

Addendum to Instruction Manual GP10 and VG10

Several functions have been added and a few functions are changed to increase the versatility of the GP10 and VG10 drives.

Please refer to both the instruction manual (P/N 027-GP1001 027-VG1001) and this addendum (P/N 027-1001A).

Function No.	Function Name	Changed or added contents
F14	Restart after momentary power failure(selection)	In case of set value 2 or 3, setting U23and U24 become effective.
F25	Stop Frequency	Setting range changed to 0 to 60Hz.
F41	Torque Limit 1 (Braking)	U01 (maximum compensation frequency during braking torque) becomes effective. Value set to 0% U60 becomes effective.
E17	Torque Limit 2 (Braking)	
E01-E09	X1 to X9 Terminal Function	Setting range increased to 0 to 35
E20-E24	Y1 to Y4/Y5A and Y5C Transistor output function	Setting range increased to 0 to 37
H07	ACC/DEC pattern (mode select)	Sharp S-shape set value = 2 is changed to variable S-shape
Uxx	User Functions	New addition

The addendum applies for the following inverter ROM versions.

Inverter of 30Hp or less :S09000 or later
40Hp or more :H09000 or later

The software will be identified by the serial number on the unit.

Example: 0129-06061A001

The A in the serial number shows the drive has the latest software installed.

ROM version in the maintenance information on the keypad panel.

(Please refer to section 4-3-9 Maintenance information in the instruction manual of the inverter).

5 Function Select
5-1 Function Select List
F: Fundamental Functions

Func No.	Name	LCD Display	Setting Range	Unit	Factory Setting 30Hp and less 40 Hp and more
F25	Stop Frequency	F25 STOP Hz	0.1 to 60Hz	Hz.	0.2

E: Extension Terminal Functions

Func No.	Name	LCD Display	Setting Range	Unit	Factory Setting 30Hp and less 40 Hp and more
E01	X1 Terminal function	E01 X1 FUNC	0 to 35		Reference: Instruction Manual
To	to	to			
E09	X9 Terminal function	E09 X9 FUNC	0 to 37		Reference: Instruction Manual
E20	Y1 Terminal function	E20 Y1 FUNC			
To	To	To			
E24	Y5 Terminal function	E24 Y5 FUNC			

U: User Functions

Func No.	Name	LCD Display	Setting Range	Unit	Factory Setting 30Hp and less 40 Hp and more
U01	Max. comp. Frequency during braking torque limit	U01 USER 01	0 to 65535h	-	75
U02	1 st S-shape level at accel	U02 USER 02	1 to 50%	%	10
U03	2 nd S-shape level at accel	U03 USER 03	1 to 50%	%	10
U04	1 st S-shape level at decel	U04 USER 04	1 to 50%	%	10
U05	2 nd S-shape level at decel	U05 USER 05	1 to 50%	%	10
U08	DC link V (Initial Value)	U08 USER 08	0 to 65535h	-	xxxx
U09	Cap. (Measured Value)	U09 USER 09	0 to 65535h	-	0
U10	PC Board Cap. Power on time	U10 USER 10	0 to 65535h		0
U11	Cooling Fan Operating time	U11 USER 11	0 to 65535h		0
U13	Magnetize current vibration Damping gain	U13 USER 13	0 to 32767		819 410
U15	Slip Compensation filter Time constant	U15 USER 15	0 to 32767		556 546
U23	Integral gain of cont. operation at power failure	U23 USER 23	0 to 65535h		1738 1000
U24	Proportional gain of cont. operation at power failure	U24 USER 24	0 to 65535h	-	1024 1000
U48	Input Phase loss protection	U48 USER 48	0,1,2	-	--75Hp 100-- 0 1
U49	RS485 Protocol Selection	U49 USER 49	0,1	-	0
U56	Speed agreement(det width)	U56 USER 56	0 to 50%	%	10%
U57	PG error (Det. Timer)	U57 USER 57	0 to 10.0S	Sec	0.5
U58	PG error selection	U58 USER 58	0,1	-	1
U59	Braking-resistor function select	U59 USER 59	00 to A8h	H	00
U60	Regeneration avoidance at deceleration	U60 USER 60	0,1	-	0
U61	Voltage detect offset and gain adjustment	U61 USER 61	--30Hp: 0 40Hp--:0,1,2	-	0

5-2 Function Explanation

F14 Restart mode momentary power failure(operation sel.)

- ◆ In selection of setting value "2" or "3", both integration constant and the proportional constant during operation ride-through can be adjusted by the function code:U23 and U24 . Please refer to the function code:U23 and U24 for details.

