

USER MANYAL

Brushless DC Motor Driver

XGVD series

(Keypad)



SPG Co., Ltd.

<http://www.spg.co.kr>



Thank you for purchasing the product of the SPG Motor. For the safe use of this product, please be sure to be thoroughly informed of all the contents in this user's manual.

〈 INDEX 〉


1. Safety Precautions-----	P3
2. Designation and Function by unit -----	P5
3. Operation -----	P7
4. Parameter -----	P11

1. Safety Precautions

In this user's manual, safety warning signs are divided into "Warning" and "Caution".

- | | |
|---|--|
|  | • A possibility of heavy injury or death when inappropriately handled. |
| [Warning] | |
|  | • A Possibility of minor injury when inappropriately handled. |
| [Caution] | |

The lists in "Caution" can also lead to serious injury or damage depending on the situation. Please be informed of both categories for you safety.

-  [Warning]
- Do not use in the explosion, flammable, corrosive, combustible material and water place. it will cause fire, electric shock, injury.
 - Do not touch the machine with wet hands. You may receive electric shock.
 - Please turn off the machine before installation, verify and inspection.
If not, you may receive electric shock.
 - Installation, connection, operation, handling and inspection should always be done by qualified professionals. If not, it may be the main reason of electric shock.
 - Grounding should always be done after installing the motor and the control unit. Failing to do so may cause electric shock
 - The input voltage of the control unit must not exceed the rated range.
If so, ou may received electric shock.
 - After the connection is done, Make sure to install terminal cover over the power terminal and the input/output signal terminal. Failure to do so may cause electric shock or fire.
 - Do not stress unnecessary force into the power cable or the motor cable.
It may cause electric shock or fire.
 - Make sure to turn off the control unit when the electricity is out. Sudden operation of the motor after the electricity comes back on may seriously Vdamage the machine.
 - Do not use the machine in elevators. Safety guard of the control unit will be activated and can make the motor stop. Which can damage the machine.
 - Do not touch the control unit within ten seconds after the power is off. Doing so may cause electric shock.
 - Do not dismantle or rebuild the motor, reduction gear and the control unit.
It may cause injury to the user and damage to the machine.
 - For inspections and repairs, please contact the nearest agency or the head office.

**[Caution]**

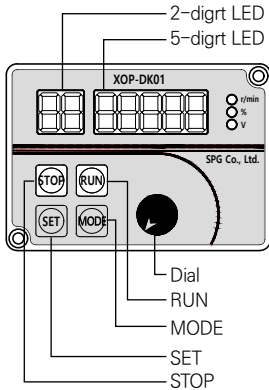
- Do not exceed the recommended limit of the motor and the control unit.
You may be injured, receive electric shock and the machine may be damaged.
- Do not pull the output shaft or cables of the motor. You may be injured.
- Do not place inflammable materials near the motor and the control unit.
It may cause fire, electric shock or cause damage to the machine.
- Make sure to cover the cycling head of the motor. If not, you may be injured.
- Do not put foreign elements in the input shaft of the control unit. It may cause fire, electric shock and damage to the machine.
- When installing the motor or the motor with reduction gear, be careful not have your finger in between the installing machine and the motor. It may cause injury.
- When assembling the motor(gear type shaft) and reduction gear, keep you fingers away from them. You may be injured.
- Please operate the motor and the control unit with recommended setting.
If not, it may cause fire, electric shock an damage to the machine.
- Always be prepared use the emergency break when test-operating. If not, you may be injured.
- When the machine malfunctions, immediately stop the operation and turn off the control unit. If not, it may cause fire, electric shock or injury.
- When safety guard operates, turn down the power, handle the cause and turn the power back on. Continuous operation of the machine without handling the cause may have you injured or cause damage to the machine.
- Slow run/slow stop controller of the control unit needs to be handled with insulated precision tools. If not, it may cause electric shock.
- During the insulation resistance evaluation, and insulation internal pressure test, never touch the terminal. For it may cause electric shock.
- The motor and the control unit should be disposed as an industrial waste.
- As the surface temperature of motor and control unit can exceed 70°C during operation, do not touch the motor, control unit during operating or after stopping. high temperature can result in person's burning.

[Important]

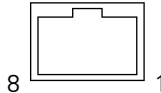
- XGVD Series are exclusively used for XGVM Series among SPG motor.
Therefore it is not compatible with other company and user should combine exclusive control unit with exclusive motor.
- Once power has been turned off, do not turn power on again or remove or insert the motor connector until the POWER LED is completely extinguished (at least 30 seconds).

