH

<1> Access Levels A: Advanced Programming Menu Q: Quick Setting Menu -: N/A in this Control Mode
<14> In V/f Control, set as a % of motor rated current. In Vector Control, set as a % of motor rated torque.

5.4 Auto-Tuning Parameters

	No.	Parameter Name	Setting Range	Units	Default	Description	Access Level <1>				
							V/f	V/f with PG	OLV	CLV	MEMOBUS Address
Auto-Tuning	T1-00	Motor Selection 1/2	1,2		1	0: Select motor 1 for Auto-Tuning 1: Select motor 2 for Auto-Tuning Note that this parameter appears only when motor 2 has been selected using the other parameter settings.	T	T	T	T	700H
	T1-01	Tuning Mode Selection	<8>		<4>	0: Rotational Auto-Tuning 1: Stationary Auto-Tuning 2: Terminal Resistance Only 3: Rotational Auto-Tuning for V/f 4: Stationary Auto-Tuning 2 8: Inertia Tuning 9: ASR Gain Tuning Perform Rotational Auto-Tuning prior to Inertia or ASR Gain Auto-Tuning	T <15>	T <15>	T <16>	T	701H
	T1-02	Motor Rated Power	0.00 to 650.00	0.01 kW	<6>	Motor rated power as specified on motor nameplate	T	T	T	T	702H
	T1-03	Motor Rated Voltage	0.0 to 255.0 <7>	0.1 VAC	200.0 <7>	Motor rated voltage as specified on motor nameplate	-	-	T	T	703H
	T1-04	Motor Rated Current	<6>	0.01 A	<6>	Motor rated current as specified on motor nameplate	T	T	T	T	704H
	T1-05	Motor Base Frequency	0.0 to 400.0	0.1 Hz	50.0	Motor rated frequency as stated on motor nameplate	-	-	T	T	705H
	T1-06	Number of Motor Poles	2 to 48		4	Number of motor poles	-	-	T	T	706H
	T1-07	Motor Base Speed	0 to 24000	2 r/min	1750	Motor rated speed as specified on motor nameplate	-	-	T	T	707H
	T1-08	PG Number of Pulses Per Revolution	0 to 60000	1 ppr	600	Number of pulses per revolution of the encoder	-	-	-	T	708H
	T1-09	Motor No-Load Current	<6>	1 A	<6>	Motor current when operating withcout load. Set during auto-tuning	-	-	T	T	70AH
	T1-10	Motor Rated Slip	0.00 to 20.00	0.01 Hz	<6>	Motor rated slip. Set during auto-tuning	T	T	-	-	70BH
Inertia & ASR Tuning	T3-01	Test Signal Frequency	0.1 to 20.0	0.1 Hz	3.0	Frequency of the test signal used during Inertia and ASR Auto-Tuning	-	-	-	T	760H
	T3-02	Test Signal Amplitude	0.1 to 10.0		0.5	Amplitude of the test signal used during Inertia and ASR Auto-Tuning	-	-	-	T	761H
	T3-03	Motor Inertia	0.0001 to 6.0000	0.0001 $kg.m^2$	<6>	Set motor inertia	-	-	-	T	762H
	T3-04	System Response Frequency	0.1 to 50.0	0.1 Hz	10.0	Response frequency of the mechanical system conneected to the motor	-	-	-	T	763H

<1> Access Levels T: Auto-Tuning Menu -: N/A in this Control Mode
<4> Default Setting is determined by the control method (A1-02 or E3-01)
<6> Default Setting and/or Setting Range is determined by drive capacity rating
<7> Values shown are for 200 VAC class drives. For 400 VAC class drives these values are doubled.
<8> Setting Range is determined by the control method (A1-02)
<15> In V/f Control Modes only options 2 (Terminal Resistance) and 3 (Rotational Auto-Tuning for V/f) are available
<16> In OLV Control Mode, options 8 (Inertia Tuning) and 9 (ASR Tuning) are not available

5.5 Drive Monitors

	No.	Parameter Name	Min. Units	Description	Analog Output Level	Access Level <1>				
						V/f	V/f with PG	OLV	CLV	MEMOBUS Address
Status Monitors	U1-01	Frequency Reference	0.01 Hz	Monitors the frequency reference. Display units are determined by o1-03	10 V: Max Frequency	M	M	M	M	40H
	U1-02	Output Frequency	0.01 Hz	Monitors the drive output frequency. Diplay units are determined by o1-03	10 V: Max Frequency	M	M	M	M	41H
	U1-03	Output Current	<17>	Monitors the drive output current	10 V: Drive Rated Current	M	M	M	M	42H
	U1-04	Control Mode	-	0: V/f control 1: V/f Control with PG 2: Open Loop Vector Control 3: Flux Loop Vector Control	-	M	M	M	M	43H
	U1-05	Motor Speed	0.01 Hz	Displays the motor speed feedback. Display units are determined by o1-03	10 V: Max Frequency	-	M	M	M	44H
	U1-06	Output Voltage Reference	0.1 VAC	Displays drive output voltage	10 V: 200 Vrms <7>	M	M	M	M	45H
	U1-07	Main Circuit DC Voltage	1 Vdc	Displays the DC Bus voltage	10 V: 400 V <7>	M	M	M	M	46H
	U1-08	Output Power	0.1 kW	Displays the calculated drive output power	10 V: Drive Rated Power (kW)	M	M	M	M	47H
	U1-09	Torque Reference	0.1%	Displays the drive internal torque reference	10 V: Motor Rated Torque	-	-	M	M	48H
	U1-10	Input Terminal Status	-	Displays Input Terminal Status U1-10=00000000 1 Digital input 1 (terminal S1 enabled) 1 Digital input 2 (terminal S2 enabled) 1 Digital input 3 (terminal S3 enabled) 1 Digital input 4 (terminal S4 enabled) 1 Digital input 5 (terminal S5 enabled) 1 Digital input 6 (terminal S6 enabled) 1 Digital input 7 (terminal S7 enabled) 1 Digital input 8 (terminal S8 enabled)	-	M	M	M	M	49H
	U1-11	Output Terminal Status	-	Displays Output Terminal Status U1-11=00000000 1 Multi-Function Digital Output (terminal M1-M2) 1 Multi-Function Digital Output (terminal M3-M4) 1 Multi-Function Digital Output (terminal M5-M6) Not Used 1 Fault Relay Output (terminal MA-MC closed MA-MC open)	-	M	M	M	M	4AH
	U1-12	Drive Status	-	Verifies drive Operation Status U1-12=00000000 1 During run 1 During zero-speed 1 During REV 1 During fault reset signal input 1 During speed agree 1 Drive ready 1 During alarm detection 1 During fault detection	-	M	M	M	M	4BH
	U1-13	Terminal A1 Input Voltage	0.1%	Displays the signal level of analog terminal A1	10 V: 100%	M	M	M	M	4EH
	U1-14	Terminal A2 Input Voltage	0.1%	Displays the signal level of analog terminal A2	10 V: 100%	M	M	M	M	4FH
	U1-15	Terminal A3 Input Voltage	0.1%	Displays the signal level of analog terminal A3	10 V: 100%	M	M	M	M	50H
	U1-16	SFS Output Frequency	0.01 Hz	Displays Output Frequency with ramp times and S-curves. Units are determined by o1-03	10 V: Max Frequency	M	M	M	M	53H
	U1-17	DI-A3 Input Status	-	Displays the status of the DI-A3 option card inputs		M	M	M	M	58H
	U1-18	OPE Fault Parameter	-	Displays the parameter that caused the oPE or Err fault	-	M	M	M	M	61H
	U1-19	MEMOBUS Comm. Error Code	-	Display the contents of a MEMOBUS/Modbus error U1-19=00000000 1 CRC Error 1 Data Length Error 0 Not Used 1 Parity Error 1 Overrun Error 1 Framing Error 1 Timed Out 0 Not Used	-	M	M	M	M	52H

	No.	Parameter Name	Min. Units	Description	Analog Output Level	Access Level <1>				
						V/f	V/f with PG	OLV	CLV	MEMOBUS Address
Status Monitors	U1-21	AI-A3 Terminal V1 Input Voltage Monitor	0.1%	Displays the signal level of the analog input terminals on the AI-A3 option card.	10 V: 100%	M	M	M	M	77H
	U1-22	AI-A3 Terminal V2 Input Voltage Monitor	0.1%		10 V: 100%	M	M	M	M	72AH
	U1-23	AI-A3 Terminal V3 Input Voltage Monitor	0.1%		10 V: 100%	M	M	M	M	72BH
	U1-24	Input Pulse Monitor	1 Hz	Monitors pulse train input frequency at terminal RP	Det. by H6-02	M	M	M	M	7DH
	U1-27	Software No.(Flash)	-	FLASH Software ID	-	M	M	M	M	4DH
	U1-28	Software No. (ROM)	-	ROM ID	-	M	M	M	M	5BH
Fault Trace	U2-01	Current Fault	-	Displays the current fault	-	M	M	M	M	80H
	U2-02	Previous Fault	-	Displays the previous most recent fault	-	M	M	M	M	81H
	U2-03	Frequency Reference at Previous Fault	0.01 Hz	Displays frequency reference at the previous fault	-	M	M	M	M	82H
	U2-04	Output Frequency at Previous Fault	0.01 Hz	Displays output frequency at the previous fault	-	M	M	M	M	83H
	U2-05	Output Current at Previous Fault	0.1 A	Displays output current at the previous fault	-	M	M	M	M	84H
	U2-06	Motor Speed at Previous Fault	0.01 Hz	Displays motor speed at the previous fault	-	-	M	M	M	85H
	U2-07	Output Voltage at Previous Fault	0.1 V	Displays output voltage at the previous fault	-	M	M	M	M	86H
	U2-08	DC Bus Voltage at Previous Fault	1 Vdc	Displays DC Bus voltage at the previous fault	-	M	M	M	M	87H
	U2-09	Output Power at Previous Fault	0.1 kW	Displays output power at the previous fault	-	M	M	M	M	88H
	U2-10	Torque Reference at Previous Fault	0.1%	Displays torque reference at the previous fault	-	-	-	M	M	89H
	U2-11	Input Terminal Status at Previous Fault	-	Displays input terminal status at the previous fault	-	M	M	M	M	8AH
	U2-12	Output Terminal Status at Previous Fault	-	Displays output terminal status at the previous fault	-	M	M	M	M	8BH
	U2-13	Drive Operation Status at Previous Fault	-	Displays drive operation status at the previous fault	-	M	M	M	M	8CH
	U2-14	Cumulative Operation Time at Previous Fault	1h	Displays cumulative operation time at the previous fault	-	M	M	M	M	8DH
	U2-15	Soft Starter Speed Reference at Previous Fault	0.01 Hz	Displays the speed reference for the soft starter at the previous fault	-	M	M	M	M	8DH
	U2-16	Motor q Axis Current at Previous Fault	0.10%	Displays the q-axis current for the motor at the previous fault	-	-	-	M	M	7E1H
	U2-17	Motor d Axis Current at Previous Fault	0.10%	Displays the d-axis current for the motor at the previous fault	-	-	-	M	M	7E2H
	U2-20	Heatsink Temperature at Previous Fault	0,1 °C	Displays the heatsink temperature at the previous fault	-	M	M	M	M	8EH
	U2-21	Peak Hold Current at Previous Fault	0.01 A	Displays the peak hold current at the previous fault	-	M	M	M	M	7E6H
	U2-22	Peak Hold Frequency at Previous Fault	0.1 Hz	Displays the peak hols frequency at the previous fault	-	M	M	M	M	7E7H
Fault History	U3-01	Most Recent Fault	-	Displays the ten most recent faults	-	M	M	M	M	90H
	U3-02	2nd Most Recent Fault	-		-	M	M	M	M	91H
	U3-03	3rd Most Recent Fault	-		-	M	M	M	M	92H
	U3-04	4th Most Recent Fault	-		-	M	M	M	M	93H
	U3-05	5th Most Recent Fault	-		-	M	M	M	M	804H
	U3-06	6th Most Recent Fault	-		-	M	M	M	M	805H
	U3-07	7th Most Recent Fault	-		-	M	M	M	M	806H
	U3-08	8th Most Recent Fault	-		-	M	M	M	M	807H
	U3-09	9th Most Recent Fault	-		-	M	M	M	M	808H
	U3-10	10th Most Recent Fault	-		-	M	M	M	M	809H
	U3-11	Operation Time at Most Recent Fault	1 h	Displays the drive cumulative operation time for the ten most recent faults in monitors U3-01 through -10	-	M	M	M	M	95H
	U3-12	Operation Time at 2nd Most Recent Fault	1 h		-	M	M	M	M	96H
	U3-13	Operation Time at 3rd Most Recent Fault	1 h		-	M	M	M	M	97H
	U3-14	Operation Time at 4th Most Recent Fault	1 h		-	M	M	M	M	98H
	U3-15	Operation Time at 5th Most Recent Fault	1 h		-	M	M	M	M	80EH
	U3-16	Operation Time at 6th Most Recent Fault	1 h		-	M	M	M	M	80FH
	U3-17	Operation Time at 7th Most Recent Fault	1 h		-	M	M	M	M	810H
	U3-18	Operation Time at 8th Most Recent Fault	1 h		-	M	M	M	M	811H
	U3-19	Operation Time at 9th Most Recent Fault	1 h		-	M	M	M	M	812H
	U3-20	Operation Time at 10th Most Recent Fault	1 h		-	M	M	M	M	813H

<1> Access Levels M: Monitor Menu -: N/A in this Control Mode
<7> Values shown are for 200 VAC class drives. For 400 VAC class drives these values are doubled.
<17> Monitor resolution is dependent on drive capacity. For smaller drives the monitor will show two decimal places and for larger drives only one.

	No.	Parameter Name	Min. Units	Description	Analog Output Level	Access Level <1>				
						V/f	V/f with PG	OLV	CLV	MEMOBUS Address
Maintenance	U4-01	Cumulative Operation Time	1 h	Displays the cumulative operation time of the drive. The way this monitor is incremented depends on parameter o4-01 setting	-	M	M	M	M	4CH
	U4-02	Number of Run Commands	1 time	Display the number of RUN commands that have been entered. Can be reset with parameter o4-13	-	M	M	M	M	75H
	U4-03	Cooling Fan Operation Time	1 h	Displays the cumulative operation time for the cooling fans. Can be reset with parameter o4-03, for example when replacing fans	-	M	M	M	M	67H
	U4-04	Cooling Fan Maintenance	1%	Displays main cooling fan usage time as a percentage of expected lifetime. Can be reset with parameter o4-03	-	M	M	M	M	7EH
	U4-05	Capacitor Maintenance	1%	Displays main circuit capacitor usage time as a percentage of expected lifetime. Can be reset with parameter o4-05	-	M	M	M	M	7CH
	U4-06	Soft Charge Bypass Relay Maintenance	1%	Displays soft charge relay usage time as a percentage of expeceted lifetime. Can be reset with parameter o4-07	-	M	M	M	M	7D6H
	U4-07	IGBT Maintenance	1%	Displays IGBT usage time as a percentage of expected lifetime. Can be reset with parameter o4-09	-	M	M	M	M	7D7H
	U4-08	Heatsink Temperature	1 °C	Displays the actual heatsink temperature	10 V: 100 °C	M	M	M	M	68H
	U4-09	LED Check	-	Ligts all LEDs to verify that the display is working correctly	-	M	M	M	M	5EH
	U4-10	kWh, Lower 4 Digits	1 kWh	Displays drive output power as a 9 digit number spread across two monitos. For example 12345678,9 kWh is shown as: U4-10: 678,9 kWh U4-11: 123345 MWh	-	M	M	M	M	5CH
	U4-11	kWh, Upper 5 Digits	1 MWh		-	M	M	M	M	5DH
	U4-13	Peak Hold Current	0.01 A	Displays the highest current value reached during run	-	M	M	M	M	7CFH
	U4-14	Peak Hold Output Frequency	0.01 Hz	Displays the output frequency at which U4-13 ocurred	-	M	M	M	M	7D0H
	U4-15	Torque Reference Monitor	0.1%	Displays the mean torque reference during drive operation	10 V: Motor Rated Torque	-	-	M	-	7FEH
	U4-16	Motor Overload Estimate (oL1)	1%	Displays the value of the motor overload detection acumulator. 100% is equal to the oL1 detection level	10 V: 100%	M	M	M	M	7D8H
	U4-18	Frequency Reference Source	-	Displays the source of the frequency reference	-	M	M	M	M	7DAH
	U4-19	Frequency Reference from MEMOBUS	0.01%	Displays the frequency reference value from MEMOBUS/Modbus	-	M	M	M	M	7DBH
	U4-20	Option Frequency Reference	-	Displays the frequency reference value from option card	-	M	M	M	M	7DCH
	U4-21	Run Command Source Selection	-	Displays the source of the RUN command	-	M	M	M	M	7DDH
	U4-22	MEMOBUS Comm. Reference	-	Displays drive control data set by MEMOBUS/Modbus to register 0001H as a four digit hex number	-	M	M	M	M	7D2H
	U4-23	Comm. Option Card Reference	-	Displays drive control data set by option card as a four digit hex number		M	M	M	M	7D3H
Control Monitors	U6-01	Motor Secondary Current (Iq)	0.1%	Displays the value of the motor secondary current (Iq)	10 V:Motor rated secondary current	M	M	M	M	51H
	U6-02	Motor Excitation Current (Id)	0.1%	Displays the value of the motor excitation current (Id)	10 V: Motor rated secondary current	-	-	M	M	52H
	U6-03	ASR Input	0.01%	Displays input and output values when using ASR control	10 V: Max frequency	-	M	-	M	54H
	U6-04	ASR Output	0.01%		10 V: Max frequency	-	M	-	M	55H
	U6-05	Output Voltage Reference (Vq)	0.1 V	Displays the ouput voltage reference for the q axis (Vq)	10 V: 200 Vrms <7>	-	-	M	M	59H
	U6-06	Output Voltage Reference (Vd)	0.1 V	Displays the ouput voltage reference for the d axis (Vd)	10 V: 200 Vrms <7>	-	-	M	M	5AH
	U6-07	q Axis ACR Output	0.1%	Displays output value for the current control loop (q axis)	10 V: 200 Vrms <7>	-	-	M	M	5FH
	U6-08	d Axis ACR Output	0.1%	Displays output value for the current control loop (d axis)	10 V: 200 Vrms <7>	-	-	M	M	60H
	U6-18	Speed Detection PG1 Counter	1 ppr	Monitors the number of pulses for speed detection (PG1)	10 V: 65536	M	M	M	M	7CDH
	U6-19	Speed Detection PG2 Counter	1 ppr	Monitors the number of pulses for speed detection (PG2)	10 V: 65536	M	M	M	M	7E5H
	U6-20	Frequency Reference Bias Value	0.1%	Displays the bias value used to adjust the frequency reference	10 V: Max frequency	M	M	M	M	7D4H
	U6-21	Offset Frequency	0.1%	Displays the value added to the main frequency reference	-	M	M	M	M	7D5H
	U6-22	Zero Servo Pulse Movement	1 ppr	Displays how far the rotor has moved from its last position	10 V: Max ppr	-	-	-	M	62H
	U6-23	Feedback Control Output	0.01%	Output monitor for the ASR speed loop	10 V: Motor rated secondary current	-	-	-	M	6BH
	U6-24	Feed Forward Control Output	0.01%	Output monitor for feed forward control	10 V: Motor rated secondary current	-	-	-	M	6CH

<1> Access Levels A: Advanced Programming Menu Q: Quick Setting Menu -: N/A in this Control Mode
<7> Values shown are for 200 VAC class drives. For 400 VAC class drives these values are doubled.

