YASKAWA

GA800 DRIVE

CUSTOM SOFTWARE SUPPLEMENT

HIGH FREQUENCY (2000 Hz)

DRIVE MODELS:

GA80Uxxxxxxx
Three-Phase 200 V Class: 0.75 to 150 HP
Three-Phase 400 V Class: 0.75 to 300 HP

SOFTWARE NUMBER:

VSAA0920X

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1 Preface and Safety

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◆ Applicable Documents

This Supplement provides information specific to High Frequency software functions. Refer to Table 1.1 for all other GA800 drive product instructions.

Table 1.1 Standard GA800 Product Instructions

Drive Series	Document
GA800	Installation & Primary Operation (TOEPC71061737)
	Technical Reference (SIEPC71061737)
	Quick Setup Procedure (TOEPC71061748 and TOEPC71061750)

◆ Supplemental Safety Information

Read and understand this manual and the GA800 Installation & Primary Operation manual before you install, operate, or do maintenance on this drive. Install the drive as specified by the GA800 Installation & Primary Operation manual and local codes. Observe all safety messages in this manual and the standard drive manuals.

This supplement describes the effects of the High Frequency custom software on the standard drive parameters and functions.

- Custom software adds functionality to a standard AC drive to enhance or enable use in a specific application.
- The software is loaded to the flash ROM area of the control board, and replaces the standard drive software.

◆ Obtaining Support

You must provide the unique part number shown on the drive nameplate when you want Yaskawa support for a drive with custom software.

The custom software described in this supplement is flashed to the control board memory and the operation of parameters, functions, and monitors are different than the standard drive software.

Refer to Yaskawa office locations listed on the back cover of this supplement for contact information.

2 Product Overview

◆ About this Product

This custom software is designed for high frequency motor applications. The drive's maximum output frequency can be set up to 1000 Hz or 2000 Hz, depending on the drive model. Non-applicable drive functions are deleted to optimize CPU processing time for this software.

◆ Applicable Models

This custom software is available for the GA800 drive models in Table 2.1.

Table 2.1 Applicable Models

Voltage Class	Models	Software Version
Three-Phase 200 V	GA80U2004xxx-056 to GA80U2415xxx-056	VSAA0920X
Three-Phase 400 V	GA80U4002xxx-056 to GA80U4414xxx-056	VSAA0920X

3 Modifications from Standard Software

Changed Item	High Frequency Software	Standard Software
Maximum Output Frequency	2000 Hz: Models 2004 to 2138 and 4002 to 4103 1000 Hz: Models 2169 to 2415 and 4140 to 4414	590 Hz
Setting unit for all frequency-related parameters	0.1 Hz	0.01 Hz
Frequency reference and output frequency display units (Also affects MEMOBUS registers 0002, 0023, and 0024)	o1-03 parameter (same as b5-20) 0: 0.01 Hz 1: 0.01% (100% = E1-04) 3: User Units (o1-10 & o1-11)	o1-03 parameter (same as b5-20) 0: 0.01 Hz 1: 0.01% (100% = E1-04) 2: min^{-1} (r/min) units 3: User Units (o1-10 & o1-11)
Control Method (A1-02)	0: V/f Control 3: Closed Loop Vector (Control mode online switching) 5: PM Open Loop Vector	0: V/f Control 1: V/f Control w/ PG 2: Open Loop Vector 3: Closed Loop Vector 4: Advanced Open Loop Vector 5: PM Open Loop Vector 6: PM Advanced Open Loop Vector 7: PM Closed Loop Vector 8: EZ Vector Control
Torque Boost	Enabled only at low speeds.	Constant throughout the entire frequency range.
Carrier Frequency (C6-04, C6-05)	Parameters are available in V/f Control and PM Open Loop Vector.	Parameters are available in V/f Control.
PM motor parameter settings	Number of digits past the decimal point are: E5-05 (PM Motor Resistance (ohms/phase)): 4 digits E5-06 (PM d-axis Inductance (mH/phase)): 3 digits E5-07 (PM q-axis Inductance (mH/phase)): 3 digits E5-09 (PM Back-EMF Vpeak (mV/ (rad/s))): 2 digits E5-24 (PM Back-EMF L-L Vrms (mV/rpm)): 2 digits	Number of digits past the decimal point are: E5-05 (PM Motor Resistance (ohms/phase)): 3 digits E5-06 (PM d-axis Inductance (mH/phase)): 2 digits E5-07 (PM q-axis Inductance (mH/phase)): 2 digits E5-09 (PM Back-EMF Vpeak (mV/ (rad/s))): 1 digit E5-24 (PM Back-EMF L-L Vrms (mV/rpm)): 1 digit
Torque Detection (L6-02, L6-05)	In Closed Loop Vector control, it is detected by the value of the current.	In Closed Loop Vector control, it is detected by the value of torque.
Special adjustment: added functions	S1-02: Polarity Level Disable S1-04: Adjustment Gain for Current Monitor S1-05: Filter Time Constant for Output Power Monitor S1-07: Current Detection Timing Adjustment S1-08: Voltage Output Timing Adjustment S1-10: Carrier Synchronization Method Selection Only for Closed Loop Vector Control: S2-01: Control Mode Switch Frequency S2-02: Control Mode Switch Hysteresis Width S2-05: Slip Compensation Gain at Hi-Speed S2-06: Slip Compensation Primary Delay Time at Hi-Speed S2-07: Slip Compensation Limit at Hi- Speed S2-08: Slip Compensation Selection during Regeneration at Hi-Speed S2-11: Control Mode Switch Frequency 2 S2-12: Control Mode Switch Hysteresis Width 2 S2-15: Motor 2 Slip Compensation Gain at Hi-Speed S2-16: Motor 2 Slip Compensation Primary Delay Time at Hi-Speed S2-17: Motor 2 Slip Compensation Limit at Hi-Speed S2-18: Motor 2 Slip Compensation Selection during	-