5. Designation and Function by unit

2.1 Names and Functions of Each Part



Terminal number	Terminal symbol	Terminal explanation
1	—	NC
2	+5V	DC 5V (Supplied from the Driver)
3	—	NC
4	—	NC
5	RS485(+)	RS485(+) Connection terminal.
6	RS485(-)	RS485(-) Connection terminal.
7	GND	GNG
8	SCK	Interface (keypad)



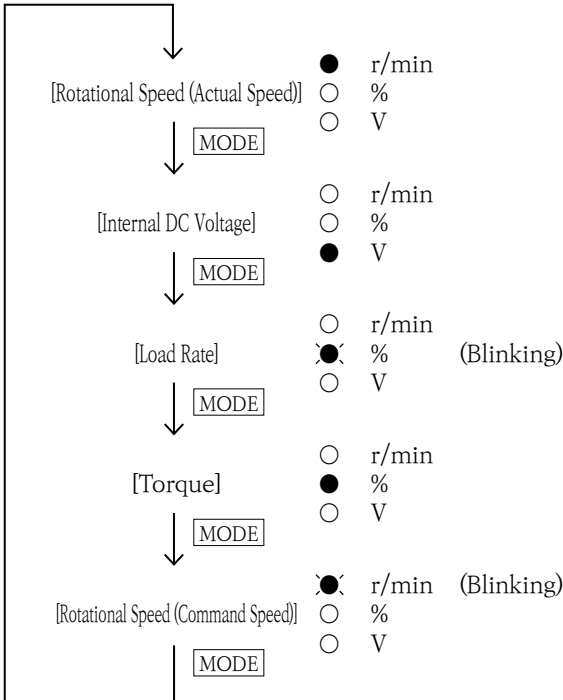
* The pin numbers for the RJ45 terminal are shown in the diagram below. The RJ45 terminal numbers are as shown in the diagram below.

Name	Function
5-digit LED	It displays rotational speed (actual speed), command speed, alarm history, parameter settings, etc.
2-digit LED	It displays Parameter No. (when editing parameters). It displays the current rotation direction during operation. It displays "[00]" when the motor is stopped. (Viewed from the motor output shaft, CCW is displayed as [F], and CW as [r]). The rotation direction of the reducer output shaft may change depending on the reduction ratio when a reducer is installed.
[MODE]	It is a switch to change the monitor mode.. Each time this switch is pressed, the mode changes in the following sequence: Rotational speed (actual speed) → Internal DC voltage (voltage of the power smoothing capacitor) → Load rate → Torque → Rotational speed (command speed) → Rotational speed (actual speed) → ... * In Parameter setting mode, pressing this switch saves the set value.
[SET]	It is a switch for Parameter setting, changing, and saving parameters.
Dial	This dial allows the selection of parameters, and the setting and changing of contents. If the Motor is in an alarm state, holding the dial for 3 seconds will clear the alarm.
[RUN]	It is the Stop Command switch. (This is only valid when "Pr.30 Operation Command Selection" is set to the appropriate value.) • Refer to "Pr.33 I1/I2 Function Selection" for the rotation direction. • If the keypad is disconnected while the switch is operating, the operation will stop.
[STOP]	It is the Stop Command switch. (This is only valid when "Pr.30 Operation Command Selection" is set to the appropriate value.)

Name	Funciton
Monitor mode	It displays otational speed (actual speed), set speed, internal DC voltage, load rate, torque, etc., on a 5-digit LED display. This mode is set when the power is turned on. When in Parameter No mode or Parameter setting mode, pressing the [MODE] switch switches to monitor mode.
Parameter No mode	It blinks to display the Parameter No (00~F0). In monitor mode, if you press the [SET] switch, it will change to Parameter No mode.
Parameter settings mode	It blinks to display the detailed contents of the parameter (settings). It is possible to change the settings by using the up or down switch.. After changing the settings, pressing the [SET] or [MODE] switch will save the changes to the EEPROM.

- 1) In general monitor mode, the rotational speed is displayed in r/min, and Torque and load rate are displayed assuming 100% of the motor's rated Torque.
- 2) The monitor mode is for reference only and is not suitable for measurement purposes.

〈Monitor Mode〉



3. Operation

3.1 Trial

3.1.1 Pre-Trial Check

- (1) Verify that all wiring is correct.
- (2) Ensure that the input power matches the rated specifications.

3.1.2 Trial

The procedure for performing a test using the keypad is as follows.

This example demonstrates how to operate the motor in CW direction at a speed of 1800 r/min using the keypad.

- (1) For safety, be sure to perform the following steps first:
Disconnect the motor from the machine or equipment to ensure that the motor can operate independently.
- (2) Turn on the power and follow the steps below to perform the test.

[STEP-1] Power ON

[STEP-2] Changing Initial Settings - 1 (Changing the operation command selection to the keypad)

- ① Press [SET].
- ② Turn the dial to select Parameter No [30].
- ③ Press [SET].
- ④ Turn the dial to select the Parameter value [Pad].
- ⑤ Press [SET] to save.