5.6 Multi-Function I/O Terminal Functions

Setting Value	Multi-Function Digital Input Terminal Functions (H1-01 to H1-10)	Multi-Function Digital Output Terminal Functions (H2-01 to H2-05)	Multi-Function Analog Input Terminal Functions (H3-05, H3-09)
00	Brake Release Check	During run	Frequency bias
01	—	Zero speed	Frequency gain
02	External reference 1/2 selection	Speed agree 1	Auxiliary frequency reference 1
03	Multi-step speed reference 1	User-set speed agree 1	Auxiliary frequency reference 2
04	Multi-step speed reference 2	Frequency detection 1	Output voltage bias
05	Multi-step speed reference 3	Frequency detection 2	Accel/decel time gain
06	Jog frequency selection	Drive ready	DC Injection Braking current
07	Accel/ Decel time selection 1	DC bus undervoltage	Torque detection level
08	Baseblock command (N.O.)	During baseblock	Stall Prevention during run
09	Baseblock command (N.C.)	Frequency reference source	—
0A	Accel/decel ramp hold	Run command source	Jump frequency
0B	Drive overheat alarm (OH2)	Torque detection 1 (N.O.)	—
0C	Analog terminal input selection	Frequency reference loss	Overload Detection Level
0D	PG encorder disable	Braking resistor fault	Frequency bias 2
0E	ASR integral reset	Fault	Motor temperature (PTC input)
0F	Terminal Not Used	Terminal Not Used	Terminal Not Used
10	Up command	Minor fault	Forward torque limit
11	Down command	During fault reset	Reverse torque limit
12	Forward jog	—	Regenerative torque limit
13	Reverse jog	Speed agree 2	—
14	Fault reset	User-set speed agree 2	Torque compensation
15	Emergency stop (N.O.)	Frequency detection 3	General torque limit
16	Motor 2 selection	Frequency detection 4	
17	Emergency Stop (N.C.)	Torque detection 1 (N.C.)	
18	—	Torque detection 2 (N.O.)	
19		Torque detection 3 (N.C.)	
1A	Accel/decel time selection 2	During reverse	—
1B	Program lockout	During baseblock (N.C.)	
1C	+ Speed reference	Motor 2 selection	
1D	- Speed reference	During regeneration	
1E	Reference sample hold	—	
1F	—	Motor overload alarm (oL1)	Terminal Not Used
20	External fault	Drive overheat prealarm (oH)	
21		Brake release Command	
22		Overload detection (N.O.)	
23		Overload detection (N.C.)	
24-2F		—	
30	Ultra Lift 1	During torque limit	
31	Forward travel limit (N.O.)	—	
32	Forward travel limit (N.C.)	During speed limit in Torque Control	
33	Reverse travel limit (N.O.)	Zero Servo complete	
34	Reverse travel limit (N.C.)	—	
35	Impact Stop Enable	—	
36	Ultra Lift 2 Enabled	—	
37	—	During run 2	
38-5F	—		
60	DC Injection		
61-66	—		
67	Communication test mode		
68 to 71	—		
72	Zero Servo		
73-76	—		
77	ASR gain		
78	External torque reference polarity inversion		
79	Brake closed		
80-FF	—		

Parameter Defaults that Change According to Control Mode

No.	Name	Setting Range	Setting Units	Default Setting			
				V/f A1-02=0	V/f with PG A1-02=1	OLV A1-02=2	CLV A1-02=3
b2-01	Zero Speed Level	0.0 to 10.0	0.1 Hz	0.5	0.5	0.5	0.50
b2-04	DC Injection Braking Time at Stop	0.00 to 10.00	0.01 s	0.00	0.00	0.00	0.50
C2-01	S-Curve Characteristic at Accel Star	0.00 to 10.00	0.01 s	0.20	0.20	0.20	0.20
C3-01	Slip Compensation Gain	0.0 to 2.5	-	0.0	—	1.0	1.0
C3-02	Slip Compensation Primary Delay Time	0 to 10000	1 ms	2000	—	200	—
C4-01	Torque Compensation Gain	0.00 to 2.50	-	1.00	1.00	1.00	—
C4-02	Torque Compensation Primary Delay Time	0 to 10000	1 ms	200	200	20	—
C5-01	ASR Proportional Gain 1 (P)	0.00 to 300.00	-	—	0.20	—	20.00
C5-02	ASR Integral Time 1 (I)	0.000 to 10.000	0.001 s	—	0.200	—	0.500
C5-03	ASR Proportional Gain 2 (P)	0.00 to 300.00	0.01	—	0.02	—	20.00
C5-04	ASR Integral (I) Time 2	0.000 to 10.000	0.001 s	—	0.050	—	0.500
C5-06	ASR Primary Delay Time Constant	0.000 to 0.500		—	—	—	0.004
E1-07 E3-05	Mid Output Frequency (Fb)	0.0 to 400.0	0.1 Hz	2.5	2.5	3.0	—
E1-08 E3-06	Mid Output Frequency Voltage (Vc)	0.0 to 255.0 <7>	0.1 VAC	<18>	<18>	<18>	—
E1-09 E3-07	Minimum Output Frequency (Fmin)	0.0 to 400.0	0.1 Hz	1.3	1.3	0.5	0.0
E1-10 E3-08	Minimum Output Frequency Voltage (Vmin)	0.0 to 255.0 <7>	0.1 VAC	<18>	<18>	<18>	—
F1-01	PG 1 Pulses	0 to 60000	1 ppr	—	1024	—	1024
F1-05	PG 1 Rotational Selection	0 to 1	—	—	0	—	0
F1-09	Overspeed (os) Detection Delay Time	0.0 to 2.0	0.1 s	—	1.0	—	0.0
L3-20	Main Circuit Voltage Tuning Gain	0.00 to 5.00	0.01	1.00	1.00	0.30	0.30
L8-38	Carrier Frequency Reduction	0 to 2	—	<18>	<18>	<18>	<18>
o1-04	V/f Display Units	0 to 1	—	—	—	—	0
S1-03	Brake Delay Frequency	0.0 to 400.0	0.1 Hz	3.0	3.0	3.0	0.0
S1-04	Brake Delay Time	0.00 to 10.00	0.01 s	0.30	0.30	0.30	0.00
S1-09	Torque Compensation (FWD)	<8>	1%	—	—	50	0
S1-14	Slip Prevention Frequency	0.0 to 20.0	0.1 Hz	3.0	3.0	3.0	0.0
S1-15	Slip Prevention Time	0.00 to 10.00	0.01 s	0.30	0.30	0.30	0.00
S3-01	Impact Stop Creep Frequency	0.0 to 20.0	0.1 Hz	6.0	6.0	3.0	3.0

<7> Values shown are for 200 VAC class drives. For 400 VAC class drives these values are doubled.
<8> Setting Range is determined by the control method (A1-02)
<18> Default Setting is not just determined by control mode but also by drive capacity

5.7 Parameter Defaults that Change According to Drive Capacity

200 V Class

No.	Parameter Name	Units	Default Setting									
—	Drive Capacity	kW	0.4	0.75	1.1	1.5	2.2	3.0	3.7	5.5	7.5	11
E2-11	Motor Rated Output											
E4-07	Motor 2 Rated Output											
o2-04	Drive kVA Selection	-	62	63	64	65	66	67	68	6A	6B	6D
C5-17	Motor Inertia	kgm²	0.0015	0.0028	0.0068	0.0068	0.0088	0.0158	0.0158	0.026	0.037	0.053
E2-01 (E4-01)	Motor Rated Current	A	1.90	3.30	4.90	6.20	8.50	11.40	14.00	19.60	26.60	39.7
E2-02 (E4-02)	Motor Rated Slip	Hz	2.90	2.50	2.60	2.60	2.90	2.70	2.73	1.50	1.30	1.70
E2-03 (E4-03)	Motor No-Load Current	A	1.20	1.80	2.30	2.80	3.00	3.70	4.50	5.10	8.00	11.2
E2-05 (E4-05)	Motor Resistance Between Lines	Ω	9.842	5.156	3.577	1.997	1.601	1.034	0.771	0.399	0.288	0.230
E2-06 (E4-06)	Motor Leakage Inductance	%	18.2	13.8	18.5	18.5	18.4	19.0	19.6	18.2	15.5	19.5
E2-10	Motor Iron Loss for Torque Compensation	W	14	26	38	53	77	91	112	172	262	245
L3-24	Inertia Calculated Acceleration Time	s	0.178	0.142	0.142	0.166	0.145	0.145	0.154	0.168	0.175	0.265
L8-02	Overheat Pre-Alarm Operation Selection	—	115	115	115	115	125	110	110	120	125	120
L8-35	Installation Method Selection	—	2	2	2	2	2	2	2	2	2	2
n1-03	Hunting Prevention Time Constant	ms	10	10	10	10	10	10	10	10	10	10
n5-02	Motor Acceleration Time	s	0.178	0.142	0.142	0.166	0.145	0.145	0.154	0.168	0.175	0.265

200 V Class

No.	Parameter Name	Units	Default Setting									
—	Drive Capacity	kW	15	18.5	22	30	37	45	55	75	90	110
E2-11	Motor Rated Output											
E4-07	Motor 2 Rated Output											
o2-04	Drive kVA Selection	-	6E	6F	70	72	73	74	75	76	77	78
C5-17	Motor Inertia	kgm²	0.076	0.138	0.165	0.220	0.273	0.333	0.49	0.90	1.10	1.90
E2-01 (E4-01)	Motor Rated Current	A	53.0	65.8	77.2	105.0	131.0	160.0	190.0	260.0	260.0	260.0
E2-02 (E4-02)	Motor Rated Slip	Hz	1.60	1.67	1.70	1.80	1.33	1.60	1.43	1.39	1.39	1.39
E2-03 (E4-03)	Motor No-Load Current	A	15.2	15.7	18.5	21.9	38.2	44.0	45.6	72.0	72.0	72.0
E2-05 (E4-05)	Motor Resistance Between Lines	Ω	0.138	0.101	0.079	0.064	0.039	0.030	0.022	0.023	0.023	0.023
E2-06 (E4-06)	Motor Leakage Inductance	%	17.2	20.1	19.5	20.8	18.8	20.2	20.5	20.0	20.0	20.0
E2-10	Motor Iron Loss for Torque Compensation	W	272	505	538	699	823	852	960	1200	1200	1200
L3-24	Inertia Calculated Acceleration Time	s	0.244	0.317	0.355	0.323	0.32	0.387	0.317	0.533	0.592	0.646
L8-02	Overheat Pre-Alarm Operation Selection	—	120	125	130	130	130	125	110	110	110	110
L8-35	Installation Method Selection	—	2	2	0	0	0	0	0	0	0	0
n1-03	Hunting Prevention Time Constant	ms	10	10	10	10	10	10	10	10	100	100
n5-02	Motor Acceleration Time	s	0.244	0.317	0.355	0.323	0.320	0.387	0.317	0.533	0.592	0.646

400 V Class

No.	Parameter Name	Units	Default Setting									
—	Drive Capacity	kW	0.4	0.75	1.5	2.2	3.0	3.7	5.5	7.5	11	15
E2-11	Motor Rated Output											
E4-07	Motor 2 Rated Output											
o2-04	Drive kVA Selection	-	92	93	94	95	96	97	99	9A	9C	9D
C5-17	Motor Inertia	kgm^2	0.0015	0.0028	0.0068	0.0088	0.0158	0.0158	0.026	0.037	0.053	0.076
E2-01 (E4-01)	Motor Rated Current	A	1.00	1.60	3.10	4.20	5.70	7.00	9.80	13.30	19.9	26.5
E2-02 (E4-02)	Motor Rated Slip	Hz	2.90	2.60	2.50	3.00	2.70	2.70	1.50	1.30	1.70	1.60
E2-03 (E4-03)	Motor No-Load Current	A	0.60	0.80	1.40	1.50	1.90	2.30	2.60	4.00	5.6	7.6
E2-05 (E4-05)	Motor Resistance Between Lines	Ω	38.198	22.459	10.100	6.495	4.360	3.333	1.595	1.152	0.922	0.550
E2-06 (E4-06)	Motor Leakage Inductance	%	18.2	14.3	18.3	18.7	19.0	19.3	18.2	15.5	19.6	17.2
E2-10	Motor Iron Loss for Torque Compensation	W	14	26	53	77	105	130	193	263	385	440
L3-24	Inertia Calculated Acceleration Time	s	0.178	0.142	0.166	0.145	0.145	0.154	0.168	0.175	0.265	0.244
L8-02	Overheat Pre-Alarm Operation Selection	—	110	110	110	110	110	110	110	115	120	120
L8-35	Installation Method Selection	—	2	2	2	2	2	2	2	2	2	2
n1-03	Hunting Prevention Time Constant	ms	10	10	10	10	10	10	10	10	10	10
n5-02	Motor Acceleration Time	s	0.178	0.142	0.166	0.145	0.145	0.154	0.168	0.175	0.265	0.244

400 V Class

No.	Parameter Name	Units	Default Setting									
—	Drive Capacity	kW	18.5	22	30	37	45	55	75	90	110	132
E2-11	Motor Rated Output											
E4-07	Motor 2 Rated Output											
o2-04	Drive kVA Selection	-	9E	9F	A1	A2	A3	A4	A5	A6	A7	A8
C5-17	Motor Inertia	kgm^2	0.138	0.165	0.220	0.273	0.333	0.490	0.900	1.10	1.90	2.10
E2-01 (E4-01)	Motor Rated Current	A	32.9	38.6	52.3	65.6	79.7	95.0	130.0	156.0	190.0	223.0
E2-02 (E4-02)	Motor Rated Slip	Hz	1.67	1.70	1.80	1.33	1.60	1.46	1.39	1.40	1.40	1.38
E2-03 (E4-03)	Motor No-Load Current	A	7.8	9.2	10.9	19.1	22.0	24.0	36.0	40.0	49.0	58.0
E2-05 (E4-05)	Motor Resistance Between Lines	Ω	0.403	0.316	0.269	0.155	0.122	0.088	0.092	0.056	0.046	0.035
E2-06 (E4-06)	Motor Leakage Inductance	%	20.1	23.5	20.7	18.8	19.9	20.0	20.0	20.0	20.0	20.0
E2-10	Motor Iron Loss for Torque Compensation	W	508	586	750	925	1125	1260	1600	1760	2150	2350
L3-24	Inertia Calculated Acceleration Time	s	0.317	0.355	0.323	0.320	0.387	0.317	0.533	0.529	0.646	0.673
L8-02	Overheat Pre-Alarm Operation Selection	—	115	120	120	110	120	130	130	120	110	120
L8-35	Installation Method Selection	—	2	0	0	0	0	0	0	0	0	0
n1-03	Hunting Prevention Time Constant	ms	10	10	10	10	10	30	30	30	30	30
n5-02	Motor Acceleration Time	s	0.317	0.355	0.323	0.320	0.387	0.317	0.533	0.592	0.646	0.673

400 V Class

No.	Parameter Name	Units	Default Setting			
—	Drive Capacity	kW	160	185	220	300
E2-11	Motor Rated Output					
E4-07	Motor 2 Rated Output					
o2-04	Drive kVA Selection	-	A9	AA	AC	AE
C5-17	Motor Inertia	kgm^2	3.30	3.60	4.10	11.0
E2-01 (E4-01)	Motor Rated Current	A	270.0	310.0	370.0	500.0
E2-02 (E4-02)	Motor Rated Slip	Hz	1.35	1.30	1.30	1.25
E2-03 (E4-03)	Motor No-Load Current	A	70.0	81.0	96.0	130.0
E2-05 (E4-05)	Motor Resistance Between Lines	Ω	0.029	0.025	0.020	0.014
E2-06 (E4-06)	Motor Leakage Inductance	%	20.0	20.0	20.0	20.0
E2-10	Motor Iron Loss for Torque Compensation	W	2850	3200	3700	4700
L3-24	Inertia Calculated Acceleration Time	s	0.777	0.864	0.910	1.392
L8-02	Overheat Pre-Alarm Operation Selection	—	130	140	140	140
L8-35	Installation Method Selection	—	0	0	0	0
n1-03	Hunting Prevention Time Constant	ms	30	100	100	100
n5-02	Motor Acceleration Time	s	0.777	0.864	0.910	1.392

6. Test Run

After completing the Startup Procedures, Auto-Tuning, and Test Run operations described in section 4 of the standard A1000 AC frequency inverter Technical Manual (SIEP C710616 27), check the following points related to the custom A1000 Crane Drive.

- The wiring should be connected so that the motor is rotating in the forward (FWD) direction when hoisting the load and in the reverse (REV) direction when lowering the load.
- When using the crane to hoist or lower the load without a counter-weight and the drive is operating in Open Loop Vector (OLV) control mode, set parameter S1-20 to “1” (Enables Regen Operation in REV)
- Output Current at Maximum Load
  - The drive output current at start as well as when opening and closing the brake should not exceed 150% of the drive rated current.
  - The output current when operating at constant speed should not exceed the motor rated current.

If the output current exceeds the levels described above, the following countermeasures can be implemented:

  - Perform Rotational Auto-Tuning (if this has already been successfully performed, then there is no need to repeat the process). Make sure that the motor is decoupled from the load when Auto-Tuning is performed.
  - Adjust parameter settings according to the guidelines in section 7 (Description of Added Functions) and Appendix I (Tuning Procedures).
  - If there is excessive current when hoisting just after lowering the load while operating in V/f Control or Open Loop Vector Control, then adjust parameter S2-03 (Run Command Delay Timer). See section 7.2 of this document for a detailed description of this function.
- If other errors occur while performing a test run, refer to section 0 (Troubleshooting) for appropriate countermeasures.

CAUTION 

- Stall Prevention and Overvoltage Suppression functions can be extremely dangerous when used with crane and hoist applications if not set correctly. To ensure safety, be certain the settings for these functions are appropriate for each particular installation.
- To ensure safety, Overspeed Detection should also be setup correctly in closed loop control modes.

7. Description of Added Functions

In this section, all new functions that the A1000 Crane Drive has compared to the standard A1000 drive are described in detail.

7.1 Brake Sequence

For the brake to open and close while generating the necessary torque for the load to maintain a stationary position, the brake sequence on the A1000 Crane Drive has been specially modified. In this section the parameters that control the brake release function are described, a detailed time chart is shown for the brake sequence in each control mode, and the brake sequence faults are explained. To better understand the descriptions, the following terms and abbreviations are defined:

FWD Run Command, REV Run Command: Refers to the signals received by the drive to operate the motor in the forward (FWD) or reverse (REV) direction. By default these signals are input to terminals S1 and S2 respectively, but they can also come from any other digital input terminal or the digital operator. When the Run Command is programmed to come from the digital operator, the brake sequence is completely disabled. Unlike the standard A1000 drive, the crane version does not allow these commands to be received by MEMOBUS/Modbus communication or via an Option Card. The following table shows drive operation when these signals are received through digital inputs.

FWD Command	REV Command	Drive Operation
OFF	OFF	Stops motor according to stopping method in b1-03
ON	OFF	Runs the drive in the FWD direction
OFF	ON	Runs the drive in the REV direction
ON	ON	Motor coasts to stop, an SE1 fault is triggered, and external brake is closed. If S1-16 is set to 0.00, motor will decelerate to stop according to C1-02 before closing the brake and EF alarm is displayed on the digital operator (no fault).

