

OPERATION MANUAL

AC Servo Drive

FDA7000 Series

Ver 1.4 (Soft. Ver. 1.15 ~)

FDA7000 Series

Servo Drive User Manual

HIGEN

Essential notes before use

A. Checking Motor ID certainly.

: Enter the motor ID indicated on the motor name plate to the parameter of “P01-01”.

For details on the motor ID, refer to Chapter 3 of this manual.

B. Checking Drive AMP-Type certainly.

AMP-Type [FDA70-]	01	02	04/ 04B	05	08	10	15/ 15B	20/ 20B	30/ 30B	45
P01-11 [Drive ID]	1	2	4	5	8	10	15	20	30	45

C. Checking Encoder ID certainly.

Encoder Type	Manual setting	INC 2000	INC 2500	INC 3000	INC 5000	INC 6000	INC 2048	ABS 11/ 13bit	INC 17/ 33bit	ABS 17/ 33bit
P01-12 [Encoder ID]	Enc-0	Enc-A	Enc-b	Enc-C	Enc-d	Enc-E	Enc-F	Enc-G	Enc-P	Enc-R

♥ When you set the encoder ID to “Enc-0”, you can change the value of P01-13 (Encoder pulse rate). But if you set the encoder ID to “Enc-A ~ Enc-R”, you cannot change the value of P01-13.

D. Operate servo system after autotuning is off. (P02-17)

: Always cancel the autotuning during normal operation after gain setting using autotuning.

E. Motor handling

: Avoid impacting to the encoder in connecting coupling to the Motor shaft or operating.

F. Recommended specification of Encoder wiring.

Encoder type	Page of wiring explanation
Incremental encoder	2-13
Absolute encoder 11bit	2-14
Absolute/Incremental encoder 17bit	2-15

G . Separate GND24 (CN1-24, 25) and GND (CN1-1, 8, 26, 33, 34, 36).

: When connect commonness, malfunction of servo drive and burnout can occur.

H . Treatment of the servo motor attached holding brake .

: The brake built in the servo motor is a normal closed type brake. Which is used only to hold and can not be used for braking. Use the holding brake only to hold a stopped servo motor.

I. Do not supply AC at N, P connector when connect the power line to Small and Medium capacity servo drive.

: If main power is DC power, because N connector (-) voltage and P connector (+) voltage, burnout of servo drive when N, P connector is supplied AC power.

Choose positively necessary AC and DC power, and use.

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Chapter 1

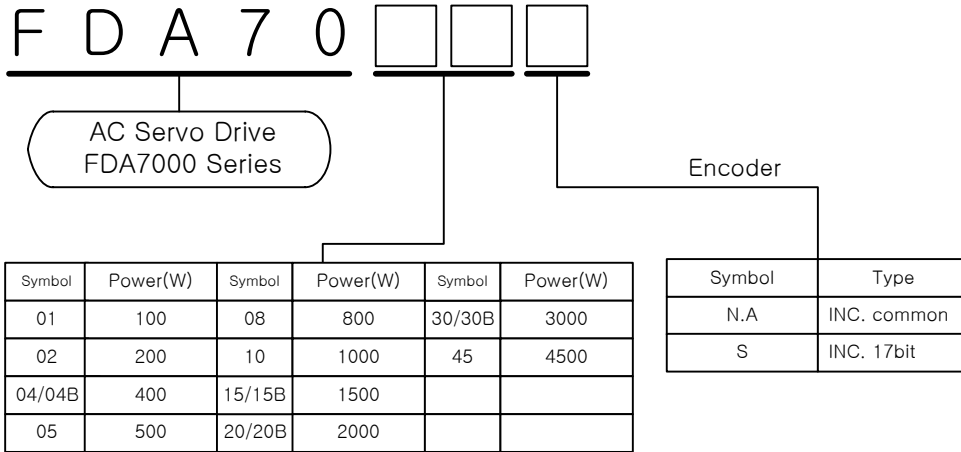
Model check and handling

Chapter 1 explains the details to check before using the servo drive and motor that you have purchased. Before assembling the product, check whether name plate is as ordered. Mishandling can disable normal operation or can significantly reduce the operating life depending on the situation. Because it can damage the servo in the worst case, please read the details and precautions of each article for handling.

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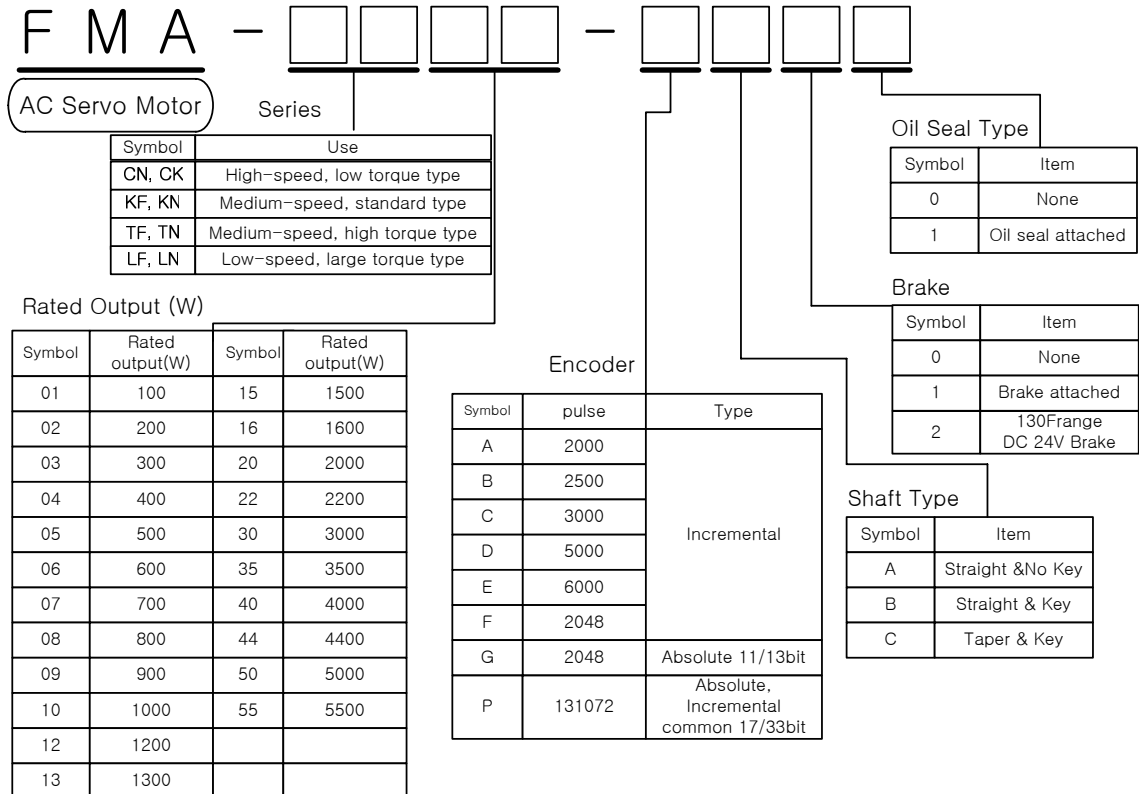
1.1 Model check

1.1.1 Servo drive model classification



(Note) Since the drive models for serial and general incremental encoder are separated as shown above, please check the model name before using the product.

1.1.2 Servo motor model classification



1.2 Servo drive specification

Servo Drive [FDA70-]		01	02	04/ 04B	05	08	10	15/ 15B	20/ 20B	30/ 30B	45	
Main circuit power	Input voltage, frequency (Note) 1	3 phase AC200~230V, 50/60Hz \pm 5% Single phase AC230V, 50/60Hz \pm 5%						3 phase AC200~230V, 50/60Hz \pm 5%				
	Permitted voltage variance rate	3 phase AC170 ~ 253V (Input voltage range +10/-15%) 2 phase AC207 ~ 253V (Input voltage range +10/-10%)						3 phase AC170 ~ 253V (Input voltage range +10/-15%)				
Control circuit power	Input voltage, frequency	No separate input part		Single phase AC200~230V, 50/60Hz \pm 5%								
	Permitted voltage variance rate			Single phase AC170 ~ 253V (Input voltage range +10/-15%)								
Detector	Detector type	17/33 bit serial encoder, 11/13 bit absolute encoder, incremental 2000 ~ 6000 [ppr] 15 line type										
	Output signal type	Differential Line Driver output										
	Detector accuracy	Maximum of 131072 [pulse] per 1 encoder revolution										
	Detector power	DC 5[V], 0.3 [A] or below										
Drive system		Sine wave PWM control (IPM use)										
Speed control specification	Speed control range	Internal speed command 1:5000, analog speed command 1:2000										
	Frequency response characteristics	600 [Hz]										
	Speed command input	DC 0 \sim \pm 10 [V], maximum speed (Can be adjusted with parameter)										
	Speed fluctuation rate	\pm 0.01 % or below (Rated load: 0 ~ 100 %) \pm 0.01 % or below (Rated power voltage: \pm 10 %) \pm 0.1 % or below (Temperature variance : 25 \pm 25 $^{\circ}$ C)										
	Acceleration /deceleration time	Straight, S type acceleration/deceleration possible (0 ~ 100 [sec])										
Position control specification	Position input frequency	500 [kpps]										
	Position input type	Direction + Pulse, CW pulse + CCW pulse 2 phase pulse (A phase + B phase)										
	Position input method	Open Collector, Line Driver method										
Torque control specification	Torque command input	DC 0 \sim \pm 10 [V], maximum command (Can be adjusted with parameter)										
	Torque linearity	4 [%] or below										
	Limited speed command	DC 0 \sim \pm 10[V] , maximum speed (Can be adjusted with parameter)										
Internal function	Protection function	Over-current, recovery over-voltage, over-load, motor mis-wiring, Encoder problem, insufficient voltage, over-speed, over-tolerance etc.										
	Regenerated resistance(W/ Ω)	50/50	70/50				250/25	500/12.5				
	Monitor output	Speed, torque (-5 ~ +5 [V])										
	Dynamic brake	Built in										
	Additional function	Test function (Jog and no motor operation), alarm record, CW/CCW revolution, encoder signal division output										
Option		Motor power cable, Encoder cable, CN1 connector, CN2 connector Digital loader										
Environmental specification	Operating ambient temperature	0 ~ 50 [$^{\circ}$ C] (There should be no freezing)										
	Ambient humidity	90[%] or below (There should be no steam)										
	Storage temperature	-20 ~ +80 [$^{\circ}$ C]										
	Insulating resistance	DC 500[V] 10 [M Ω] or above										
Weight(Kg)		1.0	1.0	1.5	1.9	1.9	1.9	4.3	4.4	4.5	4.6	

(Note) 1 This indicates the input voltage and frequency range that assures the motor rated output and rated revolution speed. This is not assured during voltage drops.

1.3 Combination table of servo drive and motor

Drive [FDA70-]	Motor						
	CN/CK Series 3000/6000 [rpm]	KN Series 2000/3000 [rpm]	TN Series 1500/3000 [rpm]	LN Series 1000/2000 [rpm]	KF Series 2000/3000 [rpm]	TF Series 1500/3000 [rpm]	LF Series 1000/2000 [rpm]
01	CKZ5 CN01 CK01	-	-	-	-	-	-
02	CN02 CK02	-	-	-	-	-	-
04/04B (* [04E])	[CN03] [CN04] [CK04] [CN04A] CN05	[KN03] KN05	-	[LN03]	-	-	[LF03]
05 (* [05E])	[CN06] CN08 CN09	[KN06] [KN06A]	[TN05]	LN06	-	[TF05]	LF06
08	CN10	-	-	-	KF08 KF10	-	-
10	-	KN07 KN11	TN09	LN09	-	TF09	LF09
15/15B	CN15	KN16	TN13	LN12 LN12A	KF15	TF13	LF12
20/20B	CN22	KN22 KN22A	TN17 TN20	LN20	KF22	TF20	LF20
30/30B	CN30 CN30A	KN35	TN30	LN30	KF35	TF30	LF30
45	CN50 CN50A	KN55	TN44	LN40	KF50	TF44	-

※ “[04E]” and “[05E]” drive models are for a more precise torque and speed position control, and categorized as specially ordered product. The motors that can be applied to “[04E]” and “[05E]” drive model are limited to the motors within the [], and for more details, please contact your point of purchase.

1.4 Installation

1.4.1 Installation of servo drive

1) Operating environment

Ambient temperature	0-50 °C (There should be no freezing) Note)
Ambient humidity	90% RH or lower (There should be no vapor)

Note) Inside control panel temperature specifications : To ensure maximum operating life and reliability of the drive, maintain the average control panel temperature at 40 °C or lower.

2) Installation direction and intervals

- Install FDA7000 can be seen from the front.
- If the drives are installed in a closed control panel, maintain an interval of more than 10 mm between drives and more than 40 mm between top and bottom. If multiple number of control panels are installed in parallel, about 100 mm space is required on the upper side. In case of installing fans, avoid heat.
- Regenerative resistor, heating source, away from the drive.

3) Prevention of ingress of dust

- Exercise caution when drilling control panels to prevent chips produced by drilling from getting into the drive.
- Take appropriate measures to prevent oils, water and metal powder from getting into the drive from openings in the control panels and the fan installed on the ceiling.
- If the drive is used in a place with large amount of toxic gases and dust, protect the drive with an air purge.

1.3.2 Servo motor installation

1) Operating environment

Ambient temperature	0-40 °C (There should be no freezing)
Ambient humidity	80% RH or lower (There should be no vapor)
External vibration	X, Y = 19.6 m/s ² (2G)

2) Caution when assembling load system (Prevent impact on shaft)

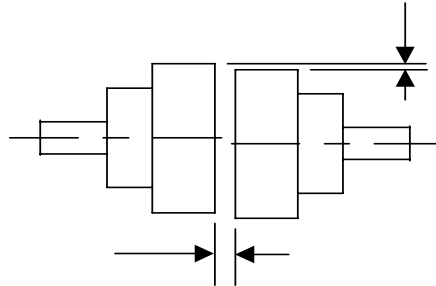
It is important to accurately match the motor shaft with the shaft center of the connecting

1. Model check and handling



machine. Mismatched shaft center causes vibration, and may cause damage to the bearing. Use a rubber hammer to install couplings to prevent excessive force from being applied to the shaft and bearing.

Check 4 places in turn. The difference between maximum and minimum should be 0.03 or lower.



3) Load tolerance on shaft

- Use flexible couplings, and maintain the shaft center deviations within the specified tolerance.
- Use pulleys and sprockets with the allowable load.

MOTOR MODEL		RADIAL LOAD		AXIAL LOAD		REFERENCE DIAGRAM
Series	Type	N	Kgf	N	kgf	
CN	CN01~CN05	196	20	68	7	
	CN06~CN08	245	25	98	10	
	CN09~CN15	490	50	196	20	
	CN20~CN30	686	70	343	35	
	CN30A~CN50A	1470	150	490	50	
KN	KN03~KN07	245	25	98	10	
	KF08~KN11	490	50	196	20	
	KF15~KN22	686	70	343	35	
	KN22A~KN55	1470	150	490	50	
TN	TN05~TN09	490	50	196	20	
	TN13~TN17	686	70	343	35	
	TN20~TN75	1470	150	490	50	
LN	LN03~LN06	490	50	196	20	
	LN09~LN12	686	70	343	35	
	LN12A~LN40	1470	150	490	50	
KF	KF08~KF10	490	50	196	20	
	KF15	686	70	343	35	
	KF22~KF50	1470	150	490	50	
TF	TF05~TF09	490	50	196	20	
	TF13	686	70	343	35	
	TF20~TF44	1470	150	490	50	
LF	LF03~LF06	490	50	196	20	
	LF09	686	70	343	35	
	LF12~LF30	1470	150	490	50	

4) Accuracy of attachments

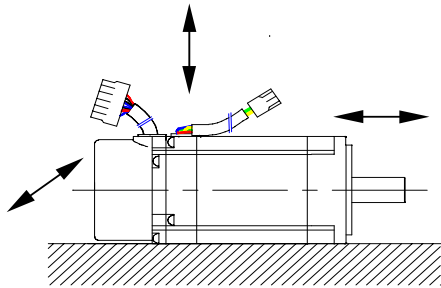
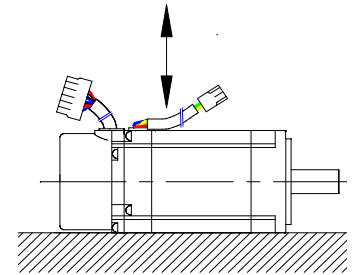
The accuracies of the shaft and attachments of the AC servo motor are shown on the following table.

Item	Accuracy (T.I.R.)	Reference Diagram
Perpendicularity of flange attachment plane and output shaft (A)	0.04mm	
Eccentricity of flange fitting outer diameter (B)	0.04mm	
Vibration of shaft end (C)	0.02mm	

(Note) T.I.R : Total Indicator Reading

5) Impact resistance

The AC servo motor withstands two times of impacts with an acceleration of 10G when up-and-down impacts are applied after setting the motor shaft horizontally. However, a precision detector is attached to the end of the shaft on the opposite side of the load, take caution not to apply impact directly to this end.



6) Vibration resistance

The AC servo motor withstands a vibration acceleration of 2.0G when vibration is applied in up and down, left and right, and front and back directions after setting the motor shaft horizontally.

7) Vibration grade

The vibration grade of the AC servo motor is V15 at the rated rpm.

8) Direction of installation

- Motor can be installed horizontally or at the top or bottom of the shaft.
- Keep the motor cable downward.
- If the motor is installed vertically, install a cable trap so that oils or water do not flow into the motor.

- 9) Cable disconnection
 - Take caution not to stress or damage to the cables.
 - If the motor is used as a mobile motor, use flexible cables.

1.5 Handling

1.5.1 Handling precaution

: Mishandling can lead to unexpected accidents or damage. The key items are listed as follows. Reference the related details and use the drive correctly.

1) Handling

- Do not apply any pressure to the encoder which is the motor detector.
Hitting the shaft with a hammer or falling can cause damages.
- Do not directly connect commercial power (AC220V) to the motor. Over-current can reduce the magnetic efficiency of the motor. Always connect to the defined servo drive for operation.

2) Wiring

- Connect the grounding terminal of the drive and motor to the drive side and ground all at once to the closest point. Use the class-3 earth (100Ω or below) to prevent electric shock and mis-operation.
- The U, V, W and FG terminal of the drive and motor must be aligned. Because the 2 lines are replaced with the commonly used motor, the rotating direction cannot be changed.
- If you connect the commercial power to the U, V, W and FG terminal of the drive, it can be damaged.
- Connect the 200V level power to the R, S and T terminal and the power besides the 200V level must be installed with a transformer.
- Always connect the standard regenerated resistance to the P and B terminal of the drive.

Chapter 2

Wiring and connection

Chapter 2 explains the main circuit wiring, I/O signal connection examples and connection to peripheral devices of the servo drive.

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2.1 Main circuit and peripheral device connection

This part explains the peripheral device and main circuit wiring. Keep the following danger and caution details during wiring.



Danger

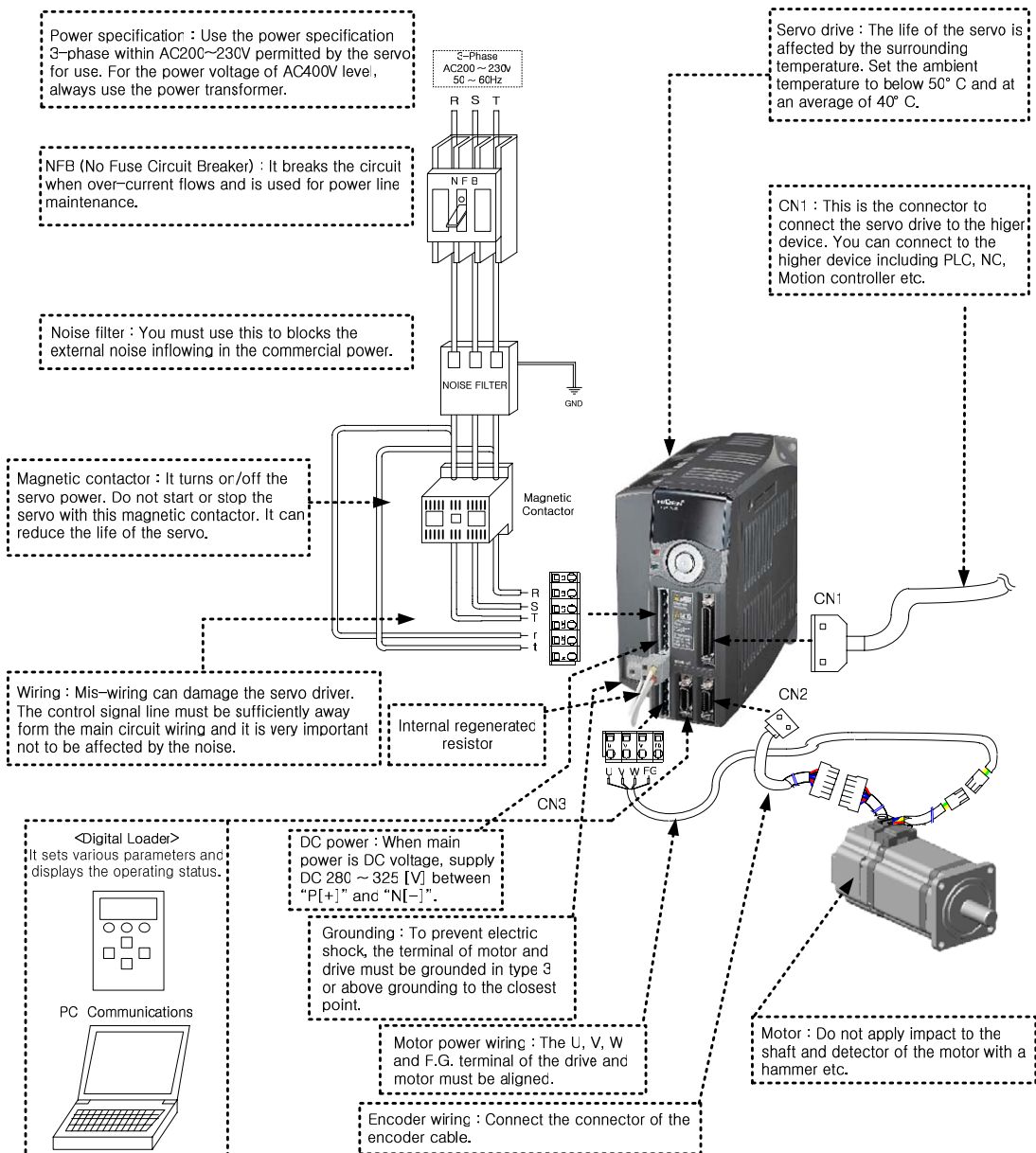
- Do not open the surface cover when connecting the power or during operation. It can cause electric shock.
- Do not operate the drive when the surface cover is removed.
It can cause electric shock because the high voltage terminal and charge part are exposed.
- Even when the power is turned off, do not remove the surface cover unless it is for wiring or periodic check.
It can cause electric shock because the inside of the servo drive is charged.
- Execute the wiring work and check more than 10 minutes after the power has been disconnected and checked of the voltage with tester etc.
- Ground the grounding terminal of the drive and motor both to the drive side and ground at once in the closest point.
To protect electric shock and mis-operation, use at least class-3 ground (100 Ω max.).
- The wiring work and checking work must be executed by specialized technician.
- The wiring must be done after the main unit is installed. It can cause electric shock or injury.
- Do not operate the key with wet hands. It can cause electric shock or injury.
- Make sure you do not damage the wire, apply excessive stress on the wire, put heavy object on top of the wire or have the wire pressed against an object. It can cause electric shock or injury.