[STEP-3] Changing Initial Settings - 2 (Changing the speed command selection to [Pad])

- ① Turn the dial to select Parameter No [31].
- ② Press [SET].
- ③ Turn the dial to select the Parameter value [PAD].
- ④ Press [SET] to save.

[STEP-4] Rotation Direction Selection

- ① Press [SET].
- ② Turn the dial to select Parameter No [33].
- ③ Press [SET].
- ④ Turn the dial to select the Parameter value.
- ⑤ Press [SET] to save.
- ⑥ A settings change warning will occur, and the speed command selection will be changed.

[STEP-5] Setting Rotation Speed (e.g., setting 0-th speed to 1800 r/min)

① Turn the dial to select the Parameter value [1800].

(At this point, Parameter No is [00].)

② Press [SET].

[STEP-6] Monitor Mode Selection

① Press [MODE].

[STEP-7] Control (Operation)

① Press [RUN] to start the motor.

[STEP-8] Control (Stop)

① Press [STOP] to stop the motor.

[STEP-9] Power OFF

〈Checkpoints〉

(1) Verify that the motor rotates smoothly. Check for any abnormal noise or vibration.

(2) Ensure that the motor accelerates and decelerates smoothly.

(3) Does the motor's rotation direction match the rotation speed?

* When a reducer is installed, the rotation direction of the reducer output shaft may be opposite due to the reduction ratio.

* The rotation direction can also be changed using "I2." Refer to "Pr.33 I1/I2 Function Selection" for details.

(4) The settings will remain unchanged even if the power is turned off. If the motor is operated only for the trial, reset the settings or initialize the parameters after the trial is complete. (Pr.54) When the parameters are initialized, all parameters will return to their default values.

3.2 Parameter Copy

3.2.1 Parameter Read

When you read the parameters from the Driver, the corresponding details are saved in the keypad.

[STEP-1] Power ON

[STEP-2] Pr.57 (Parameter copy) Call

- ① Press [SET].
- ② Turn the dial to select Parameter No [57].

[STEP-3] Parameter Read Selection

- ① Press [SET].
- ② Turn the dial to select the Parameter value [P.LoAd].

[STEP-4] Parameter Read

- ① While holding [STOP], press [SET] for 1 second.
(P.End will be displayed.)

[STEP-5] Waiting for approximately 5 seconds

- ① When the Parameter Read is complete, the Parameter value will be displayed.

3.2.2 Parameter Copy

Copy the parameters stored in the keypad to the Driver.

[STEP-1] Power ON

[STEP-2] Pr.57 (Parameter copy) Call

- ① Press [SET].
- ② Turn the dial to select Parameter No [57].

[STEP-3] Parameter Copy Selection

- ① Press [SET].
- ② Turn the dial to select the Parameter value [P.ProG].

[STEP-4] Parameter Write

- ① While holding [STOP], press [SET] for 1 second.
(P.End will be displayed.)

[STEP-5] Waiting for approximately 5 seconds

- ① When the Parameter Read is complete, the Parameter value will be displayed.

[Important]

* When the parameter copy is complete, if an error occurs during parameter copying, refer to the following table. If the error occurs, the Parameter value will be displayed.

1) [P.Err1] : Abnormal data during Parameter Copy

- ① Press [STOP] to delete, then try copying the parameters again.

② If the data continues to be abnormal, initialize the keypad and try again.

2) [P.Err2] : Copy error

- ① This occurs when the Driver series is different.

② To delete the data, press [STOP].

3.2.3 Keypad Initialization

If a problem occurs during Copy, initializing the keypad often resolves the issue.
(Initializing will delete the stored data.)

[STEP-1] Power ON

[STEP-2] Pr.57 (Parameter copy) Call

- ① Press [SET].

② Turn the dial to select Parameter No [57].

[STEP-3] Data Initialization Selection

- ① Press [SET].

② Turn the dial to select the Parameter value [P.InIT].

[STEP-4] Keypad Initialization

- ① While holding [STOP], press [SET] for 1 second.

(P.End will be displayed.)

[STEP-5] Waiting for approximately 5 seconds

- ① When the Parameter Read is complete, the Parameter value will be displayed.

- Do not disconnect the keypad cable or turn off the power while performing parameter read, copy, or keypad initialization.