Brake Release Command (**BR**): Output command used to open or close the external brake. This command is output by default to the M1-M2 relay terminals, but can be programmed to any other digital output relay. When the relay is open (no electrical continuity) the brake is closed and the motor shaft (and therefore the load) should not move. When the relay is closed (short circuit) the brake is energized and is opened so that the motor shaft can be moved.

Brake Release Check (**BX**): Feedback command received by the drive from external circuitry to ascertain that the brake has effectively been opened. By default this signal is received at digital input terminal S5, but can be programmed to any other digital input. If the Brake Release Check (BX) is programmed to a digital input, the Brake Release Command (BR) must be programmed to a digital output relay, otherwise a Parameter Setting Error (oPE22) will be triggered.

Drive Output Current (**IOUT**): Drive output current as a percentage of motor rated current.

Drive Torque Reference (**ITR**): Drive internal torque reference as a percentage of motor rated torque.

Brake Operation Delay Time (**BDT**): Time between the moment the Brake Release Command (BR) is activated and the brake is actually completely opened. This time is inherent to each external brake and is not dependent on the drive or the motor.

7.1.1 Brake Sequence Parameters (S1-)

In this section the parameters relating to the brake sequence are described, along with their interdependencies and commonly used settings for different control modes. An abbreviation is also assigned to each parameter for later use in the brake sequence time charts.

S1-01 *FWD Brake Release Frequency* (**FRF**): When a FWD Run Command is given, one of the conditions for the *Brake Release Command* (**BR**) to be activated is that drive output frequency must surpass the value set in this parameter. **FRF** should be set to a value smaller than the *Brake Delay Frequency* **BF** (S1-03) and larger than both b2-01 (DC Injection Start Frequency) and E1-09 (Minimum Output Frequency). When operating in CLV control mode without a counter weight, **FRF** should be set to zero, and *FWD Torque Compensation* **FTC** (S1-09) can be increased if slipping occurs at start.

S1-02 *REV Brake Release Frequency* (**RRF**): When a REV Run Command is given, one of the conditions for the *Brake Release Command* (**BR**) to be activated is that drive output frequency must surpass the value set in this parameter. **RRF** should be set to a value smaller than the *Brake Delay Frequency* **BF** (S1-03) and larger than both b2-01 (DC Injection Start Frequency) and E1-09 (Minimum Output Frequency). When operating in CLV control mode without a counter weight, **RRF** should be set to zero, and *REV Torque Compensation* **RTC** (S1-10) can be increased if slipping occurs at start.

No.	Parameter Name	Setting Range	Default
S1-01	FWD Brake Release Frequency	0.0 to 20.0 Hz	2.0 Hz
S1-02	REV Brake Release Frequency		2.0 Hz

S1-03 *Brake Delay Frequency* (**BF**): Initial frequency to which the drive accelerates when a Run Command is entered. Only after the **BX** signal is received and the *Brake Delay Time* **BT** (S1-04) has passed will the drive accelerate to its normal frequency reference. This parameter is usually set up to 1.0 Hz above the motor rated slip frequency, except in CLV control mode where it should be set to zero.

- If **BF** is set too low, current will be unable to flow through the motor at start and an SE2 sequence fault may occur.
- If **BF** is set too high, then excessive current at start may cause an electrical shock

S1-04 *Brake Delay Time* (**BT**): Time during which the drive holds the output frequency at the **BF** level when the **BX** signal is received before it accelerates to the primary frequency reference. This parameter should be set to the *Brake Operation Delay Time* **BDT** minus the time it takes for the brake to produce the **BX** signal when the **BR** command is given, except in CLV control mode where it should be set to zero.

No.	Parameter Name	Setting Range	Default
S1-03	Brake Delay Frequency	0.0 to 400.0 Hz	Determined by A1-02
S1-04	Brake Delay Time	0.00 to 10.00 s	Determined by A1-02

S1-05 *FWD Brake Release Current* (**IF**): When a FWD Run Command is given, one of the conditions for the *Brake Release Command* (**BR**) to be activated is that **IOUT** must surpass the value set in this parameter. In vector control modes the typical value for this parameter is determined by

$$\frac{(E2-03)\cdot 100}{(E2-01)}$$

In V/f control modes, this setting should be set to 100% if the FWD direction is the hoisting direction.

- If set too low, motor is likely to slip when starting to hoist the load
- If set too high, the brake is likely to slip before being released and an SE2 sequence fault will occur

S1-06 *REV Brake Release Current* (**IR**): When a REV Run Command is given, one of the conditions for the *Brake Release Command* (**BR**) to be activated is that **IOUT** must surpass the value set in this parameter. In vector control modes the typical value is determined by the same equation as **IF**. In V/f control modes, this setting should be set to 50% if the REV direction is the lowering direction. The same consequences as in **IF** apply if this parameter is set too high or too low.

No.	Parameter Name	Setting Range	Default
S1-05	FWD Brake Release Current	0 to 200 %	50%
S1-06	REV Brake Release Current		30%

S1-07 *FWD Brake Release Torque* (**TF**): When a FWD Run Command is given, one of the conditions for the *Brake Release Command* (**BR**) to be activated is that drive **ITR** must surpass the value set in this parameter. **TF** is only active in vector control modes and should be set to 100% if the FWD direction is the hoisting direction.

- If set too low, motor is likely to slip when starting to hoist the load
- If set too high, the brake is likely to slip before being released and an SE2 sequence fault will occur

S1-08 *REV Brake Release Torque* (**TR**): When a REV Run Command is given, one of the conditions for the *Brake Release Command* (BR) to be activated is that drive **ITR** must surpass the value set in this parameter. **TR** is only active in vector control modes and should be set to 0% if the REV direction is the lowering direction. The same consequences as in **TF** apply if this parameter is set too high or too low.

No.	Parameter Name	Setting Range	Default
S1-07	FWD Brake Release Torque	0 to 200 %	100%
S1-08	REV Brake Release Torque		0%

S1-09 *FWD Torque Compensation (**TCF**)*: Sets the vector control torque compensation amount in the FWD direction. In CLV control mode it is normally set to zero. This parameter should be increased if the *Brake Release Command* **BR** is slow/late, if slipping occurs at start, and if the brake is not released because the internal torque reference does not reach the *FWD Brake Release Torque* **TF** before a sequence fault occurs. **TCF** should be decreased if the load experiences jolting of jerking at start.

S1-10 *REV Torque Compensation (**TCR**)*: Sets the vector control torque compensation amount in the REV direction. In CLV control mode it is normally set to zero. This parameter should be increased if the *Brake Release Command* **BR** is slow/late, if slipping occurs at start, and if the brake is not released because the internal torque reference does not reach the *REV Brake Release Torque* **TR** before a sequence fault occurs. **TCR** should be decreased if the load experiences jolting of jerking at start.

S1-11 *Torque Compensation Delay Time* (**TCDT**): Sets the torque compensation ramp time at start.

No.	Parameter Name	Setting Range	Default
S1-09	FWD Torque Compensation	0 to 200 % in OLV -200 to 200 % in CLV	Determined by A1-02
S1-10	REV Torque Compensation		0 %
S1-11	Torque Compensation Delay Time	0 to 200 ms	50 ms

S1-12 *FWD Brake Hold Frequency* (**FHF**): Sets the frequency in the FWD direction at which the **BR** relay is deactivated and the brake is closed during deceleration when a STOP command is given. Normally set between 3 – 4 Hz, although a typical value can be calculated using the following formula:

$$FHF = \frac{BDT[s] \cdot MaxOutFreq[Hz]}{DecelTime[s]}$$

S1-13 *REV Brake Hold Frequency* (**RHF**): Sets the frequency in the REV direction at which the **BR** relay is deactivated and the brake is closed during deceleration when a STOP command is given. Typical value is the same as in **FHF**.

No.	Parameter Name	Setting Range	Default
S1-12	FWD Brake Hold Frequency	0.0 to 20.0 Hz	3.0 Hz
S1-13	REV Brake Hold Frequency		3.0 Hz

S1-14 *Slip Prevention Frequency* (**HF**): Frequency at which the drive will hold after the **BR** relay is deactivated at STOP. This parameter is normally set to the same value as the *Brake Delay Frequency* **BF**.

S1-15 *Slip Prevention Time* (**HT**): Time during which the drive will hold the frequency set in **HF** after the *Brake Release Command* **BR** is deactivated (brake closed) at stop. This time should match the delay between the moment the brake receives a signal to close and when the brake is actually completely closed. Increase this parameter if the load slips before the brake is completely applied.

No.	Parameter Name	Setting Range	Default
S1-14	Slip Prevention Frequency	0.0 to 20.0 Hz	Determined by A1-02
S1-15	Slip Prevention Time	0.00 to 10.00 s	Determined by A1-02

S1-16 *Sequence Fault SE1 Detection Time*: Sets the delay time before an SE1 fault is triggered. An SE1 fault condition exists when both the FWD and REV Run Commands are entered at the same time. This condition should be avoided.

S1-17 *Sequence Fault SE2 Detection Time*: Sets the delay time before an SE2 fault is triggered. An SE2 fault condition exists when a RUN Command has been given but the *Brake Release Command* **BR** has not been output because the conditions for brake opening have not been met.

S1-18 *Sequence Fault SE3 Detection Time*: Sets the delay time before an SE3 fault is triggered. An SE3 fault condition exists when the *Brake Release Command* **BR** has been output but the *Brake Release Check* **BX** feedback input signal has not been received.

S1-19 *Sequence Fault SE4 Detection Time*: Sets the delay time before an SE4 fault is triggered. An SE4 fault condition exists when the *Brake Release Check* **BX** feedback signal has been received but no *Brake Release Command* **BR** has been output.

No.	Parameter Name	Setting Range	Default
S1-16	Sequence Fault SE1 Detection Time	0.00 to 2.00 s	0.30 s
S1-17	Sequence Fault SE2 Detection Time		1.00 s
S1-18	Sequence Fault SE3 Detection Time		0.50 s
S1-19	Sequence Fault SE4 Detection Time		0.50 s

S1-20 *Operation In Reverse*: Determines if the drive is motoring or regenerating in the REV direction. If operating in OLV control mode without a counter weight, be sure to set this parameter to 1 (regeneration in REV).

S1-22 *DB Phase Fix*: Determines if the drive saves the phase of DC injection braking at stop in order to start DC injection using the same phase and therefore avoid brake slip.

No.	Parameter Name	Setting Range	Default
S1-20	Operation in Revere	0: Normal Motoring 1: Regeneration	0
S1-22	DB Phase Fix	0: Disabled 1: Enabled	0

7.1.2 Starting Sequence

In this section we will describe the way the drive behaves when starting. In order to prevent sudden slipping or dropping of the load, be sure that the *Brake Release Torque* has been set high enough to hold the load.

(1) When a RUN Command is entered (FWD or REV), the drive will accelerate up to the *Brake Delay Frequency* **BF** with the brake clamped shut. If *Torque Compensation* is enabled, it will be applied at this time.

(2) After ALL three conditions listed below are met, the *Brake Release Command* **BR** relay will close. The drive expects that in a time frame shorter than the S1-18 parameter a *Brake Release Check* **BX** feedback signal will be received from external circuitry to confirm that the brake has been opened, or a brake sequence fault will be triggered.

Conditions that must be met before the *Brake Release Command* BR relay will close and the brake opens (AND Conditions)
Drive Output Frequency ≥ Brake Release Frequency FRF (RRF)
Drive Output Current ≥ Brake Release Current IF (IR)
Drive Internal Torque Reference ≥ Brake Release Torque TF (TR) *

* This condition must only be met in vector control modes.

If these conditions are not met in a time frame shorter than S1-17, a brake sequence fault (SE2) will be triggered. If SE2 is disabled, the drive will hold at the *Brake Delay Frequency* **BF** indefinitely waiting for the conditions to be met and the brake will remain clamped shut.

(1) Once the *Brake Release Check* **BX** signal has been received, the drive will hold output frequency at the *Brake Delay Frequency* **BF** until the *Brake Delay Time* **BT** expires. Then the drive will accelerate to the main frequency reference. If **BT** is set to zero, then the drive will ramp directly to the main frequency reference.

Note: *Brake Release Frequency, Current, and Torque* values can be set individually for FWD and REV directions.

7.1.3 Stopping Sequence

In this section we will describe the way the drive behaves when stopping. In order to prevent sudden slipping or dropping of the load, enough torque must be generated to hold the load until the brake is completely clamped shut.

(1) When a STOP Command is entered (FWD or REV) the drive will stop using the method chosen in b1-03. If Coast to Stop method is chosen, the brake will immediately clamp shut and sudden load jerking is likely. When using Ramp to Stop, the drive will decelerate using the programmed ramp time until the *Slip Prevention Frequency* **HF** is reached, except in CLV control mode where the drive will decelerate to zero speed.

(2) When the Output Frequency falls below the *Brake Hold Frequency* **FHF** (**RHF**), the *Brake Release Command* **BR** will open, and the drive will expect to stop receiving the *Brake Release Check* **BX** feedback signal from external circuitry in a time frame shorter than the S1-19 parameter, or a brake sequence fault will be triggered.

(3) The drive will hold output frequency at the *Slip Prevention Frequency* **HF** level until the *Slip Prevention Time* **HT** has expired, and then ramp down to b2-01 or E1-09, whichever is smaller. This time should be long enough to allow the brake to be completely clamped shut

Note:

If the primary frequency reference falls below the FRF (RRF) or the FHF (RHF) without a STOP Command being entered, the drive will continue running at the higher of these two frequencies. If the frequency reference is input from analog terminal A1, and the signal level for this terminal is set to -10V - +10V (H3-01 = 1), the stopping sequence is executed when the frequency reference falls below the setting of parameter b2-01, or if the frequency reference equals the minimum output frequency (E1-09) for more than 100 ms. Also when H3-01 = 1, if a frequency reference lower than E1-09 is input, drive output will be interrupted (baseblock).

7.1.4 Forward/Reverse Switching

In control modes without encoder feedback (open loop), the drive cannot switch between forward and reverse directions (zero speed cross) without activating the brake. When a Run Command is entered for the direction opposite to the one the drive is going, the complete stopping sequence described in the last section will be executed and the drive will only begin the starting sequence when the brake has been completely clamped shut.

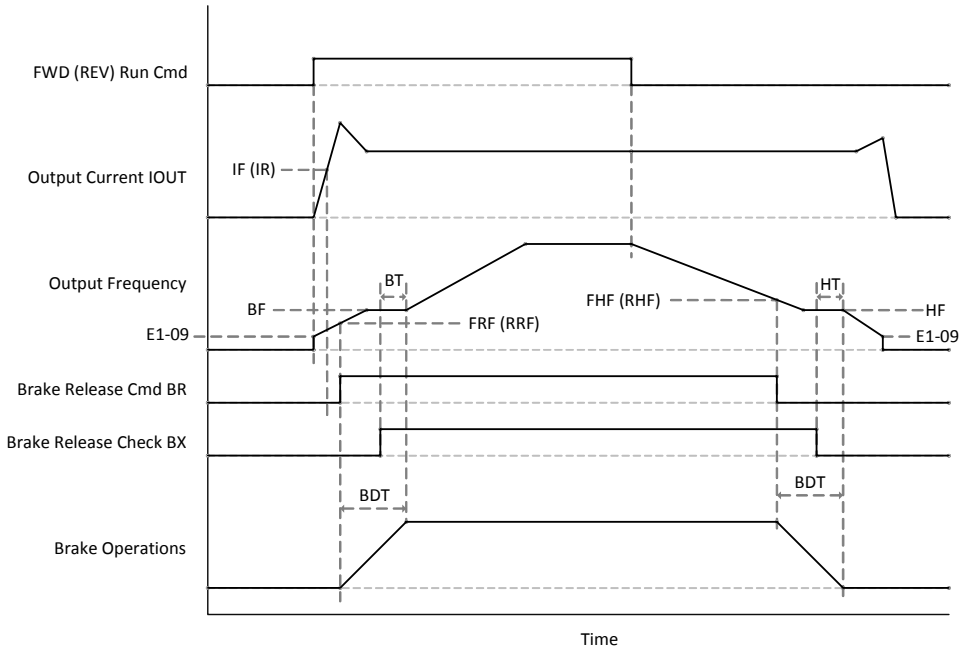
In closed loop control modes, the drive can switch continuously between FWD and REV directions (zero speed cross) without activating the brake. Note that in some situations the brake may still be activated, especially when using *Run Command Minimum On-Time*, described in section 7.2.

The brake will be applied in all control modes when switching between FWD and REV directions if the frequency reference is below the *Brake Release Frequency* **FRF** (**RRF**) level.

7.1.5 Time Charts

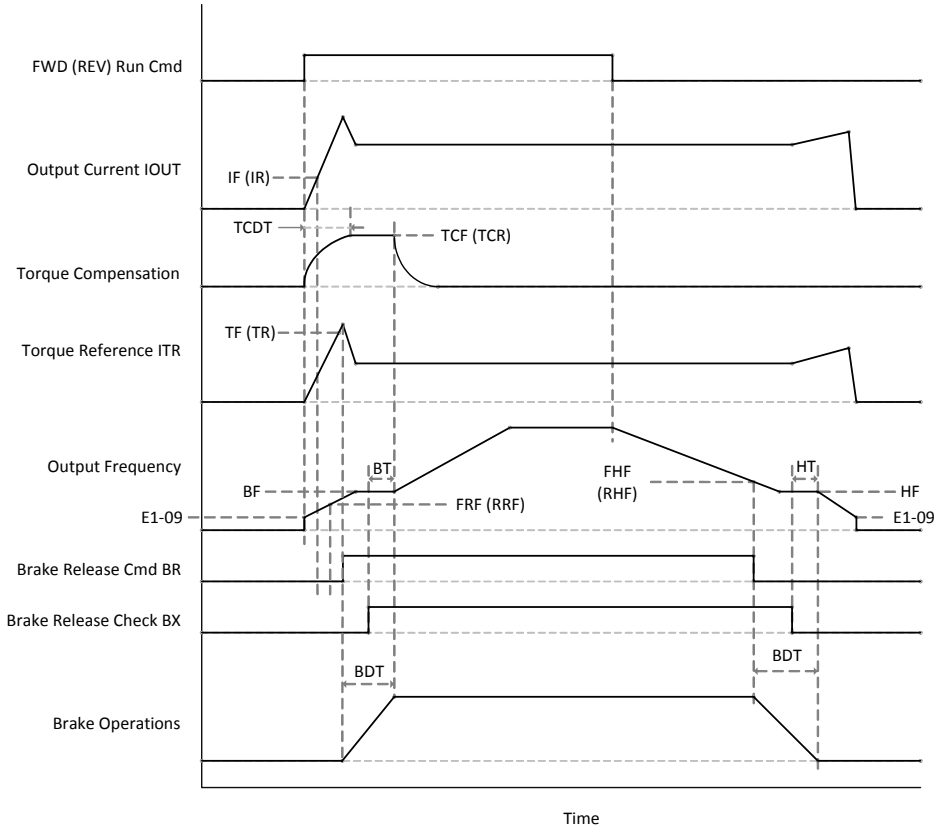
In this section brake sequence time charts are shown for all control modes. In the first three time charts we assume that run commands and frequency reference are input from external terminals and that the frequency reference is constant and higher than **FRF** (**RRF**). Also they do not show FWD/REV switching scenarios.