Caution

- Use wiring that complies with the standard. Otherwise, the servo motor may not operate.
- Do not install power condenser, surge absorber or radio noise filter on the output side of the servo drive.
- Correctly connect the output side (Terminal U,V,W,FG), or the motor can operate abnormally.
- When attaching the DC relay for control output signal on the control output signal part, be careful of the diode direction for surge absorption. The signal may not be outputted due to problems and the protection circuit will not operate during emergency stop. For diode direction, refer to the user manual.

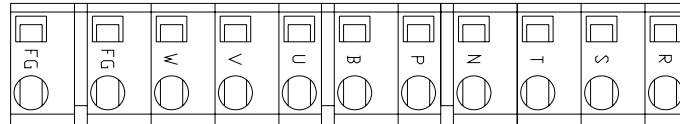
2.1.1 Main circuit and peripheral device connection



- ◆ At the U, V and W terminal, connect the U, V and W phase of the servo motor.
- ◆ Ground the FG terminal. Connect the grounding wire of the servo motor with this terminal.
- ◆ When main supply is DC voltage, supply DC280~325[V] between "P[+]" and "N[-]".
- ◆ Don't supply AC power supply between "P[+]" and "N[-]".

2.2 Main circuit terminal

2.2.1 Small type terminal connection



[FDA7001 ~ FDA7002 connection terminal]

The usage and wiring method of FDA7001~FDA7002 are as follows.

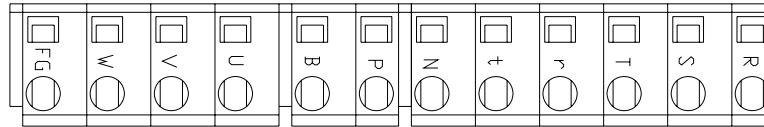
- 1) As the main power of the power circuit, connect the R,S and T terminal to 3 phase AC200~230[V]. It is possible to use 2 phase 220V, then the output is lower than rated.
- 2) Connect the regenerated resistance between the terminals P and B.
- 3) At the U, V and W terminal, connect the U, V and W phase of the servo motor.
- 4) Ground the FG terminal. Connect the grounding wire of the servo motor with this terminal.
- 5) When main power is DC voltage, supply DC280~325[V] between “P[+]” and “N[-]”.
- 6) Don't supply AC power between “P[+]” and “N[-]”.

AC SERVO Operating device	FDA7001	FDA7002
Wire thickness	AWG #16(1.25mm ²)	
Open/close device	GMC-12(13A) level product	
Breaker	ABS33b(5A) level product	
Noise filter	NFZ-4030SG(30A)	
External regenerated resistance	50W 50Ω	

♥ Open/close device and breaker : LS Industrial Systems, <http://www.lsis.biz>

♥ Noise filter : Samil Components, <http://www.samilemc.com>

2.2.2 Medium type terminal connection



[FDA7004/7004B ~ FDA7010 connection terminal]

The usage and wiring method of FDA7004/7004B~FDA70010 are as follows.

- 1) As the main power of the power circuit, connect the R,S and T terminal to 3 phase AC200~230[V].
- 2) As the auxiliary power of the power circuit, connect the r and t terminal to single phase AC200 ~ 230[V].
- 3) Connect the recovery resistance of internal type during shipment between the terminals P and B.
- 4) At the U, V and W terminal, connect the U, V and W phase of the servo motor.
- 5) Ground the FG terminal. Connect the grounding wire of the servo motor with this terminal.
- 6) When main power is DC voltage, supply DC280~325[V] between “P[+]” and “N[-]”.
- 7) Don't supply AC power between “P[+]” and “N[-]”.

AC SERVO Operating device	FDA7004B	FDA7004	FDA7005	FDA7008/ FDA7010
Wire thickness	AWG #16(1.25mm ²)		AWG #14 (2.0mm ²)	AWG #12 (3.5mm ²)
Open/close device	GMC-12(13A) level product		GMC-40(35A) level product	
Breaker	ABS33b(5A) level product			ABS33b (10A) level product
Noise filter	NFZ-4030SG(30A)			
Regenerated resistance	50W 50Ω External resister	70W 50Ω Internal resister		

♥ Open/close device and Breaker : LS Industrial Systems, <http://www.lsis.biz>

♥ Noise filter : Samil Components, <http://www.samilemc.com>

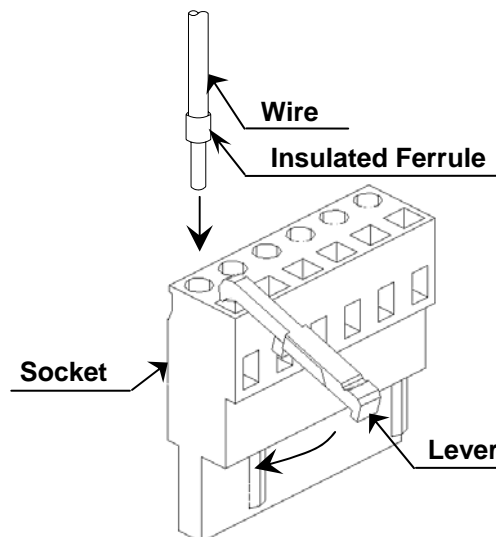
2. Wiring and connection

※ For the wiring of small/medium capacity socket, execute in the following order.

- ① After checking the wire thickness indicated in 2.2.1, remove the wire coating.
 - The coating of the wire to be used should be 8 ~ 9mm or less.
 - The thickness of the wire permitted by the socket is as follows.

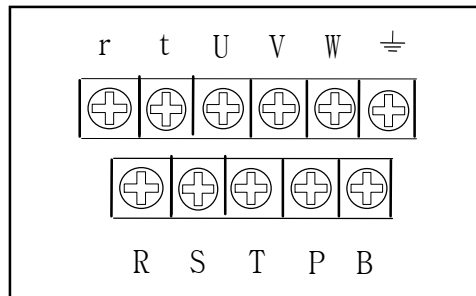
Wire type	Permitted wire thickness
Single wire	$\phi 0.5 \sim \phi 0.8$ [mm]
Twisted wire	AWG28 ~ AWG12

- ② Even though you can use the wire as is after removing the coating, for safety purposes put a ferrule end to press with the crimping tool for ferrules insulated.
- ③ Open the terminal (plug) wire inserting hole with the lever as shown in the following picture.

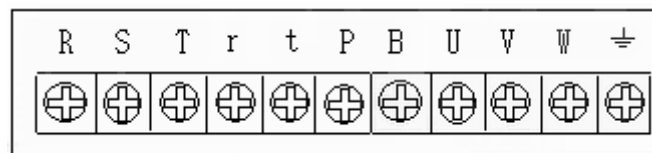


- ④ Insert the core part of the wire to the opening part. Release the lever after inserting the wire.
- ⑤ Lightly pull it out to see whether there is any problem in the connected condition of the socket and the wire.
- ⑥ When the coating of the wire is not completely inserted, it can cause electric shock. Therefore check whether there are any exposed core wires.

2.2.3 Large type terminal connection



[FDA7015 ~ FDA7045 connection terminal]



[FDA7015B ~ FDA7030B connection terminal]

The usage and wiring method of FDA7015~FDA7045, FDA7015B~FDA7030B are as follows.

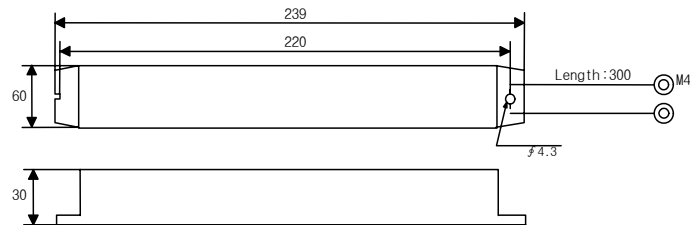
- 1) As the main power of the power circuit, connect the R,S and T terminal to 3 phase AC200~230[V].
- 2) As the auxiliary power of the power circuit, connect the r and t terminal to single phase AC200 ~ 230[V].
- 3) Connect the regenerated resistance between the terminals P and B.
- 4) At the U, V and W terminal, connect the U, V and W phase of the servo motor.
- 5) Ground the FG terminal. Connect the grounding wire of the servo motor with this terminal.

2. Wiring and connection

AC SERVO operating device	FDA7015/ FDA7015B	FDA7020/ FDA7020B	FDA7030/ FDA7030B	FDA7045
Wire thickness	AWG #12(3.5mm ²)		AWG #10 (5.5mm ²)	
Open/close device	GMC-40(35A)		GMC-50(50A) level product	
Breaker	ABS33b (10A)	ABS33b (20A)	ABS33b (30A) Level product	
Noise filter	NFZ-4030SG (30A)			NFZ-4040SG (40A)
External regenerated resistance	250W 25Ω (External diagram A)	250W 25Ω parallel 2 units (External diagram A)		

♥ Open/close device and Breaker : LS Industrial Systems, <http://www.lsis.biz>

♥ Noise filter : Samil Components, <http://www.samilemc.com>



<External view A>

2.3 CN1 I/O signal explanation

2.3.1 CN1 terminal arrangement

CN1 is the connector located on the top right part of the front side of the servo device. This connector is used for connecting the host controller that commands the operating device and the operation.

The pin arrangement and name of the CN1 connector are as shown in the following picture.

2	MONIT2
4	BAT-
6	PBO
8	GND
10	PFIN
12	PRIN
14	SPDLIM/ TLIM
16	DIR
18	SVONEN
20	ALARM
22	INSPD/INP OS/INTRQ
24	GND24

1	GND
3	MONIT1
5	PZO
7	PAO
9	PPRIN
11	PPFIN
13	STOP
15	CCWLIM/ PTQLIM
17	SPD2/ GEAR2
19	A_CODE1
21	RDY
23	-
25	GND24

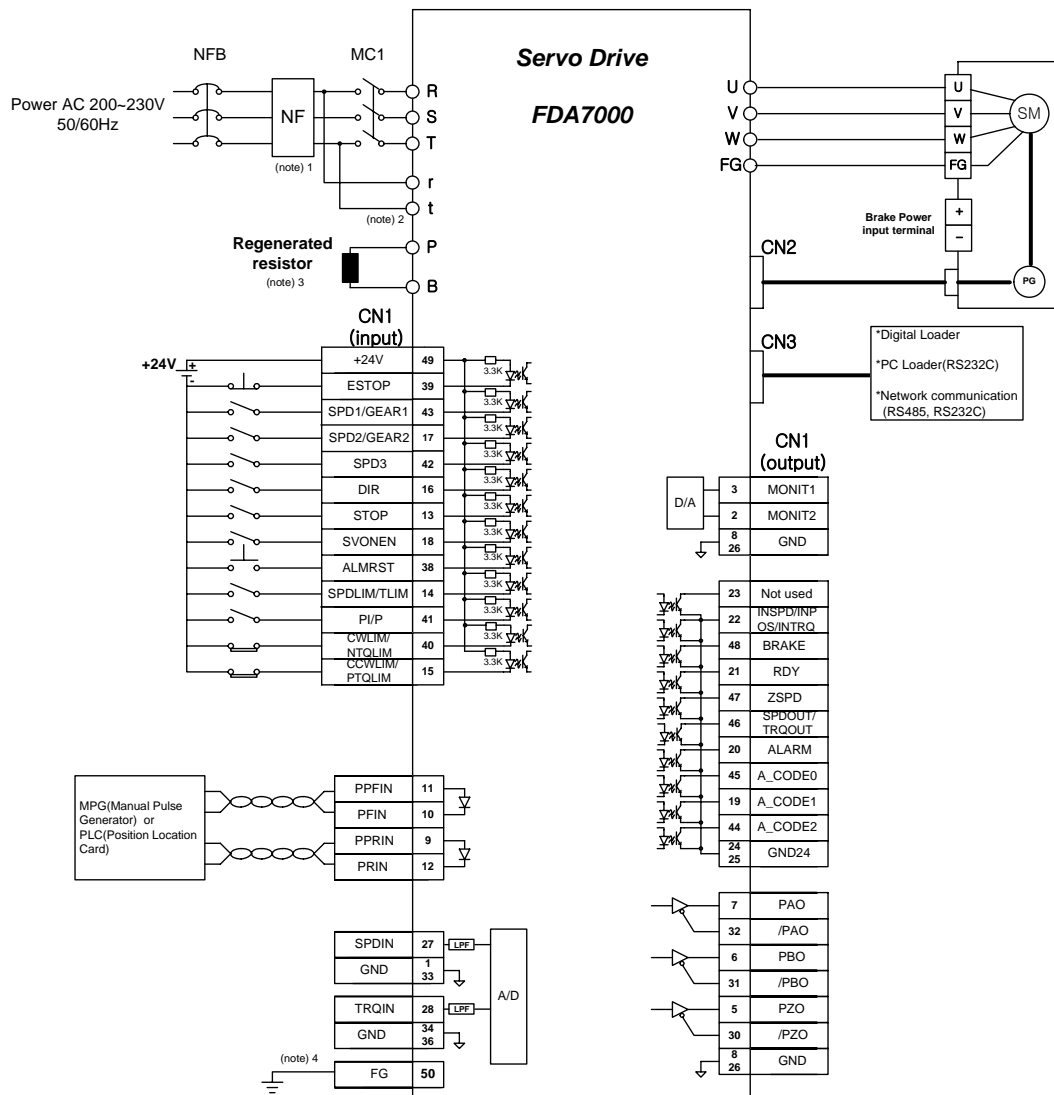
27	SPDIN
29	BAT+
31	/PBO
33	GND
35	+12V
37	-12V
39	ESTOP
41	PI/P
43	SPD1/ GEAR1
45	A_CODE0
47	ZSPD
49	+24VIN

26	GND
28	TRQIN
30	/PZO
32	/PAO
34	GND
36	GND
38	ALMRST
40	CWLIM/ NTQLIM
42	SPD3
44	A_CODE2
46	SPDOUT/ TRQOUT
48	BRAKE
50	FG

- ♥ The above table indicates the reference signal of manufactured default. For the function of partial pin among the signals, the signal allocation can be changed in P07 mode (input function setting) and P08 mode (output function setting).
- ◆ The connector for CN1 is optional.
 - Manufacturer: 3M, CASE product name: 10350-52F0-008
 - Connector (for soldering) : 10150-3000VE

2. Wiring and connection

2.3.2 CN1 I/O wiring



(Note) 1: NF stands for Noise Filter and it must be used to prevent the noise from intruding from the outside.

(Note) 2 : For the FDA7004/7004B~45 type, connect the single phase AC220V[V] to the r, t terminal, auxiliary power.

FDA7001~02 type does not have the supplementary power r, t terminal.

(Note) 3: The recovery resistances of FDA7004~FDA7010 are installed inside the driver as an internal type. The regenerated resistance of the FDA7001, 7002, 7004B, FDA7015 type or above is the separately installed type, check the capacity and apply accordingly.

(Note) 4: Connect the ground wire of CN1 cable to the F.G. (Frame Ground) terminal.

2.3.3 Variable input signal function table (Based on manufactured default)

Signal content	Term	Pin No.	Function and usage explanation
Servo drive Enable	SVONEN	18	It decides whether the servo motor can be operated or not. (ON: Enable OFF: not Enable)
Speed selection 1/ Electronic gear selection 1/	SPD1/ GEAR1/	43	- Internal command speed selection by 3 signal (SPD1, SPD2, SPD3) combination Speed control - Electronic gear ratio selection by 2 signal (GEAR1, GEAR2) combination Position control
Speed selection 2/ Electronic gear selection 2/	SPD2/ GEAR2/	17	
Speed selection 3	SPD3	42	
Direction selection	DIR	16	Selects the Speed/Position/Torque input direction. (OFF: Positive direction selected ON: Negative direction selected)
CCW limit / Positive torque limit	CCWLIM/ PTQLIM	15	Limit signal input on CCW (Speed control)/ Positive torque generation prohibited (Torque control) (ON: Cancel OFF: Prohibited)
CW limit / Negative torque limit	CWLIM/ NTQLIM	40	Limit signal input on CW (Speed control)/ Negative torque generation prohibited (Torque control) (ON: Cancel OFF: Prohibited)
Speed limit / Torque limit	SPDLIM/T LIM	14	Speed limit use input contact point (Torque control)/ Selects whether to use torque limit (Analog torque input and digital torque input can be used according to the combination of TRQ1, TRQ2 and TRQ3 Speed control.)
Alarm reset	ALMRST	38	This cancels the alarm condition.
Emergency stop	ESTOP	39	In case of external emergency, it overrides all input condition of the servo drive and quickly decelerates the motor to free run the motor. You can select the ON/OFF contact point in parameter P02-26.
PI/P control	PI/P	41	It selects the type of speed controller. (OFF:PI control ON:P control)
Stop/Start	STOP	13	It starts or stops the motor operation. You can select the ON/OFF contact point in parameter P02-25. ※ When setting P02-25 to "OFF" (Close: Stop Open: Start)

♥ For details on the input contact point function change, refer to the P07 mode of Chapter 3.

2.3.4 Variable output signal function table (Based on manufactured default)

Signal content	Name	Pin number	Function and usage explanation
-	-	23	You can directly set the input contact point function from P7-01. (Manufactured default : Not use)
Brake operation	BRAKE	48	This is the output signal to operate the external brake. When on, the brake power is supplied to enable motor operation.
Servo ready	RDY	21	No alarm, power good condition when the power is on.
Speed/Position /Torque reach completion	INSPD/INP OS/INTRQ	22	It goes on when it reaches the commanded Speed/Position/Torque.
Speed/torque limiting	SPDOUT/ TRQOUT	46	When used for speed control mode, it indicates the condition of the torque the servo motor is limiting. When used for torque control mode, it indicates the condition of the speed the servo motor is limiting.
Zero speed condition	ZSPD	47	This indicates the stopped condition of the servo motor.
Alarm condition	ALARM	20	When the alarm is detected, it goes off. During normal operation, it goes on.
Alarm 0 CODE	A_CODE0	45	It outputs alarm CODE0.
Alarm 1 CODE	A_CODE1	19	It outputs alarm CODE1.
Alarm 2 CODE	A_CODE2	44	It outputs alarm CODE2.

♥ For details on the output contact point function change, refer to the P08 mode of Chapter 3.

2.3.5 Fixed I/O signal function table

Signal content	Name	Pin number	Function and usage explanation
F+ input pulse	PPFIN	11	Depending on the set value of pulse logic, it receives and operates according to the specific position command type of negative or positive logic. Refer to Chapter 3 for details of the pulse type.
F- input pulse	PFIN	10	
R+ input pulse	PPRIN	9	
R- input pulse	PRIN	12	
Analog speed command	SPDIN	27	When operating in speed mode, enter the analog speed command.
Analog speed limit			When operating in torque mode, enter the analog speed limit.

2. Wiring and connection

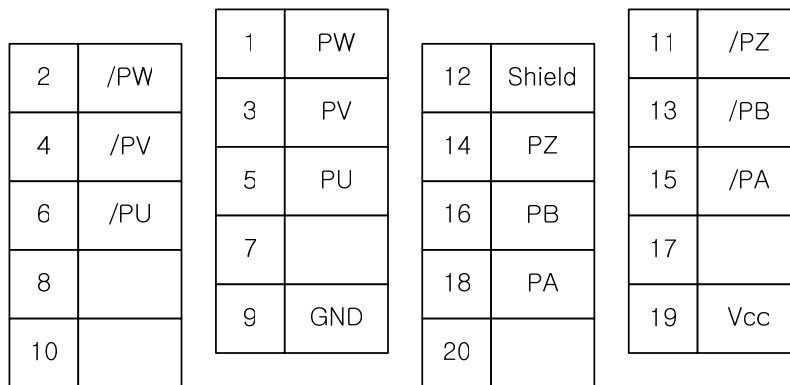
Analog torque command	TRQIN	28	When operating in torque mode, enter the analog torque command.
Analog torque limit			When operating in speed mode, enter the torque limit.
Monitor output 1	MONIT1	3	Designated variable value is outputted in 0~±5[V] range through the DA converter. [Monitor selection] 0: Speed, 1: Speed command, 2: Torque, 3: Torque command, 4: Pulse, 5: Command pulse
Monitor output 2	MONIT2	2	Designated variable value is outputted in 0~±5[V] range through the DA converter. [Monitor selection] 0: Speed, 1: Speed command, 2: Torque, 3: Torque command, 4: Pulse, 5: Command pulse
Encoder output	PAO,/PAO PBO,/PBO PZO,/PZO	7,32 6,31 5,30	After dividing the motor encoder signal from CN2 as much as the division rate set in the division setting menu, it outputs in line drive method.
+24[V] Power input	+24VIN	49	As the external I/O contact point power, enter +24[VDC]±10% 1.0[A] or above for the external power. (User preparation) ◆ When using the I/O contact point power simultaneously, recalculate the power capacity according to the output contact points.
+24[V] GND	GND24	24 25	Connect the ground of power+24[VDC]±10% for external I/O contact point. (User preparation)
0[V]	GND	1,8 26,33 34,36	Common power ground terminal of speed, command, torque limit command, speed, torque monitor output, encoder output terminal.
Battery + Battery -	BAT+ BAT-	29 4	When using the absolute encoder, connect the battery from the host controller. Do not connect the drive side and both sides of the host controller.
+12[V] output -12[V] output	+12 -12	35 37	When simply outputting speed command and torque limit, use the ±12[V] power.
FRAME GROUND	FG	50	Ground the cable ground wire of CN1.

♥ Function of fixed I/O contact point cannot be changed.

2.4 CN2 wiring and signal explanation

CN2 is the connector located on the bottom right side of the front cover of the servo drive. This connector is used for connecting the servo drive and the encoder of the servo motor. The PIN arrangement shown from the connector in the user's point of view is as follows. The encoder signals may differ depending on the type of encoder.

2.4.1 Incremental encoder



[Based on soldering side of user connector]

◆ Connector for CN2 is optional.

- Manufacturer : 3M, CASE product name : 10320-52F0-008,
- Connector (For soldering) : 10120-3000VE

The 15 line type incremental encoder arrangement of CN2 and FMA-Series AC servo motor is shown as the following table.