4. Parameter

4.1 Parameter List

Pr. No	Name	Setting Range	Default Value	Note
00	Int. speed (0 th speed)	0-Pr.3b (Setting Unit: 1 r/min)	0	
01	1st speed		3000	
02	2nd speed		1200	
03	3rd speed		600	
04	4th speed		0	
05	5th speed		0	
06	6th speed		0	
07	7th speed		0	
10	1st Acceleration Time	0.01 sec ~ 300 sec 1) 0.01 sec~3 sec (Setting Unit: 0.01 sec) 2) 3 sec ~ 30 sec (Setting Unit : 0.1 sec) 3) 30 sec ~ 300 sec (Setting Unit : 1 sec)	0.30	
11	2nd Acceleration Time		0.30	
12	1st Deceleration Time		0.30	
13	2nd Deceleration Time		0.30	
14	Acceleration Mode Selection	[L In] Linear [S-1] S type-1 *2 [S-2] S type-2 *2	L In	
15	Deceleration Mode Selection		L In	
16	Stop Mode Selection	[FrEE] Free stop [dEC] Deceleration Stop	dEC	
17	Free Wait Time	0.0~10.0 sec (Setting Unit : 0.1 sec)	1.0	
1A	P Gain	0~10000 (Setting Unit : 1)	2457	
1b	I Gain	0~10000 (Setting Unit : 1)	491	

*2 Selectable when Pr.31 (Speed Command Selection) is set to [0].

Pr. No	Name	Setting Range	Default Value	Note
30	Operation Command Selection	[PAd] keypad [Io] I1 / I2 [rS.485] \ RS-485 communication	Io	Cannot be changed during operation*1
31	Speed Command Selection	[PAd] Int speed (0 th speed) [VoL-A] H/M/L or M / L *3	VoL-A	
32	Operation Mode Selection	[S.oP 1] 1 st speed mode [S.oP 2] 2 nd speed mode [S.oP 4] 4 th speed mode [S.oP 8] 8 th speed mode	S.oP1	
33	I1 / I2 Function Selection	[F-r] 11(CCW) / I2(CW) [r-F] 11(CW) / I2(CCW) [rS-Fr] 11(run/stop) / I2(CW/CCW) [F-rST] 11(CCW) / I2(A/CLR) [r-rST] 11(CW) / I2(A/CLR)	rS.Fr	
34	I3 Function Selection	[FrEE] Free [E-ST] E-STOP [2ndA.d.] 2nd acceleration / deceleration [rST] A/CLR	FrEE	
35	I4 Function Selection		rST	
36	I5 Function Selection		FrEE	
3A	Minimum Speed Limit	0-Pr.3b (Setting Unit : 1 r/min)	0	
3b	Maximum Speed Limit	0-4000 (Setting Unit : 1 r/min)	4000	
3C	Torque limit	0-150 (Setting Unit : 1%)	150	

*1 Cannot be changed while the motor is operating.

*2 Corresponds to the RUN/STOP switch of the signal input.

*3 Corresponds to the analog speed command.

Pr. No	Name	Setting Range	Default Value	Note
40	O1 Function Selection	[AL] Alarm Output [VA] Speed Reach Output [rUn] Motor Running Output [FrEE] FREE Output	AL	
41	O2 Function Selection	[F] CCW Operation Output [r] CW Operation Output [Ov.Ld] Overload Detection Output [P.Out] Speed Pulse Output	P.oUT	
42	O1 Polarity Selection	[nor] Normal [rEV] Reverse	nor	
43	O2 Polarity Selection			
44	Speed Reach Range	20 – Pr.3b (Setting Unit: 1 r/min)	50	
45	Pulse Out		15	Cannot be changed
46	Monitor Mode Selection	[A-SPd] Actual Speed [Torq] Torque [Ld-F] Load factor [C-SPd] Speed Command [dC.VLT] Internal DC Voltage	A-SPd	
47	Display Scale (Numerator)	1-Pr.48 * 10	1	
48	Display Scale (Denominator)	1-1000	1	
4A	Clear Alarm History	[no] Do Not Clear [yES] Clear Alarm History	no	
4b	Alarm History 1	[----] No History [E-01] Sensor error [E-02] Low Voltage Protection [E-03] Overvoltage Protection [E-04] Overload Protection [E-05] Overspeed Protection [E-07] Locked rotor Protection [E-08] Overcurrent Protection [E-10] E-STOP [E-09] Overheat Protection [E-12] RS-485 communication error [E-15] Open-Phase Protection [E-90] User para. error [E-91] system para. error [E-99] Cpu error	-----	
4C	Alarm History 2		-----	
4d	Alarm History 3		-----	
4E	Alarm History 4		-----	
4F	Alarm History 5		-----	