V/f Control (Open and Closed Loop)



BDT = Brake Operation Delay Time
BF = Brake Delay Frequency (S1-03)
BT = Brake Delay Time (S1-04)
FHF = FWD Brake Hold Frequency (S1-12)
FRF = FWD Brake Release Frequency (S1-01)
HF = Slip Prevention Frequency (S1-14)
HT = Slip Prevention Time (S1-15)
IF = FWD Brake Release Current (S1-05)
IR = REV Brake Release Current (S1-06)
RHF = REV Brake Hold Frequency (S1-13)
RRF = REV Brake Release Frequency (S1-02)

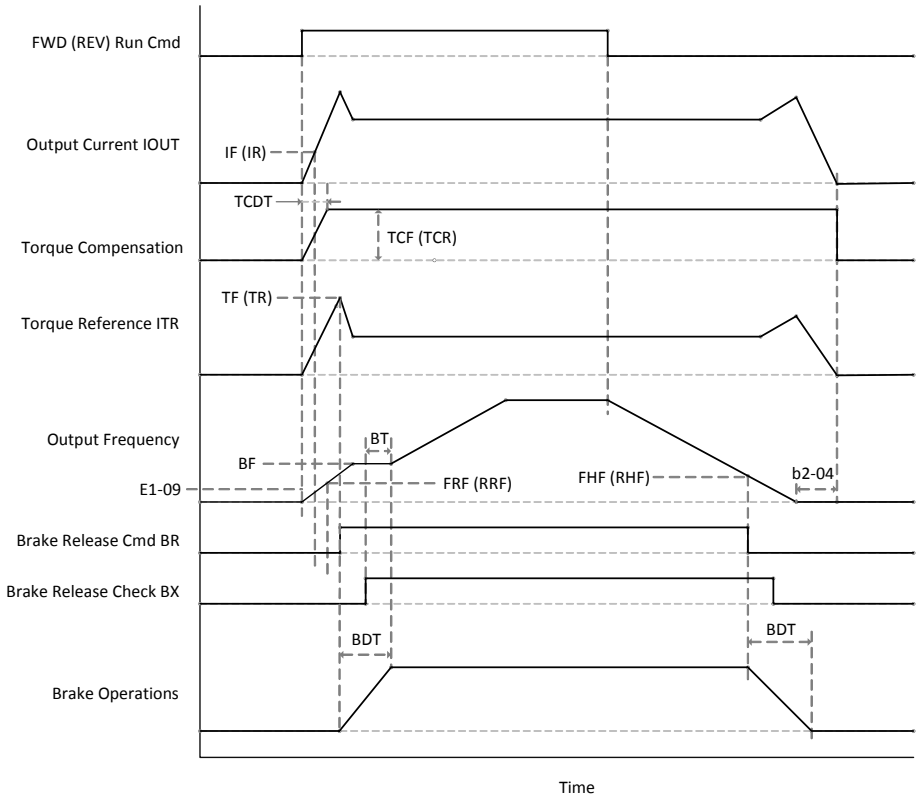
Open Loop Vector Control



BDT = Brake Operation Delay Time
BF = Brake Delay Frequency (S1-03)
BT = Brake Delay Time (S1-04)
FHF = FWD Brake Hold Frequency (S1-12)
FRF = FWD Brake Release Frequency (S1-01)
HF = Slip Prevention Frequency (S1-14)
HT = Slip Prevention Time (S1-15)
IF = FWD Brake Release Current (S1-05)
IR = REV Brake Release Current (S1-06)
RHF = REV Brake Hold Frequency (S1-13)
RRF = REV Brake Release Frequency (S1-02)
TCDT = Torque Compensation Delay Time (S1-11)
TCF = FWD Torque Compensation (S1-09)
TCR = REV Torque Compensation (S1-10)
TF = FWD Brake Release Torque (S1-07)
TR = REV Brake Release Torque (S1-08)

Note: If BT=0 then torque forcing is applied up to the FWD Brake Release Frequency FRF (RRF).

Closed Loop Vector Control



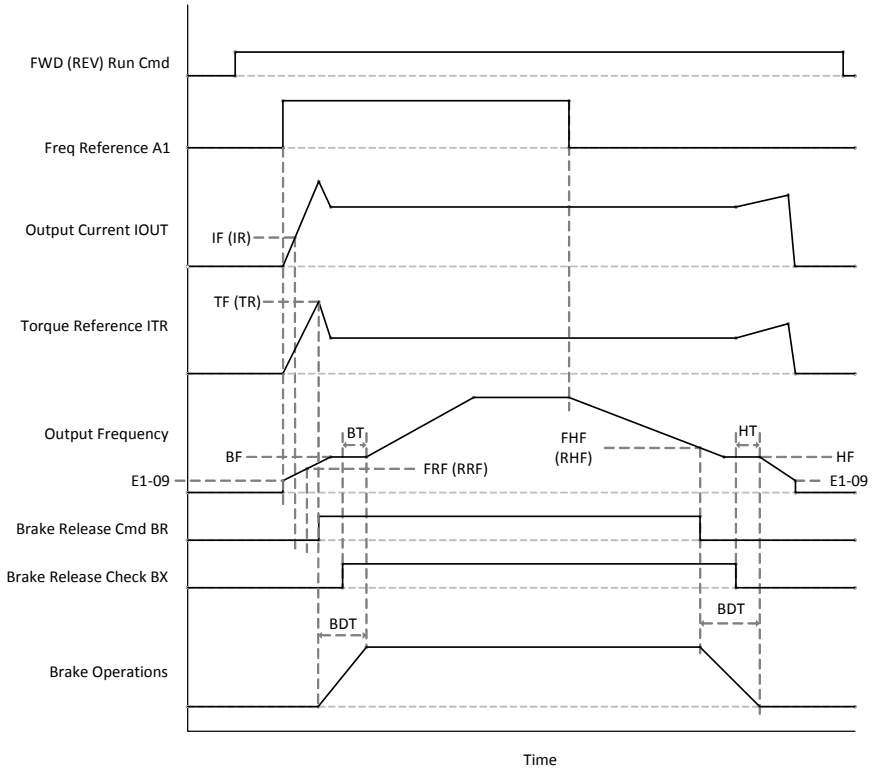
BDT = Brake Operation Delay Time
BF = Brake Delay Frequency (S1-03)
BT = Brake Delay Time (S1-04)
FHF = FWD Brake Hold Frequency (S1-12)
FRF = FWD Brake Release Frequency (S1-01)
HF = Slip Prevention Frequency (S1-14)
HT = Slip Prevention Time (S1-15)
IF = FWD Brake Release Current (S1-05)
IR = REV Brake Release Current (S1-06)
RHF = REV Brake Hold Frequency (S1-13)
RRF = REV Brake Release Frequency (S1-02)
TCDT= Torque Compensation Delay Time (S1-11)
TCF = FWD Torque Compensation (S1-09)
TCR = REV Torque Compensation (S1-10)
TF = FWD Brake Release Torque (S1-07)
TR = REV Brake Release Torque (S1-08)

Notes:

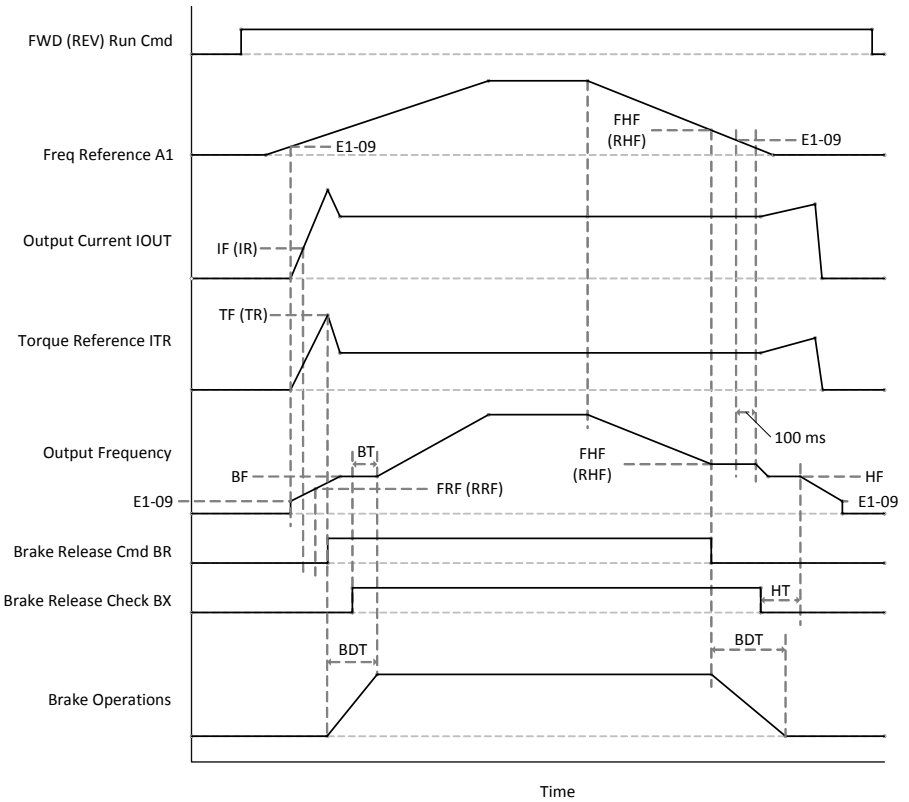
- This chart assumes that *Slip Prevention Time* (**HT**) is zero (default for CLV). The *Stop Timer* (**b2-04**) should be set to a value similar to the *Brake Operation Delay Time* (**BDT**).
- In this chart, the last condition that was met before the brake was released was the *Brake Release Torque* **TF** (**TR**). For the brake to be released, it does not matter in which order the starting sequence conditions are met.
- When not using a counter weight the brake release time can usually be shortened by lowering the *Brake Release Frequency* in order to shorten the operation cycle of the crane.
- The *Torque Compensation Delay Time* (**TCDT**) is the time it takes for torque compensation to go from 0 to 100%. If torque compensation is set to a value lower than 100%, the delay time will be proportionately shorter.
- Torque compensation can be input from analog terminal A3 by setting parameter H3-04 to 14.

When the frequency reference is given by analog input terminal A1 and the signal level is set to bipolar (-10 to +10 V) using parameter H3-01, it is possible to apply and release the brake depending on the analog input value. In the following two time charts scenarios for instant and gradual changes to the frequency reference are shown. It is important to note that all conditions for the *Brake Release Command* **BR** to be activated in the starting sequence must still be met.

Instant FREF Changes



BDT = Brake Operation Delay Time
BF = Brake Delay Frequency (S1-03)
BT = Brake Delay Time (S1-04)
FHF = FWD Brake Hold Frequency (S1-12)
FRF = FWD Brake Release Frequency (S1-01)
HF = Slip Prevention Frequency (S1-14)
HT = Slip Prevention Time (S1-15)
IF = FWD Brake Release Current (S1-05)
IR = REV Brake Release Current (S1-06)
RHF = REV Brake Hold Frequency (S1-13)
RRF = REV Brake Release Frequency (S1-02)
TF = FWD Brake Release Torque (S1-07)
TR = REV Brake Release Torque (S1-08)



BDT = Brake Operation Delay Time
BF = Brake Delay Frequency (S1-03)
BT = Brake Delay Time (S1-04)
FHF = FWD Brake Hold Frequency (S1-12)
FRF = FWD Brake Release Frequency (S1-01)
HF = Slip Prevention Frequency (S1-14)
HT = Slip Prevention Time (S1-15)
IF = FWD Brake Release Current (S1-05)
IR = REV Brake Release Current (S1-06)
RHF = REV Brake Hold Frequency (S1-13)
RRF = REV Brake Release Frequency (S1-02)
TF = FWD Brake Release Torque (S1-07)
TR = REV Brake Release Torque (S1-08)

Gradual FREF Changes

Notes:

- If the speed reference input A1 has a negative voltage value, it is read as a frequency reference in the opposite direction of the run command.

- If E1-09 parameter value is lower than b2-01, then b2-01 is used as the frequency reference lower limit.
- Only when the speed reference has been under b2-01 or E1-09 for more than 100 ms will the internal Run Command be seen as open. Until that time, the drive will operate with an output frequency of **FRF** (**RRF**) or **FHF** (**RHF**), whichever is larger.

7.1.6 Brake Sequence Faults

When a brake sequence fault is triggered, the drive will interrupt output to the motor (baseblock), change the state of the fault relay, and open the *Brake Release Command* **BR** relay in order to clamp the brake shut. In this section the triggering conditions for each brake sequence fault are described, and possible causes and corrective action are mentioned.

Fault	Description	Detection Time	Possible Cause / Corrective Action
SE1	The drive has received a FWD Run Command and a REV Run command simultaneously	S1-16	*Cause:* - Sequence error from the controller or external circuitry
			Corrective Action: - Check controller settings and external circuitry
SE2	The drive has received a Run Command but brake release conditions are not met before the time set in S1-17	S1-17	*Cause:* - The motor is not connected properly. - Brake release current **IF** (**IR**) and/or brake release torque **TF** (**TR**) is set too high
			Corrective Action: - Check motor connections - Lower brake release current and/or brake release torque to a value appropriate for the load
SE3	The drive has output a Brake Release Command **BR** but did not receive a Brake Release Check **BX** feedback signal before the time set to S1-18	S1-18	*Cause:* - Sequence error in the external brake circuit - Response time of the feedback signal from the external circuit is too slow
			Corrective Action: - Check external brake circuitry - Increase SE3 detection time or lower the response time for the feedback signal
SE4	The drive has received a Brake Release Check **BX** feedback signal without activating the Brake Release Command **BR** output relay.	S1-19	*Cause:* - Bad connection or loose wiring between relay, contactor or brake.
			Corrective Action: - Check external brake circuitry and wiring.

- To deactivate detection of any of the sequence faults, set the detection time for the respective fault to zero.
- If the *Brake Release Check* **BX** signal is not assigned to a multi-function digital input, SE3 and SE4 will not be detected.

7.2 Run Command Adjustments

The way the drive internally processes run commands that have been entered can be modified with this function. In this section the parameters associated with this function are described in detail.

7.2.1 Run Command Adjustment Parameters (S2-)

S2-01 *Run Command Minimum ON Time (FWD)*: Sets the minimum time that the drive will run when an external FWD Run Command is given.

S2-02 *Run Command Minimum ON Time (REV)*: Sets the minimum time that the drive will run when an external REV Run Command is given.

No.	Parameter Name	Setting Range	Default
S2-01	Run Command Minimum ON Time (FWD)	0.00 to 10.00 s	0.00 s
S2-02	Run Command Minimum ON Time (REV)		0.00 s

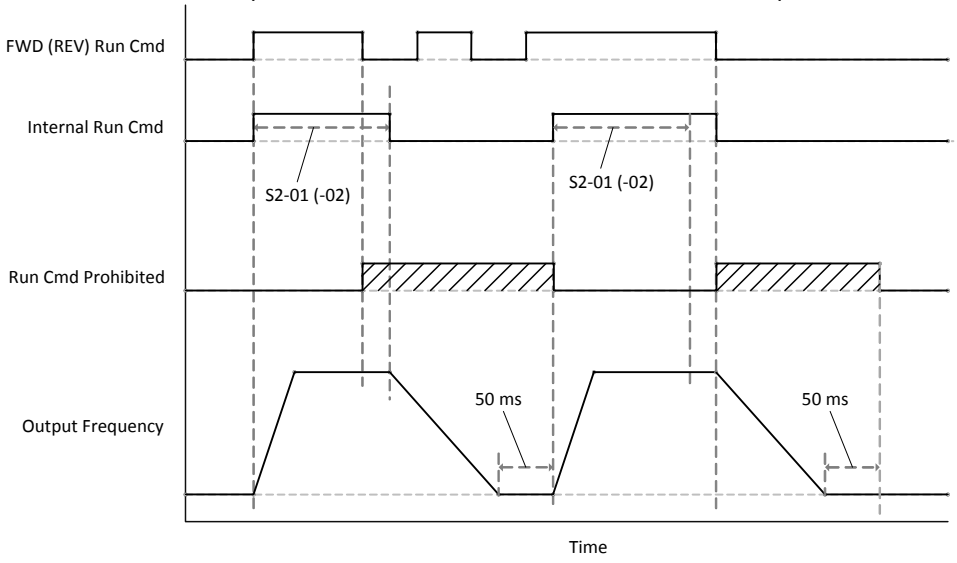
S2-03 *Run Command Delay Timer*: When a hoist command is entered immediately after the load has been lowered in V/f and Open Loop Vector control modes, a large amount of current may flow through the drive and trigger a fault. To reduce the output current peak the hoist command can be delayed using this parameter. To calculate an appropriate time for this parameter use the following formula:

$$S2-03 = \frac{\sqrt{(E2-01)^2 - (E2-03)^2}}{2\pi \cdot (E2-02) \cdot (E2-03)} \cdot 1.5s$$

No.	Parameter Name	Setting Range	Default
S2-03	Run Command Delay Timer	0.00 to 10.00 s	0.00 s

7.2.2 Run Command Adjustment Operation

The following time chart shows drive operation when *Run Command Minimum On Time* parameters are used.



(1) When the drive is stopped and a run command is entered (in all control modes):

- If the duration of the external run command is shorter than the *Minimum On Time* (S2-01, -02) then the drive will run until the *Minimum On Time* has expired.
- If the duration of the external run command is longer than the *Minimum On Time* (S2-01, -02), then the drive will run until the external run command is removed.

(2) When the drive is decelerating and a run command is entered:

- When the drive is motoring in the same direction as the run command that has been entered, the drive will operate according to the table below.

Control Mode	Minimum ON Time (S1-01, -02) = 0		Minimum ON Time (S1-01, -02) ≠ 0	
	Output Frequency > Fα	Output Frequency ≤ Fα	Output Frequency > Fα	Output Frequency ≤ Fα
ALL	Drive Re-accelerates	Brief Stop	Stops for a minimum of 50ms	

- When the drive is motoring in the opposite direction as the run command that has been entered, the drive will operate according to the following table:

Control Mode	Minimum ON Time (S1-01, -02) = 0		Minimum ON Time (S1-01, -02) ≠ 0	
	Output Frequency > Fα	Output Frequency ≤ Fα	Output Frequency > Fα	Output Frequency ≤ Fα
CLV	Brake is not applied, FWD/REV switching is activated	Stops for a minimum of 50 ms		
V/f, V/f with PG, OLV				

7.3 Impact Stop Function

On conveyor belt applications, if the load at some point receives an impact, this can trigger a digital input signal to the drive. If a Stop Command is also given, the drive will monitor the torque reference and if it exceeds a preset value, the drive will stop. In this section the parameters that control the impact stop function are detailed, the function operation is described, and a detailed time chart is shown for an impact stop situation. For this function to be activated, a multi-function digital input must be programmed to setting 35 (*Impact Stop Command*). Do not use on applications where an impact does not generate a higher torque reference.

7.3.1 Impact Stop Parameters (S3-)

S3-01 *Impact Stop Creep Frequency* (**FCR**): When an impact stop command is entered and the run command is removed, the drive will decelerate to the frequency value stored in this parameter. **FCR** must be set higher than the *Slip Prevention Frequency* (**HF**) parameter S1-14, otherwise an oPE22 fault will be triggered.

S3-02 *Impact Stop Creep Time* (**TCR**): Time during which the drive will operate at the *Impact Stop Frequency* **FCR** waiting for an impact to be detected. When this time expires, the drive executes the stopping sequence.

No.	Parameter Name	Setting Range	Default
S3-01	Impact Stop Creep Frequency	0.0 to 20.0 Hz	Determined by A1-02
S3-02	Impact Stop Creep Time	0.0 to 20.0 s	10.0 s

S3-03 *Impact Stop Detection Torque FWD* (**IFOT**): Sets the torque threshold in the FWD direction at which the drive will detect an impact and stop. The parameter is set as a percentage of motor rated torque (vector control) or current (V/f control). If set too low, the drive will stop the motor before impact occurs, and if set too high the drive will not detect an impact and will continue to operate until **TCR** expires.