Related Functions
U23
U24

F25 Stop frequency

Set values: 0.1 to 60.0Hz

F41 Torque limit 1 (braking)

E17 Torque limit 2 (braking)

- ◆ The upper limit of increase frequency at the torque limit operation is set by the function code: U01.
- ◆ When the set value "0%(Regeneration avoidance)" is set, the operation mode is set by the function code:U60. Please refer to the function code:U01 and U60 for details.

Related Functions
U01
U60

E01 X1 Terminal function

to

E09 X9 Terminal function

Set value	Function
33	Line speed control Cancellation [Hz/LSC]
34	Line speed frequency memory [LSC-HLD]
35	Frequency setting 1 / Frequency setting 2 [Hz1/Hz]

Line speed control cancellation [Hz/LSC]

Line speed frequency memory [LSC-HLD]

- ◆ These functions are effective for the option card (SOPC-G11S-PG, -PG2, -PGA). Refer to each instruction manual.

Frequency setting 1/ Frequency setting 2[Hz1/Hz2]

- ◆ This function switches the frequency setting method set in function codes F01 and C30 by an external digital input signal. It is reverse-logic of the set value "11" (frequency set 2/frequency set 1[Hz2/Hz1]) .

Set value input signal	Frequency setting method selected
35	
Off	C30 FREQ CMD2
On	F01 FREQ CMD1

note : This set value cannot be used with the set value "11" simultaneously. When the set value "11" and "35" are selected, the display becomes "Er6".

E20 Y1 Terminal function

to

E24 Y5A and Y5C Terminal function

Set value	Function
30	Life expectancy detection signal [LIFE]
35	Speed agreement signal [DSAG]
36	PG error signal [PG-ABN]
37	Torque limiting (Signal with delay) [TL2]

Life expectancy detection signal [LIFE]

- ◆ When either of data for the Life expectancy judgment of the function code:U09 to U11 reaches at the Life expectancy judgment level, the ON signal is output. However, the inverter does not alarm, therefore the alarm output for any fault (30A, 30b, 30C) does not operate.

Function code	Parts of Life expectancy judgment	Life expectancy judgment level
U09	Capacitor in main circuit	85% or less of the initial value
U10	Electrolytic capacitor on PC board	61,000 hours
U11	Cooling fan	25,000 hours

- ◆ In the following cases, normal life judgment of the capacitor in main circuit may not be able to be performed.
 - ① When a power is turned off during inverter operation.
 - ② When cooling fan ON/OFF control is operated. (function code : H06= 1)
 - ③ When the power is supplied by the auxiliary input terminals (R0,T0).
 - ④ When the option card is operated .
 - ⑤ When RS485 communication is operated .
 - ⑥ When the power supply is turned off with digital input (FWD, REV, X1-X9) of a control terminal being ON.
 In the case of ③,④,⑤ and ⑥, life judgment is enabled by adjusting both code functions: U08 and U09.

Related Functions
U08~U11

Speed agreement signal [DSAG]

PG error signal [PG-ABN]

- ◆ These functions are effective for the option card (SOPC-G11S-PG, -PG2, -PGA). Refer to each option card manual.

Torque limiting(Signal with delay)[TL2]

- ◆ The turning on signal is output by continuing the limiting action (Torque limit operation, regeneration avoidance operation and over-current limiting operation) of 20ms or

more.

H07 ACC/DEC pattern (mode select)

◆ This function selects the acceleration and deceleration pattern.

Set value

- 0 : Inactive (linear acceleration and deceleration)
- 1 : S-shape acceleration and deceleration (mild)
- 2 : S- shape (Variable) acceleration and deceleration
- 3 : Curvilinear acceleration and deceleration

Please refer to from U02 to U05 (set of the range of S-shape), when you select the set value "2".

Related Functions
U02~U05

U function is displayed since K08000 or later of keypad ROM version.

U01 Max. compensation freq. during braking torque limit

◆ This function becomes effective, when the torque limit (brake) is used. The inverter controls to increase the output frequency so that torque calculations do not exceed the torque limit (brake) setting (F41 or E17). (When F41 or E17 is set to 999, it becomes invalid.) This function sets the increment of upper limit for output frequency.

when the regeneration avoidance is selected, the resurrection ability can be improved by raising the increment of upper limit. However, the output frequency of the inverter is limited at the frequency limit(high):F15

U 0 1 U S E R 0 1

Setting range : 0 to 65535

The set value "15" becomes 1Hz.
(The set value "1" becomes 1/15Hz)

U02 1st S-shape level at acceleration (start)

U03 2nd S-shape level at acceleration (stop)

U04 1st S-shape level at deceleration (start)

U05 2nd S-shape level at deceleration (stop)

◆ When "2" is set in the function code: H07, both curvilinear acceleration and deceleration ranges of S-shape can be set up arbitrarily.