Changed Item	High Frequency Software	Standard Software
Parameters available for Closed Loop Vector control (Online Control Mode Switch Function)	C4-xx: Torque Compensation E1-xx: V/f Pattern for Motor1 E3-xx: V/f Pattern for Motor2 n1-xx: Hunting Prevention	Not available in Closed Loop Vector control.
Deleted functions	A1-06: Application Preset b3-xx: Speed Search b7-xx: Droop Control b8-xx: Energy Saving Control d5-xx: Torque Control d6-xx: Field Forcing E5-01: PM Motor Code Selection L2-xx: KEB, Power Loss Ride Through (deleted only for Closed Loop Vector Control) L3-xx: Overvoltage Suppression Current Limit Acceleration Suppression L5-xx: Fault restart n3-xx: Overexcitation Braking, High Slip Braking n5-xx: Feed Forward Control o1-04: V/f Pattern Display Unit	-

4 General Precautions

- Select the appropriate drive capacity for your motor.
- Use only devices designed specifically for operation with a PWM drive.
- For operation in PM Open Loop Vector Control, contact Yaskawa for consultation.
- Foreign Exchange and Foreign Trade Regulations. Follow all procedures and submit all relevant documentation according to any and all rules, regulations, and laws that may apply.

5 Modified Parameters

◆ Additional Parameters, Monitors, and Registers

Table 5.1 Added Parameters

Parameter (Hex.)	Name	Range	Default
S1-02 (0681)	Polarity Level Disable	0: Disabled, 1: Enabled	1
S1-04 (0683)	Adjustment Gain for Current Monitor	0.00 - 2.00	1.00
S1-05 (0684)	Filter Time Constant for Output Power Monitor	0.00 - 5.00 s	0.00 s
S1-07 (0686)	Current Detection Timing Adjustment	-2.00 - +2.00	0.00
S1-08 (0687)	Voltage Output Timing Adjustment	-2.00 - +2.00	0.00
S1-10 (0689)	Carrier Synchronization Method Selection	0, 1	0
S2-01 (0691)	Control Mode Switch Frequency	0 - 400 Hz	0 Hz
S2-02 (0692)	Control Mode Switch Hysteresis Width	2 - 100 Hz	20 Hz
S2-05 (0695)	Slip Compensation Gain at Hi-Speed	0.0 - 2.5	0.0
S2-06 (0696)	Slip Compensation Primary Delay Time at Hi-Speed	0 - 10000 ms	2000 ms
S2-07 (0697)	Slip Compensation Limit at Hi-Speed	0 - 250%	200%

Parameter (Hex.)	Name	Range	Default
S2-08 (0698)	Slip Compensation Selection during Regeneration at Hi Speed	0 - 2	0
S2-11 (0699)	Motor2 Control Mode Switch Frequency	0 - 400 Hz	0 Hz
S2-12 (069A)	Motor2 Control Mode Switch Hysteresis Width	2 - 100 Hz	20 Hz
S2-15 (069D)	Motor2 Slip Compensation Gain at Hi-Speed	0.0 - 2.5	0.0
S2-16 (069E)	Motor2 Slip Compensation Primary Delay Time	0 - 10000 ms	2000 ms
S2-17 (069F)	Motor2 Slip Compensation Limit at Hi-Speed	0 - 250%	200%
S2-18 (06A0)	Motor2 Slip Compensation Selection during Regeneration at Hi Speed	0 - 2	0