S3-04 *Impact Stop Detection Torque REV* (**IROT**): Sets the torque threshold in the REV direction at which the drive will detect an impact and stop. The parameter is set as a percentage of motor rated torque (vector control) or current (V/f control). If set too low, the drive will stop the motor before impact occurs, and if set too high the drive will not detect an impact and will continue to operate until **TCR** expires.

S3-05 *Impact Stop Detection Time* (**TIOT**): Time during which the torque or current reference must surpass the value set in **IFOT** (**IROT**) before an impact is detected and the drive is stopped. If set too low, drive will stop before an impact occurs

No.	Parameter Name	Setting Range	Default
S3-03	Impact Stop Detection Torque FWD	0 to 200 %	100%
S3-04	Impact Stop Detection Torque REV	0 to 200 %	100%
S3-05	Impact Stop Detection Time	0.0 to 2.0 s	0.3 s

7.3.2 Impact Stop Operation

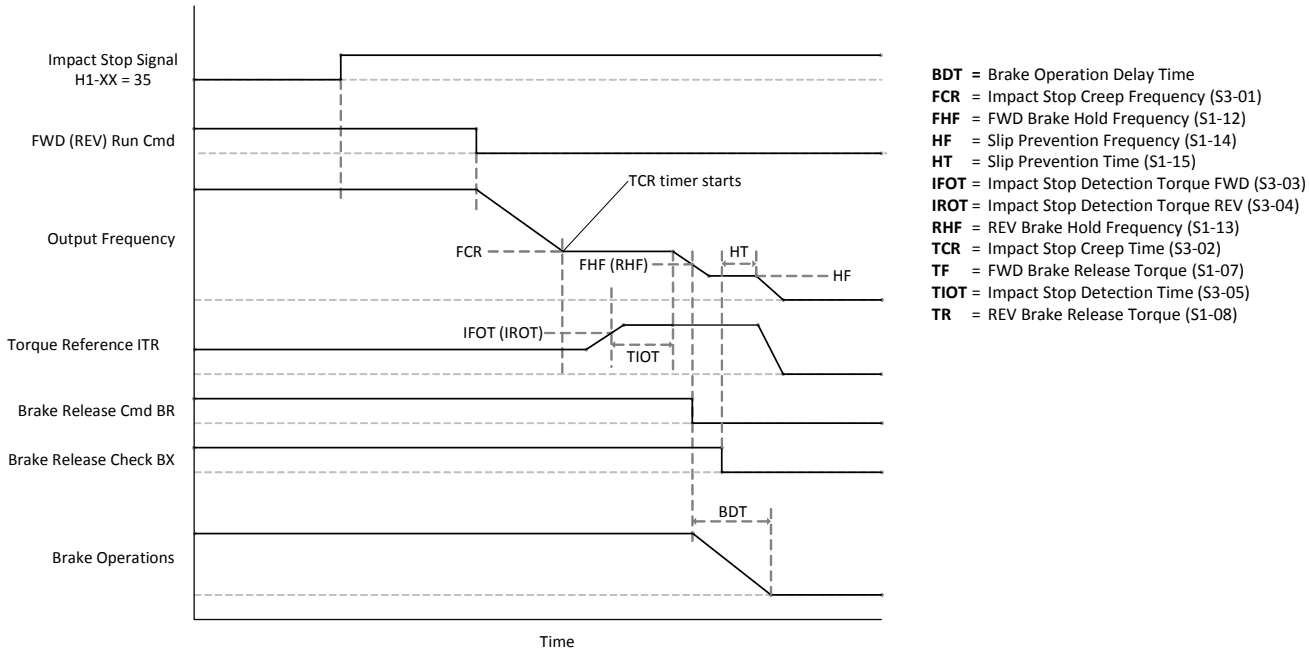
(1) When an *Impact Stop Command* is received from a digital input and a Stop Command is entered, the drive will decelerate to the *Impact Stop Creep Frequency* **FCR** if the output frequency is above this value.

(2) Once the drive's output frequency equals the *Impact Stop Creep Frequency* **FCR**, the drive will monitor its *Internal Torque Reference* **ITR**. If the **ITR** surpasses the value set to the *Impact Stop Detection Torque* **IFOT** (**IROT**) for a time longer than the *Impact Stop Detection Time* **TIOT** then the drive will have detected an impact and decelerates to the *Slip Prevention Frequency* **HF** and the regular Stopping Sequence is initiated.

(3) If the drive's *Internal Torque Reference* **ITR** fails to surpass the *Impact Stop Detection Torque* **IFOT** (**IROT**) value before the *Impact Stop Creep Time* **TCR** expires, the drive initiates a regular Stopping Sequence until the brake is clamped shut.

7.3.3 Impact Stop Time Chart

The following time chart shows drive operation when the *Impact Stop Function* is triggered. It is assumed that the drive has a constant frequency reference.



7.4 Ultra Lift Acceleration Function

Depending on the load, the A1000 Crane Drive can modify the frequency reference or acceleration rate in order to shorten operation time or protect the load. These functions are called Ultra Lift and are divided into two different sections. The following parameter can be used to select between the two Ultra Lift functions or disable them altogether.

S4-01 *Ultra Lift Control Selection*: This parameter selects the Ultra Lift function to be used or disables the function.

No.	Parameter Name	Setting Range	Default
S4-01	Ultra Lift Control Selection	0: Ultra Lift Disabled 1: Ultra Lift Function 1 Enabled 2: Ultra Lift Function 2 Enabled	0

7.4.1 Ultra Lift Acceleration Function 1

The Ultra Lift Acceleration Function 1 can be used to shorten the cycle time of the crane when a load lighter than the crane's capabilities is hoisted or lowered. When the function is activated and the drive detects a light load on the crane, a higher frequency reference and thus a higher motor speed is allowed. The Ultra Lift 1 function can be activated using parameter S4-01 or by setting one of the drive's multi-function digital inputs to 30 with parameters H3-¦. In this section the parameters that influence the Ultra Lift 1 Acceleration Function are described, the drive's operation in Ultra Lift 1 is detailed, and a time chart of the function is shown.

Ultra Lift Acceleration Function 1 Parameters (S4-¦)

S4-02 *Ultra Lift 1 Max Frequency FWD* (**FAMF**): Sets the maximum output frequency in the FWD direction for the drive when a light load is detected and the Ultra Lift 1 function is activated. The maximum output frequency set to parameter E1-04 has priority over this setting.

S4-03 *Ultra Lift 1 Max Frequency REV* (**FAMR**): Sets the maximum output frequency in the REV direction for the drive when a light load is detected and the Ultra Lift 1 function is activated. The maximum output frequency set to parameter E1-04 has priority over this setting.

No.	Parameter Name	Setting Range	Default
S4-02	Ultra Lift 1 Max Frequency FWD	40.0 to 200.0 Hz	60.0 Hz
S4-03	Ultra Lift 1 Max Frequency REV		60.0 Hz

S4-04 *Ultra Lift 1 Detection Torque FWD* (**IFAT**): Sets the torque threshold in the FWD direction at which the drive determines that there is a light load on the crane and activates the Ultra Lift 1 function. This parameter is set as a percentage of motor rated torque in vector control modes and as a percentage of motor rated current in V/f control modes. To find an optimal setting for this parameter the U1-48 monitor for Ultra Lift torque reference can be used.

S4-05 *Ultra Lift 1 Detection Torque REV* (**IRAT**): Sets the torque threshold in the REV direction at which the drive determines that there is a light load on the crane and activates the Ultra Lift 1 function. This parameter is set as a percentage of motor rated torque in vector control modes and as a percentage of motor rated current in V/f control modes. To find an optimal setting for this parameter the U1-48 monitor for Ultra Lift torque reference can be used.

No.	Parameter Name	Setting Range	Default
S4-04	Ultra Lift 1 Detection Torque FWD	0 to 200 %	50 %
S4-05	Ultra Lift 1 Detection Torque REV		50 %

S4-06 *Ultra Lift 1 Detection Frequency* (**FAD**): Frequency at which the drive compares its *Internal Torque Reference* **ITR** (vector control) or current output (V/f control) to the *Ultra Lift 1 Detection Torque* **IFAT** (**IRAT**) in order to determine if there is a light load on the crane and activate the Ultra Lift 1 function. This parameter is usually set to the same value as the *Base Frequency* (E1-06).

S4-07 *Ultra Lift 1 Detection Time* (**TA**): Time interval during which the **ITR** or output current must not exceed the *Ultra Lift 1 Detection Torque* **IFAT** (**IRAT**) before the Ultra Lift 1 function is activated and the drive is allowed to accelerate. If this parameter is set too short, the drive may improperly detect the size of the load and output frequency will fluctuate. If set too long, the crane's operation time may be lengthened without need.

No.	Parameter Name	Setting Range	Default
S4-06	Ultra Lift 1 Detection Frequency	40.0 to 60.0 Hz	60.0 Hz
S4-07	Ultra Lift 1 Detection Time	0.0 to 10.0 s	1.0 s

S4-19 *Ultra Lift 1 Torque Bias FWD*: Sets the value of the mechanical loss of the crane in the FWD direction as a percentage of motor rated torque. It may be necessary to set this parameter if the Ultra Lift 1 function is not working properly in Open Loop Vector control mode. A typical value for this parameter can be determined empirically by operating the crane in the FWD direction without a load, and setting S4-19 to the opposite value of the U1-09 torque reference monitor.

S4-20 *Ultra Lift 1 Torque Bias REV*: Sets the value of the mechanical loss of the crane in the REV direction as a percentage of motor rated torque. It may be necessary to set this parameter if the Ultra Lift 1 function is not working properly in Open Loop Vector control mode. A typical value for this parameter can be determined empirically by operating the crane in the REV direction without a load, and setting S4-19 to the opposite value of the U1-09 torque reference monitor.

No.	Parameter Name	Setting Range	Default
S4-19	Ultra Lift 1 Torque Bias FWD	-50.0 to 50.0 %	0.0 %
S4-20	Ultra Lift 1 Torque Bias REV		0.0 %

Note: These parameters are only available in Open Loop Vector (OLV) control mode.

When setting Ultra Lift 1 parameters, be aware that the following conditions should be met:

- S4-06 (Ultra Lift 1 Detection Frequency **FAD**) ≤ S4-02 (Ultra Lift 1 Max Frequency FWD **FAMF)**
- S4-03 (Ultra Lift 1 Max Frequency REV **FAMR**) ≤ E1-04 (Max Output Frequency)

If **FAMF** (**FAMR**) is set to a value lower than **FAD**, the drive will decelerate when the Ultra Lift 1 function is activated. Also, if there is a change in motor temperature, an identical load will generate a different torque reference (5 – 7% error) and this should be taken into account when setting Ultra Lift 1 function parameters.

Ultra Lift 1 Function Operation

(1) When the Ultra Lift 1 function is enabled either through the S4-01 parameter or using a multi-function digital input, and if the frequency reference is above the value of the *Ultra Lift 1 Detection Frequency* **FAD**, the drive will accelerate up to an output frequency of **FAD**. After that frequency has been reached, the *Ultra Lift 1 Detection Time* **TA** timer is initiated.

(2) When ⅓ of the **TA** time has passed, the drive initiates the load check by comparing its torque reference and the *Ultra Lift 1 Detection Torque* **IFAT** (**IRAT**). If the torque reference stays below the level set to **IFAT** (**IRAT**) for the remaining ⅔ of the *Ultra Lift 1 Detection Time* **TA** then the drive will accelerate up to its frequency reference or the *Ultra Lift 1 Max Frequency* **FAMF** (**FAMR**), whichever is lower.

(3) If the torque reference goes above the level set to **IFAT** (**IRAT**) at any point during the remaining ⅔ of the *Ultra Lift 1 Detection Time* **TA**, then the drive will continue to run at the *Ultra Lift 1 Detection Frequency* **FAD**. Even if the torque reference decreases at a later time point, the Ultra Lift 1 function will not be activated.

The Ultra Lift 1 function is reset if one of the following actions occurs:

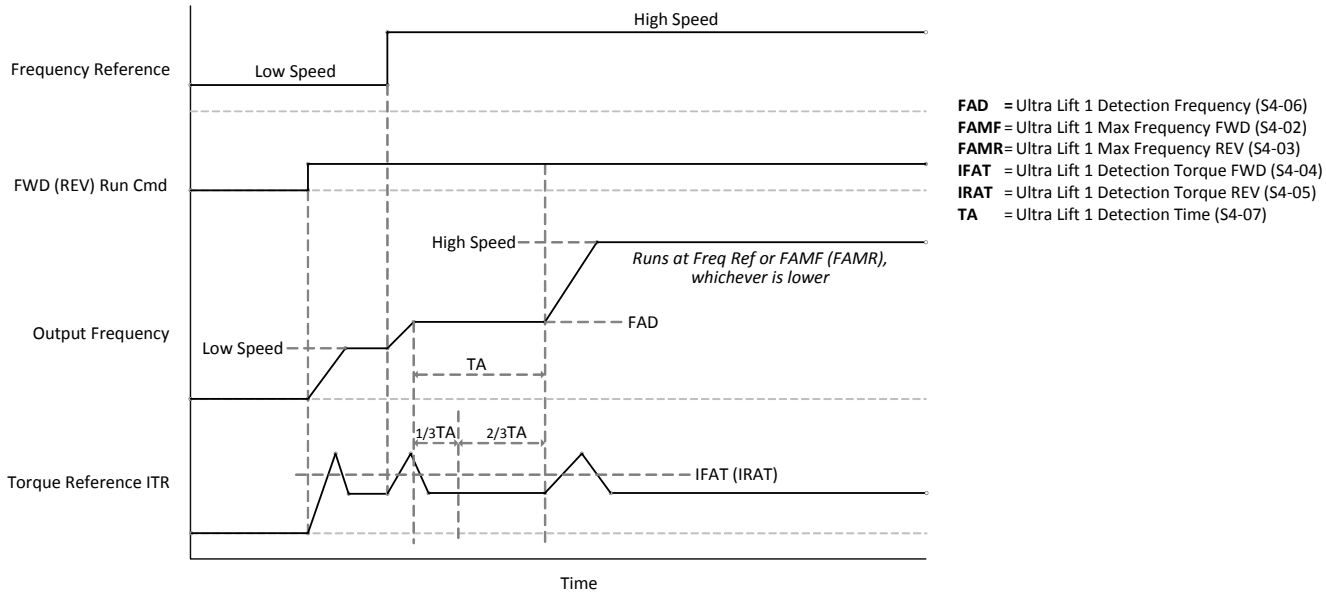
- The Run Command is removed
- The frequency reference falls below the *Ultra Lift 1 Detection Frequency* **FAD**
- The drive faults

- A Run Command in the opposite direction is entered
- An external baseblock command is entered

It is important to keep in mind that the crane's stopping distance is determined by its speed. Therefore, care should be taken when setting Ultra Lift 1 parameters to ensure that the stopping distance is safe.

Ultra Lift 1 Time Chart

The following time chart shows drive operation when the *Ultra Lift 1 Function* is activated through the S4-01 parameter.



7.4.2 Ultra Lift Acceleration Function 2

The Ultra Lift Acceleration Function 2 can be used to smoothen the acceleration time in order to protect a heavy load and to avoid a situation where the motor could stall and the load slip. When the function is activated and the drive detects that output power has reached a predefined value, the acceleration time is scaled to limit the kinetic energy of the load. The Ultra Lift 2 function can be activated using parameter S4-01 or by setting one of the drive's multi-function digital inputs to 36 with parameters H3-01 through -10. In this section the parameters that influence the Ultra Lift 2 Acceleration Function are described, the drive's operation in Ultra Lift 2 is detailed, and a time chart of the function is shown.

Ultra Lift Acceleration Function 2 Parameters (S4-)

S4-08 *Ultra Lift 2 Activation Frequency* (**FAM2**): Sets the output frequency threshold from which the Ultra Lift 2 function can be activated. This parameter is usually set to a value close to the motor's base frequency (E1-06).

No.	Parameter Name	Setting Range	Default
S4-08	Ultra Lift 2 Activation Frequency	0 to 200 Hz	50 Hz

S4-09 *Ultra Lift 2 Motoring Limit Start Level* (**LGS**): Sets the power threshold when motoring from which the drive's acceleration rate is lengthened when the *Ultra Lift 2 Activation Frequency* **FAM2** has been reached. This parameter is set as a percentage of motor rated power, and the typical setting range is between 50 and 80%.

S4-10 *Ultra Lift 2 Motoring Hold Level* (**LGH**): Sets the power threshold when motoring from which the drive stops all acceleration in order to maintain output power. This parameter is set as a percentage of motor rated power, the typical setting is between 50 and 120%, and its value should be above that of the *Ultra Lift 2 Motoring Limit Start Level* **LGS**. If set too low, the drive will halt acceleration even with a light load and the crane's operation time will be lengthened. If set too high, even heavy loads will reach high speeds and the motor may stall, causing the load to slip.

S4-11 *Ultra Lift 2 Regen Limit Start Level* (**LRS**): Sets the power threshold when regenerating from which the drive's acceleration rate is lengthened when the *Ultra Lift 2 Activation Frequency* **FAM2** has been reached. This parameter is set as a percentage of motor rated power, and the typical setting range is between 0 and 50%. It is important to note that when regenerating, the motor load rate during acceleration is lower than when the drive is motoring, because the force of the load is in the opposite direction.

S4-12 *Ultra Lift 2 Regen Hold Level* (**LRH**): Sets the power threshold when regenerating from which the drive stops all acceleration in order to maintain output power. This parameter is set as a percentage of motor rated power, the typical setting is between 50 and 120%, and its value should be above that of the *Ultra Lift 2 Regen Limit Start Level* **LRS**. If set too low, the drive will halt acceleration even with a light load and the crane's operation time will be lengthened. If set too

high, even heavy loads will reach high speeds and the motor may stall, causing the load to slip.

No.	Parameter Name	Setting Range	Default
S4-09	Ultra Lift 2 Motoring Limit Start Level	0 to 200 %	50 %
S4-10	Ultra Lift 2 Motoring Hold Level		100 %
S4-11	Ultra Lift 2 Regen Limit Start Level		10 %
S4-12	Ultra Lift 2 Regen Hold Level		100 %

S4-13 *Ultra Lift 2 Limit Timer* (**TA2**): If the acceleration rate is lengthened using the Ultra Lift 2 function for a time longer than the value set in this parameter, acceleration is halted until the motor comes to a complete stop. This parameter is normally set between 50 and 100% of the acceleration time when running at high speed. It can prevent reacceleration when making a transition in Ultra Lift or when the load has already reached the ground.

No.	Parameter Name	Setting Range	Default
S4-14	Ultra Lift 2 Limit Timer	0.1 to 10.0 s	1.0 s

S4-14 *Ultra Lift 2 Fault Operation Selection*: Determines drive's reaction when an Ultra Lift 2 function fault (oL16) occurs.

S4-15 *Ultra Lift 2 Fault Detection Level* (**LEA2**): Sets the power threshold at which the drive will fault when the Ultra Lift 2 function is activated. This parameter is set as a percentage of motor rated power and the typical setting range is between 100 and 150%.