The range is the ratio for maximum output frequency 1 (F03) or 2 (A01).

U 0 2 U S E R 0 2

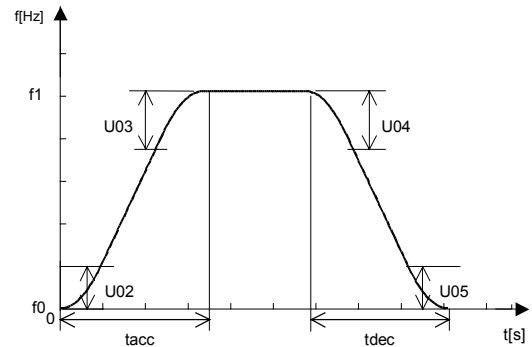
U 0 3 U S E R 0 3

U 0 4 U S E R 0 4

U 0 5 U S E R 0 5

Setting range : 1 to 50%

Output frequency



◆ 100% value of this function means maximum frequency (**fmax**).

Acceleration time "**tacc**" and deceleration time "**tdec**" of upper figure become longer than the linear acceleration time and deceleration time. When the set acceleration time (F07,E10,E12,E14) is assumed to be **Ta** and deceleration time (F08,E11,E13,E15) is assumed to be **Td**, "**tacc**" and "**tdec**" can be calculated by the following expressions.

• At acceleration,

$$|f1 - f0| \geq f_{max} \times \frac{U02 + U03}{100} \text{ or,}$$

At deceleration,

$$|f1 - f0| \geq f_{max} \times \frac{U04 + U05}{100}$$

$$tacc = \left(\frac{f1 - f0}{f_{max}} + \frac{U02 + U03}{100} \right) \times Ta$$

$$tdec = \left(\frac{f1 - f0}{f_{max}} + \frac{U04 + U05}{100} \right) \times Td$$

linear Acceleration and S-shape clause
deceleration clause

• At acceleration,

$$|f1 - f0| < f_{max} \times \frac{U02 + U03}{100} \text{ or,}$$

At deceleration,

$$|f1 - f0| < f_{max} \times \frac{U04 + U05}{100}$$

$$tacc = 2 \times \left\{ \sqrt{\frac{f1 - f0}{f_{max}} \times \frac{100}{U02 + U03}} \right\} \times \left(\frac{U02 + U03}{100} \right) \times Ta$$

$$tdec = 2 \times \left\{ \sqrt{\frac{f1 - f0}{f_{max}} \times \frac{100}{U04 + U05}} \right\} \times \left(\frac{U04 + U05}{100} \right) \times Td$$

Addendum

Instruction Manual GP10 & VG10

U08 Initial value of main DC link capacitor

U09 Measured value of main DC link capacitor

- ◆ Data for the life expectancy judgment of the capacitor in main circuit is stored in this function. The electrical discharge time of the capacitor can be measured automatically, and the time of part replacement can be confirmed according to the decrement rate from the factory shipment.

U 0 8 U S E R 0 8

U 0 9 U S E R 0 9

Setting range : 0 to 65535

- ◆ The electrical discharge time which is measured in the factory shipment is set to function code U08 as an initial value. This value is different in each inverter.
- ◆ The electrical discharge time of the capacitor is measured automatically, when the power supply is turned off. And, the result is stored in function code U09. When the power supply is turned off under the conditions as follows, decrement rate (%) to the factory shipment can be measured.
Conditions: which has been described to "Estimation of life expectancy based on maintenance information" of the instruction manual "8-2 periodical inspection".

The result of $\frac{U09}{U08} \times 100$ is displayed in CAP=xxx.x%

maintenance information. 85% becomes a standard at the part replacement time.

- ◆ When you make measurement of capacity and life expectancy judgment of capacitor with an actual operating condition, set the value "30" to the function code "E20 to E24". And write the measurement result U09 with an actual operating condition to the function code U08 as an initial value as early as possible since inverter operation starts.

However, life judgment by the measurement result cannot be performed in case of ① and ②.