Table 5.2 Modified Parameter Setting Ranges

Parameter	Name	Range
A1-02	Control Method Selection	0, 3, 5
b5-20	PID Unit Selection	0, 1, 3
C6-02	Carrier Frequency Selection	F
E3-01	Motor 2 Control Mode Selection	3
E5-01	PM Motor Code Selection	FFFF
E5-05	PM Motor Resistance (ohms/phase)	0.0000 - 6.5000 Ω
E5-06	PM d-axis Inductance (mH/phase)	0.000 - 65.000 mH
E5-07	PM q-axis Inductance (mH/phase)	0.000 - 65.000 mH
E5-09	PM Back-EMF Vpeak (mV/ (rad/s))	0.00 - 650.00 mV/(rad/sec)
E5-24	PM Back-EMF L-L Vrms (mV/rpm)	0.00 - 650.00 mV/min^{-1}
L2-01	Momentary Power Loss Operation Selection	0, 1, 2
L3-01	Stall Prevent Select during Acceleration	0, 1
L3-02	Stall Prevent Level during Acceleration	0 - 170%
L3-04	Stall Prevention during Deceleration	0, 1, 3
o1-03	Frequency Display Unit Selection	0, 1, 3

Table 5.3 Parameters with Modified Defaults

Parameter	Name	Setting Range	Setting Unit	Default Value
A1-02	Control Method Selection	0, 3, 5	-	0
C6-02	Carrier Frequency Selection	F	-	F
C6-03	Carrier Frequency Upper Limit	1.0 - 15.0	kHz	10.0
C6-04	Carrier Frequency Lower Limit	1.0 - 15.0	kHz	1.1
C6-05	Carrier Freq Proportional Gain	0 - 99	-	12
E3-04	Motor 2 Maximum Output Frequency	3	-	3
E5-01	PM Motor Code Selection	FFFF	-	FFFF

Table 5.4 Parameters with Modified Upper Limits

Parameter	Name	Setting Range	Setting Unit	Default Value
b5-15	PID Sleep Function Start Level	0.0 - 2000.0	0.1 Hz	0.0 Hz
b6-01	Dwell Reference at Start	0.0 - 2000.0	0.1 Hz	0.0 Hz
b6-03	Dwell Reference at Stop	0.0 - 2000.0	0.1 Hz	0.0 Hz

Parameter	Name	Setting Range	Setting Unit	Default Value
C1-11	Accel/Decel Time Switchover Freq	0.0 - 2000.0	0.1 Hz	0.0 Hz
C5-07	ASR Gain Switchover Frequency	0.0 - 2000.0	0.1 Hz	0.0 Hz
d1-01	Reference 1	0.0 - 2000.0	0.1 Hz	0.0 Hz
d1-02	Reference 2	0.0 - 2000.0	0.1 Hz	0.0 Hz
d1-03	Reference 3	0.0 - 2000.0	0.1 Hz	0.0 Hz
d1-04	Reference 4	0.0 - 2000.0	0.1 Hz	0.0 Hz
d1-05	Reference 5	0.0 - 2000.0	0.1 Hz	0.0 Hz
d1-06	Reference 6	0.0 - 2000.0	0.1 Hz	0.0 Hz
d1-07	Reference 7	0.0 - 2000.0	0.1 Hz	0.0 Hz
d1-08	Reference 8	0.0 - 2000.0	0.1 Hz	0.0 Hz
d1-09	Reference 9	0.0 - 2000.0	0.1 Hz	0.0 Hz
d1-10	Reference 10	0.0 - 2000.0	0.1 Hz	0.0 Hz
d1-11	Reference 11	0.0 - 2000.0	0.1 Hz	0.0 Hz
d1-12	Reference 12	0.0 - 2000.0	0.1 Hz	0.0 Hz
d1-13	Reference 13	0.0 - 2000.0	0.1 Hz	0.0 Hz
d1-14	Reference 14	0.0 - 2000.0	0.1 Hz	0.0 Hz
d1-15	Reference 15	0.0 - 2000.0	0.1 Hz	0.0 Hz
d1-16	Reference 16	0.0 - 2000.0	0.1 Hz	0.0 Hz
d1-17	Jog Reference	0.0 - 2000.0	0.1 Hz	6.0 Hz
d3-01	Jump Frequency 1	0.0 - 2000.0	0.1 Hz	0.0 Hz
d3-02	Jump Frequency 2	0.0 - 2000.0	0.1 Hz	0.0 Hz
d3-03	Jump Frequency 3	0.0 - 2000.0	0.1 Hz	0.0 Hz
d3-04	Jump Frequency Width	0.0 - 2000.0	0.1 Hz	1.0 Hz
d6-02	Field Weakening Frequency Limit	0.0 - 2000.0	0.1 Hz	0.0 Hz
E1-04	Maximum Output Frequency	40.0 - 2000.0	0.1 Hz	60.0 Hz
E1-06	Base Frequency	0.0 - 2000.0	0.1 Hz	60.0 Hz
E1-07	Mid Point A Frequency	0.0 - 2000.0	0.1 Hz	3.0 Hz
E1-09	Minimum Output Frequency	0.0 - 2000.0	0.1 Hz	1.5 Hz
E1-11	Mid Point B Frequency	0.0 - 2000.0	0.1 Hz	0.0 Hz
E3-04	Motor2 Maximum Output Frequency	40.0 - 2000.0	0.1 Hz	60.0 Hz
E3-06	Motor2 Base Frequency	0.0 - 2000.0	0.1 Hz	60.0 Hz
E3-07	Motor2 Mid Point A Frequency	0.0 - 2000.0	0.1 Hz	3.0 Hz
E3-09	Motor2 Mid Point B Frequency	0.0 - 2000.0	0.1 Hz	1.5 Hz
E3-11	Motor2 Minimum Output Frequency	0.0 - 2000.0	0.1 Hz	0.0 Hz
L4-01	Speed Agree Detection Level	0.0 - 2000.0	0.1 Hz	0.0 Hz
L4-03	Speed Agree Detection Level (+/-)	-2000.0 - +2000.0	1 Hz	0 Hz