Pr. No	Name	Setting Range	Default Value	Note
50	Low Voltage Alarm Selection	[no] No Alarm Occurrence (Warning) [yES] Set Alarm	no	Cannot be changed during operation ^{*1}
51	Retry Selection	0-4	0	
52	Retry Interval	1-120 sec (Setting Unit: 1 sec)	5	
54	Parameter Initialization	[no] Do Not Initialize [yES] Execute Initialization	no	
57	Parameter Copy	[no] [P. InIt] Keypad Initialization [P. LoAd] Parameter Read [P. ProG] Parameter Write	no	
5A	RS-485 Driver ID	128-159	129	Cannot be changed during operation ^{*1}
5b	RS-485 Transmission Speed	[2400] 2400 bps [4800] 4800 bps [9600] 9600 bps	9600	
5C	RS-485 Communication Protocol	[8-n-1] 8bit, parity(no), stop bit(1) [8-n-2] 8bit, parity(no), stop bit(2) [8-o-1] 8bit, parity(odd), stop bit(1) [8-E-1] 8bit, parity(even), stop bit(1) [7-o-1] 7bit, parity(odd), stop bit(1) [7-0-2] 7bit, parity(odd), stop bit(2) [7-E-1] 7bit, parity(even), stop bit(1) [7-E-2] 7bit, parity(even), stop bit(2)	8-E-1	
5d	RS-485 Response Time	6-255 (Setting Unit: 1 ms)	6	
5E	RS-485 Retry	[0-6] Number of Retries [7] No Retry	0	
5F	RS-485 Protocol timeout	1-255 (Setting Unit: 1 sec)	10	
F0	Manufacturer's Area	-	-	

^{*1} Cannot be changed while the motor is operating.

^{*4} Changes take effect after the power is turned off and then back on after 10 seconds.

4.2 Parameter Functions

[Pr. 00] Int speed (0th speed)

It is possible to set the rotation speed. It is valid when [Pad] is selected in Pr.31 (Speed Command Selection). The upper limit is restricted by Pr. 3b (Max Speed Limit).

[Pr. 01-07] 1st speed – 7th speed

It is possible to set the rotation speed for 1st speed to 7th speed. It can be selected in Pr.32 (Operation Mode Selection).

[Pr. 10-11] 1st / 2nd Acceleration Time

It is possible to set the acceleration time (based on the time required to change by 1000 r/min).

- * For 0.3 sec (default), the time required to accelerate from 0 to 3000 r/min is 0.9 sec.
- * For times under 3 seconds, it can be increased by 0.01 seconds; from 3 to 30 seconds, by 0.1 seconds; and above 30 seconds, by 1 second.

[Pr. 12-13] 1st / 2nd Deceleration Time

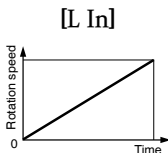
It is possible to set the deceleration time (based on the time required to change by 1000 r/min).

- * For 0.3 sec (default), the time required to decelerate from 3000 r/min to 0 is 0.9 sec.
- * For times under 3 seconds, it can be increased by 0.01 seconds; from 3 to 30 seconds, by 0.1 seconds; and above 30 seconds, by 1 second.

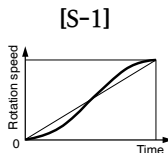
[Pr. 14-15] Acceleration/Deceleration Mode Selection

It is possible to set the acceleration and deceleration patterns.

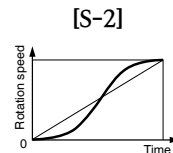
Select [S-shape] when [Pad] is selected in Pr. 31 (Speed Command Selection).



The acceleration and deceleration patterns are linear.
This is the standard mode for acceleration and deceleration.



The acceleration and deceleration patterns are curved.



The speed change at the start and end of acceleration and deceleration is gradual.

[Pr. 16] Stop Mode Selection

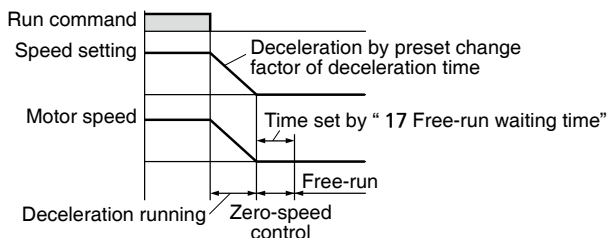
It is possible to select the motor stop method.

1) [FrEE] (FREE)

When a stop command is input, the power supply to the motor is cut off, and the motor comes to a natural stop (FREE). If the load inertia is large, it may take longer for the motor to come to a complete stop.

2) [dEC] (DECEL)

When a stop command is input, the motor's speed decreases according to the set deceleration time. An electric brake (servo-lock) is applied by zero-speed control for the time set in Pr. 17 (Free Wait Time). Afterward, the power is cut off, and the motor enters a FREE state.



[Pr. 17] Free Wait Time

This is valid when [dEC] (DECEL) is selected in Pr.16 (Stop Mode Selection). After deceleration stops, an electric brake is applied by zero-speed control (after which it enters a FREE state).