- ① During inverter operation, a power supply is turned off and it stops.
- ② Cooling fan ON/OFF control is used.
(function code : H 06= 1)

Turn off the power supply of inverter, on the conditions at which the inverter has stopped, and a cooling fan is operated. It is not necessary to remove an option card and the connection with a control terminal.

As for this "measurement with an actual operating condition", carry out this measurement about 10 times to minimize the error of a measurement result, and make the average value into an initial value.

Moreover, when there is 10% or more of change from the last measured value, measurement is disregarded in order to prevent incorrect measurement. Renewal of a display is not carried out.

- ◆ Set measured value U09 to the initial value U08 after exchanging capacitors.

Related Functions
E20 to E24
(Set value :30)

U10 PC board capacitor powered on time

- ◆ The accumulation time of the capacitor on PC board are displayed. the accumulation time of the control power supply multiplied by the life expectancy coefficient defined by the temperature inside the inverter are displayed. Hence, the hours displayed may not agree with the actual operating hours. Since the accumulation time are counted by unit hours, power input for less than one hour will be
- ◆ disregarded.
The accumulation time are displayed in TCAP=xxxxxh of maintenance information. The standard at the replacement time is 61,000h. Refer to the instruction manual "8-2 regular check" and 4-9 Maintenance information.

U 1 0 U S E R 1 0

Setting range : 0 to 65535 hours

- ◆ Clear the accumulation time to 0 hour, after replacing the PC board on which capacitors are mounted. There is also PC Board without the capacitors, (ex :Control circuit board) not to be cleared the accumulation time. For details, contact Safronics.

Related Functions
E20 to E24
(Set value :30)

U11 Cooling fan operating time

- ◆ The integrated operating hours of the cooling fan are displayed. Since the integrated hours are counted by unit hours, power input for less than one hour will be disregarded. The integrated hours are displayed in TFAN=xxxxxh of maintenance information. The standard at the replacement time is 40,000h in the inverter of 3.7kW or less. The standard at the replacement time is 25,000h in the inverter of 5.5kW or more.(Estimated life expectancy of a cooling-fan at inverter ambient temperature of 40°C)
The displayed value should be considered as a rough estimate because the actual life of a cooling fan is influenced significantly by the temperature. Refer to the instruction manual "8-2 regular check" and 4-9 Maintenance information.

U 1 1 U S E R 1 1

Setting range : 0 to 65535 hours

- ◆ Clear integrated operating time to 0 hour after replacing the cooling fan.

Related Functions
E20 to E24
(Set value:30)

U13 Magnetize current vibration damping gain

◆ Adjust if Magnetize current vibration was occurred in the inverter output current .

U 1 3 U S E R 1 3

Setting range: 0 to 65535

◆ Adjust the value from 0 to 2048 as a standard value. Vibration damping gain becomes 100% in set value 4096.

◆

U15 Slip compensation filter time constant

◆ The filter time constant of Slip compensation is set.

U 1 5 U S E R 1 5

Setting range : 0 to 32767

◆ Calculate the filter time constant using the following formula.

$$\text{Filter time constant} = \frac{2^{16}}{\text{"U15" set value}} \text{ [ms]}$$

◆ The response time of the control slows because the filter time constant is enlarged when a value is set to smaller. However, system becomes steady.

◆ The response time of the control quickens because the filter time constant becomes smaller, when a set value is enlarged.

Note : Response time quickens when a set value is enlarged. Therefore, there is a possibility that the output frequency becomes unstable. Please adjust a set value to smaller than factory setting value.

U23 Integral gain of cont. operation at power failure

U24 Proportional gain of cont. operation at power failure

◆ This function becomes effective, when function code F14 (Restart mode after momentary power failure) set value is 2 or 3.

U 2 3 U S E R 2 3

U 2 4 U S E R 2 4

Setting range : 0~65535

◆ In case of F14 set value : 2.

When the operation continuation level (H15) is reached, deceleration to a stop occurs. The DC voltage of the main circuit sharpens the deceleration slope, and the inverter collects the inertia energy of the load to maintain the DC bus voltage and controls the motor until it stops, so that the undervoltage protective function is not activated.

The deceleration slope is adjusted with U23 and U24. However, the deceleration operation time never becomes longer than the set deceleration time.

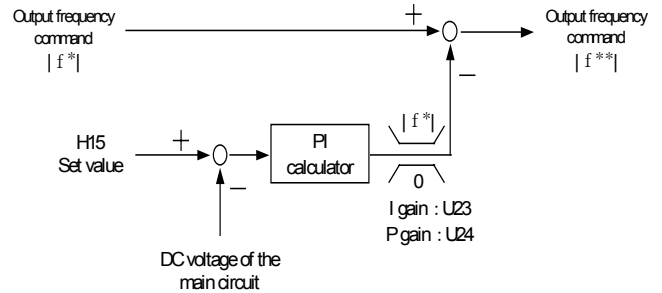
◆ In case of F14 set value : 3.