S4-16 *Ultra Lift 2 Fault Detection Time* (**TEA2**): Sets the time during which output power must surpass the level set to *Ultra Lift 2 Fault Detection Level* **LEA2** before an oL16 fault is triggered. This parameter is usually set between 0.1 and 1.0 seconds

No.	Parameter Name	Setting Range	Default
S4-09	Ultra Lift 2 Fault Operation Selection	0: Ramp to Stop 1: Coast to Stop 2: Emergency Stop 3: Alarm Only, Acceleration Prohibited	2
S4-10	Ultra Lift 2 Fault Detection Level	0 to 200 %	150 %
S4-11	Ultra Lift 2 Fault Detection Time	0.0 to 10.0 s	0.1 s

S4-17 *Ultra Lift 2 Accel Time Gain* (**GAT**): Sets the scaling factor for the acceleration time when the Ultra Lift 2 function is activated. This parameter is usually set between 1.5 and 3.0. When set to 1.0, the acceleration time will not be modified if the Ultra Lift 2 function is activated.

No.	Parameter Name	Setting Range	Default
S4-17	Ultra Lift 2 Accel Time Gain	1.0 to 10.0	2.0

S4-18 *Operation Selection During Ultra Lift 2 Regen*: Determines if the Ultra Lift 2 function can be activated when the drive is regenerating.

No.	Parameter Name	Setting Range	Default
S4-18	Operation Selection During Ultra Lift 2 Regen	0: Disabled 1: Enabled	0

Ultra Lift 2 Operation

(1) When the Ultra Lift 2 function is enabled through parameter S4-01 or using a multi-function digital input, the drive will accelerate normally until the output frequency reaches the *Ultra Lift 2 Activation Frequency* **FAM2**. At this point, the drive will start to monitor its output power.

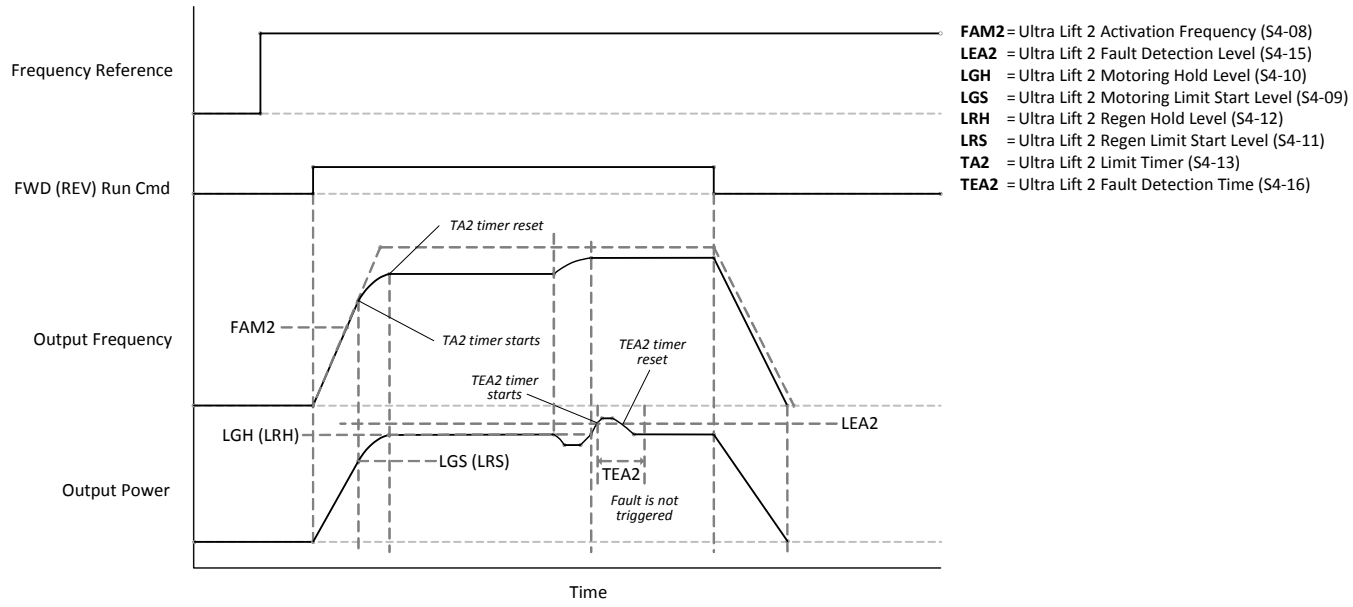
(2) If the output power exceeds the value set to *Ultra Lift 2 Limit Start Level* **LGS** (**LRS**) then the drive will lengthen the acceleration rate to limit the kinetic energy of the load using the *Ultra Lift 2 Accel Time Gain* **GAT** as the factor of modification. At this moment the *Ultra Lift 2 Timer* **TA2** counter is initiated. The counter is reset whenever the output power goes below the level set to **LGS** (**LRS**).

(3) If output power reaches the level set to *Ultra Lift 2 Hold Level* **LGH** (**LRH**) or if the *Ultra Lift 2 Timer* **TA2** expires then the drive will halt acceleration. If the timer expires then the drive will not accelerate again until the motor comes to a complete stop.

(4) If output power reaches the level set to the *Ultra Lift 2 Fault Detection Level* **LEA2** for the duration of the *Ultra Lift 2 Detection Time* **TEA2** then the drive will activate the protection function selected in S4-09.

Ultra Lift 2 Function Time Chart

The following time chart shows drive operation when the *Ultra Lift 2 Function* is activated through the S4-01 parameter.



7.5 Overload Detection Function (oL5)

As a protective safety feature, the A1000 Crane Drive has incorporated an Overload Detection function. When the drive detects that the load is too large, it can change its behavior depending on parameter settings. In this section the parameters associated with the Overload Protection function are described. It is important to note that this function is disabled when the Run Command is entered from the digital operator (b1-02 = 0), and only works when the brake has been released. Two independent overload detection conditions can be set.

7.6 Overload Detection Function Parameters (S5-)

S5-01 *Overload Detection Operation Selection 1*: Determines overload detection conditions and the actions that are carried out when an overload condition is detected.

No.	Parameter Name	Setting Range	Default
S5-01	Overload Detection Operation Selection 1	0: Overload Detection Disabled 1: At Speed Agree. Alarm only, acceleration halted, drive continues to run 2: During Run. Alarm only, acceleration halted, drive continues to run. 3: At Speed Agree. Alarm only, emergency stop, Run Command must be cycled. 4: During Run. Alarm only, emergency stop, Run Command must be cycled. 5: At Speed Agree. Fault, coast to stop, fault must be reset to continue operation. 6: During Run. Fault, coast to stop, fault must be reset to continue operation.	0

S5-02 *Overload Detection Torque 1*: Sets the threshold above which a crane overload is detected. In vector control modes, set as a percentage of motor rated torque. In V/f control modes, set as a percentage of motor rated current.

S5-03 *Overload Detection Time 1*: Sets the time that the torque reference (vector control) or output current (V/f control) must surpass the level set to S5-02 before an Overload Condition is triggered.

No.	Parameter Name	Setting Range	Default
S5-02	Overload Detection Torque 1	0 to 300 %	150 %
S5-03	Overload Detection Time 1	0.0 to 10.0 s	0.1 s

S5-04 *Overload Detection Operation Selection 2*: Determines overload detection conditions and the actions that are carried out when an overload condition is detected.

No.	Parameter Name	Setting Range	Default
S5-04	Overload Detection Operation Selection 4	0: Overload Detection Disabled 1: At Speed Agree. Alarm only, acceleration halted, drive continues to run 2: During Run. Alarm only, acceleration halted, drive continues to run. 3: At Speed Agree. Alarm only, emergency stop, Run Command must be cycled. 4: During Run. Alarm only, emergency stop, Run Command must be cycled. 5: At Speed Agree. Fault, coast to stop, fault must be reset to continue operation. 6: During Run. Fault, coast to stop, fault must be reset to continue operation.	0

S5-05 *Overload Detection Torque 2*: Sets the threshold above which a crane overload is detected. In vector control modes, set as a percentage of motor rated torque. In V/f control modes, set as a percentage of motor rated current.

S5-06 *Overload Detection Time 2*: Sets the time that the torque reference (vector control) or output current (V/f control) must surpass the level set to S5-05 before an Overload Condition is triggered.

No.	Parameter Name	Setting Range	Default
S5-05	Overload Detection Torque 2	0 to 300 %	150 %
S5-06	Overload Detection Time 2	0.0 to 10.0 s	0.1 s

It is possible to trigger one of the drive's multi-function digital outputs when an overload condition occurs using the following settings:

H3-┤ Setting	Name	Message	Description
22	Overload Detection (N.O.)	Overload detection N.O.	If conditions for either Overload Detection 1 or 2 arise, then the output relay will close. It will remain closed for the duration that "OL5" appears on the digital operator screen.
23	Overload Detection (N.C.)	Overload Detection N.C.	If conditions for either Overload Detection 1 or 2 arise, then the output relay will open. It will remain open for the duration that "OL5" appears on the digital operator screen.

7.7 Overtorque Detection Function (oL3, oL4)

As a protective safety feature, the A1000 Crane Drive has incorporated an Overtorque Detection function. When the drive detects that the torque or current reference is too large, it can change its behavior depending on parameter settings. In this section the parameters associated with the Overtorque Protection function are described. It is important to note that this function is disabled when the Run Command is entered from the digital operator (b1-02 = 0), and only works when the brake has been released. Two independent overtorque detection conditions can be set.

7.8 Overtorque Detection Function Parameters (S6-┤)

S6-01 *Overtorque Detection Operation Selection 1*: Determines overtorque detection conditions and the actions that are carried out when an overload condition is detected.

No.	Parameter Name	Setting Range	Default
S6-01	Overtorque Detection Operation Selection 1	0: Overtorque Detection Disabled 1: At Speed Agree. Alarm only during overtorque detection, drive continues to run 2: During Run. Alarm only during overtorque detection, drive continues to run. 3: At Speed Agree. Fault, coast to stop, fault must be reset to continue operation. 4: During Run. Fault, coast to stop, fault must be reset to continue operation. 5: At Speed Agree. Alarm only, reset when drive stops, drive continues to run. 6: During Run. Alarm only, reset when drive stops, drive continues to run.	0

S6-02 *Overtorque Detection Level 1*: Sets the threshold above which an overtorque condition is detected. In vector control modes, set as a percentage of motor rated torque. In V/f control modes, set as a percentage of motor rated current.

S6-03 *Overtorque Detection Time 1*: Sets the time that the torque reference (vector control) or output current (V/f control) must surpass the level set to S6-02 before an Overload Condition is triggered.

No.	Parameter Name	Setting Range	Default
S5-02	Overtorque Detection Level 1	0 to 300 %	150 %
S5-03	Overtorque Detection Time 1	0.0 to 10.0 s	0.1 s

S6-04 *Overtorque Detection Operation Selection 2*: Determines overtorque detection conditions and the actions that are carried out when an overload condition is detected.

No.	Parameter Name	Setting Range	Default
S6-04	Overtorque Detection Operation Selection 2	0: Overtorque Detection Disabled 1: At Speed Agree. Alarm only during overtorque detection, drive continues to run 2: During Run. Alarm only during overtorque detection, drive continues to run. 3: At Speed Agree. Fault, coast to stop, fault must be reset to continue operation. 4: During Run. Fault, coast to stop, fault must be reset to continue operation. 5: At Speed Agree. Alarm only, reset when drive stops, drive continues to run. 6: During Run. Alarm only, reset when drive stops, drive continues to run.	0

S6-05 *Overtorque Detection Level 1*: Sets the threshold above which an overtorque condition is detected. In vector control modes, set as a percentage of motor rated torque. In V/f control modes, set as a percentage of motor rated current.

S6-06 *Overtorque Detection Time 1*: Sets the time that the torque reference (vector control) or output current (V/f control) must surpass the level set to S6-05 before an Overload Condition is triggered.

No.	Parameter Name	Setting Range	Default
S5-05	Overtorque Detection Level 2	0 to 300 %	150 %
S5-06	Overtorque Detection Time 2	0.0 to 10.0 s	0.1 s

It is possible to trigger one of the drive's multi-function digital outputs when an overtorque condition occurs using the following settings:

H3-┤ Setting	Name	Message	Description
0B	Overtorque Detection 1 (N.O.)	Overtorque Detection 1 N.O.	If conditions for Overtorque Detection 1 arise, then the output relay will close. It will remain closed for the duration that "oL3" appears on the digital operator screen.
17	Overtorque Detection 1 (N.C.)	Overtorque Detection 1 N.C.	If conditions for Overtorque Detection 1 arise, then the output relay will open. It will remain open for the duration that "oL3" appears on the digital operator screen.
18	Overtorque Detection 2 (N.O.)	Overtorque Detection 2 N.O.	If conditions for Overtorque Detection 2 arise, then the output relay will close. It will remain closed for the duration that "oL4" appears on the digital operator screen.
19	Overtorque Detection 2 (N.C.)	Overtorque Detection 2 N.C.	If conditions for Overtorque Detection 2 arise, then the output relay will open. It will remain open for the duration that "oL4" appears on the digital operator screen.

7.9 Overtravel Limit Function

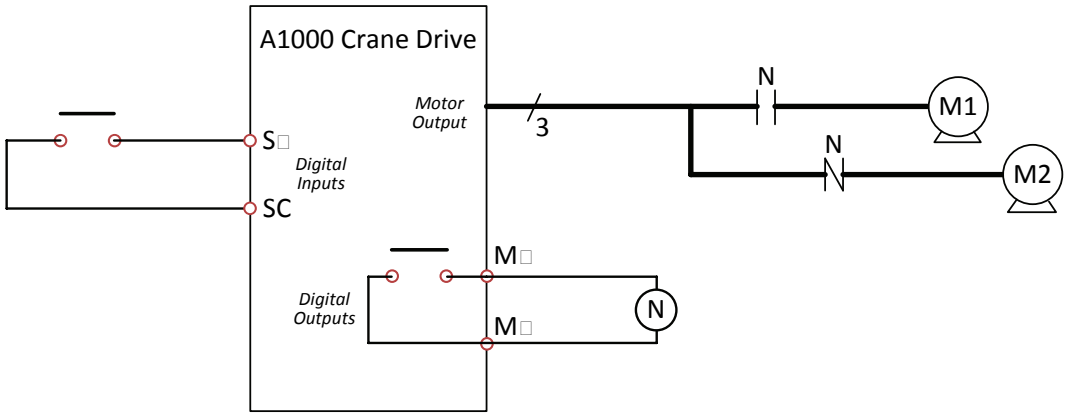
In the A1000 Crane Drive an Overtravel Limit Function has been implemented. On horizontal applications, it can prevent the cart/container from traveling past a predetermined location, and in hoisting applications it can prevent the load from being hoisted too high or too low. The function is controlled by multi-function digital inputs that can be programmed in the FWD or REV directions and as Normally Open (N.O.) or Normally Closed (N.C.) contacts. In the following table the Overtravel Limit settings for the H1-┤ digital input parameters are shown.

H1-┤ Setting	Name	Message	Description
31	FWD Overtravel Limit (N.O.)	FWD Limit N.O.	If the input relay is closed during FWD Run, then the Brake Release Command **BR** will open (causing the brake to clamp shut) and the motor will coast to stop. If the relay is closed while running in REV direction there is no change in drive operations. If the relay is closed and a FWD Run Command is entered, the drive will not run.
32	FWD Overtravel Limit (N.C.)	FWD Limit N.C.	If the input relay is opened during FWD Run, then the Brake Release Command **BR** will open (causing the brake to clamp shut) and the motor will coast to stop. If the relay is opened while running in REV direction there is no change in drive operations. If the relay is opened and a FWD Run Command is entered, the drive will not run.
33	REV Overtravel Limit (N.O.)	REV Limit N.O.	If the input relay is closed during REV Run, then the Brake Release Command **BR** will open (causing the brake to clamp shut) and the motor will coast to stop. If the relay is closed while running in FWD direction there is no change in drive operations. If the relay is closed and a REV Run Command is entered, the drive will not run.
34	REV Overtravel Limit (N.C.)	REV Limit N.C.	If the input relay is opened during REV Run, then the Brake Release Command **BR** will open (causing the brake to clamp shut) and the motor will coast to stop. If the relay is opened while running in FWD direction there is no change in drive operations. If the relay is opened and a REV Run Command is entered, the drive will not run.

7.10 Motor Switch Function

The A1000 Crane Drive can operate two motors if an external sequence is used to switch between them. There are some limitations to the drive's functions when driving the second motor, which are detailed in this section. The second motor can also only operate in V/f and Open Loop Vector (OLV) control modes, as there is no support for encoder feedback

from a second motor. An external sequence that could be used to switch between motors is shown below.



If the *Motor Switch Command* is received through a digital input and the drive is stopped, then the drive will automatically change the state of the digital output and the motor contactors will also change states. The drive will then use all the parameters for the motor that has been selected. It takes approximately 50 ms for the motor switch to be executed, 500 ms when in closed loop control modes.
If the *Motor Switch Command* is received while the drive is running, a message indicating that the drive will change motor flashes on the digital operator screen until the motor comes to a complete stop. Once the drive is stopped, it will switch motors.

Parameters that are independent for each motor are shown in the following table.

Function	Motor 1	Motor 2
Control Mode	A1-02	E3-01
V/f Characteristics	E1-04 ~ E1-13	E3-02 ~ E3-08
Motor Parameters	E2-01 through E2-09	E4-01 through E4-07

When operating motor 2 with the drive, only V/f and Open Loop Vector (OLV) control modes are possible. The following three parameters are also enabled only when operating with motor 1.

No.	Parameter Name	Setting Range	Default
S2-03	Run Command Delay Timer	0.00 to 10.00 s	0.00 s
S4-19	Ultra Lift 1 Torque Bias FWD	-50.0 to 50.0 %	0.0 %
S4-20	Ultra Lift 1 Torque Bias REV		0.0 %

To allow *Motor Switch* operation, the corresponding multi-function digital inputs and outputs must be set according to the following tables:

H1-□□ Setting	Name	Message	Description
16	Motor Switch Command	Motor Changeover	Switches between motor 1 and motor 2. Open: Motor 1 Selected Closed: Motor 2 Selected When no multi-function input is set to 16, the drive will always operate motor 1.

H3-□□ Setting	Name	Message	Description
1C	Motor Selection	Motor 2 Selected	Signals which motor has been selected Open: Motor 2 Selected Closed: Motor 1 Selected

7.11 External Baseblock Command

To avoid sudden slipping or dropping of the load when an external baseblock command is entered and cleared, the function has been modified from its standard behavior. In the A1000 Crane Drive, when an external baseblock command is received, output current is interrupted for a minimum of 0.1 seconds and the SFS output is set to zero. The brake will be immediately applied.

When the baseblock command is cleared, a Run Command must be entered for the drive to start. No speed search will be performed and the drive will start from 0 Hz. If the baseblock command is cleared but no Run Command is entered, the drive will maintain baseblock.

8. Crane Drive Faults

The A1000 Crane Drive has incorporated 13 additional faults to those on the standard A1000 inverter. In this section those faults are described along with possible causes and solutions.