[Pr. 1A] P Gain Setting

It is possible to activate the proportional gain setting of the speed amplifier. Generally, there is no need to change this. Increasing this value raises the gain, enhancing the motor's responsiveness. However, setting it too high may cause motor vibration.

[Pr. 1b] I Gain Setting

It is possible to activate the integral gain setting of the speed amplifier. Generally, there is no need to change this. Increasing this value raises the gain, improving the motor's rigidity (servo lock strength). However, setting it too high may slow the motor's response.

[Pr. 30] Operation Command Selection

It is possible to select the motor's operation command.

1) [PAc] (KEYPAD)

Commands the motor to stop using the keypad switch.

The motor cannot be operated by signal inputs "I1" and "I2." These signal inputs are only valid for settings such as rotation direction. Please refer to Pr.33 (I1/I2 Function Selection).

2) [Io] (I1 / I2)

Only the input terminals "I1" and "I2" are valid.

3) [RS.485] (RS-485 Communication)

RExecutes commands via RS485.

(Operation commands via I/O are invalid, but alarm or sensor inputs are excluded.)

[Pr. 31] Speed Command Selection

It is possible to select the speed command.

1) [PAc] (KEYPAD)

Internal speed (0th speed)

2) [VoL-A] (VOL-A)

Analog input terminal (DC 0~5V).

[Pr. 32] Operation Mode Selection

It is possible to select the operation mode.

Setting	Operation mode	Function of signal input		
		I3	I4	I5
[1]	1st speed operation mode		Free-run stop External forced trip	
[2]	2nd speed operation mode	Speed setting	2nd acceleration/deceleration time Trip reset	
[3]	4th speed operation mode	Speed setting	Speed setting	
[4]	8th speed operation mode	Speed setting	Speed setting	Speed setting

1) 2nd speed operation mode

I3	Setting to be chosen
OFF	Internal speed (0-th speed) or [VoL-A]
ON	1st speed

2) 4th speed operation mode

I3	I4	Setting to be chosen
OFF	OFF	Internal speed (0-th speed) or [VoL-A]
ON	OFF	1st speed
OFF	ON	2nd speed
ON	ON	3rd speed

3) 8th speed operation mode

I3	I4	I5	Setting to be chosen
OFF	OFF	OFF	Internal speed (0-th speed) or [VoL-A]
ON	OFF	OFF	1st speed
OFF	ON	OFF	2nd speed
ON	ON	OFF	3rd speed
OFF	OFF	ON	4th speed
ON	OFF	ON	5th speed
OFF	ON	ON	6th speed
ON	ON	ON	7th speed

[Pr. 33] I1 / I2 function is selected ([Io] is selected in Pr.30 (Operation Command Selection))

1) [F-r] (FORWARD – REVERSE)

State of I1 and I2		Action
I1	I2	
OFF	OFF	Stop Deceleration stop when “Pr.16 Stop mode selection” is [dEC]
ON	OFF	CCW run
OFF	ON	CW run
ON	ON	Free-run stop Trip reset (which must be retained 0.2 sec or longer) *

2) [r-F] (REVERSE – FORWARD)

State of I1 and I2		Action
I1	I2	
OFF	OFF	Stop Deceleration stop when “Pr.16 Stop mode selection” is [dEC]
ON	OFF	CW run
OFF	ON	CCW run
ON	ON	Free-run stop Trip reset (which must be retained 0.2 sec or longer) *

3) [rS-Fr] (RUN/STOP – FORWARD/REVERSE)

State of I1 and I2		Action
I1	I2	
OFF	OFF	Stop Deceleration stop when “Pr.16 Stop mode selection” is [dEC]
ON	OFF	CCW run
OFF	ON	Stop Deceleration stop when “Pr.16 Stop mode selection” is [dEC]
ON	ON	CW run

4) [F-rST] (FORWARD – A/CLR)

State of I1 and I2		Action
I1	I2	
OFF	–	Stop Deceleration stop when “Pr.16 Stop mode selection” is [dEC]
ON	–	CCW run
–	ON	Trip reset (which must be retained 0.2 sec or longer) *

5) [r-rST] (REVERSE – A/CLR)

State of I1 and I2		Action
I1	I2	
OFF	–	Stop Deceleration stop when “Pr.16 Stop mode selection” is [dEC]
ON	–	CW run
–	ON	Trip reset (which must be retained 0.2 sec or longer) *

[Pr. 33] I1 / I2 function is selected ([PA] is selected in Pr.30 (Operation Command Selection))

1) [F-r] (FORWARD – REVERSE)