The output frequency is lowered by the control by which the DC voltage of the main circuit is kept constant from the regeneration energy, so that the inverter may continue operation when momentary power failure occurs.

The response is adjusted with U23 and U24 at this time.

◆ Calculate the integral gain using the following formula.

$$\text{Integral gain} = \frac{2^{16}}{\text{"U23" set value}} \text{ [ms]}$$



U48 Input phase loss protection

◆ This function selects operation of input phase loss or power supply unbalance protection.

U 4 8 U S E R 4 8

Setting range : 0 to 2

Set value	Operation
0	Active (without reactor (ACR/DCR))
1	Active (with reactor (ACR/DCR))
2	Inactive

CAUTION

When "2" is set to U48, protection operation of the inverter to input phase loss or power supply voltage unbalance does not work. If you use it as it is, there is a possibility of damaging an inverter. **Failure may result.**

U49 RS485 protocol selection

◆ The protocol of RS485 communication is changed.

U 4 9 U S E R 4 9

Setting range : 0, 1

Set value	Operation
0	FGI-bus
1	Modbus-RTU

Instruction manual and specifications are prepared about communicative details. Contact Saftronics.

U56 Speed agreement /PG error(Detection width)

U57 Speed agreement /PG error (Detection timer)

U58 PG error selection

◆ These functions are effective for the option card (SOPC-G11S-PG, -PG2, -PGA).

Refer to each instruction manual.

U 5 6 U S E R 5 6

U 5 7 U S E R 5 7

U 5 8 U S E R 5 8

U60 Regeneration avoidance at deceleration

◆ This function is available, when torque limit (brake) of F41 (or E17) is set to "0%".

U 6 0 U S E R 6 0

Setting range: 0, 1

Set value	Operation
0	Torque limit operation (for high response use)
1	OU alarm avoidance operation (only deceleration or Large inertia use)

◆ If function code U60 is set to "0", braking torque is kept to about "0%" under acceleration, deceleration, constant speed state. Output frequency is controlled in correspond to the rapid change in motor load to prevent OU alarm. Deceleration time becomes longer than the set deceleration time (F08).

◆ In case of setting value U60=1, Compared with setting value "0", it controls not to perform torque limit operation only at the deceleration time, but to prevent the rise of the DC voltage of the main circuit, and avoid OU alarm. At this time, although deceleration time becomes longer than a setting value of F08, it becomes shorter than setting value "0" of U60. It may occur OU alarm, if load changes rapidly during deceleration.

U61 Voltage detect offset and gain adjustment

◆ 40Hp or more
It adjusts, only when a print board is replaced by maintenance, etc. If not necessary, do not use this function.

U 6 1 U S E R 6 1

Setting range : 0, 1, 2

Inverter capacity	Operation
30Hp or less	0 : Inactive(fixed)
40Hp or more	0 : Inactive
	1 : Voltage detect offset adjustment
	2 : Voltage detect gain adjustment

◆ Set the function code in the following procedure.
If the inverter is operated without this adjustment after replacing the PC board, normal operation may not be able to be performed.

(Offset adjustment)

- 1) Confirm that the main power supply is turned ON, the motor wiring are connected and the motor has stopped (inverter operation command is OFF).
- 2) When the data of U61 is changed to "1", and the FUNC/DATA key is ON, the offset self adjustment is started. The display of "storing" of the keypad panel disappears several seconds later. When the set value returns to "0", adjustment is completed.
If the main power supply is turned OFF, while outputting alarm, motor is driving, coast-to-stop command(BX) is ON and this adjustment is started, the inverter becomes "Er7:TUNING ERROR".

In this case, start the adjustment after removing the above-mentioned factor.

(Gain adjustment)

- 1) Drive the motor in an arbitrary frequency of about 10 to 60Hz(However, constant speed) after executing the above-mentioned offset adjustment.
(U61:1) At this time, gain adjustment is available unrelated to the load state.
- 2) When the data of U61 is changed to "2", and the FUNC/DATA key is ON, the gain self adjustment is started. The display of "storing" of the keypad panel disappears several seconds to 30 seconds later. When the set value returns to "0", adjustment is completed.
If inverter is not operated, this adjustment is not available.