Display	Fault Name	Description	Corrective Action	Fault Type
OL3	Overtorque Detection 1	Triggered when the Overtorque Detection 1 function is enabled (S6-01=1 to 6) and the drive's Internal Torque Reference (vector control) or Output Current (V/f control) exceeds the Overtorque Detection Level 1 (S6-02) for longer than the Overtorque Detection Time 1 (S6-03).	Check the load or S6 parameter settings	A (when S6-01 = 3 or 4) B (when S6-01 = 1, 2, 5, or 6)
OL4	Overtorque Detection 2	Triggered when the Overtorque Detection 2 function is enabled (S6-04=1 to 6) and the drive's Internal Torque Reference (vector control) or Output Current (V/f control) exceeds the Overtorque Detection Level 2 (S6-05) for longer than the Overtorque Detection Time 2 (S6-06).	Check the load or S6 parameter settings	A (when S6-04 =3 or 4) B (when S6-04 = 1, 2, 5, or 6)
OL5	Overload Detection	Triggered when the Overload Detection function is enabled (S5-01 = 1 to 6 for overload detection 1, or S5-04 = 1 to 6 for overload detection 2) and the drive's Internal Torque Reference (vector control) or Output Current (V/f control) exceeds the Overload Detection Level (S5-02 for overload detection 1, and S5-05 for overload detection 2), for longer than the Overload Detection Time (S5-03 for overload detection 1 and S5-06 for overload detection 2)	Check the load or S5 parameter settings	A (when S5-01 = 5 or 6) (when S5-04 = 5 or 6) B (when S5-01 = 1 thru 4) (when S5-04 = 1 thru 4)
OL6	Ultra Lift Acceleration 2 Fault	Triggered when the Ultra Lift 2 function has been enabled (using S4-01 or a digital input), the drive's output frequency is higher than the Ultra Lift 2 Activation Frequency and the Drive's Output Power exceeds the level set to S4-15 (Ultra Lift 2 Fault Detection Level) for a time longer than S4-16 (Ultra Lift 2 Fault Detection Time).	Check the load or S4 parameter settings	A (when S4-14 = 0, 1, 2) B (when S4-14 = 3)
OPE24	Parameter Setting Fault	Ultra Lift 1 and Ultra Lift 2 have both been selected at the same time.	Check S4 and H1 parameter settings	C
OPE11	Parameter Setting Error	The following parameter relations are not being met: C6-05 (carrier frequency proportional gain) > 6, and C6-04 (carrier frequency lower limit) > C6-03 (carrier frequency upper limit) C6-03 to C6-05 upper/lower limit error	Check parameter settings.	C
OPE22	Parameter Setting Error	The following parameter relations are not being met: When the brake delay time (S1-04) ≠ 0 and the Brake Release Frequency (S1-01, 02) ≤ brake delay frequency (S1-03) When slip prevention time (S1-15) ≠ 0, and Brake release frequency (S1-12, 13) ≥ slip prevention frequency (S1-14) Impact Stop Function (H1-xx = 35) has been set to multi-function input, and the impact stop clip frequency (S3-01) > brake release frequency (S1-12, S1-13) Although the Brake Release Check has been set to multi-function digital input (H1-xx = 0), the brake release command has not been set to multi-function digital output (H2-xx = 21).	Check parameter settings.	C
OPE23	Parameter Setting Error	While using a vector control mode, one of the following parameters is set to a value greater than the torque limit for the motoring direction (L7-01, L7-02). When detection is triggered for the forward/reverse Brake Release Torque (S1-07, S1-08) Impact stop detection torque (S3-03, S3-04) Swift-Lift 1 detection torque (S4-04, S4-05) Overload detection level (S5-02, S5-05) Overload torque detection level (S6-02, S6-05)	Check parameter settings.	C
OPE25	Parameter Setting Error	A multi-function input terminal set to switch to motor 2 has been triggered while the following incorrect data is set for motor 2: Brake release frequency (S1-01, S1-02) is less than or equal to brake delay frequency (S1-03) while at the same time the brake delay time in S1-04 ≠ 0. Brake close frequency (S1-12, S1-13) is greater than or equal to the slip prevention frequency (S1-14) while at the same time the slip prevention time S1-15 ≠ 0. The impact stop creep frequency (S3-01) is greater than the break close frequency while at the same time a multi-function input terminal is set for "Impact stop" (H1-xx = 35).	Check parameter settings.	C
SE1	Brake Sequence Fault 1	Fault occurred in brake sequence. (for more information, see section 7.1.6)		A
SE2	Brake Sequence Fault 2			A
SE3	Brake Sequence Fault 3			A
SE4	Brake Sequence Fault 4			A

Fault Types:

A: Fault (motor coasts to stop, flashing operator display, fault relay tripped, brake clamped shut).
B: Minor Fault (continue running, operator display will flash, no fault relay tripped, minor error relay tripped (if selected).
C: Alarm (operation not possible, operator display flashes, no fault relay output, no minor error relay output).

Troubleshooting

Problem	Cause	Corrective Action
Fault OPE11 has occurred.	Parameter setting error.	*See section 8*
Fault OPE22 or OPE23 has occurred.	Parameter setting error.	*See section 8*
Fluctuation is occurring in Open Loop Vector Mode when lowering the load without a counter-weight	Setting error when operating in reverse (S1-20).	Set S1-20 to "1".
Fluctuation occurs in Open Loop Vector Mode when performing lowering operations in a traverse crane or a hoist crane with a counter-weight.	Setting error when operating in reverse (S1-20).	Set S1-20 to "1".
Sequence Fault SE1~SE4 has occurred.	External sequence or parameter setting error.	*See section 7.1.6*
The crane sequence and/or impact stop sequence aren't functioning.	Parameter b1-02 equals zero (allowing the Run Command via the digital operator),	Change b1-02 to "1" (Control Circuit Terminal), and have the Run Command entered via the control circuit.
The drive remains stopped although a Run Command has been entered.	The external baseblock signal is active (by default, terminal S8 is set to External Baseblock N.C.)	Input external baseblock signal correctly, or deactivate external baseblock input with H1 parameters.
Deceleration Rate is not always constant	Decel time is not functioning properly due to the stall prevention setting.	Increase the deceleration time to the point where the Stall Prevention Function isn't triggered.
The motor stops when running at the speed of the Brake Release Frequency.	Excessive motor slip Setting error in the Brake Release Frequency (S1-01, -02)	Increase the Brake Release Frequency (S1-01, -02).
Output Current is too high, and/or the crane is fluctuating (in Open Loop Vector Control).	Brake Sequence has not been tuned Drive parameter gain setting and motor do not match	*Refer to "Appendix I: Tuning Procedures".*
Excessive current just after the crane has stopped lowering and started to hoist the load.	Depends on the characteristics of the motor.	*See section 7.1.4*
The load slips down or drops suddenly.	V/f setting is to low. *When operating in Vector Control Mode:* Motor parameters have not been tuned Torque Limit is set too low.	Increase the V/f setting. *When in Open Loop or Closed Loop Vector Control:* Perform Auto-Tuning Increase the setting for the Torque Limit.
Excessive slipping at start.	Brake Release Current / Torque (S1-05~08) is set too low. V/f setting is too low *When in Open Loop or Closed Loop Vector Control:* The setting in C4-02 is too long during Torque Compensation (Open Loop Vector) Torque Compensation Amount / Torque Forcing Amount (S1- 09) is too low. Slip Prevention Time (S1-15) setting is to short (when not in Closed Loop Vector Control Stop Timer (b2-04) setting is too short (Closed Loop Vector Control)	Increase the Brake Release Current / Torque (S1-05~08). Increase the V/f setting. *When in Open Loop or Closed Loop Vector Control:* Lower the Torque Compensation Primary Delay Time (C4-02) to as low as 20 ms. Increase the Torque Compensation / Forcing Amount (S1-09). Set a longer Slip Prevention Time in S1-15 (when not in Closed Loop Mode) Set a longer DC Injection time at stop (in Closed Loop Vector Control) *Refer to "Appendix I: Tuning Procedures".*
Brake slips at start.	Brake Release current, Torque (S1-05~08) setting is too high. V/f setting is too high.	Decrease the Brake Release Current / Torque (S1-05~08). Lower the V/f setting. *Refer to "Appendix I: Tuning Procedures".*
Brake slips when the drive has stopped.	Slip Prevention Time (S1-15) is too long Slip Prevention Frequency (S1-14) is set too high	Shorten the Slip Prevention Time (S1-15) Lower the Slip Prevention Frequency (S1-14) *Refer to "Appendix I: Tuning Procedures".*

Problem	Cause	Corrective Action
The drive fails to accelerate despite Stall Prevention During Accel being activated when speed is lost during acceleration.	Brake Delay Time (S1-04) is too long Accel Time setting is too short.	Shorten the Brake Delay Time (S1-04) Increase the acceleration time.
Slipping occurs during an abnormally early Inching Operation.	Drive Control / Brake Operation isn't following Inching Operations.	Increase the Run Command Minimum On-Time (S2-01, -02).
Drives stops *before* an impact although Impact Stop is enabled.	Impact Stop Detection Torque (S3-03, -04) is too low. Impact Stop Detection Time (S3-05) is too short.	Increase Impact Stop Detection Torque setting (S3-03, -04). Increase the Impact Stop Detection Time (S3-05)
At an Impact Stop, the drives keep operating at the Clip Frequency (Fcr).	・Impact Stop Detection Torque (S3-03, -04) is set too high. Motor torque fails to increase upon impact Impact Stop Clip Time (S3-02) is too long	Lower the Impact Stop Detection Torque setting (S3-03, -04). Check the friction on the load side (wheel slippage, etc). Impact Stop Clip Time (S3-02) is too short.
Speed increases despite a heavy load during Ultra Lift 1.	The value set in Ultra Lift 1 Detection Torque (S4-04, -05) is too high Ultra Lift 1Detection Time (S4-07) is too short.	Decrease the Ultra Lift Detection 1 Torque (S4-04, -05) setting. Increase the Ultra Lift 1 Detection Time (S4-07).
Hoisting of light load does not accelerate, although Ultra Lift 1 is enabled.	Ultra Lift 1 isn't activating. Ultra Lift 1 Detection Torque (S4-04, -05) is set too low. Mechanical loss is larger than Ultra Lift 1 Detection Torque (S4-05) when in reverse	Enable the Swift Lift 1 function. *See section 7.4, "Ultra Lift Function".* Increase the setting value for the Ultra Lift 1 Detection Torque (S4-04, -05) Adjust the Ultra Lift 1 Torque Bias (S4-19, -20). *See section 7.4.1 "Ultra Lift 1"*
Fault OPE24 has occurred.	Parameter setting error.	*See section 8*
Fault OL6 has occurred.	The accel time set to the drive is too short	Increase the acceleration time.
Speed increases despite a heavy load during Ultra Lift 2.	The Limit Starting Level / Hold Level (S4-09, -10) is set too high.	Lower the Limit Starting Level / Hold Level (S4-09, -10)
No acceleration when hoisting light loads, although Ultra Lift 2 is enabled.	Ultra Lift 2 is not activating. The Limit Starting Level / Hold Level (S4-09, -10) is set too low.	Enable the Ultra Lift 2 function *See section 7.4.2 "Ultra Lift 2".* Increase the Limit Starting Level / Hold Level (S4-09, -10)

Appendix I. Tuning Procedures

In this section, the tuning procedures for different operational situations are described.

Tuning During No-Load Testing

(1) There is fluctuation when hoisting

Increase the AFR Gain (n2-01). This parameter should be increased very gradually to reduce fluctuation. It is normally set between 1.0 and 2.0.

(2) There is fluctuation when lowering

Gradually increase the Brake Release Frequency REV (S1-02) and the Brake Delay Frequency (S1-03). Note that S1-02 must always be less than or equal to S1-03. The recommended maximum setting for S1-03 is 3.0 Hz. It may also be necessary to gradually increase the AFR Gain (n2-01).

Tuning when Testing at Rated Load

(1) At Stop, the load seems as if it may fall even though the brake is clamped shut

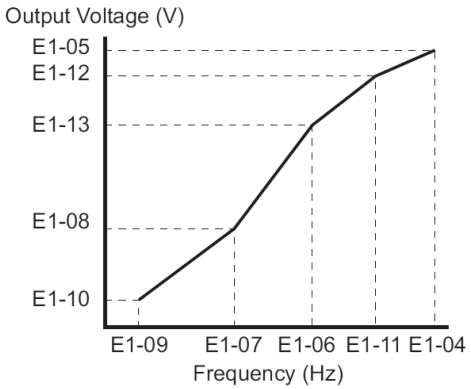
Adjust the brake sequence when stopping. This may require the modification of the FWD or REV Brake Hold Frequency (S1-12, -13), the Slip Prevention Frequency (S1-14) and/or the Slip Prevention Time (S1-15).

(2) The load slips

If the load slips or drops unexpectedly at start or stop, it may be necessary to modify the V/f pattern and/or the Torque Compensation parameter (S1-09) in order for the drive to produce enough torque to hold the load. Torque Compensation (S1-09) should be increased gradually and V/f parameters should be set as follows:

V/f Control Mode

E1-04 (F_{max})	=	Motor Max Output Frequency
E1-05 (V_{max})	=	Motor Rated Voltage
E1-06 (F_{base})	=	Motor Base Frequency
E1-07 (F_a)	=	Minimum Frequency to Obtain Required Torque
E1-08 (V_b)	=	Minimum Voltage to Obtain Required Torque
E1-09 (F_{min})	=	Up to 1.5 Hz
E1-10 (V_{min})	=	$\frac{(V_{\max} - V_b)}{(F_{base} - F_a)} \times (F_{\min} - F_{base}) + V_{\max}$
E1-11,-12,-13	=	Default Value
C4-01 (KT)	=	0.0



When motor data is unknown, use the following values for the V/f pattern:

E1-04 through -7	=	Default Values
E1-08 (V_b)	=	Default Value + (5 to 10 V)*
E1-09 (F_{min})	=	Default Value
E1-10 (V_{min})	=	Default Value + (5 to 10 V)*
C4-01 (KT)	=	1.0

* Increase the setting gradually. Double these values when using a 400 V Class drive.

Open Loop Vector (OLV) Control Mode

Perform Auto Tuning first. If load still slips, modify as follows.

E1-04 through -7	=	Default Values
E1-08 (V_b)	=	Default Value + (2 to 3 V)*
E1-09 (F_{min})	=	Default Value
E1-10 (V_{min})	=	Default Value + (2 to 3 V)*

* Increase the setting gradually. Double these values when using a 400 V Class drive.

In Closed Loop Vector (CLV) control mode, no modification to the V/f pattern is necessary.

(1) There is fluctuation when hoisting or lowering

Gradually increase the Torque Compensation Delay Time parameter C4-02 up to a maximum recommended value of 50ms. AFR Gain (n2-01) may need to be gradually increased, and the AFR Time Constant 1 (n2-02) may need to be increased if fluctuation occurs when hoisting or decreased if fluctuation occurs when lowering the load.

(2) There is excessive current when hoisting the load just after lowering it

Adjust the Run Command Delay Timer (S2-03) according to the formula in section 7.2.1.

Tuning when Testing at Overload

(1) The load sips when hoisting

Increase the Torque Compensation parameter (S1-09).

Tuning when Acceleration or Deceleration Times (C1-01 through -08) are Modified

When acceleration times are modified, FWD and REV Brake Hold Frequency (S1-12, -13), Slip Prevention Frequency (S1-14), and Slip Prevention Time (S1-15) may need to be modified.

Appendix II. Parameter Table

No.	Parameter Name	Default	Setting Value	No.	Parameter Name	Default	Setting Value
A1-00	***Language Selection***	1		C1-05	Accel Time 3	10.0	
A1-01	**Access Level**	2		C1-06	Decel Time 3	10.0	
A1-02	**Control Method Selectio**	2		C1-07	Accel Time 4	10.0	
A1-03	Intitalize Parameters	0000		C1-08	Decel Time 4	10.0	
A1-04	**Password 1**	0000		C1-09	Emergency Stop Time	10.0	
A1-05	***Password 2***	0000		C1-10	Accel/ Decel Time Setting Units	1	
A2-01 to A2-32	User Parameters	—		C1-11	Accel/ Decel Time Switching Frequency	0.0	
				C2-01	S-Curve Characteristic Time at Acceleration Start	0.20	
b1-01	Frequency Reference Selection	1		C2-02	S-Curve Characteristic Time at Acceleration End	0.20	
b1-02	Run Command Selection	1		C2-03	S-Curve Characteristic Time at Deceleration Start	0.20	
b1-03	Stopping Method	0		C2-04	S-Curve CharacteristicTime at Deceleration End	0.00	
b1-04	Reverse Prohibited Selection	0		C3-01	Slip Compensation Gain	1.0	
b1-05	**Operation Selection for Setting of E1-09 or less**	0		C3-02	Slip Compensation Primary Delay Time	200	
b1-06	***Read Sequence Input Twice***	1		C3-03	Slip Compensation Limit	200	
b1-14	Phase Order Selection	0		C3-04	Slip Compensation Selection During Regeneration	0	
b1-15	Frequency Reference Selection 2	0		C3-05	Output Voltage Limit Operation Selection	0	
b1-16	Run Command Selection 2	0		C3-21	Motor 2 Slip Compensation Gain	1.0	
b1-17	Run Command at Power Up	0		C3-22	Motor 2 Slip Compensation Primary Delay Time Constant	200	
b2-01	Zero Speed Level	0.5		C3-23	Motor 2 Slip Compensation Limit	200	
b2-02	DC Braking Current	50		C3-24	Motor 2 Slip Compensation Selection During Regeneration	0	
b2-03	DC Injection Braking Time at Start	0.00		C4-01	Torque Compensation Gain	1.00	
b2-04	DC Injection Braking Time at Stop	0.00		C4-02	Torque Compensation Primary Delay Time Constant	20	
b2-08	***Magnetic Flux Compensation Volume***	0		C4-06	Torque Compensation Primary Delay Time Constant 2	150	
b7-01	Droop Control Gain	0.0		C4-07	Motor 2 Torque Compensation Gain	1.00	
b7-02	Droop Control Delay Time	0.05		C5-01	ASR Proportional Gain 1 (P)	20.00	
b7-03	Droop Control Limit Selection	1		C5-02	ASR Integral Time 1 (I)	0.500	
b9-01	Zero Servo Gain	5		C5-03	ASR Proportional Gain 2 (P)	20.00	
b9-02	Zero Servo Completion Width	10		C5-04	ASR Integral Time 2 (I)	0.500	
C1-01	Accel Time 1	10.0		C5-05	ASR Limit	5.0	
C1-02	Decel Time 1	10.0		C5-06	ASR Primary Delay Time Constant	0.004	
C1-03	Accel Time 2	10.0		C5-07	ASR Gain Switch Frequency	0.0	
C1-04	Decel Time 2	10.0		C5-08	ASR Integral Limit	400	