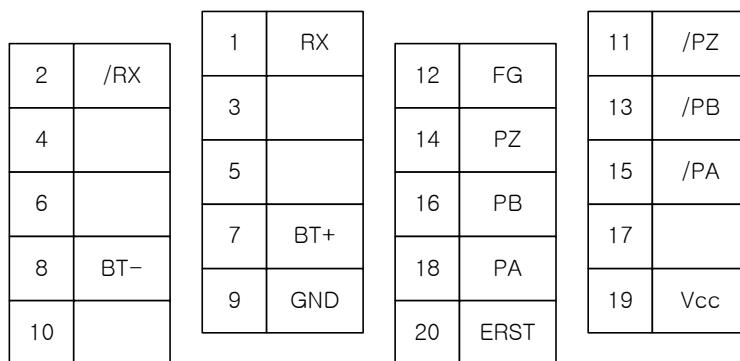
CN2 PIN No. (Drive)	Signal name (Drive)	MOTOR(□60,80series) side Connector pin No. for encoder.	MOTOR(□130,180series) side Connector pin No. for encoder.
1	PW	11	P
2	/PW	12	R
3	PV	9	M
4	/PV	10	N
5	PU	7	K
6	/PU	8	L
7			
8			
9	GND	14	G
10			
11	/PZ	6	F
12	Shield	15	J
13	/PB	4	D
14	PZ	5	E

2. Wiring and connection

15	/PA	2	B
16	PB	3	C
17			
18	PA	1	A
19	Vcc(DC 5V)	13	H
20			

- ♥ Connect the grounding wire of the encoder wiring cable for F.G.
- ♥ Applied cable specification: AWG24 x 9Pair TWIST,SHIELD CABLE (Maximum length 20m)

2.4.2 11bit absolute encoder



[Based on soldering side of user connector]

- ◆ Connector for CN2 is optional.
 - Manufacturer : 3M, CASE product name : 10320-52F0-008,
 - Connector (for soldering) : 10120-3000VE

The 11bit absolute encoder wiring details of CN2 and FMA-series AC servo motor are shown as the following table.

CN2 PIN No. (Drive)	Signal name (Drive)	MOTOR(□ 60,80 series) side Connector pin no. for encoder	MOTOR(□ 130,180 series) side Connector pin no. for encoder.
1	RX	11	P
2	/RX	12	R
3			
4			
5			
6			
7	BAT+	9	K
8	BAT-	10	L
9	GND	14	G
10			

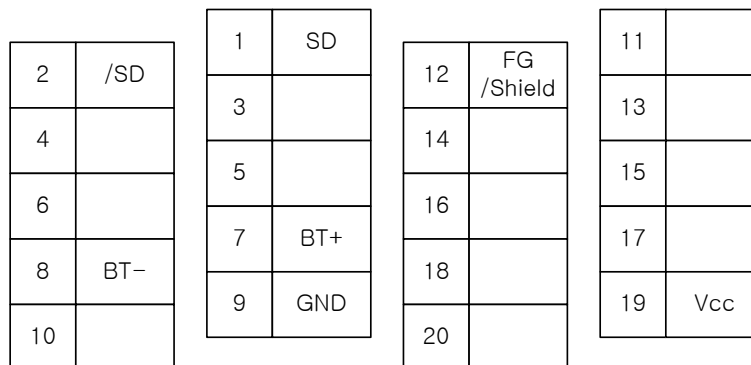
2. Wiring and connection

11	/PZ	6	F
12	F.G.	8	N
	Shield	15	J
13	/PB	4	D
14	PZ	5	E
15	/PA	2	B
16	PB	3	C
17			
18	PA	1	A
19	Vcc(DC 5V)	13	H
20	ERST	7	M

♥ Connect the grounding wire of the encoder wiring cable for F.G

♥ Applied cable specification: AWG24 x 9Pair TWIST,SHIELD CABLE (Maximum length 20m)

2.4.3 17bit absolute/incremental encoder



[Based on soldering side of user connector]

- ◆ The connector for CN2 is optional.
- ◆ For incremental 17bit encoder, you do not need to connect the No. 7 (BT+) and No. 8 (BT-) terminal.
 - Manufacturer : 3M, CASE product name : 10320-52F0-008,
 - Connector (for soldering) : 10120-3000VE

The 17bit absolute encoder wiring details of CN2 and FMA-series AC servo motor are shown as the following table.

CN2 PIN No. (Drive)	Signal name (Drive)	MOTOR(□ 60,80 series) side Connector pin no. for encoder	MOTOR(□ 130,180 series) side Connector pin no. for encoder
1	SD	1	P
2	/SD	2	R

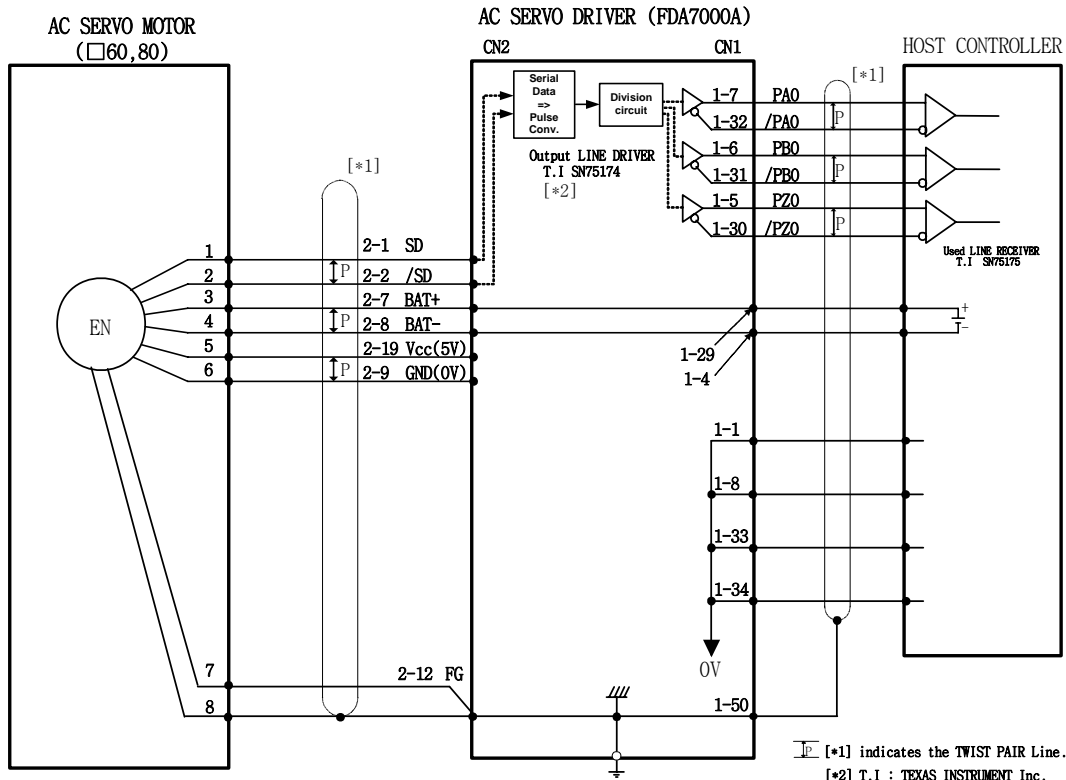
2. Wiring and connection

3			
4			
5			
6			
7	BAT+	3	K
8	BAT-	4	L
9	GND	6	G
10			
11			
12	F.G.	7	N
	Shield	8	J
13			
14			
15			
16			
17			
18			
19	Vcc(DC 5V)	5	H
20			

- ♥ Connect the grounding wire of the encoder wiring cable for F.G
- ♥ Applied cable specification: AWG24 x 5Pair TWIST,SHIELD CABLE (Maximum length 20m)

2. Wiring and connection

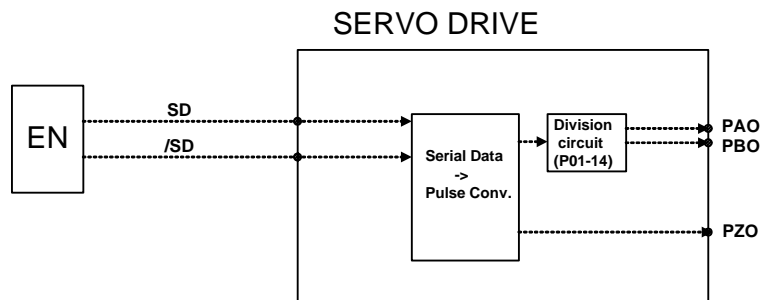
※ A wiring example of CN2 of motor side (□60,80) and FDA7000(A) when applying the 17bit absolute/incremental encoder



- ◆ Applied cable specification: AWG24 x 9Pair TWIST, SHIELD CABLE (Maximum length 20m)
- ◆ You do not need to connect the incremental 17bit encoder no. 7 (BT+) and no. 8 (BT-) terminals,

2.4.4 17bit absolute encoder data transmission

The output signal of absolute encoder is the incremental division output PAO, /PAO, PBO, PBO, PZO, /PZO



2. Wiring and connection

Signal name	Condition	Signal content
PAO	When turning on the power and initializing	Serial data Initial incremental pulse
	During normal operation after initialization is complete	Incremental pulse
PBO	When turning on the power and initializing	Initial incremental pulse
	During normal operation after initialization is complete	Incremental pulse
PZO	Always	Origin pulse

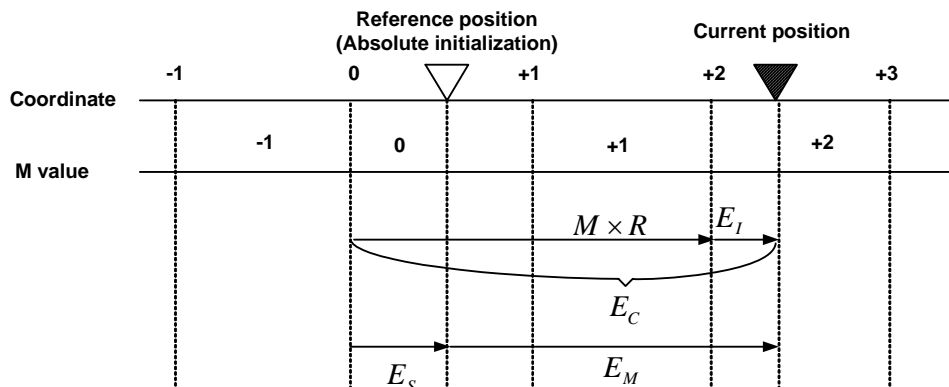
① PAO serial data specification

Data transmission method	Asynchronous
Baud Rate	9600[bps]
Start bit	1 bit
Stop bit	1 bit
Parity	Excellent
Character Code	ASCII Code 7 bit
Data Format	8 Character

♥ Outputted revolution in line 5.

② Absolute data content

- ① Serial data : This indicates where the motor axis is positioned after several revolutions from the reference position (Absolute encoder initialized value).
- ② Initial incremental indication : It outputs the pulse in the same speed as the revolution as about 1250 rpm (17 bit serial encoder application and P01-14=16384(4096[pulse])) from the origin position to current motor position of the motor axis.



※ Absolute data E_M is calculated as follows.

$$E_C = M \times R + E_I$$

$$E_M = E_C - E_S$$

E_C : Current position read from encoder

M : Serial data (multi turns data)

E_I : Initial incremental pulse (Generally showed in “-“ value)

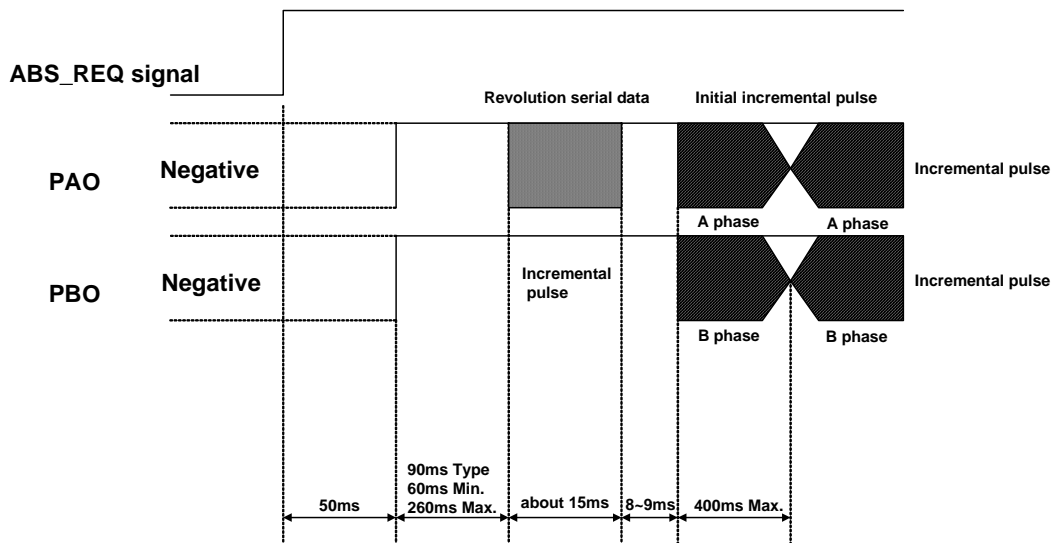
E_S : Initial incremental pulse read from absolute encoder initialization point
(Generally shown in “-“ value and this value is stored and used in the host controller.)

E_M : Current position necessary from customer system

R : Pulse for 1 encoder revolution (Value with division ratio [P01-14] applied)

③ Absolute data transmission sequence

- ① Maintain the ABS_REQ signal to “H” Level.
- ② After 50ms, it switches to standby condition to receive the serial data. The up/down counter for incremental pulse count is cleared to “0”.
- ③ It receives the serial data 8 byte.
- ④ After receiving the initial serial data and about 400ms past, it operates as general incremental encoder.



Chapter 3

Parameter setting

Chapter 3 explains the individual servo parameter setting according to the usage. The parameter setting can be executed with the internal mount loader and digital loader, and refer to Chapter 5 for details on how to use the internal mount load and digital loader. The parameter NO. with the symbol (*) marked indicates that the value can only be corrected when the SVONEN input contact point is "OFF".

3.1 Status display parameter	3-1
3.2 Motor and operating device setting.....	3-5
3.3 General control parameter setting	3-8
3.4 Speed control parameter setting.....	3-15
3.5 Input contact point digital speed and torque setting.....	3-20
3.6 Position control parameter setting	3-21
3.7 Torque control parameter setting	3-23
3.8 Input contact point function setting	3-25
3.9 Output contact point function setting	3-30
3.10 Analog monitor function setting.....	3-35
3.11 Jog operation parameter setting	3-36
3.12 Alarm display setting.....	3-38

3. Parameter setting

The menu setting can be executed with the digital and internal mount loader. Refer to Chapter 5 for details on how to use the internal mount load and digital loader.

The acronym and meaning used in this manual are as follows.

Acronym	Meaning
PC	Position Controller
CC	Current Controller
SC	Speed Controller
LMT	Limit
ENB	Enable
INIT	Initialize
PROG	Program
CMD	Command
ACCEL	Acceleration
DECEL	Deceleration
SPD	Speed
POS	Position
COMPEN	Compensation
ABS	Absolute
REV	Revolution
ADJ	Adjustment
MAX	Maximum
TRQ	Torque
MULTI	Multiple
NF	Notch Filter
COM	Communication
TC	Time Constant
FF	Feedforward
ERR	Error
ELCTR	Electric
NUM	Numerator
DEN	Denominator

3.1 Status display parameter

Parameter	Setting	Unit	Display range	Manufactured default	Function
StE-01	Display Select	-	100~ 1330	1203	Speed/Torque/ Position control

When the power of the servo drive is turned on, this sets the menu to display on the display window. The first and second space indicates the upper menu number of each menu, and third and fourth space indicates the lower menu number. For example, if it is set as StE-01 = 1203, the “12” means the StE menu and “03 refers to the StE-03.

3. Parameter setting

[First and second space value]

Upper menu name	P01	P02	P03	P04	P05	P06	P07	P08	P09	JOG	ALS	StE
1 st and 2 nd value	01	02	03	04	05	06	07	08	09	10	11	12

Refer to each parameter for the third and fourth menu number.

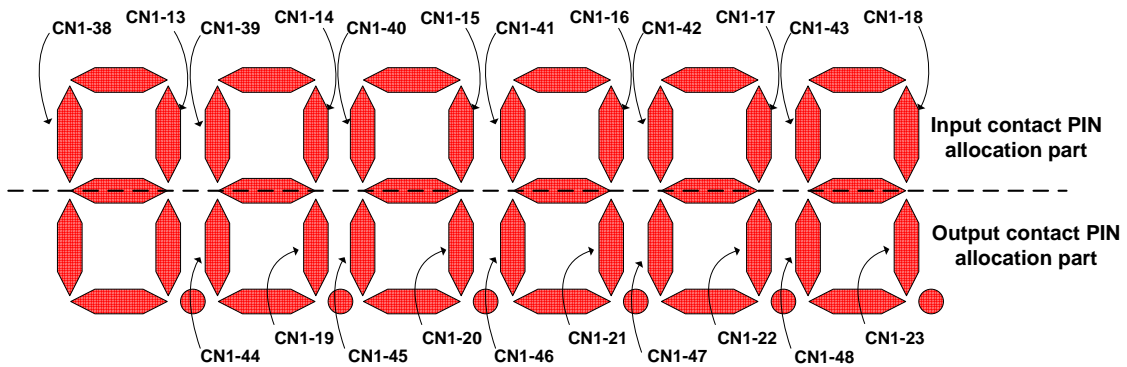
StE-02	Command Speed	Unit rpm	Display range -9999.9 ~ 9999.9	Manufactured default -	Speed/position control
StE-03	Motor Speed	Unit rpm	Display range -9999.9 ~ 9999.9	Manufactured default -	Speed/Torque/Position control
StE-04	CCW Speed Limit	Unit rpm	Display range 0.0 ~ 9999.9	Manufactured default -	Speed/Torque/Position control
StE-05	CW Speed Limit	Unit rpm	Display range -9999.9 ~ 0.0	Manufactured default -	Speed/Torque/Position control
StE-06	Command Pulse	Unit pulse	Display range -99999 ~ 99999	Manufactured default -	Position control
StE-07	Feedback Pulse	Unit pulse	Display range -99999 ~ 99999	Manufactured default -	Position control
StE-08	Error Pulse	Unit pulse	Display range -99999 ~ 99999	Manufactured default -	Position control
StE-09	Command Torque	Unit %	Display range -300.0 ~ 300.0	Manufactured default -	Speed/Torque/Position control
StE-10	Load Rate	Unit %	Display range -300.0 ~ 300.0	Manufactured default -	Speed/Torque/Position control
StE-11	Max Load Rate	Unit %	Display range -300.0 ~ 300.0	Manufactured default -	Speed/Torque/Position control
StE-12	CCW TRQ LMT	Unit %	Display range 0.0 ~ 300.0	Manufactured default -	Speed/Torque/Position control
StE-13	CW TRQ LMT	Unit %	Display range -300.0 ~ 0.0	Manufactured default -	Speed/Torque/Position control
StE-14	Inertia Ratio	Unit -	Display range 0.0 ~ 50.0	Manufactured default 2.0	Speed/Torque/Position control
StE-15	MULTI Turns	Unit rev	Display range 0 ~ 99999	Manufactured default -	Speed/Torque/Position control
StE-16	Single Turn	Unit -	Display range 0 ~ 999999	Manufactured default -	Speed/Torque/Position control

3. Parameter setting



StE-17	I/O Status	Unit -	Display range 0 ~ 999999	Manufactured default -	Speed/Torque/ Position control
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<For internal mount loader >



The PIN allocation based on the manufactured default is as follows.

CN1 PIN No. (input)	18	43	17	42	16	41	15	40	14	39	13	38
Initial allocated value	SVON EN	SPD1/ GEAR1	SPD2/ GEAR2	SPD3	DIR	PI/P	CCWLIM/ PTQLIM	CWLIM/ NTQLIM	SPDLIM /TLIM	E-STOP	STOP	ALM RST

CN1 PIN No. (Output)	23	48	22	47	21	46	20	45	19	44
Initial allocated value	-	BRAKE	INSPD/ INPOS/ INTRQ	ZSPD	RDY	SPDOUT /TRQOUT	ALARM	A_CODE0	A_CODE1	A_CODE2

3. Parameter setting



<For digital loader >

The following table shows the PIN allocation based on the manufactured default value.

CN1 PIN No. (Input)	18 (SVON EN)	43 (SPD1)	17 (SPD2)	42 (SPD3)	16 (DIR)	41 (PI/P)	15 (CCW LIM)	40 (CWLIM)	14 (SPDLIM /TLIM)	39 (ESTOP)	13 (STOP)	38 (ALM RST)
Example	1	1	0	0	0	0	0	1	0	1	0	0
Operation content	Motor in operation	Internal command speed 1 selection			Command direction revolution	PI control operation	CCW revolution possible	CW revolution impossible	Speed/torque limit not used	Not used	Not used	Not used

CN1 PIN No. (Output)	23 (-)	48 (BRAKE)	22 (INSPD/ INPOS/ INTRQ)	47 (ZSPD)	21 (RDY)	46 (SPDOUT/ TRQOUT)	20 (ALARM)	45 (A_CODE0)	19 (A_CODE1)	44 (A_CODE2)
Example	-	1	1	1	1	0	1	0	0	0
Operation content	Not used	Motor brake cancel	Command speed/position/torque reached condition	0 speed reached condition	Servo ready condition	Speed/torque limit not in process	Normal condition	Normal condition		

StE-18	PROG Version	Unit	Setting range	Manufactured default	Speed/Torque/ Position control
		-	0.0 ~ 99.99		

This menu displays encoder type, program version and drive capacity.

- * First character : Encoder type (**I** = incremental type, **S** = serial type)
- * Second character : Drive capacity (**S** = small, **8** = middle, **L** = large)
- * Remainder character : software version

(Ex : **SS 1.15** = Serial encoder, small capacity drive, S/W version 1.15)

3. Parameter setting



3.2 Motor and operating device setting

P01-01*	Motor ID	Unit -	Setting range GEN - 00 ~ 99	Manufactured default By capacity	Speed/Torque/ Position control
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Set the motor ID to use. P01-02 ~ P01-10 (Except P01-07 and P01-08), the motor parameter, masked.