Table 5.5 Deleted MEMOBUS/Modbus Registers

Register No.	Name	Revised Content
003E	Output Frequency	Deleted
00AC	U1-05 (Motor Speed)	Deleted
00B5	U1-16 (SFS Output Frequency)	Deleted
00B7	Frequency Reference Monitor	Deleted

Table 5.6 Deleted Parameters from Standard Software

Parameter	Name
A1-06	Application Preset
b3-06	Speed Estimation Current Level 1
b3-05	Speed Search Delay Time
b3-07	Speed Estimation Current Level 2
b3-08	Speed Estimation ACR P Gain
b3-09	Speed Estimation ACR I Time
b3-10	Speed Estimation Detection Gain
b3-24	Speed Search Method Selection
b3-25	Speed Search Wait Time
b3-26	Direction Determination Level
b3-35	Low Back EMF Detection Level
b3-36	High Back EMF Detection Level
b7-xx	Droop Control
b8-01	Energy Saving Control Selection
b8-02	Energy Saving Gain
b8-03	Energy Saving Filter Time
b8-04	Energy Saving Coefficient Value
b8-05	Power Detection Filter Time
b8-06	Search Operation Voltage Limit
b8-16	PM E-Save Coefficient Ki
b8-17	PM E-Save Coefficient Kt
b8-18	E-Save d-axis Current FilterTime
C3-28	Adaptive Slip Control Mode
d5-xx	Torque Control
d6-xx	Field Forcing
L2-xx	Power Loss Ride Through Select (delete only for closed loop vector control)
L2-06	Kinetic Energy Backup Decel Time
L2-07	Kinetic Energy Backup Accel Time
L2-08	Frequency Gain at KEB Start
L2-09	KEB Minimum Frequency Level
L2-10	Minimum KEB Time
L2-11	KEB DC Bus Voltage Setpoint
L2-29	Kinetic Energy Backup Method
L2-30	KEB Zero Speed Operation
L2-31	KEB Start Voltage Offset Level
L3-11	Overvoltage Suppression Select
L3-17	DC Bus Reg Level
L3-20	DC Bus Voltage Adjustment Gain
L3-21	OVSuppression Accel/Decel P Gain
L3-24	Motor Accel Time@ Rated Torque
L3-25	Load Inertia Ratio
L3-35	Speed Agree Width for Auto Decel

Parameter	Name
L3-36	VibraSuppression Gain duringAccel
L3-37	Current Limit P Gain @ Accel
L3-38	Current Limit I Time @ Accel
L3-39	CurlimIntegTime Con duringAcc/Dec
L3-40	CurlimMaxScurve Sel duringAcc/Dec
L5-xx	Fault Reset (*Deleted only for Closed Loop Vector control)
n3-xx	High Slip Braking/ Overexcitation Deceleration parameter
n5-xx	Feed Forward Control
o1-04	V/f Pattern Display Unit

Table 5.7 Deleted Multi-function Digital Inputs (H1-xx) and Outputs (H2-xx)

Setting	Name
H1-xx = 65	KEB Ride-Thru 1 (N.C.)
H1-xx = 66	KEB Ride-Thru 1 (N.O.)
H1-xx = 68, 168	High Slip Braking (HSB)
H1-xx = 7A	KEB Ride-Thru 2 (N.C.)
H1-xx = 7B	KEB Ride-Thru 2 (N.O.)
H2-xx = 4A, 14A	During KEB Ride-Thru

Table 5.8 Added Multi-Function Digital Output (H2-xx) Setting Values

Setting	Name
H2-xx = 50	Control Mode

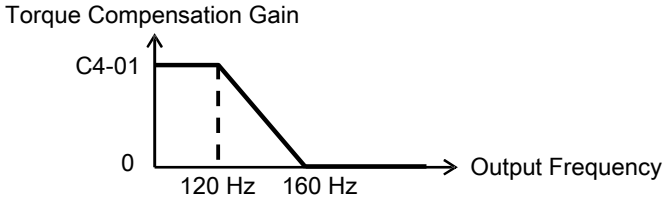
Table 5.9 Added Parameter Setting Errors