State of I1 and I2		Action
I1	I2	
OFF	OFF	CCW rotation selection
ON	OFF	
OFF	ON	CW rotation selection
ON	ON	Free-run stop irrespective of RUN switch Trip reset (which must be retained 0.2 sec or longer)*

2) [r-F] (REVERSE – FORWARD)

State of I1 and I2		Action
I1	I2	
OFF	OFF	CW rotation selection
ON	OFF	
OFF	ON	CCW rotation selection
ON	ON	Free-run stop irrespective of RUN switch Trip reset (which must be retained 0.2 sec or longer)*

3) [rS-Fr] (RUN/STOP – FORWARD/REVERSE)

State of I1 and I2		Action
I1	I2	
–	OFF	CCW rotation selection
–	ON	CW rotation selection

4) [F-rST] (FORWARD – A/CLR) + [RUN] switch

State of I1 and I2		Action
I1	I2	
–	ON	Trip reset (which must be retained 0.2 sec or longer) *

5) [r-rST] (REVERSE – A/CLR) + [RUN] switch

State of I1 and I2		Action
I1	I2	
–	ON	Trip reset (which must be retained 0.2 sec or longer) *

[Pr. 34-36] I3 / I4 / I5 Function Selection**1) [FrEE] (FREE)**

Stops naturally when ON (connected to Pin6 [GND]).

2) [E-ST] (E-STOP)

An E-STOP alarm occurs when OFF (disconnected from Pin6 [GND]).

3) [2nd A.d.] (2nd ACC/DEC)

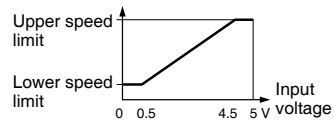
Operates at the 2nd acceleration/deceleration time when ON (connected to Pin6 [GND]).

4) [rST] (A/CLR)

Clears the alarm when ON (connected to Pin6 [GND]).

[Pr. 3A] Minimum Speed Limit

When [VoL-A] is selected in Pr.31 (Speed Command Selection), this sets the motor's minimum speed at 0V input.

**[Pr. 3b] Maximum Speed Limit**

When [VoL-A] is selected in Pr.31 (Speed Command Selection), this sets the motor's maximum speed at 5V input.

[Pr. 3C] Torque limit

Sets the upper limit of the motor output torque.

[Pr. 40-41] O1 / O2 Functions Selection

It is possible to select output terminals O1 and O2. The output polarity can be reversed by Pr42-43.

- 1) [AL] (ALARM OUT) : Alarm Output
- 2) [VA] (SPEED ATTAINMENT) : Speed Reach Output
- 3) [rUn] (RUN) : Motor Running (Operation) Output
- 4) [FrEE] (FREE) : FREE Output
- 5) [F] (FORWARD) : CCW Operation Output
- 6) [r] (REVERSE) : CW Operation Output
- 7) [oV.Ld] (OVERLOAD) : Overload Detection Output
- 8) [P.oUT](SPEED OUT) : Speed Pulse Output

[Pr. 42-43] O1 / O2 Polarity Selection

It is possible to select the polarity of output terminals O1 and O2.

- 1) [nor] (NORMAL) : Transistor ON when the function is active
- 2) [rEV] (REVERSE) : Transistor OFF when the function is active

[Pr. 44] Speed Reach Range

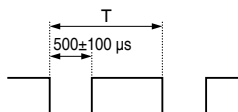
It is possible to select Speed Reach Range.

- 1) A signal is output when the difference between the actual rotational speed and the set rotational speed is smaller than the [Speed Reach Range].
- 2) If the speed attainment range is set too small, the output signal may turn on or off depending on speed fluctuations.
- 3) The signal is not output during a change in rotation direction.

[Pr. 45] Pulse Out

Sets the number of pulses per motor revolution.

(EX) For 3000 r/min with [15] set in Pr. 45)



[Pr. 46] Monitor Mode Selection

It is possible to select the monitor mode.

- 1) [A-SPd] (ACTUAL SPEED) : Actual Rotational Speed
- 3) [Ld.rT] (LOAD AVERAGE TORQUE) : Load Average Torque
- 4) [C-SPd] (COMMAND SPEED) : Speed Command
- 5) [dc.VLT] (DC VOLTAGE) : Internal DC Voltage

* In speed display mode, the value displayed is multiplied by Pr.47 (Display Scale Numerator) / Pr.48 (Display Scale Denominator).

$$T = \frac{60}{3000 \times 15} = 1.33 \text{ ms}$$

Frequency $f = 1/T = 0.75 \text{ kHz}$

[Pr. 47-48] Display Scale (Numerator) / Display Scale (Denominator)

It is possible to set the scale of the displayed value.