ID	Model name	ID	Model name	ID	Model name	ID	Model name	ID	Model name
00	Individual	20	TF05	40	LF03	60	KN03	80	LN03
01		21	TF09	41	LF06	61	KN05	81	LN06
02		22	TF13	42	LF09	62	KN06	82	LN09
03		23	TF20	43	LF12	63	KN07	83	LN12
04		24	TF30	44	LF20	64	KN06A	84	LN12A
05	CKZ5	25	TF44	45	LF30	65	KN11	85	LN20
06	CK01	26		46		66	KN16	86	LN30
07		27		47		67	KN22	87	LN40
08	CK02	28		48	CN40	68	KN22A	88	TN110
09	CK04	29		49	CN50	69	KN35	89	TN150
10		30	KF08	50	CN04A	70	TN05	90	
11	CN01	31	KF10	51	CN06	71	TN09	91	
12	CN02	32	KF15	52	CN08	72	TN13	92	
13	CN03	33	KF22	53	CN10	73	TN17	93	
14	CN04	34	KF35	54	CN09	74	TN20	94	
15	CN05	35	KF50	55	CN15	75	TN30	95	
16		36		56	CN22	76	TN44	96	
17		37		57	CN30	77	TN75	97	
18		38		58	CN30A	78	TN55	98	KN70
19		39		59	CN50A	79	KN55	99	TN75N

P01-02	Inertia	Unit gfcms ²	Display range 0.01 ~ 999.99	Manufactured default By motor type	Speed/Torque/ Position control
P01-03	TRQ Constant	Unit kgfcm/A	Display range 0.1 ~ 999.99	Manufactured default By motor type	Speed/Torque/ Position control
P01-04	Phase Inductance	Unit mH	Display range 0.001 ~ 99.999	Manufactured default By motor type	Speed/Torque/ Position control
P01-05	Phase Resistance	Unit Ω	Display range 0.01 ~ 99.999	Manufactured default By motor type	Speed/Torque/ Position control
P01-06	Rated Current	Unit A(rms)	Display range 0.01 ~ 999.99	Manufactured default By motor type	Speed/Torque/ Position control

3. Parameter setting



P01-07	Rated Speed	Unit rpm	Display range 0.0 ~ 9999.0	Manufactured default By motor type	Speed/Torque/ Position control
P01-08	MAX Speed	Unit rpm	Display range 0.0 ~ 9999.0	Manufactured default By motor type	Speed/Torque/ Position control
P01-09	Rated TRQ	Unit kgfcm	Display range 0.0 ~ 9999.0	Manufactured default By motor type	Speed/Torque/ Position control
P01-10	Pole Number	Unit Pole	Display range 2 ~ 98	Manufactured default By motor type	Speed/Torque/ Position control
P01-11*	Drive ID	Unit -	Display range 0 ~ 45	Manufactured default By drive type	Speed/Torque/ Position control

Enter the setting value in the following table depending on the servo drive capacity.

Drive capacity [FDA70-]	01	02	04/ 04B	05	08	10	15/ 15B	20/ 20B	30/ 30B	45
P01-11 [Drive ID]	1	2	4	5	8	10	15	20	30	45

P01-12*	Encoder ID	Unit -	Display range Enc - 0 ~ R	Manufactured default Enc - A	Speed/Torque/ Position control
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Encoder ID	Manual setting	INC 2000	INC 2500	INC 3000	INC 5000	INC 6000	INC 2048	ABS 11/ 13bit	INC 17/ 33bit	ABS 17/ 33bit
P01-12	Enc-0	Enc-A	Enc-b	Enc-C	Enc-d	Enc-E	Enc-F	Enc-G	Enc-P	Enc-R

P01-13*	Encoder Pulse	Unit ppr	Display range 1 ~ 32768	Manufactured default 2000	Speed/Torque/ Position control
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Encoder ID	Enc-0	Enc-A	Enc-b	Enc-C	Enc-d	Enc-E	Enc-F	Enc-G	Enc-P	Enc-R
P01-13	Manual setting	2000	2500	3000	5000	6000	2048	2048	32768	32768

P01-14	Pulse Out Rate	Unit pulse	Display range 1 ~ 131072	Manufactured default By model	Speed/Torque/ Position control
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Divide the encoder pulse on A and B feed back from the motor, and set the encoder pulse out rate in line driver method. (But for the 17 bit serial encoder applied to FDA7000S, enter the 4 times multiplied value and the setting range is "16384 ~ 131072".)

* **Manufactured default : FDA7000: 2000, FDA7000S: 32768**

3. Parameter setting

P01-15*	COM Baud Rate	Unit -	Display range 0 ~ 15	Manufactured default 0	Speed/Torque/ Position control
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Select the communication speed. Set the communication speed of the transmitting side (main unit).

P01-15	RS232	RS485	P01-15	RS232	RS485
00	9600	9600	08	38400	9600
01	9600	19200	09	38400	19200
02	9600	38400	10	38400	38400
03	9600	57600	11	38400	57600
04	19200	9600	12	57600	9600
05	19200	19200	13	57600	19200
06	19200	38400	14	57600	38400
07	19200	57600	15	57600	57600

P01-16*	Serial Select	Unit -	Display range 0 ~ 2	Manufactured default 0	Speed/Torque/ Position control
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You can use the analog speed, torque and pulse input using the serial communication and communication card(Ether Net). Refer to the following.

Set value	Content
0	Analog speed, torque and pulse command through CN1
1	Speed, torque and position data command by serial communication.
2	Speed, torque and position data command by communication card.

P01-17*	Serial I/O	Unit -	Display range 0 ~ 2	Manufactured default 0	Speed/Torque/ Position control
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Set this when using the I/O contact point by communication.

Set value	Content
0	I/O contact point use through CN1
1	I/O contact point use by communications (RS232C/RS485)
2	I/O contact point use by communications card (Ether Net)

3. Parameter setting



P01-18*	Serial ID	Unit -	Display range 1 ~ 31	Manufactured default 1	Speed/Torque/ Position control
P01-19	Parameter Lock	Unit -	Display range ON/OFF	Manufactured default OFF	Speed/Torque/ Position control

P01-20*	Absolute Origin	Unit -	Display range ON/OFF	Manufactured default OFF	Speed/Torque/ Position control
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* When applying the 2048 or 17 bit absolute encoder, you can execute the encoder origin point. If you enter "ON" for the parameter, it will change to "OFF" and reset the Multi-turn data.

3.3 General control parameter setting

P02-01*	Control Mode	Unit -	Display range 0 ~ 5	Manufactured default 1	Speed/Torque/ Position control
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The conversion of control mode cannot be changed when SERVO ON states.

Set value	Type contact point condition	Applied control mode
0	-	Torque control mode
1	-	Speed control mode
2	-	Position control mode
3	ON	Speed control mode
	OFF	Torque control mode
4	ON	Speed control mode
	OFF	Position control mode
5	ON	Position control mode
	OFF	Torque control mode

P02-02	Mode Change Time	Unit ms	Display range 100.0 ~ 10000.0	Manufactured default 500.0	Speed/Torque/ Position control
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When the servo drive is set to multiple control mode, decelerate the servo motor during the set control mode conversion time for the conversion contact point input of the control mode to convert to control mode when the speed is zero.

3. Parameter setting

P02-03	CCW TRQ LMT	Unit %	Display range 0.0 ~ 300.0	Manufactured default 300.0	Speed/Torque/ Position control
P02-04	CW TRQ LMT	Unit %	Display range -300.0 ~ 0.0	Manufactured default -300.0	Speed/Torque/ Position control

P02-05	CCW Speed Limit	Unit rpm	Display range 0.0 ~ 6000.0	Manufactured default Maximum value of applied motor	Speed/Torque/ Position control
P02-06	CW Speed Limit	Unit rpm	Display range -6000.0 ~ 0.0	Manufactured default -Maximum value of applied motor	Speed/Torque/ Position control
P02-07	Brake Speed	Unit rpm	Display range 0.0 ~ 9999.9	Manufactured default 50.0	Speed/Torque/ Position control
P02-08	Brake Time	Unit ms	Display range 0.0 ~ 10000.0	Manufactured default 50.0	Speed/Torque/ Position control

♥ Operating conditions brake (P02-07, P02-08)

- 1) In case of SERVO OFF by ALARM occurrence.
 - 2) In case that SERVO OFF that do not use STOP contact point of CN1 connector.
- Which of the operating speed (P02-07) and operating time (P02-08) of the user menu is satisfied, the brake will operate.

(NOTE) Brake action that use STOP in SERVO ON state refers P02-30 of user menu.

P02-09	DB Mode	Unit -	Display range 0 ~ 3	Manufactured default 2	Speed/Torque/ Position control
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DB mode control is to stop the serve motor abruptly during an emergency stop. The user menu P02-09 sets the stop operation of the servo motor when the servo is turned off or during an emergency stop. (Caution !) However, this function is not available in Large type drive.

Set value	Operation explanation
0	Maintain by decelerating the dynamic brake when the servo is off.
1	Free-run operation at set zero speed (P03-14) decelerating the dynamic brake when the servo is off.
2	Maintain free-run operation by decelerating in free-run condition when the servo is off
3	Maintain dynamic brake at set zero speed (P03-14) decelerating in free-run condition when the servo is off

3. Parameter setting

P02-10	Notch Filter 1	Unit -	Display range 0 ~ 2	Manufactured default 0	Speed/Torque/ Position control
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The operation of the notch filter is set to operate the notch filter to reduce the resonance of the machinery.

Set value	Operation explanation
0	Do not use the notch filter 1.
1	Operate the notch filter 1 in the set resonance frequency and resonance bandwidth.
2	This is the method of reducing the resonance after automatically detecting the resonance frequency, it automatically detects the frequency of which the vibration is generated and reduces the resonance (Automatically switches from mode 2 → 1).

P02-11	NF Frequency 1	Unit Hz	Display range 50.0 ~ 2000.0	Manufactured default 300.0	Speed/Torque/ Position control
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This sets the notch filter frequency 1 to reduce the resonance of the machinery.

P02-12	NF Bandwidth 1	Unit %	Display range 10.0 ~ 99.9	Manufactured default 95.0	Speed/Torque/ Position control
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It shows the certain gain bandwidth where the notch filter 1 operate to reduce the resonance of machinery.

P02-13	Notch Filter2	Unit -	Display range 0 ~ 1	Manufactured default 0	Speed/Torque/ Position control
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Set the notch filter 2 to reduce the resonance of the machinery.

Set value	Operation explanation
0	Do not use the notch filter 2.
1	Operate the notch filter 2 in the set resonance frequency and resonance bandwidth.

P02-14	NF Frequency 2	Unit Hz	Display range 50.0 ~ 2000.0	Manufactured default 500.0	Speed/Torque/ Position control
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This sets the notch filter frequency 2 to reduce the resonance of the machinery.

3. Parameter setting



P02-15	NF Bandwidth 2	Unit %	Display range 10.0 ~ 99.9	Manufactured default 95.0	Speed/Torque/ Position control
P02-16	TRQ Filter TC	Unit ms	Display range 0.0 ~ 1000.0	Manufactured default By capacity	Speed/Torque/ Position control
P02-17	Auto Tuning	Unit -	Display range 0 ~ 1	Manufactured default 0	Speed/Torque/ Position control

P02-18	System Response	Unit -	Display range 1 ~ 19	Manufactured default By capacity	Speed/Torque/ Position control
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The system response setting is to set the response to the target of the machine system.

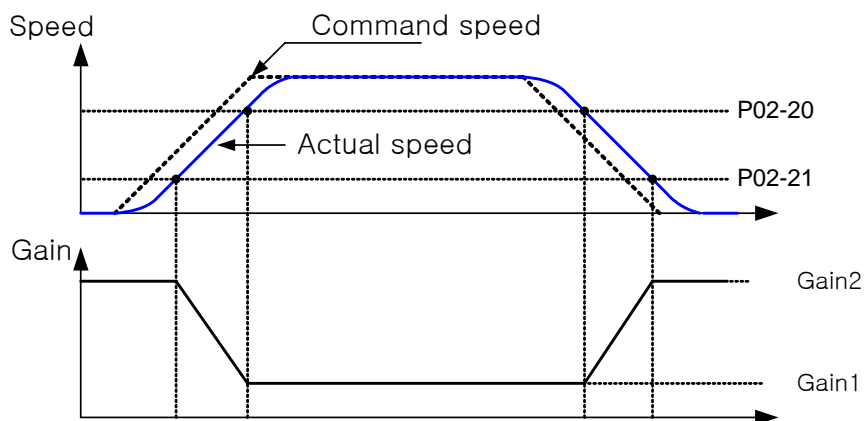
P02-18 (System response setting)	P05-05 (Position loop gain 1)	P05-06 (Position loop gain 2)	P03-05 (Speed control loop gain 1)	P03-06 (SC TC1)	P03-07 (Speed control loop gain 2)	P03-08 (SC TC2)	P02-16 (Command torque filter TC)
1	2.0	5.0	2.0	200.0	5.0	120.0	4.5
2	5.0	10.0	5.0	120.0	10.0	80.0	3.5
3	10.0	15.0	10.0	80.0	15.0	60.0	3.0
4	15.0	20.0	15.0	60.0	20.0	45.0	2.5
5	20.0	25.0	20.0	45.0	25.0	40.0	2.0
6	25.0	30.0	25.0	40.0	30.0	30.0	1.5
7	30.0	35.0	30.0	30.0	35.0	25.0	1.3
8	35.0	45.0	35.0	25.0	45.0	18.0	1.2
9	45.0	55.0	45.0	18.0	55.0	17.0	0.9
10	55.0	70.0	55.0	17.0	70.0	13.0	0.8
11	70.0	85.0	70.0	13.0	85.0	11.0	0.6
12	85.0	105.0	85.0	11.0	105.0	10.0	0.5
13	105.0	130.0	105.0	10.0	130.0	8.0	0.4
14	130.0	160.0	130.0	8.0	160.0	6.0	0.25
15	160.0	200.0	160.0	6.0	200.0	5.4	0.2
16	200.0	240.0	200.0	5.4	240.0	5.0	0.15
17	240.0	300.0	240.0	5.0	300.0	3.5	0.1
18	300.0	350.0	300.0	3.5	350.0	3.2	0.0
19	350.0	360.0	350.0	3.2	360.0	3.1	0.0

3. Parameter setting

P02-19	Inertia Ratio	Unit -	Display range 1.0 ~ 50.0	Manufactured default 2.0	Speed/Torque/ Position control
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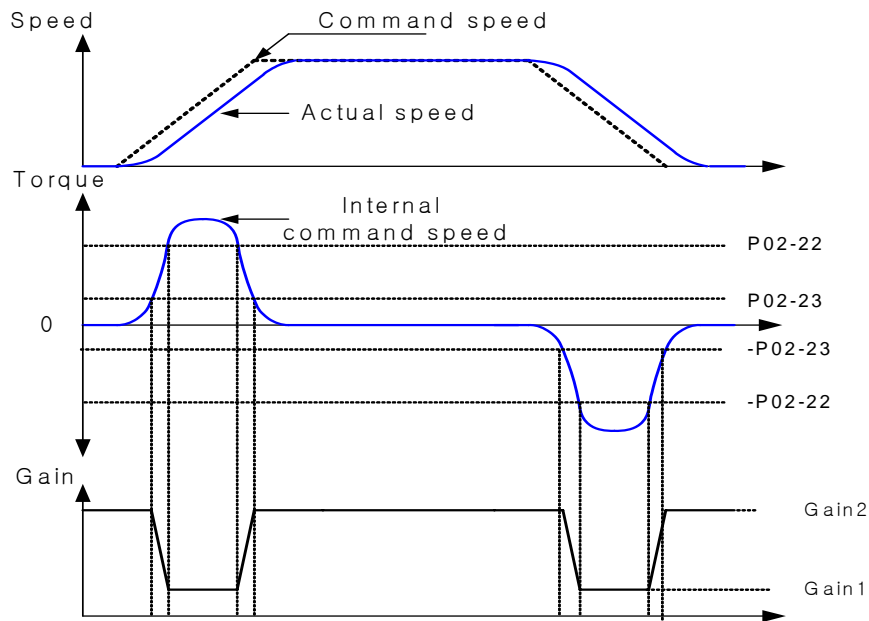
P02-20	Gain ADJ Speed 1	Unit rpm	Display range 100.0 ~ 5000.0	Manufactured default 800.0	Speed/Torque/ Position control
P02-21	Gain ADJ Speed 2	Unit rpm	Display range 10.0 ~ 500.0	Manufactured default 100.0	Speed/Torque/ Position control

When executing the control gain conversion by operation speed of the servo motor, it decides the speed converted by the control gain.



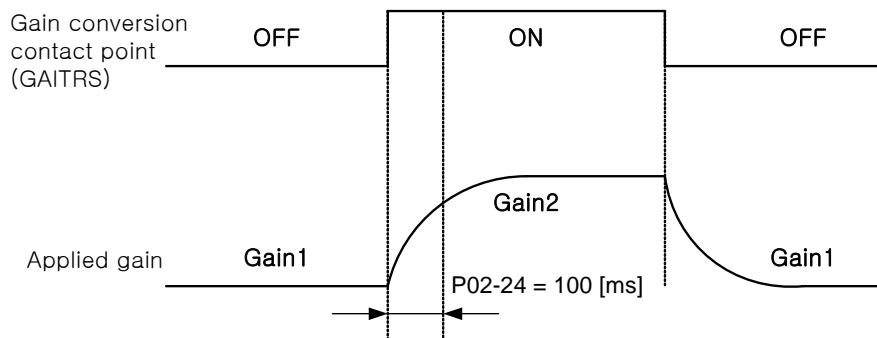
P02-22	Gain ADJ TRQ 1	Unit %	Display range 50.0 ~ 300.0	Manufactured default 150.0	Speed/Torque/ Position control
P02-23	Gain ADJ TRQ 2	Unit %	Display range 0.0 ~ 300.0	Manufactured default 50.0	Speed/Torque/ Position control

When executing the control gain conversion by operating torque of the servo motor, it decides the torque converted by the control gain.



P02-24	Contact Gain TC	Unit ms	Display range 0.0 ~ 10000.0	Manufactured default 100.0	Speed/Torque/ Position control
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When executing the control gain conversion by the external input contact point, it decides the control gain conversion time.



P02-25	Temporary Stop	Unit -	Display range ON / OFF	Manufactured default OFF	Speed/Torque/ Position control
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As the stop function, it sets the operation type of the set input contact point. Depending on the menu value, the stop operation is converted.

3. Parameter setting

P02-26	Emergency Stop	Unit -	Display range ON / OFF	Manufactured default OFF	Speed/Torque/ Position control
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As the emergency stop, it sets the operation of the set input contact point. Depending on the menu value, the emergency stop operation is converted.

P02-27	Direction Select	Unit -	Display range ON / OFF	Manufactured default OFF	Speed/Torque/ Position control
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As the direction function, it sets the operation of the set input contact point. Depending on the menu value, the direction select is converted.

P02-28	Ripple COMPEN	Unit -	Display range ON / OFF	Manufactured default OFF	Speed/Torque/ Position control
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In case of speed ripple during operation, this function can reduce the speed ripple. You can select from the following set values.

ON	Use speed ripple compensation function
OFF	Do not use speed ripple compensation function

P02-29*	Parameter INIT	Unit -	Display range ON/OFF	Manufactured default OFF	Speed/Torque/ Position control
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P02-30	Servo OFF Delay time	Unit ms	Display range 0.0 ~ 1000.0	Manufactured default 10.0	Speed/Torque/ Position control
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When using the servo motor to control a vertical movement machine, the structure movable part may be moved toward the downward depending on brake timing due to the gravity or external force. By using this parameter to delay turning the servo off that movement can be protect.

P02-31	CW Limit	Unit -	Display range ON / OFF	Manufactured default OFF	Speed/Torque/ Position control
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As the CW Limit function, it sets the operation type of the set input contact point. Depending on the menu value, the CW Limit operation is converted.

3. Parameter setting

P02-32	CCW Limit	Unit -	Display range ON / OFF	Manufactured default OFF	Speed/Torque/ Position control
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As the CCW Limit function, it sets the operation type of the set input contact point. Depending on the menu value, the CCW Limit operation is converted.

P02-33	Servo ON/OFF	Unit -	Display range ON / OFF	Manufactured default OFF	Speed/Torque/ Position control
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As the Servo ON/OFF function, it sets the operation type of the set input contact point. Depending on the menu value, the Servo ON/OFF operation is converted.

(note) After this parameter alteration selects motor ID (P01-01), drive ID (P01-11), Encoder ID (P01-12), use. If execute SERVO ON when parameter does not conform, there is damage danger servo motor and drive.

3.4 Speed control parameter setting

P03-01*	Speed Gain Mode	Unit -	Display range 1 ~ 5	Manufactured default 1	Speed control
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When the servo drive is set to speed control mode, it sets the speed control gain mode.

Set value	Operation explanation
1	Use speed controller gain 1 (P03-05, P03-06).
2	Use speed controller gain 2 (P03-07, P03-08).
3	Apply variable gain using gain 1 (P03-05, P03-06) and gain 2 (P03-07, P03-08) according to set speed (P02-20, P02-21) for the speed controller gain.
4	Apply variable gain using gain 1 (P03-05, P03-06) and gain 2 (P03-07, P03-08) according to set torque (P02-22, P02-23) for the speed controller gain.
5	Select gain 1 (P03-05, P03-06) or gain 2 (P03-07, P03-08) by the external contact point signal for the speed controller gain.

P03-02	PI-IP Control %	Unit %	Display range 0.0 ~ 100.0	Manufactured default 100.0	Speed/position control
P03-03	Friction COMPEN	Unit %	Display range 0.0 ~ 100.0	Manufactured default 0.0	Speed/position control

When the servo motor is attached on the machinery with severe friction with ball screw etc., this sets the friction compensation coefficient to reduce the dead zone that occurs during conversion of turning direction.

3. Parameter setting



P03-04	Load COMPEN	Unit %	Display range 0.0 ~ 100.0	Manufactured default 0.0	Speed/position control
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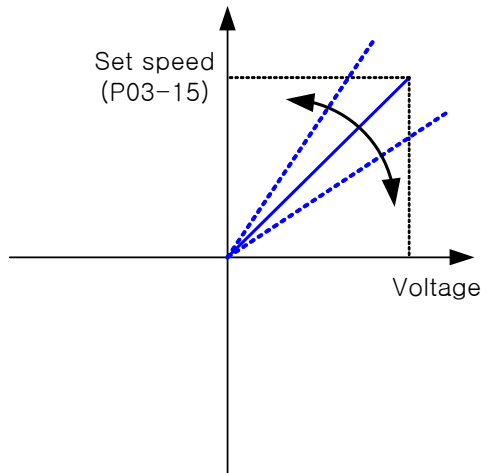
This sets the external load compensation coefficient to improve the response of the servo motor for the sudden load change.

P03-05	SC Loop Gain 1	Unit Hz	Display range 0.0 ~ 1000.0	Manufactured default By capacity	Speed/position control
P03-06	SC TC 1	Unit ms	Display range 0.0 ~ 10000.0	Manufactured default By capacity	Speed/position control
P03-07	SC Loop Gain 2	Unit Hz	Display range 0.0 ~ 1000.0	Manufactured default By capacity	Speed/position control
P03-08	SC TC 2	Unit ms	Display range 0.0 ~ 10000.0	Manufactured default By capacity	Speed/position control
P03-09	Analog CMD TC	Unit ms	Display range 0.0 ~ 2000.0	Manufactured default 0.0	Speed control
P03-10	ACCEL Time	Unit ms	Display range 0.0 ~ 90000.0	Manufactured default 0.0	Speed control
P03-11	DECEL Time	Unit ms	Display range 0.0 ~ 90000.0	Manufactured default 0.0	Speed control
P03-12*	S-Mode TC	Unit ms	Display range 0.0 ~ 9000.0	Manufactured default 0.0	Speed control
P03-13	In Speed Range	Unit rpm	Display range 0.0 ~ 9999.9	Manufactured default 10.0	Speed control
P03-14	Zero Speed Range	Unit rpm	Display range 0.0 ~ 9999.9	Manufactured default 10.0	Speed control

3. Parameter setting

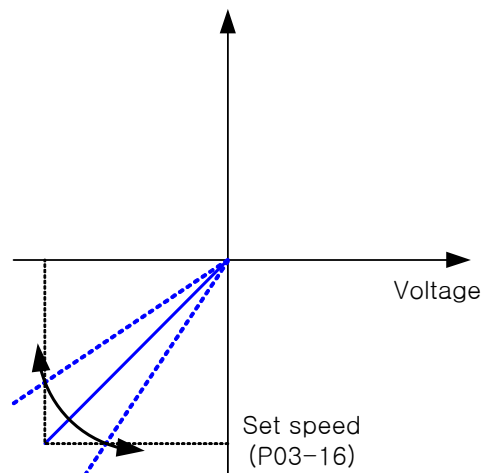
P03-15*	+ 10[V] RPM	Unit rpm	Display range 0.0 ~ 9999.9	Manufactured default Applied motor rated speed	Speed/Torque control
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This sets the command speed range of the +10[V] analog voltage when the servo drive is in speed control or torque control mode.