Setting	Name
oPE21	Control Mode Switch Frequency Setting Error

6 Details for New and Modified Software Functions

◆ Torque Compensation Function

Decrease *C4-01 [Torque Compensation Gain]* according to the output frequency as shown below:



◆ Notes for Auto-Tuning in PM Open Loop Vector

For SPM motors with a small difference in d-axis inductance *[E5-06]* and q-axis inductance *[E5-07]*, set *S1-02= 0 [Polarity Level Disable = Disabled]* before you start Auto-Tuning.

For motors where there is a larger difference in d-axis inductance *[E5-06]* and q-axis inductance *[E5-07]*, decrease *n8-84 [Polarity Detection Current]* before you start to Auto-Tuning if there is a relatively low amount of motor armature resistance *[E5-05]*.

Note:

Because of unique design of high frequency motors, Auto-Tuning may not be sufficient for the drive to achieve proper performance with the motor. Set motor parameters *[E5-xx]* manually using to the information on the motor nameplate.

◆ Adjustment Gain for Current Monitor (S1-04)

Normally, it is not necessary to change the default setting of *S1-04 [Adjustment Gain for Current Monitor]*. However, due to the influence of high-frequency noise, the value displayed on *U1-03 [Output Current]* may differ from the actual measured value obtained using a clamp meter. If adjustment is required, use *S1-04* to align the monitor value more closely with the measured current.

◆ Filter Time Constant for Output Power Monitor (S1-05)

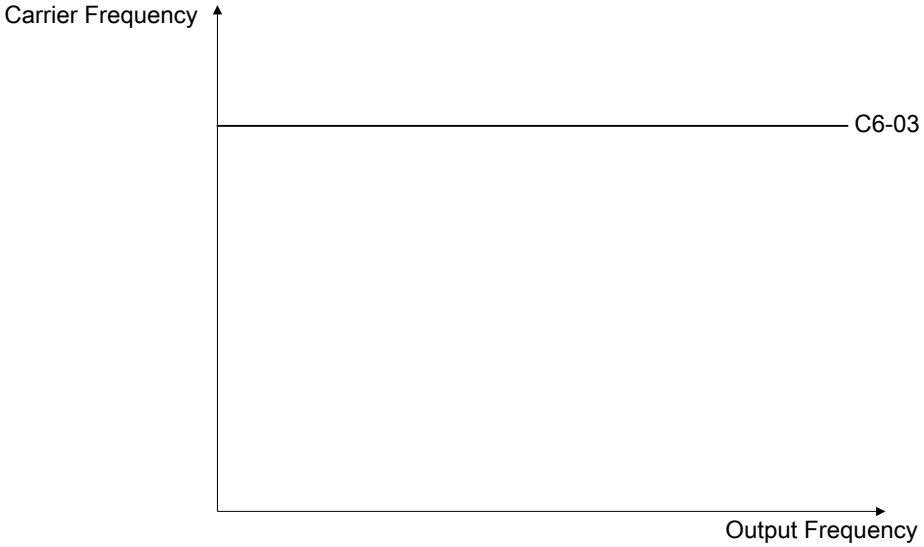
Parameter *S1-05* filters the output power monitor *U1-08 [Output Power]*. Set this parameter if the *U1-08* monitor fluctuates during high frequency operation.

◆ Current Detection Timing Adjustment (S1-07), Voltage Output Timing Adjustment (S1-08)

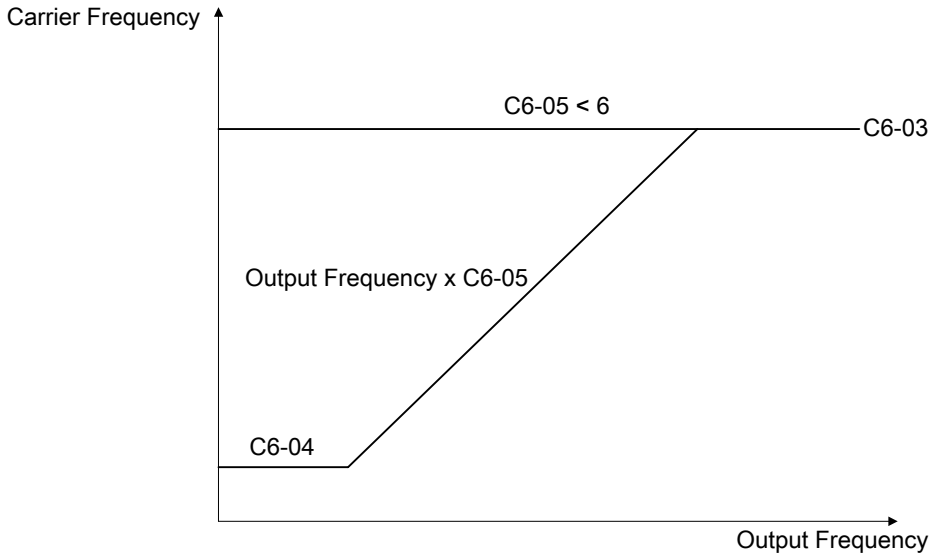
Refer to *Parameter Adjustment for PM Motors on page 14* for more information.