[Pr. 4A] Alarm History Clear

It is possible to clear the alarm history. The procedure for clearing the alarm history is as follows

- 1) Select [YES].
- 2) While pressing [STOP], press [SET] for 1 second.
- 3) P.End will be displayed.
- 4) Wait approximately 5 seconds, and alarm history will be cleared.
- 5) Normal operation will resume.

[Pr. 4b-4F] Alarm History

Up to 5 alarm histories are stored. Pr.4b (Alarm History 1) is the most recent history. If there is no alarm history, it will be displayed as [- - - -].

[Pr. 50] Low Voltage Alarm Selection

- 1) If [no] is selected, no alarm will occur during a voltage drop. The motor will stop, and if the voltage is restored and an operation command is present, the motor will automatically restart. (Caution)
- 2) If [YES] is selected, an alarm will occur during a voltage drop. If the power is turned off, the alarm history will not be saved. The alarm history will only be recorded if the power was momentarily interrupted and then restored to normal.

[Pr. 51] Retry Selection

It is possible to set the alarm retry.

- 1) Automatically resets the alarm to continue operation.
- 2) Only use this feature on equipment where automatic motor restart poses no safety concerns.
- 3) Retry is not possible for alarms caused by overcurrent protection, phase loss protection, or system errors.
- 4) If [no] is selected, no retries will be performed.
- 5) If [1-4] is selected, the motor will retry the specified number of times.
- 6) If the motor does not run for more than 2 hours, the retry count will reset to 0.
- 7) The retry interval can be set in Pr.52 (Retry Interval).
- 8) If an alarm occurs after exceeding the retry count, an alarm signal is output, and the motor stops.
- 9) During the retry process, no alarm signal is output (but it is recorded in the alarm history).

[Pr. 52] Retry Interval

It is possible to set the interval between alarm occurrence and retry. (1-120 seconds)

[Pr. 54] Parameter Initialization

It is possible to initialize parameters to their default settings. The initialization procedure is as follows

- 1) Select [YES].
- 2) While pressing [STOP], press [SET] for 1 second.
- 3) P.End will be displayed.
- 4) Wait approximately 5 seconds, and the parameter initialization will be completed.
- 5) Turn off the power, and after the power LED turns off, turn the power back on.

[Pr. 57] Parameter Copy

It is possible to copy parameters.

- 1) If [no] is selected, parameters will not be copied.
- 2) [P. InIT] (PARAMETER INITIALIZE): Initializes the keypad.
- 3) [P. LoAd] (PARAMETER LOAD): Reads Parameters from the keypad.
- 4) [P. ProG] (PARAMETER PROGRAM): Writes parameters to the Driver.

* Refer to [3.3 Parameter Copy] for details.

[Pr. 5A] RS-485 Driver ID

It is possible to set the Driver ID.

- 1) 80h (128) is an ID number used to set control data for all connected Drivers in a single operation. (No response is given.)
- 2) If set to 80h (128), parameter changes and status requests are ignored, so for normal operation, please set it to 81h(129)-9Fh(159).

[Pr. 5b] RS-485 Transmission Speed

It is possible to set the communication speed for RS-485 communication.

- [0] : 2400 bps
- [1] : 4800 bps
- [2] : 9600 bps

[Pr. 5C] RS-485 Communication Protocol

It is possible to set the communication protocol for RS-485 communication.

[8-n-1] 8bit, parity(no), stop bit(1)

[8-n-2] 8bit, parity(no), stop bit(2)

[8-o-1] 8bit, parity(odd), stop bit(1)

[8-E-1] 8bit, parity(even), stop bit(1)

[7-o-1] 7bit, parity(odd), stop bit(1)

[7-o-2] 7bit, parity(odd), stop bit(2)

[7-E-1] 7bit, parity(even), stop bit(1)

[7-E-2] 7bit, parity(even), stop bit(2)

[Pr. 5d] RS-485 Response Time

Response time refers to the time it takes for the Driver to switch to transmission mode on the RS-485 bus after receiving communication data. The actual response time may vary depending on the type of request and the data. (Unit: msec)

[Pr. 5E] RS-485 Retry

It sets the retry count for RS-485 communication.

[0-6] : Number of retries

[7] : No retries

[Pr. 5F] RS-485 protocol timeout

The RS-485 protocol timeout is the allowed time between receiving a character code during communication and receiving the next character code. If a valid character code is not received within this time, the communication time is exceeded, and the received data is discarded. If a timeout continues to occur and the number of detections exceeds the retry count, an RS-485 communication error will occur. (Unit: sec)

[Pr. F0] Manufacturer Area

This cannot be changed.

21C, for world geared motor!

USER MANYAL

 **SPG Co., Ltd.**

※For further development of the product, specification and design can be changed without notice. For other information, please contact customer service depot of the head office or sales department.

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