P03-16*	-10[V] RPM	Unit rpm	Display range -9999.9 ~ 0.0	Manufactured default -Applied motor rated speed	Speed/Torque control
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This sets the command speed range of the -10[V] analog voltage when the servo drive is in speed control or torque control mode.



3. Parameter setting

P03-17	Auto Offset	Unit -	Display range ON / OFF	Manufactured default OFF	Speed/Torque control
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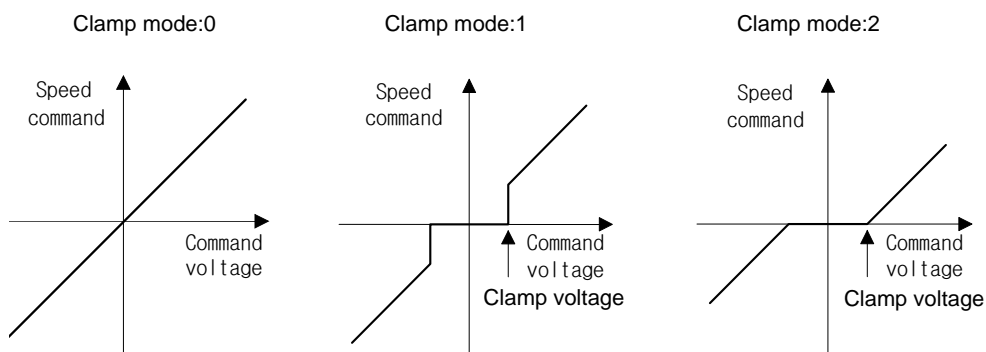
It automatically adjusts the offset voltage of the servo drive for the analog 0 [V] input of the host controller. At first, servo off and then supply the zero speed voltage to the speed input pin of CN1 connector. And then set P03-17 on and adjust the offset voltage automatically so that it can detect the connected voltage to zero speed. When the offset voltage adjustment is complete, the P03-17 is automatically turned off and the offset voltage is automatically updated to the parameter of P03-18.

P03-18	Manual Offset	Unit mV	Display range -1000.0 ~ 1000.0	Manufactured default 0.0	Speed/Torque control
P03-19*	Override ENB	Unit -	Display range ON / OFF	Manufactured default OFF	Speed control

The override mode operation is set to ON when minute speed is adjusted when the user is combining the speed command with the speed by digital contact point or analog speed command.

P03-20	Clamp Mode	Unit -	Display range 0 ~ 2	Manufactured default 0	Speed control
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Clamp mode is only applied in the speed control mode. Clamp mode can be used when stopping the servo motor without dropping the analog command voltage to 0[V]. Once it is clamped, it will return to its clamped location even when it turns by external force.



3. Parameter setting

P03-21	Clamp Voltage	Unit mV	Display range -1000.0 ~ 1000.0	Manufactured default 0.0	Speed control
P03-22*	F/Back TC	Unit ms	Display range 0.0 ~ 2000.0	Manufactured default 0.0	Speed control
P03-23	Zero SPD VIB REJ	Unit rpm	Display range 0.0 ~ 1000.0	Manufactured default 0.1	Speed/position control

P03-24*	Feedforward TRQ	Unit -	Display range 0 ~ 2	Manufactured default 0	Speed/position control
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When torque command operation mode is set to “2”, the feedforward TRQ can be used. The feedforward TRQ input enables fast decision making during speed control. But if the feed forward input is too high, it can cause an overshoot or undershoot. Apply appropriately.

Set value	Operation explanation
0	The function by analog torque command is operated by input contact point (SPDLIM/TLIM).
1	The analog torque command continually operates in torque limit value irrelevant from the contact point input.
2	The analog torque command operates as feedforward torque item. (Precision control)

3.5 Input contact point digital speed and torque setting

P04-01	Speed 1 Digital input speed 1	Unit rpm	Setting range -9999.9 ~ 9999.9	Manufactured default 10.0	Speed/Torque control
P04-02	Speed 2 Digital input speed 2	Unit rpm	Setting range -9999.9 ~ 9999.9	Manufactured default 100.0	Speed/Torque control
P04-03	Speed 3 Digital input speed 3	Unit rpm	Setting range -9999.9 ~ 9999.9	Manufactured default 200.0	Speed/Torque control
P04-04	Speed 4 Digital input speed 4	Unit rpm	Setting range -9999.9 ~ 9999.9	Manufactured default 500.0	Speed/Torque control
P04-05	Speed 5 Digital input speed 5	Unit rpm	Setting range -9999.9 ~ 9999.9	Manufactured default 1000.0	Speed/Torque control
P04-06	Speed 6 Digital input speed 6	Unit rpm	Setting range -9999.9 ~ 9999.9	Manufactured default 2000.0	Speed/Torque control
P04-07	Speed 7 Digital input speed 7	Unit rpm	Setting range -9999.9 ~ 9999.9	Manufactured default 3000.0	Speed/Torque control
P04-08	Torque 1 Digital input torque 1	Unit %	Setting range -300.0 ~ 300.0	Manufactured default 0.0	Torque control
P04-09	Torque 2 Digital input torque 2	Unit %	Setting range -300.0 ~ 300.0	Manufactured default 2.0	Torque control
P04-10	Torque 3 Digital input torque 3	Unit %	Setting range -300.0 ~ 300.0	Manufactured default 20.0	Torque control
P04-11	Torque 4 Digital input torque 4	Unit %	Setting range -300.0 ~ 300.0	Manufactured default 50.0	Torque control
P04-12	Torque 5 Digital input torque 5	Unit %	Setting range -300.0 ~ 300.0	Manufactured default 75.0	Torque control
P04-13	Torque 6 Digital input torque 6	Unit %	Setting range -300.0 ~ 300.0	Manufactured default 100.0	Torque control
P04-14	Torque 7 Digital input torque 7	Unit %	Setting range -300.0 ~ 300.0	Manufactured default 120.0	Torque control

3. Parameter setting

3.6 Position control parameter setting

P05-01*	POS Gain Mode	Unit -	Display range 1 ~ 5	Manufactured default 1	Position control
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When the servo drive is set to position control mode, this parameter sets the position control gain type.

Set value	Operation explanation
1	Use the position loop gain 1. (P05-05).
2	Use the position loop gain 2. (P05-06).
3	Apply variable gain using gain 1 (P05-05) and gain 2 (P05-06) according to set speed (P02-20, P02-21) for the position controller gain.
4	Apply variable gain using gain 1 (P05-05) and gain 2 (P05-06) according to set speed (P02-22, P02-23) for the position controller gain.
5	Select gain 1 (P05-05) or gain 2 (P05-06) according to external contact point signal of the position controller gain.

P05-02*	POS Pulse Type	Unit -	Display range 0 ~ 5	Manufactured default 1	Position control
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Set the position command pulse mode.

	[Pulse Logic]	Command pulse row mode		Remark
		In CCW direction	In CW direction	
N e g a t i v e L o g i c	0	PF PR	PF PR	A phase + B phase
	1	PF PR	PF PR	CCW pulse CW pulse
	2	PF PR	PF PR	Direction + Pulse
P o s i t i v e L o g i c	3	PF PR	PF PR	A phase + B phase
	4	PF PR	PF PR	CCW pulse CW pulse
	5	PF PR	PF PR	Direction + Pulse

3. Parameter setting

P05-03	Position control Speed Mode	Unit -	Display range ON / OFF	Manufactured default OFF	Position/speed control
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If the servo drive is set to position control mode, set P05-03 on to apply the acceleration/ deceleration (P03-10, P03-11) and S shape mode operation (P03-12) setted in user menu P03.

P05-04	Feedforward	Unit %	Display range 0.0 ~ 100.0	Manufactured default 0.0	Position control
P05-05	PC P Gain 1	Unit Hz	Display range 0.0 ~ 500.0	Manufactured default By capacity	Position control
P05-06	PC P Gain 2	Unit Hz	Display range 0.0 ~ 500.0	Manufactured default By capacity	Position control
P05-07	PI-P Pulse ERR	Unit pulse	Display range 0 ~ 99999	Manufactured default 0	Position control

In position control mode, when the error between command pulse and actual movement pulse exceeds the set value of P05-07, it converts to P control mode to reduce the overshoot.

P05-08	In Position	Unit pulse	Display range 0 ~ 99999	Manufactured default 100	Position control
P05-09	Follow ERR	Unit pulse	Display range 0 ~ 99999	Manufactured default 30000	Position control
P05-10	POS CMD TC	Unit ms	Display range 0.0 ~ 2000.0	Manufactured default 0.0	Position control
P05-11	FF TC	Unit ms	Display range 0.0 ~ 2000.0	Manufactured default 0.0	Position control
P05-12*	ELCTR Gear NUM 1	Unit -	Display range 1 ~ 99999	Manufactured default 1	Position control
P05-13*	ELCTR Gear DEN 1	Unit -	Display range 1 ~ 99999	Manufactured default 1	Position control
P05-14*	ELCTR Gear NUM 2	Unit -	Display range 1 ~ 99999	Manufactured default 1	Position control
P05-15*	ELCTR Gear DEN 2	Unit -	Display range 1 ~ 99999	Manufactured default 2	Position control
P05-16*	ELCTR Gear NUM 3	Unit -	Display range 1 ~ 99999	Manufactured default 1	Position control

3. Parameter setting

P05-17*	ELCTR Gear DEN 3	Unit -	Display range 1 ~ 99999	Manufactured default 4	Position control
P05-18*	ELCTR Gear NUM 4	Unit -	Display range 1 ~ 99999	Manufactured default 1	Position control
P05-19*	ELCTR Gear DEN 4	Unit -	Display range 1 ~ 99999	Manufactured default 8	Position control

P05-20	Bias SPD COMPEN	Unit rpm	Display range -1000.0 ~ 1000.0	Manufactured default 0.0	Position control
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To reduce the position decision time in position control mode, it adds the internal compensated speed of the servo drive.

P05-21	Bias Pulse Band	Unit pulse	Display range 0 ~ 500	Manufactured default 10	Position control
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The bias pulse band is the value of bias compensation speed (P05-20), when the error pulse exceeds the set value of P05-21. It adds the internal compensated speed (P05-20).

P05-22	Backlash Pulse	Unit pulse	Display range 0 ~ 99999	Manufactured default 0	Position control
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3.7 Torque control parameter setting

P06-01*	Analog TRQ TC	Unit ms	Display range 0.0 ~ 2000.0	Manufactured default 0.0	Torque control
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When the host controller commands the torque of the servo drive in analog voltage, this sets the low band pass filter TC of the analog torque command.

P06-02	TRQ ACCEL Time	Unit ms	Display range 0.0 ~ 9000.0	Manufactured default 0.0	Torque control
P06-03	TRQ DECEL Time	Unit ms	Display range 0.0 ~ 9000.0	Manufactured default 0.0	Torque control

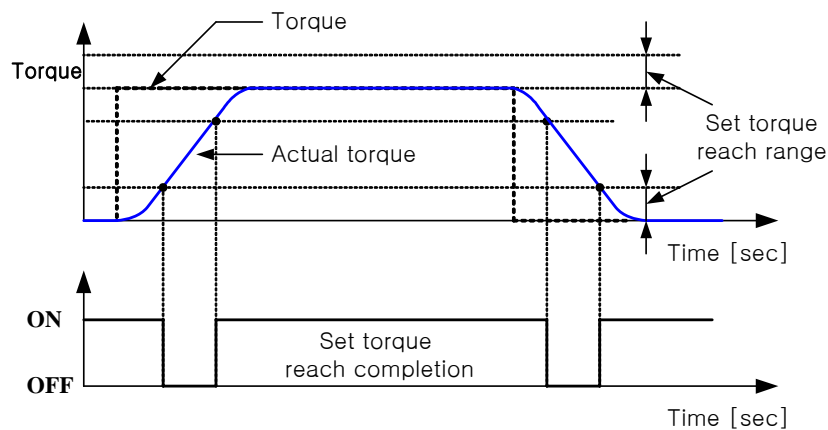
User sets the acceleration/deceleration time of the torque command in the torque control mode of the servo drive.

3. Parameter setting

P06-04*	TRQ S-Mode	Unit ms	Display range 0.0 ~ 2000.0	Manufactured default 0.0	Torque control
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If you adjust the S-mode operation time constant under the condition of satisfying the operation characteristics of the machine system, you can reduce the vibration and impact of the machinery.

P06-05	In TRQ Range	Unit %	Display range 0.0 ~ 100.0	Manufactured default 10.0	Torque control
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P06-06	Stop TRQ Range	Unit %	Display range 0.0 ~ 100.0	Manufactured default 10.0	Torque control
P06-07	10[V] TRQ	Unit %	Display range 0.0 ~ 300.0	Manufactured default 100.0	Speed/Torque control

This sets the command torque range applicable to the 10 [V] analog voltage in speed or torque control mode of the servo drive.

P06-08	Auto Offset	Unit -	Display range ON / OFF	Manufactured default OFF	Speed/Torque control
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It automatically adjusts the offset voltage of the servo drive for analog 0[V] input of the host controller.

P06-09	Manual Offset	Unit mV	Setting range -1000.0 ~ 1000.0	Manufactured default 0.0	Speed/Torque control
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3.8 Input contact point function setting

P07-01*	CN1_18 Digital INPUT 1	Unit -	Setting range 0 ~ 30	Manufactured default 1	Speed/Torque/ Position control
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In P07-01 menu, you can set the individual pin function (0~20) and set the pin (25~30) by control mode. But in P07-02~P07-12 menu, you can only set the individual pin function setting (0~20). To set the pin by control mode, enter the value of "25~30" in the P07-01 menu so that the menu of P07-01 ~ P07-12 is automatically reset with the applicable mode pin setting. For more details, please refer to the "[CN function table]" in the next page.

* After "25 ~ 30" input to P07-01 menu, P07-01 menu changes as "1" after 1 ~ 2 second.

P07-02*	CN1_43 Digital INPUT 2	Unit -	Setting range 0 ~ 20	Manufactured default 9	Speed/Torque/ Position control
P07-03*	CN1_17 Digital INPUT 3	Unit -	Setting range 0 ~ 20	Manufactured default 10	Speed/Torque/ Position control
P07-04*	CN1_42 Digital INPUT 4	Unit -	Setting range 0 ~ 20	Manufactured default 11	Speed/Torque/ Position control
P07-05*	CN1_16 Digital INPUT 5	Unit -	Setting range 0 ~ 20	Manufactured default 3	Speed/Torque/ Position control
P07-06*	CN1_41 Digital INPUT 6	Unit -	Setting range 0 ~ 20	Manufactured default 4	Speed/Torque/ Position control
P07-07*	CN1_15 Digital INPUT 7	Unit -	Setting range 0 ~ 20	Manufactured default 13	Speed/Torque/ Position control
P07-08*	CN1_40 Digital INPUT 8	Unit -	Setting range 0 ~ 20	Manufactured default 14	Speed/Torque/ Position control
P07-09*	CN1_14 Digital INPUT 9	Unit -	Setting range 0 ~ 20	Manufactured default 12	Speed/Torque/ Position control
P07-10*	CN1_39 Digital INPUT 10	Unit -	Setting range 0 ~ 20	Manufactured default 16	Speed/Torque/ Position control
P07-11*	CN1_13 Digital INPUT 11	Unit -	Setting range 0 ~ 20	Manufactured default 15	Speed/Torque/ Position control
P07-12*	CN1_38 Digital INPUT 12	Unit -	Setting range 0 ~ 20	Manufactured default 19	Speed/Torque/ Position control

This sets the input contact point function to control the operation of the servo drive from the host controller. When you set the function applicable for each input contact point, the servo drive executes the set functions. Connect to the pin allocated as the input contact point of the CN1 connector and you can set and use the desired function from the menu. You can arrange the input contact point in multiple arrangements so that other pins can have the same function.

3. Parameter setting

[Input contact point function table]

Function number	Function acronym	Function explanation
0	-	Do not use applicable input pin
1	SVONEN	Servo on/off operation input contact point
2	TYPE	When the control mode is multiple mode, control mode conversion input contact point
3	DIR	Torque/speed/location direction conversion input contact point
4	PI/P	P-PI control mode conversion input contact point
5	GAITRS	Control gain conversion input contact point
6	TRQ1	Digital torque input contact point 1
7	TRQ2	Digital torque input contact point 2
8	TRQ3	Digital torque input contact point 3
9	SPD1/GEAR1	Digital speed input contact point 1 / electronic gear ratio conversion input contact point 1
10	SPD2/GEAR2	Digital speed input contact point 2 / electronic gear ratio conversion input contact point 2
11	SPD3	Digital speed input contact point 3
12	SPDLIM/TLIM	Speed limit use input contact point (Torque control)/ Torque limit use input contact point (Speed, Position control)
13	CCWLIM/PTQLIM	CCW revolution limit input contact point(Speed, Position control)/ CCW torque generation limit input contact point(Torque control)
14	CWLIM/NTQLIM	CW revolution limit input contact point(Speed, Position control)/ CW torque generation limit input contact point (Torque control)
15	STOP	Temporary stop input contact point
16	ESTOP	Emergency stop input contact point
17	PLSINH	Position command pulse input limit input contact point
18	PLSCLR	Position command pulse clear input contact point
19	ALMRST	Alarm reset input contact point
20	ABSREQ	Initial data request signal for absolute encoder
25	SETUP1	Use torque control mode internal setting function (Can only be entered in P07-01 menu)
26	SETUP2	Use speed control mode internal setting function (Can only be entered in P07-01 menu)
27	SETUP3	Use position control mode internal setting function (Can only be entered in P07-01 menu)
28	SETUP4	Use speed/torque multi control mode internal setting function (Can only be entered in P07-01 menu)
29	SETUP5	Use speed/position multi control mode internal setting function (Can only be entered in P07-01 menu)
30	SETUP6	Use position/torque multi control mode internal setting function (Can only be entered in P07-01 menu)

3. Parameter setting

※ Torque control mode internal setting function table

(When P7-01 is set to 25 (Torque control mode))

Parameter	Input pin	Function number	Function acronym	Function explanation
P07-01	CN1-18	1	SVONEN	Servo on/off operation input contact point
P07-02	CN1-43	15	STOP	Temporary stop input contact point
P07-03	CN1-17	16	ESTOP	Emergency stop input contact point
P07-04	CN1-42	19	ALMRST	Alarm reset input contact point
P07-05	CN1-16	6	TRQ1	Digital torque input contact point 1
P07-06	CN1-41	7	TRQ2	Digital torque input contact point 2
P07-07	CN1-15	9	SPD1/GEAR1	Digital speed input contact point 1
P07-08	CN1-40	10	SPD2/GEAR2	Digital speed input contact point 2
P07-09	CN1-14	3	DIR	Torque direction conversion input contact point
P07-10	CN1-39	13	CCWLIM/PTQLIM	CCW torque generation limit input contact point
P07-11	CN1-13	14	CWLIM/NTQLIM	CW torque generation limit input contact point
P07-12	CN1-38	12	SPDLIM/TLIM	Speed limit use input contact point
GND24V	CN1-24,25	-	-	24V common input
EXT24V	CN1-49	-	-	24V external input

※ Speed control mode internal setting function table

(When P7-01 is set to 26 (Speed control mode))

Parameter	Input pin	Function number	Function acronym	Function explanation
P07-01	CN1-18	1	SVONEN	Servo on/off operation input contact point
P07-02	CN1-43	15	STOP	Temporary stop input contact point
P07-03	CN1-17	16	ESTOP	Emergency stop input contact point
P07-04	CN1-42	19	ALMRST	Alarm reset input contact point
P07-05	CN1-16	4	PI/P	P-PI control mode conversion input contact point
P07-06	CN1-41	9	SPD1/GEAR1	Digital speed input contact point 1
P07-07	CN1-15	10	SPD2/GEAR2	Digital speed input contact point 2
P07-08	CN1-40	11	SPD3	Digital speed input contact point 3
P07-09	CN1-14	3	DIR	Speed direction conversion input contact point
P07-10	CN1-39	13	CCWLIM/PTQLIM	CCW revolution limit input contact point
P07-11	CN1-13	14	CWLIM/NTQLIM	CW revolution limit input contact point
P07-12	CN1-38	12	SPDLIM/TLIM	Torque limit use input contact point
GND24V	CN1-24,25	-	-	24V common input
EXT24V	CN1-49	-	-	24V external input

3. Parameter setting

※ Position control mode internal setting function table

(When P7-01 is set to 27 (Position control mode))

Parameter	Input pin	Function number	Function acronym	Function explanation
P07-01	CN1-18	1	SVONEN	Servo on/off operation input contact point
P07-02	CN1-43	15	STOP	Temporary stop input contact point
P07-03	CN1-17	16	ESTOP	Emergency stop input contact point
P07-04	CN1-42	19	ALMRST	Alarm reset input contact point
P07-05	CN1-16	9	SPD1/GEAR1	electronic gear ratio conversion input contact point 1
P07-06	CN1-41	10	SPD2/GEAR2	electronic gear ratio conversion input contact point 2
P07-07	CN1-15	12	SPDLIM/TLIM	Torque limit use input contact point
P07-08	CN1-40	3	DIR	Position command pulse direction conversion input contact point
P07-09	CN1-14	18	PLSCLR	Position command pulse clear input contact point
P07-10	CN1-39	17	PLSINH	Position command pulse input limit input contact point
P07-11	CN1-13	13	CCWLIM/PTQLIM	CCW revolution limit input contact point
P07-12	CN1-38	14	CWLIM/NTQLIM	CW revolution limit input contact point
GND24V	CN1-24,25	-	-	24V common input
EXT24V	CN1-49	-	-	24V external input

※ Speed/torque multi control mode internal setting function table

(When P7-01 is set to 28 (Speed/torque multi control mode))