No.	Parameter Name	Default	Setting Value	No.	Parameter Name	Default	Setting Value
C5-12	Integral Operation during Accel/Decel	0		d3-01	Jump Frequency 1	0.0	
C5-17	Motor Inertia	0.0015		d3-02	Jump Frequency 2	0.0	
C5-18	Load Inertia Ratio	1.0		d3-03	Jump Frequency 3	0.0	
C5-21	Motor 2 Speed Control Proportional Gain 1(P)	20.00		d3-04	Jump Frequency Width	1.0	
C5-22	Motor 2 Speed Control Integral Time 1(I)	0.500		d4-01	Frequency Reference Hold Function Selection	0	
C5-23	Motor 2 Speed Control Proportional Gain 2(P)	20.00		d4-03	Frequency Reference Bias Step (Up/Down 2)	0.00	
C5-24	Motor 2 ASR Integral Time 2 (I)	0.500		d4-04	Frequency Reference Bias Accel/Decel (Up/Down 2)	0	
C5-25	Motor 2 ASR Limit	5.0		d4-05	Frequency Reference Bias Operation Mode Selection	0	
C5-26	Motor 2 ASR Primary Delay Time Constant	0.004		d4-06	Frequency Reference Bias Value (Up/Down 2)	0.0	
C5-27	Motor 2 ASR Gain Switch Frequency	0.0		d4-07	Analog Frequency Reference Change Limit Level (Up/Down 2)	1.0	
C5-28	Motor 2 ASR Integral Limit	400		d4-08	Frequency Reference Bias Upper Limit Value (Up/Down 2)	100.0	
C5-32	Integral Operation during Accel/Decel for Motor 2	0		d4-09	Frequency Reference Bias Lower Limit Value (Up/Down 2)	0.0	
C5-37	Motor 2 Inertia	0.0015		d4-10	Up/Down Lower Limit Selection	0	
C5-38	Motor 2 Load Inertia Ratio	1.0		d7-01	Offset Frequency 1	0.0	
C6-01	Drive Duty Selection	0		d7-02	Offset Frequency 2	0.0	
C6-02	Carrier Frequency Selection	1		d7-03	Offset Frequency 3	0.0	
C6-03	Carrier Frequency Upper Limit	2.0		E1-01	Input Voltage Setting	200	
C6-04	Carrier Frequency Lower Limit	2.0		E1-03	V/f Pattern Selection	F	
C6-05	Carrier Frequency Proportional Gain	00		E1-04	Max Output Frequency (Fmax)	50.0	
d1-01	Frequency Reference 1	0.00		E1-05	Max Voltage (Vmax)	200.0	
d1-02	Frequency Reference 2	0.00		E1-06	Base Frequency (Fa)	50.0	
d1-03	Frequency Reference 3	0.00		E1-07	Mid Output Frequency (Fb)	3.0	
d1-04	Frequency Reference 4	0.00		E1-08	Mid Output Frequency Voltage (Vc)	14.4	
d1-05	Frequency Reference 5	0.00		E1-09	Minimum Output Frequency (Fmin)	0.5	
d1-06	Frequency Reference 6	0.00		E1-10	Minimum Output Frequency Voltage (Vmin)	3.0	
d1-07	Frequency Reference 7	0.00		E1-11	Mid Output Frequency 2	0.0	
d1-08	Frequency Reference 8	0.00		E1-12	Mid Output Frequency Voltage 2	0.0	
d1-17	Jog Frequency Reference	6.00		E1-13	Base Voltage (Vbase)	0.0	
d2-01	Frequency Reference Upper Limit Value	100.0		E2-01	Motor Rated Current	1.90	
d2-02	Frequency Reference Lower Limit Value	0.0		E2-02	Motor Rated Slip	2.90	
d2-03	Main Speed Reference Lower Limit Value	0.0		E2-03	Motor No-Load Current	1.20	

No.	Parameter Name	Default	Setting Value	No.	Parameter Name	Default	Setting Value
E2-04	Number of Motor Poles	4		F1-01	PG Pulses	1024	
E2-05	Motor Resistance Between Lines	9.842		F1-02	Operation Selection at PG Open Circuit (PGo)	1	
E2-06	Motor Leakage Inductance	18.2		F1-03	Operation Selection at Overspeed (oS)	1	
E2-07	Motor Iron Core Saturation Coefficient 1	0.50		F1-04	Operation Selection at Deviation	3	
E2-08	Motor Iron Core Saturation Coefficient 2	0.75		F1-05	PG 1 Rotation Selection	0	
E2-09	Motor Mechanical Loss	0.0		F1-06	PG 1 Division Rate	1	
E2-10	Motor Iron Loss for Torque Compensation	14		F1-07	Integral Value During Accel/Decel Selection	0	
E2-11	Motor Rated Power	0.40		F1-08	Overspeed Detection Level	115	
E3-01	Motor 2 Control Method	2		F1-09	Overspeed Detection Delay Time	0.0	
E3-04	Motor 2 Max Output Frequency	50.0		F1-10	Excessive Speed Deviation Detection Level	10	
E3-05	Motor 2 Max Voltage	200.0		F1-11	Excessive Speed Deviation Detection Delay Time	0.5	
E3-06	Motor 2 Base Frequency	50.0		F1-12	Number of PG 1 Gear Teeth 1	0	
E3-07	Motor 2 Mid Output Freq.	3.0		F1-13	Number of PG 1 Gear Teeth 2	0	
E3-08	Motor 2 Mid Output Freq. Voltage	14.4		F1-14	PG Open-Circuit Detection Time	2.0	
E3-09	Motor 2 Min. Output Freq.	0.5		F1-20	PG 1 Disconnect Detection	1	
E3-10	Motor 2 Min. Output Freq. Voltage	3.0		F1-21	PG 1 Signal Selection	0	
E3-11	Motor 2 Mid Output Frequency 2	0.0		F1-30	PG Card Option Port for Motor 2 Selection	1	
E3-12	Motor 2 Mid Output Frequency Voltage 2	0.0		F1-31	PG 2 Pulses Per Revolution	1024	
E3-13	Motor 2 Base Voltage	0.0		F1-32	PG 2 Rotation Selection	0	
E4-01	Motor 2 Rated Current	1.90		F1-33	PG 2 Gear Teeth 1	0	
E4-02	Motor 2 Rated Slip	2.90		F1-34	PG 2 Gear Teeth 2	0	
E4-03	Motor 2 Rated No-Load Current	1.20		F1-35	PG2 Division Rate for Pulse Monitor	1	
E4-04	Motor 2 Motor Poles	4		F1-36	PG2 Option Card Disconnect Detection	1	
E4-05	Motor 2 Line-to-Line Resistance	9.842		F1-37	PG 2 Signal Selection	0	
E4-06	Motor 2 Leakage Inductance	18.2		F2-01	Analog Command Option Card Operation Selection	0	
E4-07	Motor 2 Motor Iron-Core Saturation Coefficient 1	0.50		F2-02	Analog Input Option Card Gain	100.0	
E4-08	Motor 2 Motor Iron-Core Saturation Coefficient 2	0.75		F2-03	Analog Input Option Card Bias	0.0	
E4-09	Motor 2 Mechanical Loss	0.0		F3-01	Digital Input Option Card Selection	0	
E4-10	Motor 2 Iron Loss	14		F3-03	DI-A3 Data Bit Size	2	
E4-11	Motor 2 Rated Capacity	0.40		F4-01	Terminal V1 Monitor Selection	102	

No.	Parameter Name	Default	Setting Value	No.	Parameter Name	Default	Setting Value
F4-02	Terminal V1 Monitor Gain	100.0		H2-02	Terminal P1-PC Function Selection (photocoupler)	0	
F4-03	Terminal V2 Monitor Selection	103		H2-03	Terminal P2 Function Selection (photocoupler)	2	
F4-04	Terminal V2 Monitor Gain	50.0		H2-06	Estimated Power Pulse Output Unit Selection	0	
F4-05	Terminal V1 Monitor Bias	0.0		H3-01	Terminal A1 Signal Level Selection	0	
F4-06	Terminal V2 Monitor Bias	0.0		H3-02	Terminal A1 Function Selection	0	
F4-07	Terminal V1 Signal Level	0		H3-03	Terminal A1 Input Gain	100.0	
F4-08	Terminal V2 Signal Level	0		H3-04	Terminal A1 Input Bias	0.0	
F5-01	Terminal M1-M2 Output Selection	0		H3-05	Terminal A3 Signal Level Selection	0	
F5-02	Terminal M3-M4 Output Selection	1		H3-06	Terminal A3 Function Selection	2	
F5-03	Terminal P1-PC Output Selection	2		H3-07	Terminal A3 Input Gain	100.0	
F5-04	Terminal P2-PC Output Selection	4		H3-08	Terminal A3 Input Bias	0.0	
F5-05	Terminal P3-PC Output Selection	6		H3-09	Terminal A2 Signal Level Selection	2	
F5-06	Terminal P4-PC Output Selection	37		H3-10	Terminal A2 Function Selection	0	
F5-07	Terminal P5-PC Output Selection	F		H3-11	Terminal A2 Input Gain	100.0	
F5-08	Terminal P6-PC Output Selection	F		H3-12	Terminal A2 Input Bias	0.0	
F5-09	DO-A3 Output Mode Selection	0		H3-13	Analog Input Filter Time Constant	0.03	
F6-01	Communications Error Operation Selection	1		H3-14	Analog Input Terminal Enable Selection	7	
F6-02	Selection of External Fault from Communication Option Board	0		H3-16	Terminal A1 Tuning Offset	0	
F6-03	Stopping Method for External Fault from Communication Option Board	1		H3-17	Terminal A2 Tuning Offset	0	
F6-04	Trace Sampling from Communications Option Board			H3-18	Terminal A3 Tuning Offset	0	
F6-06	Torque Reference/Torque Limit Selection from Communications Option			H4-01	Terminal FM Monitor Selection	102	
F6-07	NetRef/ComRef Selection	2.0		H4-02	Terminal FM Output Gain	100.0	
F6-08	Reset Communication Parameters	0		H4-03	Terminal FM Bias	0.0	
H1-01	Terminal S1 Function Selection	0		H4-04	Terminal AM Monitor	103	
H1-02	Terminal S2 Function Selection	0		H4-05	Terminal AM Gain	50.0	
H1-03	Terminal S3 Function Selection	40		H4-06	Terminal AM Bias	0.0	
H1-04	Terminal S4 Function Selection	41		H4-07	Terminal FM Signal Level Selection	0	
H1-05	Terminal S5 Function Selection	24		H4-08	Terminal AM Signal Level Selection	0	
H1-06	Terminal S6 Function Selection	14		H5-01	Node Address	1f	
H1-07	Terminal S7 Function Selection	0		H5-02	Communication Speed Selection	3	
H1-08	Terminal S8 Function Selection	9		H5-03	Communication Parity Selection	0	
H2-01	Terminal M1-M2 Function Selection (Relay)	21		H5-04	Stopping Method After Communication Error (CE)	3	

No.	Parameter Name	Default	Setting Value	No.	Parameter Name	Default	Setting Value
H5-05	Conmm. Faulte Detection Selection	1		L3-20	DC Bus Voltage Tuning Gain	0.30	
H5-06	Drive Transmit Wait Time	5		L3-21	Accel/Decel Rate Calculation Gain	1.00	
H5-07	RTS Control Selection	1		L3-23	Automatic Reduction Selection for Stall Prevention during Run	0	
H5-09	Communication Error Detection Time	2.0		L3-24	Motor Acceleration Time for Inertia Calculations	0.178	
H5-10	Unit Selection for MEMOBUS/Modbus Register 0025H	0		L3-25	Load Inertia Ratio	1.0	
H5-11	Communications ENTER Function Selection	0		L3-26	Additional DC Bus Capacitors	0	
H5-12	Run Command Method Selection	0		L3-27	Stall Prevention Detection Time	50	
H6-01	Pulse Train Input Function Selection	0		L4-01	Frequency Detection Level	0.0	
H6-02	Pulse Train Input Scaling	1440		L4-02	Frequency Detection Width	2.0	
H6-03	Pulse Train Input Gain	100.0		L4-03	Frequency Detection Level (+/ －)	0.0	
H6-04	Pulse Train Input Bias	0.0		L4-04	Frequency Detection Width (+/ －)	2.0	
H6-05	Pulse Train Input Filter Time	0.10		L4-05	Frequency Reference Loss Detection Selection	0	
H6-06	Pulse Train Monitor Selection	102		L4-06	Frequency Reference at Reference Loss	80.0	
H6-07	Pulse Train Monitor Scaling	1440		L4-07	Speed Agreement Detection Selection	0	
H6-08	Pulse Train Input Minimum Frequency	0.5		L7-01	Forward Torque Limit	200	
L1-01	Motor Protection Function Selection	1		L7-02	Reverse Torque Limit	200	
L1-02	Motor Protection Operation Time	1.0		L7-03	Forward Regenerative Torque Limit	200	
L1-03	Motor Overheat Alarm Operation Selection (PTC input)	3		L7-04	Reverse Regenerative Torque Limit	200	
L1-04	Motor Overheat Operation Selection	1		L7-06	Torque Limit Integral Time Constant	200	
L1-05	Motor Temperature Input Filter Time Constant	0.20		L7-07	Torque Limit Control Method Selection during Accel/Decel	0	
L1-13	Continuous Electrothermal Operation Selection	1		L8-01	Internal Dynamic Braking Resistor Protection Selection (ERF type)	0	
L2-05	DC Bus Undervoltage Detection Level	190		L8-02	Overheat Alarm Level	115	
L3-01	Stall Prevention Selection during Acceleration	1		L8-03	Overheat Pre-Alarm Operation Selection	3	
L3-02	Stall Prevention Level during Acceleration	150		L8-05	Input Phase Protection Selection	1	
L3-03	Stall Prevention Limit during Acceleration	50		L8-07	Output Phase Protection Selection	1	
L3-04	Stall Prevention Selection during Deceleration	0		L8-08	Output Phase Detection Level	5.0	
L3-05	Stall Prevention Selection during Run	1		L8-09	Ground Protection Selection	1	
L3-06	Stall Prevention Level during Run	160		L8-10	Heatsink Cooling Fan Operation Selection	0	
L3-11	Overvoltage Suppression Function Selection	0		L8-11	Heatsink Cooling Fan Off Delay Time	60	
L3-17	Target DC Bus Voltage for Overvoltage Suppression and Stall Prevention	375v		L8-12	Ambient Temperature Setting	40	

No.	Parameter Name	Default	Setting Value	No.	Parameter Name	Default	Setting Value
L8-15	oL2 Characteristics Selection at Low Speeds	1		o2-02	STOP Key Function Selection	1	
L8-18	Software Current Limit	0		o2-03	User Parameter Default Value	0	
L8-19	Frequency Reduction Rate during Overheat Pre-Alarm	0.8		o2-04	Drive Model Selection	0	
L8-32	MC, Fan Power Supply Fault Selection	1		o2-05	Frequency Reference Setting Method Selection	0	
L8-35	Installation Method Selection	2		o2-06	Operation Selection when Digital Operator is Disconnected	0	
L8-38	Carrier Frequency Reduction Selection	2		o2-07	Motor Direction at Power Up when Using Operator	0	
L8-40	Carrier Frequency Redcution Off Delay Time	0.50		o3-01	Copy Function Selection	0	
L8-41	Current Alarm Selection	1		o3-02	Copy Allowed Selection	0	
L8-55	Internal Braking Transistor Protection	1		o4-01	Cumulative Operation Time Setting	0	
n1-01	Hunting Prevention Function Selection	1		o4-02	Cumulative Operation Time Selection	0	
n1-02	Hunting Prevention Gain	1.00		o4-03	Cooling Fan Operation Time Setting	0	
n1-03	Hunting Prevention Time Constant	10		o4-05	Capacitor Maintenance Setting	0	
n1-05	Hunting Prevention Gain While in Reverse	0.00		o4-07	DC Bus Pre-charge Relay Maintenance Setting	0	
n2-01	Speed Feedback Detection Suppression (AFR)Gain	1.00		o4-09	IGBT Maintenance Setting	0	
n2-02	Speed Feedback Detection Suppression (AFR)Time Constant	50		o4-11	U2,U3 Initialize Selection	0	
n2-03	Speed Feedback Detection Suppression (AFR)Time Constant 2	750		o4-12	kWh Monitor Initialization	0	
n3-13	Overexcitation Gain	1.10		o4-13	Number of Run Commands Counter Initialization	0	
n3-14	High Frequency Injection during Overexcitation Deceleration	0		S1-01	Brake Release Frequency (FWD)	2.0	
n3-21	High-Slip Suppression Current Level	100		S1-02	Brake Release Frequency (REV)	2.0	
n3-23	Overexcitation Operation Selection	0		S1-03	Brake Delay Frequency	3.0	
n5-01	Feed Forward Control Selection	0		S1-04	Brake Delay Time	0.30	
n5-02	Motor Accel Time	0.178		S1-05	Brake Release Current (FWD)	50	
n5-03	Feed Forward Control Proportional Gain	1.00		S1-06	Brake Release Current (REV)	30	
n6-01	Online Tuning Selection	0		S1-07	Brake Release Torque (FWD)	100	
n6-05	Online Tuning Gain	1.0		S1-08	Brake Release Torque (REV)	0	
o1-01	Drive Mode Unit Monitor Selection	106		S1-09	Torque Compensation (FWD)	50	
o1-02	User Monitor Selection after Power Up	1		S1-10	Torque Compensation (REV)	0	
o1-03	Digital Operator Display Selection	0		S1-11	Torque Compensation Delay Time	50	
o1-04	V/f Pattern Display Unit	0		S1-12	Brake Hold Frequency (FWD)	3.0	
o1-10	User-Set Display Units Maximum Value	5000		S1-13	Brake Hold Frequency (REV)	3.0	
o1-11	User-Set Display Units Decimal Display	2		S1-14	Slip Prevention Frequency	3.0	

No.	Parameter Name	Default	Setting Value
S1-15	Slip Prevention Time	0.30	
S1-16	Sequence Fault SE1 Detection Time	0.30	
S1-17	Sequence Fault SE2 Detection Time	1.00	
S1-18	Sequence Fault SE3 Detection Time	0.50	
S1-19	Sequence Fault SE4 Detection Time	0.50	
S1-20	Operation in Reverse	0	
S2-01	Run Command Minimum On Time (FWD)	0.00	
S2-02	Run Command Minimum On Time (REV)	0.00	
S2-03	Run Command Delay Timer (Reverse Forward)	0.00	
S3-01	Impact Stop Creep Frequency	3.0	
S3-02	Impact Stop Creep Frequency	10.0	
S3-03	Impact Stop Detection Torque (FWD)	100	
S3-04	Impact Stop Detection Torque (REV)	100	
S3-05	Impact Stop Detection Time	0.3	
S4-01	Swift Lift Control Selection	0	
S4-02	Swift Lift 1 Max. Frequency (FWD)	60.0	
S4-03	Swift Lift 1 Max. Frequency (REV)	60.0	
S4-04	Swift Lift 1 Detection Torque (FWD)	50	
S4-05	Swift Lift 1 Detection Torque (REV)	50	
S4-06	Swift Lift 1 Detection Frequency	60.0	
S4-07	Swift Lift 1 Detection Time	1.0	
S4-08	Swift Lift 2 Activation Frequency	50	
S4-09	Swift Lift 2 Motoring Limit Start Level	50	
S4-10	Swift Lift 2 Motoring Hold Level	100	
S4-11	Swift Lift 2 Regen Limit Start Level	10	
S4-12	Swift Lift 2 Regen Hold Level	100	
S4-13	Swift Lift 2 Limit Timer	1.0	
S4-14	Swift Lift 2 Fault Operation Selection	2	
S4-15	Swift Lift 2 Fault Detection Level	150	
S4-16	Swift Lift 2 Fault Detection Time	0.1	
S4-17	Swift Lift 2 Accel Time Gain	2.0	
S4-18	Swift Lift 2 Operation Selection during Regeneration	0	
S4-19	Swift Lift 1 Torque Bias (FWD)	0.0	
S4-20	Swift Lift 1 Torque Bias (REV)	0.0	
S5-01	Overload Detection Operation Selection 1	0	
S5-02	Overload Detection Torque 1	150	
S5-03	Overload Detection Time 1	0.1	
S5-04	Overload Detection Operation Selection 2	0	
S5-05	Overload Detection Torque 2	150	
S5-06	Overload Detection Time 2	0.1	
S6-01	Overtorque Detection Operation Selection 1	0	
S6-02	Overtorque Detection Level 1	150	
S6-03	Overtorque Detection Time 1	0.1	
S6-04	Overtorque Detection Operation Selection 2	0	
S6-05	Overtorque Detection Level 2	150	
S6-06	Overtorque Detection Time 2	0.1	

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