◆ Carrier Synchronization Method Selection (S1-10)

The figure below shows setting a Variable Carrier Frequency in Relation to Output Frequency (Applicable when *S1-10 [Carrier Synchronization Method Selection]* is set to 0).

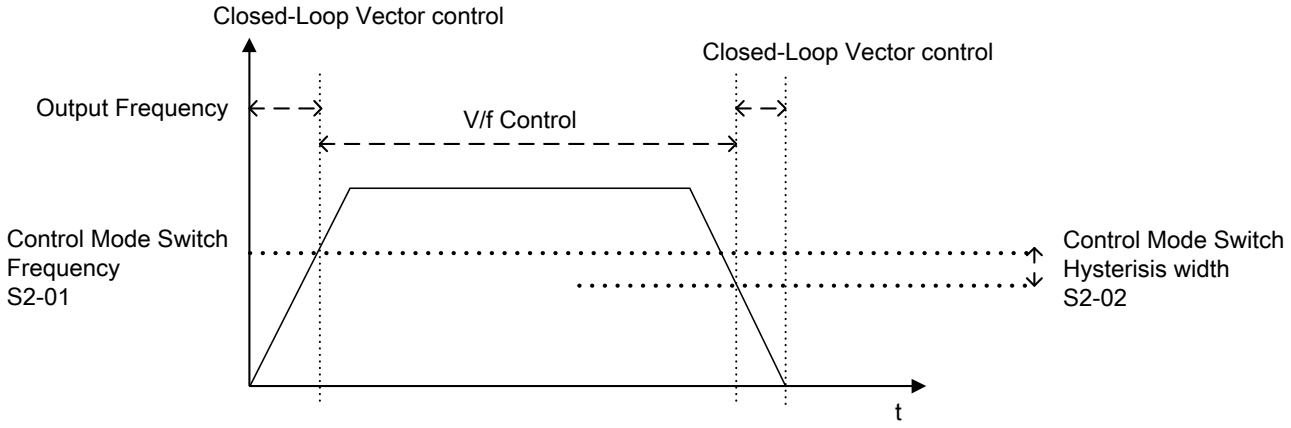


The figure below shows setting a Variable Carrier Frequency in Synchronization with Output Frequency (Applicable when *S1-10 [Carrier Synchronization Method Selection]* is set to 1).



◆ Online Control Mode Switch Function

This software can switch between Closed Loop Vector control and V/f control during run. At Low-Speed, the drive will run in Closed Loop Vector control and automatically switch to V/f control when the output is above the set frequency.



The following parameters are configurable only when *A1-02 = 3 [Control Method Selection = Closed Loop Vector Control]*.

Table 6.1 Added Parameters and Monitors

Parameter (Hex.)	Name	Description	Setting Range	Default Setting	Change During Run
S2-01 0691	Mode change fout	Sets the frequency level to switch from Closed Loop Vector Control to V/f Control. **Note:** This parameter is disabled when it is set to 0 Hz or 400 Hz. • When set to 0 Hz, the drive operates in V/f Control mode. • When set to 400 Hz, the drive operates in Closed Loop Vector Control mode. If the relationship among the *Control Mode Switch Frequency [S2-01]*, *PG Pulses per Revolution [F1-01]*, and *Number of Motor Poles [E2-04]* is more than the permissible input frequency of the PG option, it will trigger an oPE21 error.	0 - 400 Hz	0 Hz	No
S2-02 0692	Mode change Hys	Sets the hysteresis width of Control Method Switch. Increase the value if shock occurs during Control Method switching. **Note:** Make sure to set *S2-01 > S2-02*.	2 - 100 Hz	20 Hz	No