Parameter	Input pin	Function number	Function acronym	Function explanation
P07-01	CN1-18	1	SVONEN	Servo on/off operation input contact point
P07-02	CN1-43	15	STOP	Temporary stop input contact point
P07-03	CN1-17	16	ESTOP	Emergency stop input contact point
P07-04	CN1-42	19	ALMRST	Alarm reset input contact point
P07-05	CN1-16	6	TRQ1	Digital torque input contact point1
P07-06	CN1-41	9	SPD1/GEAR1	Digital speed input contact point 1
P07-07	CN1-15	10	SPD2/GEAR2	Digital speed input contact point 2
P07-08	CN1-40	2	TYPE	When the control mode is set to multi mode, control mode conversion input contact point
P07-09	CN1-14	3	DIR	Torque/speed direction conversion input contact point
P07-10	CN1-39	13	CCWLIM/PTQLIM	CCW revolution limit input contact point(Speed control) / CCW torque generation limit input contact point(Torque control)
P07-11	CN1-13	14	CWLIM/NTQLIM	CW revolution limit input contact point(Speed control) / CW torque generation limit input contact point(Torque control)
P07-12	CN1-38	12	SPDLIM/TLIM	Speed limit use input contact point (Torque control)/ Torque limit use input contact point(Speed/position control)
GND24V	CN1-24,25	-	-	24V common input
EXT24V	CN1-49	-	-	24V external input

3. Parameter setting

※ Speed/position multi control mode internal setting function table

(When P7-01 is set to 29 (Speed/position multi control mode))

Parameter	Input pin	Function number	Function acronym	Function explanation
P07-01	CN1-18	1	SVONEN	Servo on/off operation input contact point
P07-02	CN1-43	15	STOP	Temporary stop input contact point
P07-03	CN1-17	16	ESTOP	Emergency stop input contact point
P07-04	CN1-42	19	ALMRST	Alarm reset input contact point
P07-05	CN1-16	18	PLSCLR	Position command pulse clear input contact point
P07-06	CN1-41	9	SPD1/GEAR1	Digital speed input contact point1/ electronic gear ratio conversion input contact point1
P07-07	CN1-15	10	SPD2/GEAR2	Digital speed input contact point2/ electronic gear ratio conversion input contact point2
P07-08	CN1-40	2	TYPE	When the control mode is set to multi mode, control mode conversion input contact point
P07-09	CN1-14	3	DIR	Speed/position direction conversion input contact point
P07-10	CN1-39	13	CCWLIM/PTQLIM	CCW revolution limit input contact point
P07-11	CN1-13	14	CWLIM/NTQLIM	CW revolution limit input contact point
P07-12	CN1-38	12	SPDLIM/TLIM	Torque limit use input contact point
GND24V	CN1-24,25	-	-	24V common input
EXT24V	CN1-49	-	-	24V external input

※ Position/torque multi control mode internal setting function table

(When P7-01 is set to 30 (Position/torque multi control mode))

Parameter	Input pin	Function number	Function acronym	Function explanation
P07-01	CN1-18	1	SVONEN	Servo on/off operation input contact point
P07-02	CN1-43	15	STOP	Temporary stop input contact point
P07-03	CN1-17	16	ESTOP	Emergency stop input contact point
P07-04	CN1-42	19	ALMRST	Alarm reset input contact point
P07-05	CN1-16	9	SPD1/GEAR1	electronic gear ratio conversion input contact point 1
P07-06	CN1-41	10	SPD2/GEAR2	electronic gear ratio conversion input contact point 2
P07-07	CN1-15	12	SPDLIM/TLIM	Torque limit use input contact point(Position control)/ Speed limit use input contact point (Torque control)
P07-08	CN1-40	2	TYPE	When the control mode is set to multi mode, control mode conversion input contact point
P07-09	CN1-14	18	PLSCLR	Position command pulse clear input contact point
P07-10	CN1-39	6	TRQ1	Digital torque input contact point1
P07-11	CN1-13	13	CCWLIM/PTQLIM	CCW revolution limit input contact point (Position control)/ CCW torque generation limit input contact point (Torque control)
P07-12	CN1-38	14	CWLIM/NTQLIM	CW revolution limit input contact point(Position control)/ CW torque generation limit input contact point(Torque control)
GND24V	CN1-24,25	-	-	24V common input
EXT24V	CN1-49	-	-	24V external input

3.9 Output contact point function setting

P08-01*	CN1_23 Digital OUTPUT 1	Unit -	Display range 0 ~ 30	Manufactured default 0	Speed/Torque/ Position control
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In the P08-01 menu, you can set the individual pin function (0~18) or set the pin (25~30) by control mode, But in P08-02~P08-10 menu, you can only set the individual pin function (0~18). Enter the “25~30” value in the P08-01 menu to use the pin setting by control mode, and the menu of P08-01 ~ P08-10 will automatically be reset with the pin setting of the applicable mode. For more details, please refer to the “[Output contact point function table]” in the next page.

P08-02*	CN1_48 Digital OUTPUT 2	Unit -	Display range 0 ~ 18	Manufactured default 3	Speed/Torque/ Position control
P08-03*	CN1_22 Digital OUTPUT 3	Unit -	Display range 0 ~ 18	Manufactured default 6	Speed/Torque/ Position control
P08-04*	CN1_47 Digital OUTPUT 4	Unit -	Display range 0 ~ 18	Manufactured default 5	Speed/Torque/ Position control
P08-05*	CN1_21 Digital OUTPUT 5	Unit -	Display range 0 ~ 18	Manufactured default 7	Speed/Torque/ Position control
P08-06*	CN1_46 Digital OUTPUT 6	Unit -	Display range 0 ~ 18	Manufactured default 9	Speed/Torque/ Position control
P08-07*	CN1_20 Digital OUTPUT 7	Unit -	Display range 0 ~ 18	Manufactured default 14	Speed/Torque/ Position control
P08-08*	CN1_45 Digital OUTPUT 8	Unit -	Display range 0 ~ 18	Manufactured default 15	Speed/Torque/ Position control
P08-09*	CN1_19 Digital OUTPUT 9	Unit -	Display range 0 ~ 18	Manufactured default 16	Speed/Torque/ Position control
P08-10*	CN1_44 Digital OUTPUT 10	Unit -	Display range 0 ~ 18	Manufactured default 17	Speed/Torque/ Position control

This sets the output contact point function to check the operation of the servo drive by the host controller. When you set the function applicable for each output contact point, the servo drive outputs the signal according to the set function. Connect to the output contact point of the CN1 connector to use the desired function set from the menu. If you duplicate the output contact point function setting, you can have the same output signal from different pins.

3. Parameter setting

[Output contact point function table]

Function number	Function acronym	Function explanation
0	-	Do not use output function
1	SVONOFF	Servo on/off operation output
2	TYPEOUT	Control mode conversion output
3	BRAKE	Brake operation signal output
4	ZTRQ	Zero torque reach output
5	ZSPD	Zero speed reach output
6	INSPD/INPOS/INTRQ	Set speed reach completion output/ Set position reach completion output/ Set torque reach completion output
7	RDY	Servo ready status output
8	PPIOUT	P-PI control mode status output
9	SPDOUT / TRQOUT	Speed limit status output (Torque control)/ Torque limit status output (Speed, Position control)
10	PCWOUT / PTQOUT	CCW revolution speed limit status output (Torque control)/ CCW torque limit status output (Speed, Position control)
11	NCWOUT / NTQOUT	CW revolution speed limit status output (Torque control)/ CW torque limit status output (Speed, Position control)
12	PCWRUN	CCW revolution status output
13	NCWRUN	CW revolution status output
14	ALARM	Alarm generation status output
15	A_CODE0	Alarm code-0 output
16	A_CODE1	Alarm code-1 output
17	A_CODE2	Alarm code-2 output
18	A_CODE3	Alarm code-3 output
25	SETUP1	Use torque control mode internal setting function (Can only be entered in P08-01 menu)
26	SETUP2	Use speed control mode internal setting function (Can only be entered in P08-01 menu)
27	SETUP3	Use position control mode internal setting function (Can only be entered in P08-01 menu)
28	SETUP4	Use speed/torque multi control mode internal setting function (Can only be entered in P08-01 menu)
29	SETUP5	Use speed/position multi control mode internal setting function (Can only be entered in P08-01 menu)
30	SETUP6	Use position/torque multi control mode internal setting function (Can only be entered in P08-01 menu)

3. Parameter setting

※ Torque control mode internal setting function table

(Output function setting table when P8-01 = 25)

Parameter	Output pin	Function number	Function acronym	Function explanation
P08-01	CN1-23	1	SVONOFF	Servo on/off operation output
P08-02	CN1-48	3	BRAKE	Brake operation signal output
P08-03	CN1-22	7	RDY	Servo ready status output
P08-04	CN1-47	6	INSPD/INPOS /INTRQ	Set torque reach completion output
P08-05	CN1-21	9	SPDOUT / TRQOUT	Speed limit status output (Torque control)
P08-06	CN1-46	14	ALARM	Alarm generation status output
P08-07	CN1-20	10	PCWOUT / PTQOUT	CCW revolution speed limit status output (Torque control)
P08-08	CN1-45	11	NCWOUT / NTQOUT	CW revolution speed limit status output (Torque control)
P08-09	CN1-19	4	ZTRQ	Zero torque reach output
P08-10	CN1-44	0	-	Do not use output function
GND24V	CN1-24,25	-	-	24V common input
EXT24V	CN1-49	-	-	24V external input

※ Speed control mode internal setting function table

(Output function setting table when P8-01 = 26)

Parameter	Output pin	Function number	Function acronym	Function explanation
P08-01	CN1-23	1	SVONOFF	Servo on/off operation output
P08-02	CN1-48	3	BRAKE	Brake operation signal output
P08-03	CN1-22	7	RDY	Servo ready status output
P08-04	CN1-47	6	INSPD/INPOS /INTRQ	Set speed reach completion output
P08-05	CN1-21	9	SPDOUT / TRQOUT	Torque limit status output (Speed control)
P08-06	CN1-46	14	ALARM	Alarm generation status output
P08-07	CN1-20	10	PCWOUT / PTQOUT	CCW torque limit status output (Speed control)
P08-08	CN1-45	11	NCWOUT / NTQOUT	CW torque limit status output (Speed control)
P08-09	CN1-19	5	ZSPD	Zero speed reach output
P08-10	CN1-44	8	PPIOUT	P-PI control mode status output
GND24V	CN1-24,25	-	-	24V common input
EXT24V	CN1-49	-	-	24V external input

3. Parameter setting

※ Position control mode internal setting function table

(Output function setting table when P8-01 = 27)

Output contact point	Output pin	Function number	Function acronym	Function explanation
P08-01	CN1-23	1	SVONOFF	Servo on/off operation output
P08-02	CN1-48	3	BRAKE	Brake operation signal output
P08-03	CN1-22	7	RDY	Servo ready status output
P08-04	CN1-47	6	INSPD/INPOS /INTRQ	Set position reach completion output
P08-05	CN1-21	9	SPDOUT / TRQOUT	Torque limit status output (Position control)
P08-06	CN1-46	14	ALARM	Alarm generation status output
P08-07	CN1-20	10	PCWOUT / PTQOUT	CCW torque limit status output (Speed control)
P08-08	CN1-45	11	NCWOUT / NTQOUT	CW torque limit status output (Speed control)
P08-09	CN1-19	0	-	Do not use the output function
P08-10	CN1-44	0	-	Do not use the output function
GND24V	CN1-24,25	-	-	24V common input
EXT24V	CN1-49	-	-	24V external input

※ Speed/torque multi control mode internal setting function table

(Output function setting table when P8-01 = 28)

Parameter	Output pin	Function number	Function acronym	Function explanation
P08-01	CN1-23	2	TYPEOUT	Control mode conversion output
P08-02	CN1-48	3	BRAKE	Brake operation signal output
P08-03	CN1-22	7	RDY	Servo ready status output
P08-04	CN1-47	6	INSPD/INPOS /INTRQ	Set speed reach completion output
P08-05	CN1-21	9	SPDOUT / TRQOUT	Torque limit status output (Speed control)
P08-06	CN1-46	14	ALARM	Alarm generation status output
P08-07	CN1-20	10	PCWOUT / PTQOUT	CCW torque limit status output (Speed control)
P08-08	CN1-45	11	NCWOUT / NTQOUT	CW torque limit status output (Speed control)
P08-09	CN1-19	5	ZSPD	Zero speed reach output
P08-10	CN1-44	4	ZTRQ	Zero torque reach output
GND24V	CN1-24,25	-	-	24V common input
EXT24V	CN1-49	-	-	24V external input

3. Parameter setting

※ Speed/position multi control mode internal setting function table

(Output function setting table when P8-01 = 29)

Parameter	Output pin	Function number	Function acronym	Function explanation
P08-01	CN1-23	2	TYPEOUT	Control mode conversion output
P08-02	CN1-48	3	BRAKE	Brake operation signal output
P08-03	CN1-22	7	RDY	Servo ready status output
P08-04	CN1-47	6	INSPD/INPOS /INTRQ	Set speed reach completion output
P08-05	CN1-21	9	SPDOUT / TRQOUT	Torque limit status output (Speed control)
P08-06	CN1-46	14	ALARM	Alarm generation status output
P08-07	CN1-20	10	PCWOUT / PTQOUT	CCW torque limit status output (Speed control)
P08-08	CN1-45	11	NCWOUT / NTQOUT	CW torque limit status output (Speed control)
P08-09	CN1-19	5	ZSPD	Zero speed reach output
P08-10	CN1-44	0	-	Do not use the output function
GND24V	CN1-24,25	-	-	24V common input
EXT24V	CN1-49	-	-	24V external input

※ Position/torque multi control mode internal setting function table

(Output function setting table when P8-01 = 30)

Parameter	Output pin	Function number	Function acronym	Function explanation
P08-01	CN1-23	2	TYPEOUT	Control mode conversion output
P08-02	CN1-48	3	BRAKE	Brake operation signal output
P08-03	CN1-22	7	RDY	Servo ready status output
P08-04	CN1-47	6	INSPD/INPOS /INTRQ	Set speed reach completion output
P08-05	CN1-21	9	SPDOUT / TRQOUT	Torque limit status output (Speed control)
P08-06	CN1-46	14	ALARM	Alarm generation status output
P08-07	CN1-20	10	PCWOUT / PTQOUT	CCW torque limit status output (Speed control)
P08-08	CN1-45	11	NCWOUT / NTQOUT	CW torque limit status output (Speed control)
P08-09	CN1-19	4	ZTRQ	Zero torque reach output
P08-10	CN1-44	0	-	Do not use the output function
GND24V	CN1-24,25	-	-	24V common input
EXT24V	CN1-49	-	-	24V external input

3.10 Analog monitor function setting

The internal speed, command speed, torque, command torque, feedback pulse and command pulse of the servo can be monitored externally through analog monitor 1 and monitor 2. The output voltage range is -5 ~ +5[V]. The following are the parameters related to the monitor use.

P09-01	Monitor 1	Unit -	Display range 0 ~ 5	Manufactured default 0	Speed/Torque/ Position control
P09-05	Monitor 2	Unit -	Display range 0 ~ 5	Manufactured default 1	Speed/Torque/ Position control

This sets the parameter to monitor the internal variable of the servo drive in analog output.

Set value	0	1	2	3	4	5
Monitoring variable	Actual speed [rpm]	Command speed [rpm]	Actual torque [%]	Command torque [%]	Feedback pulse [pulse]	Command pulse [pulse]

When the monitoring scale value is 1, the maximum speed output is +5[V] and maximum torque (3*Rated torque) is +5[V].

P09-02	Monitor ABS 1	Unit -	Display range ON / OFF	Manufactured default OFF	Speed/Torque/ Position control
P09-06	Monitor ABS 2	Unit -	Display range ON / OFF	Manufactured default OFF	Speed/Torque/ Position control

OFF : Output by distinguishing the sign

ON : Output in absolute value without distinguishing the sign

P09-03	Monitor Scale 1	Unit -	Display range 0.1 ~ 2000.0	Manufactured default 1.0	Speed/Torque/ Position control
P09-07	Monitor Scale 2	Unit -	Display range 0.1 ~ 2000.0	Manufactured default 1.0	Speed/Torque/ Position control

[Basic ratio]

Actual speed, command speed : Maximum speed / 5[V]

Actual torque, command torque : 3*Rated torque / 5[V]

Feedback pulse, command pulse : 20000[pulse] / 5[V]

3. Parameter setting

P09-04	Monitor Offset 1	Unit mV	Display range -1000.0 ~ 1000.0	Manufactured default 0.0	Speed/Torque/ Position control
P09-08	Monitor Offset 2	Unit mV	Display range -1000.0 ~ 1000.0	Manufactured default 0.0	Speed/Torque/ Position control

3.11 Jog operation parameter setting

JOG-01	Key Jog Mode	Unit -	Display range ON / OFF	Manufactured default OFF	Speed/Torque/ Position control
---------------	--------------	-----------	---------------------------	--------------------------------	-----------------------------------

This sets the key jog operation mode by left and right key. If you set JOG-01 to ON, it switches to the jog mode without external command to turn on the servo. At this time, press the left or right button to turn in the CCW direction or CW direction at the speed set in JOG-02.

JOG-02	Key Jog Speed	Unit rpm	Display range -9999.9 ~ 9999.9	Manufactured default 100.0	Speed/Torque/ Position control
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This sets the operation speed of the key jog mode.

JOG-03	Auto Jog Mode	Unit -	Display range 0 ~ 2	Manufactured default 0	Speed/Torque/ Position control
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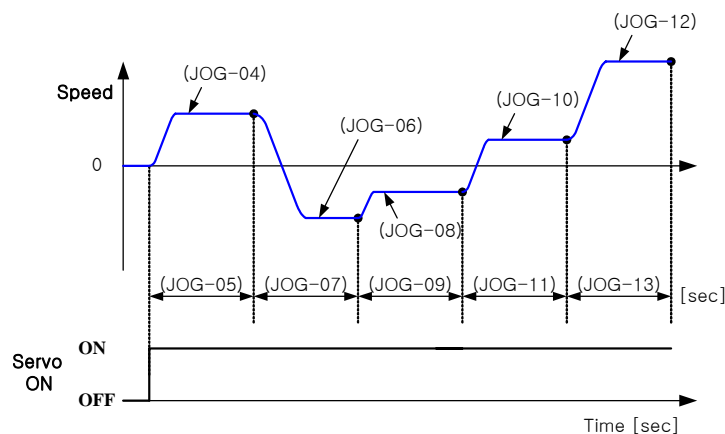
This sets auto jog mode operation. Auto jog mode supports 8-step repeated pattern operation and the patterns support the No. 1 Auto jog mode that sets the revolution speed [rpm] and revolution time [sec] and No. 2 Auto jog mode that supports the revolution speed [rpm] and revolution [rev].

Set value	Operation explanation
0	Do not use auto jog mode
1	Revolution speed-Use revolution time auto jog mode
2	Revolution speed –Use revolution auto jog mode

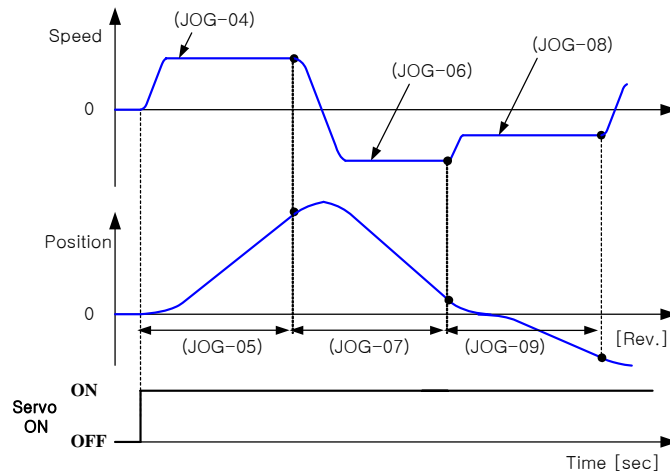
JOG-04	Jog Speed 1	Unit rpm	Display range -9999.9 ~ 9999.9	Manufactured default 100.0	Speed/Torque/ Position control
JOG-05	Jog Time1/REV1	Unit [sec]/[rev]	Display range 0.00 ~ 5000.00	Manufactured default 1.00	Speed/Torque/ Position control
JOG-06	Jog Speed 2	Unit rpm	Display range -9999.9 ~ 9999.9	Manufactured default -100.0	Speed/Torque/ Position control

3. Parameter setting

JOG-07	Jog Time2/REV2	Unit [sec]/[rev]	Display range e 0.00 ~ 5000.00	Manufactured default 1.00	Speed/Torque/ Position control
JOG-08	Jog Speed 3	Unit rpm	Display range -9999.9 ~ 9999.9	Manufactured default 200.0	Speed/Torque/ Position control
JOG-09	Jog Time3/REV3	Unit [sec]/[rev]	Display range 0.00 ~ 5000.00	Manufactured default 1.00	Speed/Torque/ Position control
JOG-10	Jog Speed 4	Unit rpm	Display range -9999.9 ~ 9999.9	Manufactured default -200.0	Speed/Torque/ Position control
JOG-11	Jog Time4/REV4	Unit [sec]/[rev]	Display range 0.00 ~ 5000.00	Manufactured default 1.00	Speed/Torque/ Position control
JOG-12	Jog Speed 5	Unit rpm	Display range -9999.9 ~ 9999.9	Manufactured default 400.0	Speed/Torque/ Position control
JOG-13	Jog Time5/REV5	Unit [sec]/[rev]	Display range 0.00 ~ 5000.00	Manufactured default 1.00	Speed/Torque/ Position control
JOG-14	Jog Speed 6	Unit rpm	Display range -9999.9 ~ 9999.9	Manufactured default -400.0	Speed/Torque/ Position control
JOG-15	Jog Time6/REV6	Unit [sec]/[rev]	Display range 0.00 ~ 5000.00	Manufactured default 1.00	Speed/Torque/ Position control
JOG-16	Jog Speed 7	Unit rpm	Display range -9999.9 ~ 9999.9	Manufactured default 800.0	Speed/Torque/ Position control
JOG-17	Jog Time7/REV7	Unit [sec]/[rev]	Display range 0.00 ~ 5000.00	Manufactured default 1.00	Speed/Torque/ Position control
JOG-18	Jog Speed 8	Unit rpm	Display range -9999.9 ~ 9999.9	Manufactured default -800.0	Speed/Torque/ Position control
JOG-19	Jog Time8/REV8	Unit [sec]/[rev]	Display range 0.00 ~ 5000.00	Manufactured default 1.00	Speed/Torque/ Position control



[Auto jog mode 1(Speed - time)]



[Auto jog mode 2 (Speed - revolution)]

3.12 Alarm display setting

ALS-01	Current Alarm	Unit -	Display range -	Manufactured default nor	Speed/Torque/ Position control
---------------	---------------	-----------	--------------------	-----------------------------	-----------------------------------

This parameter indicates the current alarm. ALS-01 menu is not the user input parameter but the menu to notify the alarm condition of the servo drive.

Alarm number	Alarm acronym	Alarm content	A_CODE0	A_CODE1	A_CODE2	A_CODE3
-	Normal	Normal condition	0	0	0	0
00	EMER STOP	Emergency stop alarm	1	0	0	0
01	OVER CURNT	Servo over-current alarm	0	1	0	0
02	OVER VOLT	Servo over-voltage alarm	1	1	0	0
03	OVER LOAD	Overload alarm	0	0	1	0
04	POWER FAIL	Servo insufficient voltage alarm	1	0	1	0
05	LINE FAIL	Encoder missed operation alarm	0	1	1	0
06	OVER SPEED	Over-speed alarm	1	1	1	0
07	FOLLOW ERR	Location following error alarm	0	0	0	1
08	OUTPUT NC	Output NC alarm	1	0	0	1
09	PPR ERROR	Encoder pulse rate setting alarm	0	1	0	1
10	ABS DATA	Absolute encoder data error alarm	1	1	0	1
11	ABS BATT	Absolute encoder battery low alarm	0	0	1	1
12	ABS MDER	Absolute encoder multi turns data transmission error alarm	1	0	1	1
13	OUTPUT EC	Output mis-wiring alarm	0	1	1	1

3. Parameter setting

ALS-02	Alarm Reset	Unit -	Display range ON/OFF	Manufactured default OFF	Speed/Torque/ Position control
---------------	-------------	-----------	-------------------------	--------------------------------	-----------------------------------

It resets and initializes the occurred alarm. Check and remove the cause of the alarm before resetting the alarm and then reset.

This is the parameter that the occurred alarm history resets and initializes.

ALS-03 ~ ALS-12	Alarm History 1 ~ Alarm History 10	Unit -	Indicated range 0 ~ 32	Manufactured default 0	Speed/Torque/ Position control
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This is the menu that stores and shows the alarm history. The user cannot set this arbitrarily.

ALS-13	History Reset	Unit -	Display range ON/OFF	Manufactured default OFF	Speed/Torque/ Position control
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It resets and initializes the occurred alarm history.

Chapter 4

Servo using method and Gain adjustment

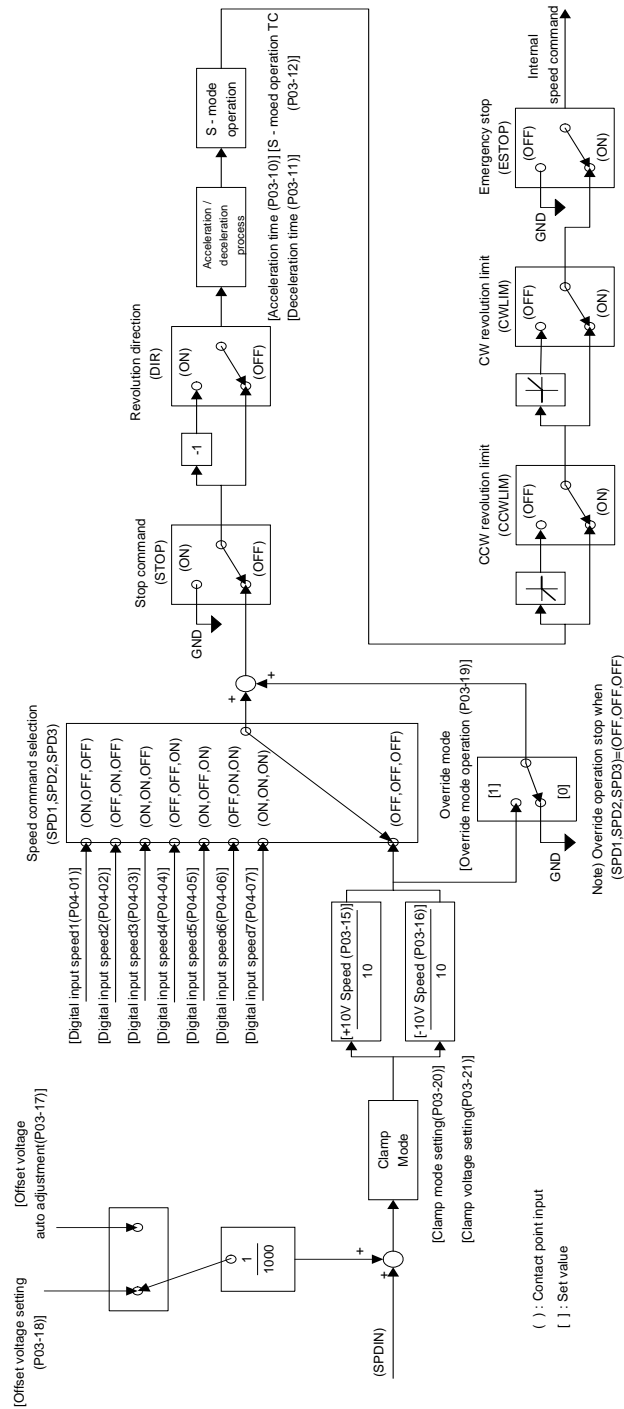
Chapter 4 explains the servo using method and gain adjustment by each control mode.

4.1 Gain adjustment for speed mode	4-1
4.2 Gain adjustment for position mode	4-7
4.3 Gain adjustment for torque mode.....	4-14
4.4 Autotuning	4-17
4.5 Precaution for absolute encoder	4-20



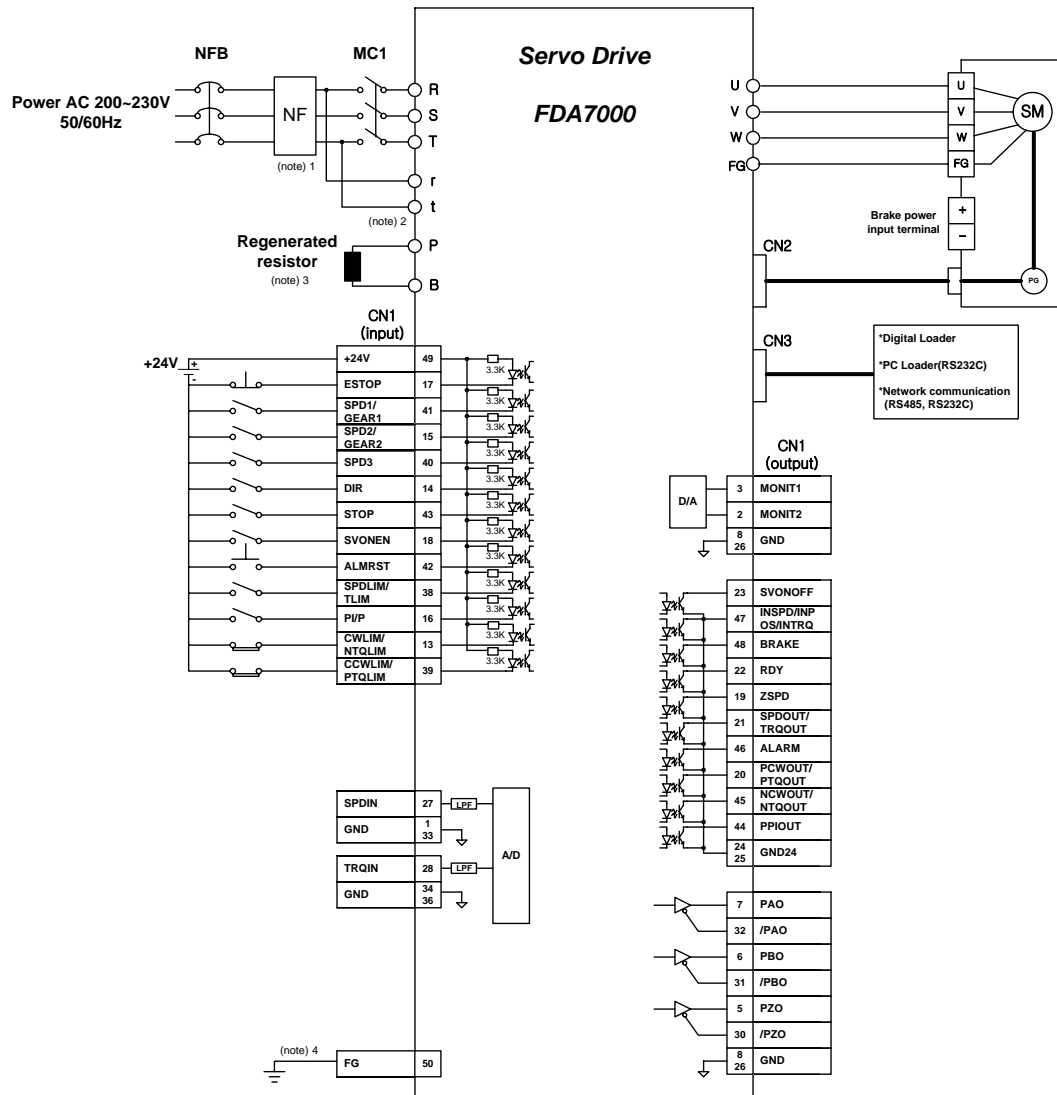
4.1 Gain adjustment method for speed control mode

This explains the gain adjustment method when using speed servo. The following diagram shows the generation sequence of the speed command in speed control.



4. Servo using method and gain adjustment

4.1.1 CN1 wiring diagram for speed control servo



♥ The above input and output contact points are shown when setting the speed control mode contact point. (P07-01,P08-01=26).

(Note) 1 : NF stands for Noise Filter and it must be used to prevent the noise from intruding from the outside.

(Note) 2 : For the FDA7004/7004B~45 type, connect the single phase AC220V[V] to the r, t terminal, auxiliary power. FDA7001~02 type does not have the auxiliary power r, t terminal.

(Note) 3 : The recovery resistances of FDA7004~FDA7010 are installed inside the driver as an internal type. The recovery resistance of the FDA7001, 7002, 7004B, FDA7015 type or above is the separately installed type. Check the capacity and apply accordingly.

(Note) 4 : Connect the ground wire of CN1 cable to the FG (Frame Ground) terminal.

(Note) 5 : Separate GND24 (CN – 24, 25) and GND (CN1 – 1, 8, 26, 33, 34, 36).

When connect commonness, malfunction of servo drive and burnout can occur.

4. Servo using method and gain adjustment



4.1.2 Speed servo gain adjustment

1) This sets the speed control mode gain.

P03-01	Speed Gain Mode	Unit -	Setting range 1 ~ 5	Manufactured default 1	Speed control
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When the servo drive set to speed control mode, this sets the speed control gain.

Set value	Operation explanation
1	Use speed controller gain 1 (P03-05, P03-06).
2	Use speed controller gain 2 (P03-07, P03-08).
3	Apply variable gain using gain 1 (P03-05, P03-06) and gain 2 (P03-07, P03-08) according to set speed (P02-20, P02-21) for the speed controller gain.
4	Apply variable gain using gain 1 (P03-05, P03-06) and gain 2 (P03-07, P03-08) according to set torque (P02-22, P02-23) for the speed controller gain.
5	Select gain 1 (P03-05, P03-06) or gain 2 (P03-07, P03-08) by the external contact point signal for the speed controller gain.

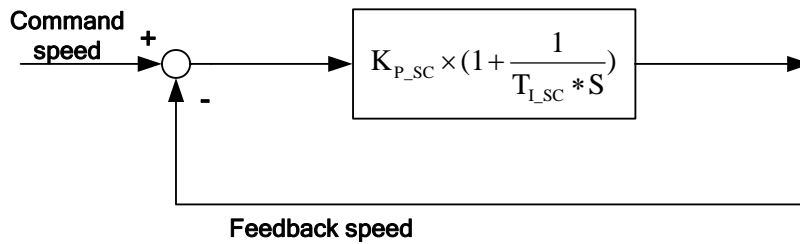
2) Set the SC loop gain 1 and 2 applied by the set value of P03-01.

P03-05	SC Loop Gain1	Unit Hz	Display range 0.0 ~ 1000.0	Manufactured default By capacity	Speed/torque control
P03-07	SC Loop Gain2	Unit Hz	Display range 0.0 ~ 1000.0	Manufactured default By capacity	Speed/torque control

3) Set SC TC1 and 2 applied by the set value of P03-01.

P03-06	SC TC1	Unit ms	Display range 0.0 ~ 10000.0	Manufactured default By capacity	Speed/torque control
P03-08	SC TC2	Unit ms	Display range 0.0 ~ 10000.0	Manufactured default By capacity	Speed/torque control

4. Servo using method and gain adjustment



K_{P_SC} = SC Loop Gain

T_{L_SC} = SC TC

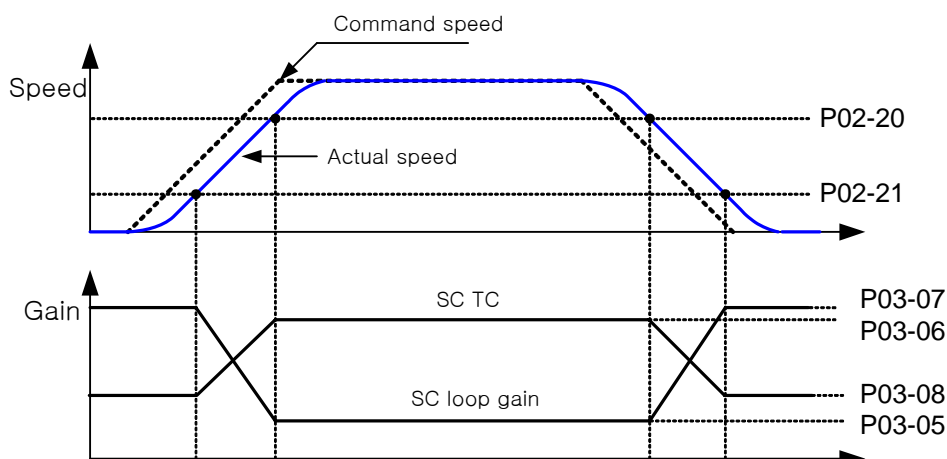
4) This sets the inertia ratio.

P02-19	Inertia Ratio	Unit -	Display range 1.0~ 50.0	Manufactured default 2.0	Speed/Torque/ Position control
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$$\text{Load inertia} = \frac{\text{System inertia (Motor inertia + Load inertia)}}{\text{Motor inertia}}$$

5) When P03-01="3", the variable gain is applied based on the following gain adjustment speed 1 and 2.

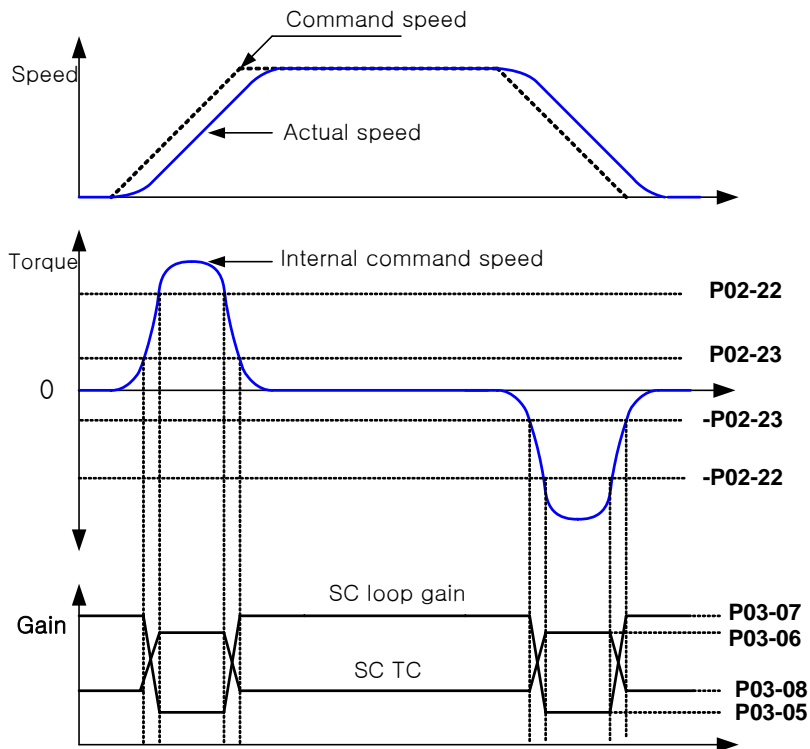
P02-20	Gain ADJ Speed1	Unit rpm	Display range 100.0 ~ 5000.0	Manufactured default 800.0	Speed/Torque/ Position control
P02-21	Gain ADJ Speed2	Unit rpm	Display range 10.0 ~ 500.0	Manufactured default 100.0	Speed/Torque/ Position control



6) When P03-01="4", the variable gain is applied based on the following gain adjustment torque 1 and 2.

4. Servo using method and gain adjustment

P02-22	Gain ADJ TRQ1	Unit %	Display range 0.0 ~ 300.0	Manufactured default 150.0	Speed/Torque/ Position control
P02-23	Gain ADJ TRQ1	Unit %	Display range 0.0 ~ 300.0	Manufactured default 50.0	Speed/Torque/ Position control

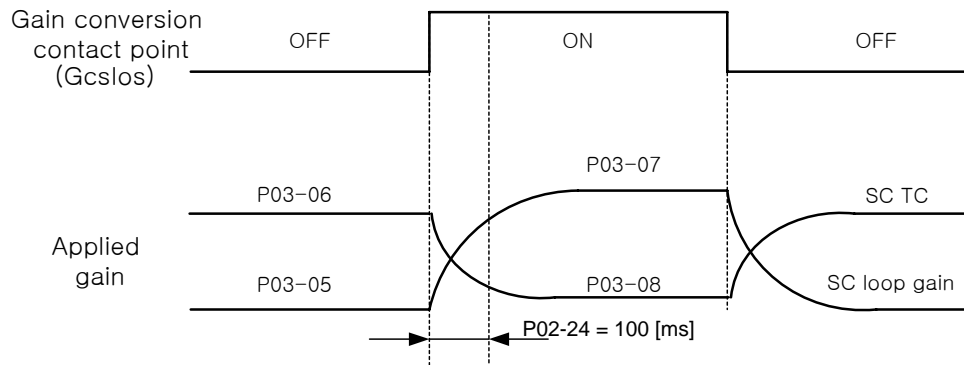


7) When P03-01="5", the variable gain is applied based on the ON/OFF status of external control gain conversion contact point. At this time, the conversion time of the control gain is decided.

P02-24	Contact Gain TC	Unit ms	Display range 0.0 ~ 10000.0	Manufactured default 100.0	Speed/Torque/ Position control
---------------	-----------------	---------	-----------------------------	----------------------------	--------------------------------

Increasing the contact gain TC in P02-24 has an effect of smoothing conversion of control gain.

4. Servo using method and gain adjustment



8) This sets the mixture rate of the PI-IP controller.

P03-02	PI-IP Control %	Unit %	Display range 0.0 ~ 100.0	Manufactured default 100.0	Speed control
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[Characteristics of individual controller]

a) **PI** speed controller

: It has excellent acceleration/deceleration and good responsiveness characteristics but can cause large overshoot.

b) **IP** speed controller

: It has lower acceleration/deceleration and responsiveness characteristics compared to the PI speed controller, but it can suppress the overshoot to reduce the vibration.

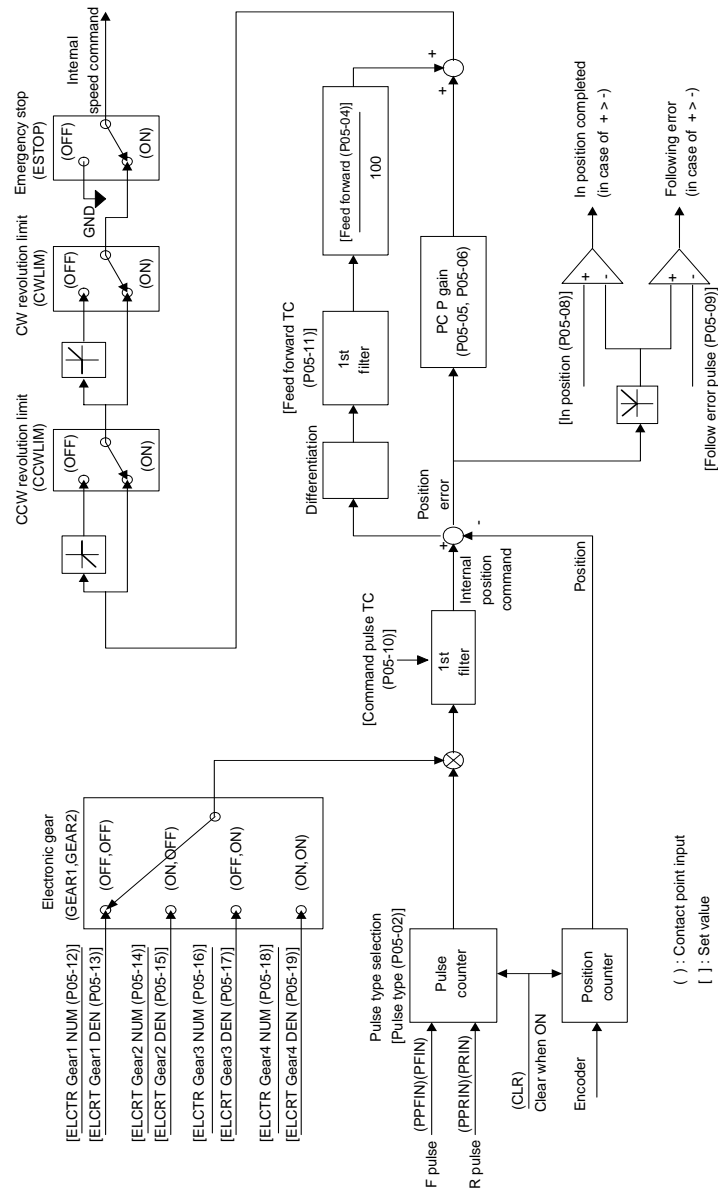
You can adjust the controller set ratio with the desired performance by considering the responsiveness and overshoot.