Parameter (Hex.)	Name	Description	Setting Range	Default Setting	Change During Run
S2-05 0695	Slip Comp Gain	Sets the gain for the Motor Slip Compensation at High-Speed function. Adjustment of this parameter is typically not required; however, tuning may be necessary under the following conditions: • Increase the setting if the motor at constant speed is slower than the frequency reference. • Decrease the setting if the motor at constant speed is faster than the frequency reference.	0.0 - 2.5	0.0	Yes
S2-06 0696	Slip Comp Time	Sets the filter on the output side of the Slip Compensation at Hi-Speed Function. Adjustment of this parameter is typically not required; however, tuning may be necessary under the following conditions: • Decrease the setting when the slip compensation response is too slow. • Increase this setting when speed is unstable.	0 - 10000 ms	2000 ms	Yes
S2-07 0697	Slip Comp Limit	Sets the upper limit for the Slip Compensation at Hi-Speed Function as a percentage of the motor rated slip *(E2-02)*.	0 - 250%	200%	No
S2-08 0698	Slip Comp Regen	0 : Disabled 1 : Enabled (6 Hz and above) 2 : Enabled (compensation provided wherever possible) **Note:** When Slip Compensation during Regeneration at Hi-Speed has been activated and a regenerative load is applied, it may be necessary to use a dynamic braking option (braking resistor, braking resistor unit, or braking unit).	0 - 2	0	No
S2-11 0699	Change fout2	Sets the frequency of switching from Closed Loop Vector Control to V/f Control for Motor 2 **Note:** This parameter is disabled when it is set to 0 Hz or 400 Hz. • When set to 0 Hz, the drive operates in V/f Control mode. • When set to 400 Hz, the drive operates in Closed Loop Vector Control mode. If the relationship among the Control Mode Switch Frequency *[S2-01]*, PG Pulses per Revolution *[F1-01]*, and Number of Motor Poles *[E2-04]* is more than the permissible input frequency of the PG option, it will trigger an oPE21 error.	0 - 400 Hz	0 Hz	No
S2-12 069A	Change Hys2	Sets the hysteresis width of Control Mode Switch for Motor 2. Increase if shock occurs during Control Mode switching. **Note:** Please set the value such that *S2-11 > S2-12*.	2 - 100 Hz	20 Hz	No
S2-15 069D	SlpCmp Gain Mtr2	Sets the gain for the Motor Slip Compensation at Hi-Speed Function for Motor 2. Although this parameter rarely needs to be changed, adjustments might be needed under the following circumstances: • Increase the setting if the motor at constant speed is slower than the frequency reference. • Decrease the setting if the motor at constant speed is faster than the frequency reference.	0.0 - 2.5	0.0	Yes
S2-16 069E	Slip Comp Time 2	Sets the filter on the output side of the Slip Compensation at Hi-Speed Function for Motor 2. Although this parameter rarely needs to be changed, adjustments might be needed under the following circumstances: • Decrease the setting when the slip compensation response is too slow. • Increase this setting when speed is unstable.	0 - 10000 ms	2000 ms	Yes
S2-17 069F	Slip Comp Limit2	Sets the upper limit for the Slip Compensation at Hi-Speed Function for Motor 2 as a percentage of the motor rated slip *(E2-02)*.	0 - 250%	200%	No
S2-18 06A0	RegenSlpCom p2	0 : Disabled 1 : Enabled (6 Hz and above) 2 : Enabled (compensation provided wherever possible) **Note:** When Slip Compensation during Regeneration at Hi-Speed has been activated and a regenerative load is applied, it might be necessary to use a dynamic braking option (braking resistor, braking resistor unit, or braking unit).	0 - 2	0	No

Table 6.2 Added Multi-Function Digital Input

Setting	Name	Description	Control Mode	
			V/f	CLV
50	Ctrl mode change	Control Mode will switch from Closed Loop Vector Control to V/f Control according to *Control Mode Switch Frequency [S2-01]* at "OFF" All area V/f Control at "ON". **Note:** Muti-Function Input is only accepted while the drive is stopped. The status of Multi-Function Input is dismissed during run.	OFF	ON

◆ oPE21: Control Mode Switch Frequency Setting Error

When operating in Closed Loop Vector control, an oPE21 error may occur if the permissible value for the PG option is exceeded.

To prevent this error, set *Control Mode Switch Frequency [S2-01* or *S2-11]* in accordance with the specified conditions outlined below.

For Motor 1:

- PG-B3: *F1-01 x E2-04 / 2 x S2-01* > 50 kHz
- PG-X3: *F1-01 x E2-04 / 2 x S2-01* > 300 kHz

For Motor 2:

- PG-B3: *F1-31 x E4-04 / 2 x S2-11* > 50 kHz
- PG-X3: *F1-31 x E4-04 / 2 x S2-11* > 300 kHz

7 Parameter Adjustment for PM Motors

◆ Parameters

No. (Hex.)	Name	Content	Setting Range	Default Setting	Change during Run	Control Method	
						0	5
S1-07 (0686)	Current Detection Timing Adjustment	UVW -> dq conversion of current detection with the following phase θ: θ=θ(n-1) + S1-07 x Δθ	-2.00 - +2.00	0.00	No	A	A
S1-08 (0687)	Voltage Output Timing Adjustment	Output voltage command with the following phase θ dq->UVW conversion: θ=θ(n) + S1-08 × Δθ	-2.00 - +2.00	0.00	Yes	A	A

Convert the current detection value to UVW->DQ with this phase calculation.

θ=θ(n-1) + S1-07 x Δθ

In the calculation, θ is the estimated motor magnetic pole position and Δθ is output frequency multiplied by current control period.

To minimize the effects of circuit delay, the current used for motor control is intentionally delayed for a fixed period before A/D conversion. This delay does not impact a normal-speed motor drive, but can significantly affect high-frequency motor drive performance. Parameter *S1-07* fine-tunes the timing of current detection, compensating for the inherent delay in the current detection circuit.

Convert the output voltage command to dq→UVW with this phase calculation:

θ=θ(n) + S1-08 x Δθ

After estimating the magnetic pole position of the motor, there is a brief delay (typically several tens of microseconds) before voltage output. This effect does not happen in normal-speed motor drives, but it can affect performance in high-frequency motor drives. Parameter *S1-08* corrects the timing of voltage output, compensating for the delay introduced after pole position estimation.

◆ Adjustment Procedure

After completing the test run checklist as outlined in the Technical Reference (SIEPC71061737), verify the following items to ensure proper operation.

No.	Items
1	Did you set *E1-01* to *E1-09 [Motor Parameters]*? Set the data provided by the motor manufacturer.
2	Did you set *E5-01* to *E5-24 [PM Motor Parameters]*? Enter the motor data as specified by the motor manufacturer. However, it is recommended to use actual measured values for the induced voltage parameters, when available. For the inductance parameters Ld and Lq, avoid using nominal values. Instead, input values that reflect magnetic saturation characteristics influenced by shaft current, if such data is provided by the motor manufacturer.

No.	Items
3	Have you set *C6-03* to *C6-05 [Carrier Frequency Parameters]*? It is recommended to set the carrier frequency as high as possible in relation to the output frequency to ensure optimal drive performance.
4	Did you set *L8-27 [Parameters for Motor Demagnetization Current Level]*? Refer to the motor manufacturer's specified design value and configure the parameter accordingly. If the design value is not provided, it is essential to set this parameter manually, as failure to do so may result in motor magnet demagnetization due to elevated operating temperatures.
5	Did you set *E1-01* to *E1-09 [Motor Parameters]*? Set the data provided by the motor manufacturer.

◆ Adjusting Drives During Test Run

This section outlines the procedure for adjusting the drive to resolve controllability-related issues, such as turbulence or vibration, identified during the test run.

Issue Description	Parameter	Countermeasures	Default Setting	Adjusted Value
Normal acceleration is not possible due to the influence of voltage accuracy in the low output voltage range at startup and low speed.	S1-10 [Carrier Synchronization Method Selection]	Set the drive to run at a low carrier at low speeds.	0	1
Cannot accelerate.	n8-51 [Pull-in Current at Acceleration]	Set a larger value +10% to increase torque during acceleration.	50%	Adjust by +10% as necessary.
Losing impact load at constant speed.	n8-48 [Pull-in Current]	Set a larger value by +10% to increase the impact load capacity. **Note:** If the current flows too much at a constant speed, reduce the setting value slightly.	30%	Adjust by +10% as necessary.
Vibration is generated.	n8-55 [Control Response Adjustment]	This parameter is primarily adjusted based on the inertia ratio between the motor and the load to ensure stable and responsive control performance. **Note:** If a large value is set, vibration may occur.	0	1, 2, 3
Improve efficiency.	n8-56 [High Efficiency Control Selection]	For proper vector control operation, set this parameter to *2 [Enabled (Vd & Vq)]*. If the default setting does not cause any operational issues, parameter adjustment may not be necessary.	1	2
Output voltage drops and current increases during high-speed operation.	S1-07 [Current Detection Timing Adjustment]	Recommended setting range is -0.20 to -0.30 If there is a drop in output voltage or an increase in output current during high-speed operation, adjust the setting in increments of 0.1 as needed.	0.0	-0.25 Adjust by increments of 0.1 as necessary.
	S1-08 [Output Voltage Timing Adjustment]	When operating at high speed, it is recommended to set the value to +0.5 to compensate for PWM payout timing. If the output voltage drops during operation, adjust this value by increments of +0.1 or -0.1. If the output voltage drops or there are other issues during operation, continue to modify this value by +0.1 or -0.1 as needed.	0.0	0.5 Adjust by increments of 0.1 as necessary.

Revision History

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August 2025	-	VSAA0920X	First release. Document is based on EZZ024817.

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In the event that the end user of this product is to be the military and said product is to be employed in any weapons systems or the manufacture thereof, the export will fall under the relevant regulations as stipulated in the Foreign Exchange and Foreign Trade Regulations. Therefore, be sure to follow all procedures and submit all relevant documentation according to any and all rules, regulations and laws that may apply.
Specifications are subject to change without notice for ongoing product modifications and improvements.

Original Instructions

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