♥ P03-02 = 100 : Applied to **PI** speed controller

P03-02 = 0 : Applied to **IP** speed controller

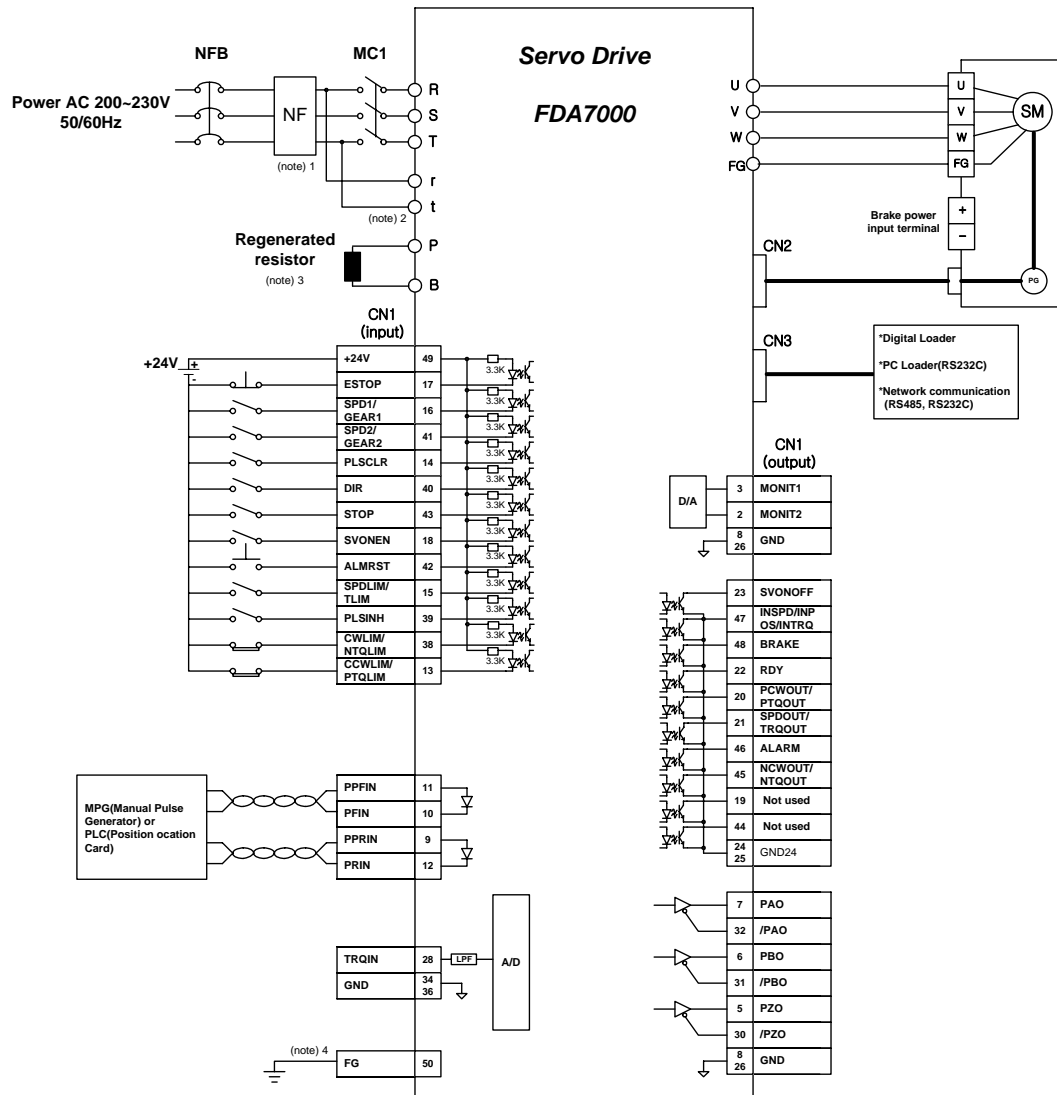
4.2 Gain adjustment method for position control mode

This explains the position servo control mode and gain adjustment method. The following diagram shows the generating sequence of the speed command for position control.



4. Servo using method and gain adjustment

4.2.1 CN1 wiring diagram for position control servo



♥ The above input and output contact points are shown when setting the position control mode contact point. (P07-01,P08-01=27).

(Note) 1 : NF stands for Noise Filter and it must be used to prevent the noise from intruding from the outside.

(Note) 2 : For the FDA7004/7004B~45 type, connect the single phase AC220V[V] to the r, t terminal, auxiliary power. FDA7001~02 type does not have the auxiliary power r, t terminal.

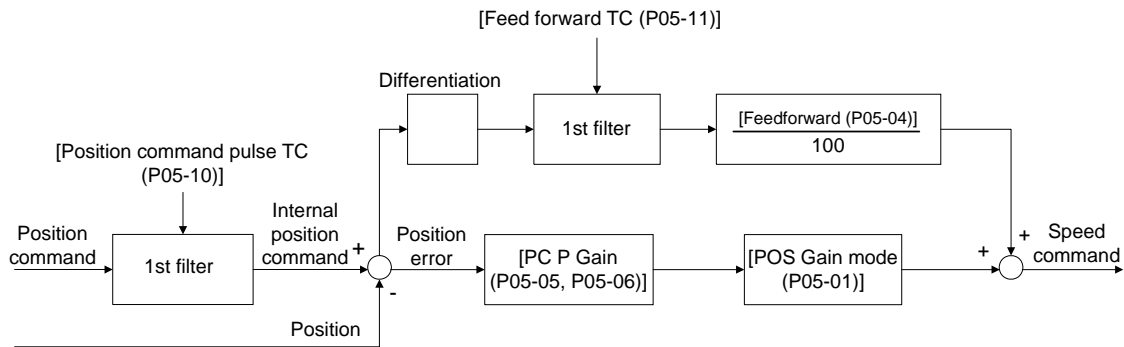
(Note) 3 : The recovery resistances of FDA7004~FDA7010 are installed inside the driver as an internal type. The recovery resistance of the FDA7001, 7002, 7004B, FDA7015 type or above is the separately installed type. Check the capacity and apply accordingly.

(Note) 4 : Connect the ground wire of CN1 cable to the FG (Frame Ground) terminal.

(Note) 5 : Separate GND24 (CN – 24, 25) and GND (CN1 – 1, 8, 26, 33, 34, 36).

When connect commonness, malfunction of servo drive and burnout can occur.

4.2.2 Position servo gain adjustment



(Note) In this control mode, Error pulse should be cleared according to the servo condition.

Before the stop function release, the error pulse is cleared by PLSCLR action.

1) This sets the position control gain mode.

P05-01	POS Gain Mode	Unit -	Display range 1 ~ 5	Manufactured default 1	Position control
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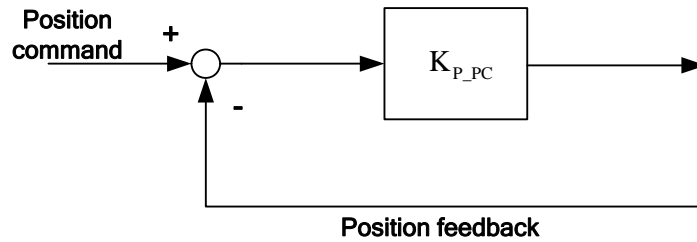
When the servo drive set to position control mode, this sets the position control gain mode.

Set value	Operation explanation
1	Use PC P gain 1 (P05-05).
2	Use PC P gain 2 (P05-06).
3	Apply variable gain using gain 1 (P05-05) and gain 2 (P05-06) according to set speed (P02-20, P02-21) for the position controller gain.
4	Apply variable gain using gain 1 (P05-05) and gain 2 (P05-06) according to set torque (P02-22, P02-23) for the position controller gain.
5	Select gain 1 (P05-05) or gain 2 (P05-06) by the external contact point signal for the position controller gain.

2) This sets the PC P gain applied by the set value of P05-01

4. Servo using method and gain adjustment

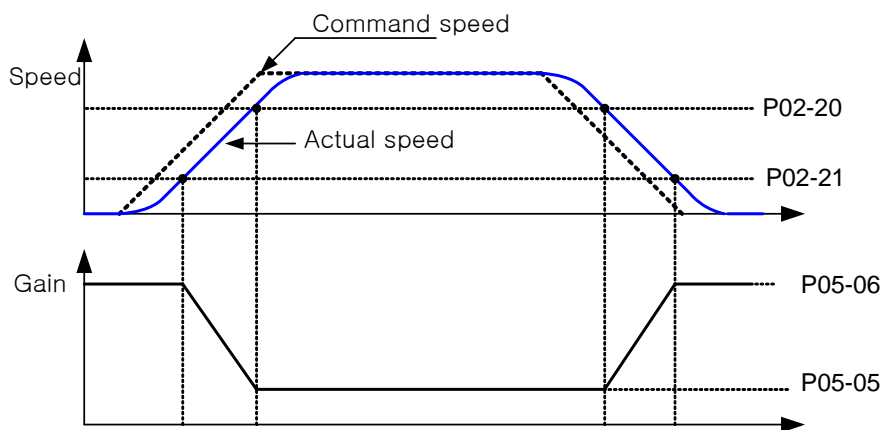
P05-05	PC P Gain1	Unit Hz	Display range 0.0 ~ 500.0	Manufactured default By capacity	Position control
P05-06	PC P Gain2	Unit Hz	Display range 0.0 ~ 500.0	Manufactured default By capacity	Position control



$$K_{P_PC} = \text{PC P Gain}$$

3) When P05-01="3", the variable gain is applied based on the following gain adjustment speed 1 and 2.

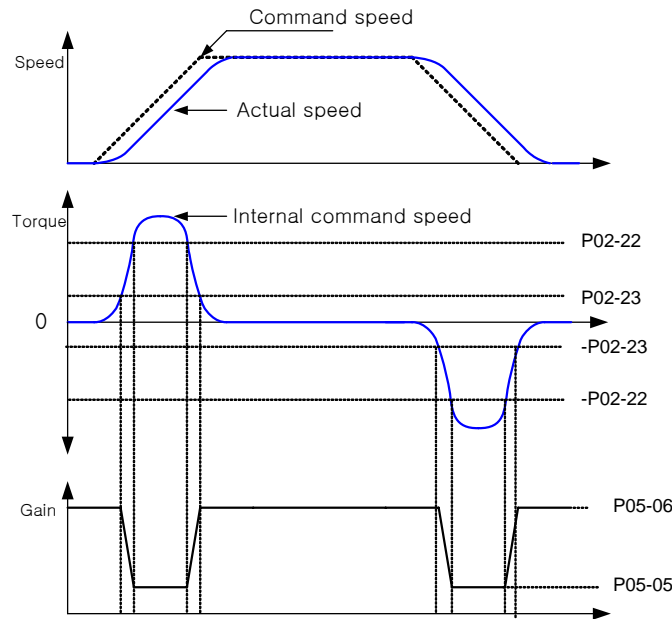
P02-20	Gain ADJ Speed1	Unit rpm	Display range 100.0 ~ 5000.0	Manufactured default 800.0	Speed/Torque/ Position control
P02-21	Gain ADJ Speed2	Unit rpm	Display range 10.0 ~ 500.0	Manufactured default 100.0	Speed/Torque/ Position control



4) When P05-01="4", the variable gain is applied based on the following gain adjustment torque1 and 2.

4. Servo using method and gain adjustment

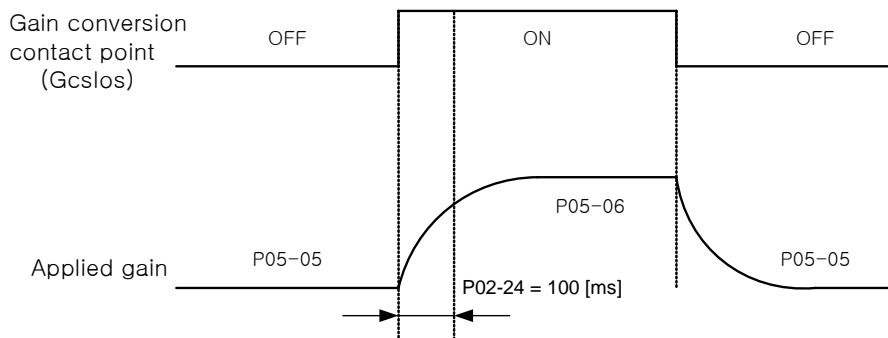
P02-22	Gain ADJ TRQ1	Unit %	Display range 0.0 ~ 300.0	Manufactured default 150.0	Speed/Torque/ Position control
P02-23	Gain ADJ TRQ2	Unit %	Display range 0.0 ~ 300.0	Manufactured default 50.0	Speed/Torque/ Position control



5) When P5-01="5", the variable gain is applied based on the ON/OFF status of the external control gain conversion contact point. At this time, the conversion time of the control gain is decided.

P02-24	Contact Gain TC	Unit ms	Display range 0.0 ~ 10000.0	Manufactured default 100.0	Speed/Torque/ Position control
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If you want to execute smooth gain conversion, set the Contact Gain TC to long. Enter the Contact Gain TC in (ms) unit.



4. Servo using method and gain adjustment



6) Feed forward ratio setting

P05-04	Feedforward	Unit %	Display range 0.0 ~ 100.0	Manufactured default 0.0	Position control
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Enter the feedforward ratio for the position command speed in [%] unit. When this value increases it can reduce the position decision time but if set to high, it can cause an overshoot or vibration to the machine. If this value is set "0", the position controller becomes simple position loop control mode.

Refer to the Max_Value [Feedforward] according to the following $R = [\text{Speed loop gain}] / [\text{Position loop gain}]$.

R = [Speed loop gain] / [Position loop gain]	Max_Value [Feedforward]
5	70 or below
7	80 or below
10	85 or below
20	90 or below

P05-11	FF TC	Unit ms	Setting range 0.0 ~ 2000.0	Manufactured default 0.0	Position control
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Enter the 1st filter TC in [ms] unit of the feedforward input of the position command speed. The entered position command is divided and processed through the 1st filter before being used as the feedforward input, the TC of this filter can be adjusted. In the applied field where the position command changes abruptly, set this value high and in applied field where the position command changes smoothly, set this value low. If you do not want to use this filter, input "0".

[Recommended setting condition]

$$P05 - 11(\text{Feedforward TC}) \leq 1000 \times (\text{Max_Value}[\text{Feedforward}] - [\text{Feedforward}]) / 100 / [\text{PC P Gain}]$$

7) Position command pulse TC setting

P05-10	POS CMD TC	Unit ms	Display range 0.0 ~ 2000.0	Manufactured default 0.0	Position control
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Set the filter TC on the position command pulse input for smoothing operation in the position

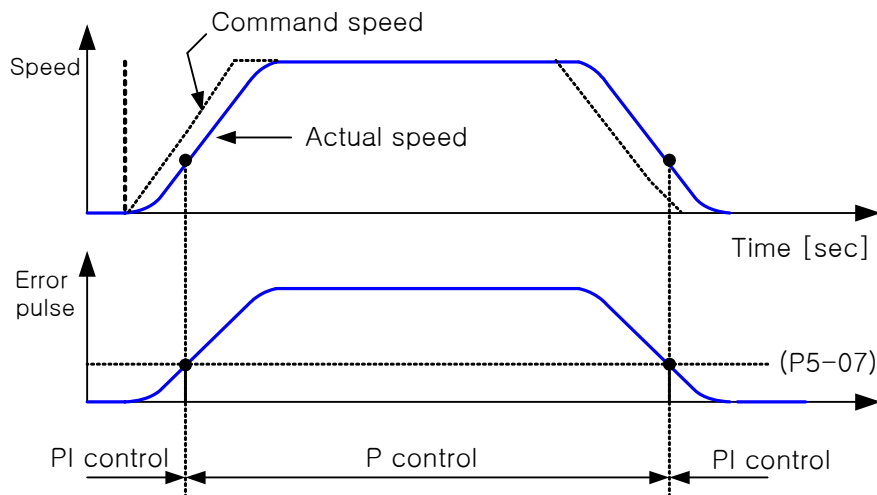
4. Servo using method and gain adjustment

control mode. If you would like to execute smoothing operation without setting the position command filter TC, set the position decision mode setting of Position control speed mode (P05-03) to ON. It permits the acceleration/deceleration (P03-10, P03-11) and S mode operation (P03-12) set in user menu P03 of speed command. The smoothing operation is advantageous when reaching position decision in position control mode.

8) This sets the PI-P mode pulse error.

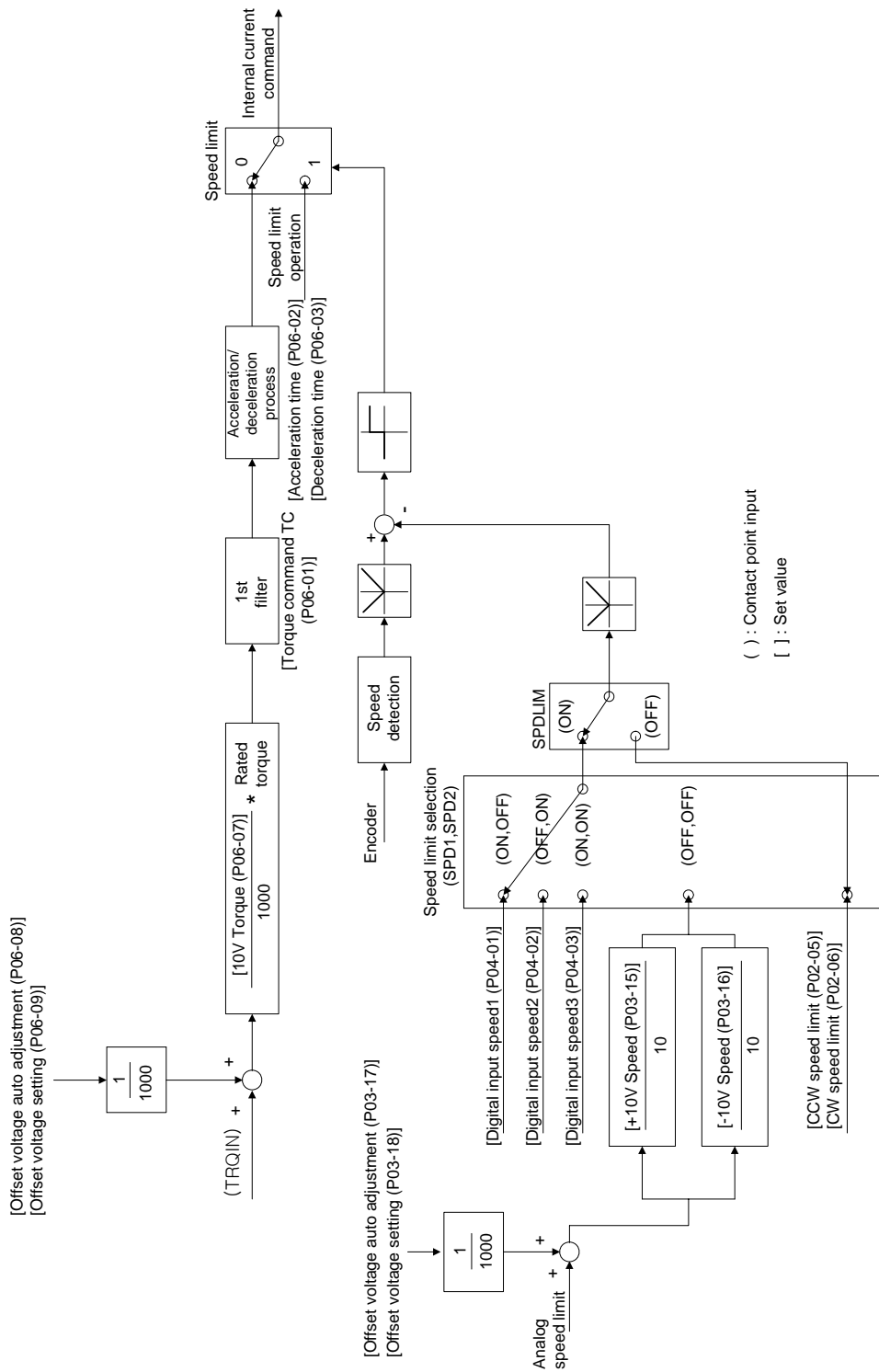
P05-07	PI-P Pulse ERR	Unit pulse	Display range 0 ~ 99999	Manufactured default 0	Position control
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If the error between command pulse and actual movement pulse exceeds the set value of P05-07, it switches to P control mode to suppress overshoot.



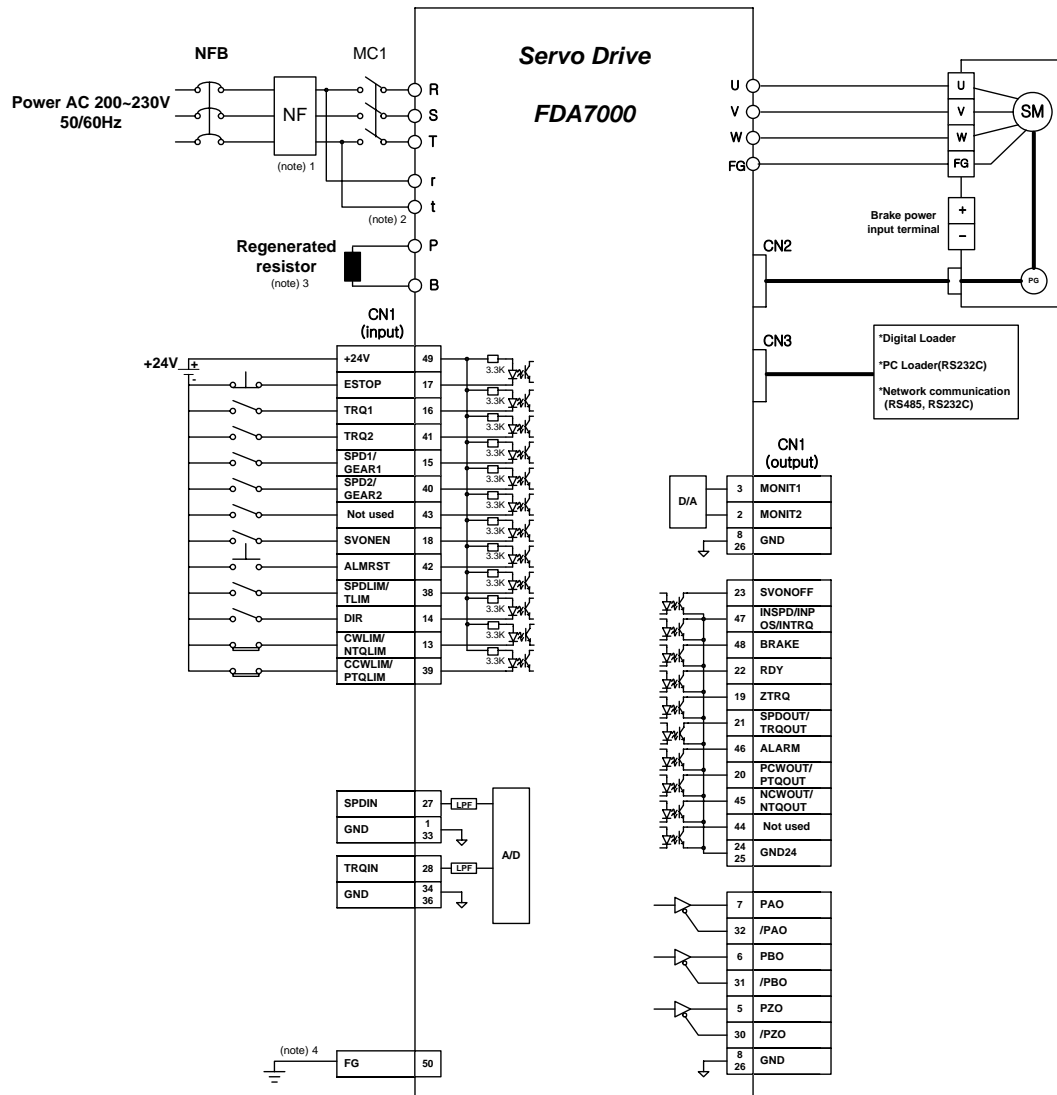
4.3 Gain adjustment method for torque control mode

This explains the torque servo using method and gain adjustment method. The following diagram shows the generation sequence of the current command during torque control.



4. Servo using method and gain adjustment

4.3.1 CN1 wiring diagram for torque control servo



♥ The above input and output contact points are shown when setting the torque control mode contact point. (P07-01, P08-01=25).

(Note) 1 : NF stands for Noise Filter and it must be used to prevent the noise from intruding from the outside.

(Note) 2 : For the FDA7004/7004B~45 type, connect the single phase AC220V[V] to the r, t terminal, auxiliary power. FDA7001~02 type does not have the auxiliary power r, t terminal.

(Note) 3 : The recovery resistances of FDA7004~FDA7010 are installed inside the driver as an internal type. The recovery resistance of the FDA7001, 7002, 7004B, FDA7015 type or above is the separately installed type. Check the capacity and apply accordingly.

(Note) 4 : Connect the ground wire of CN1 cable to the FG (Frame Ground) terminal.

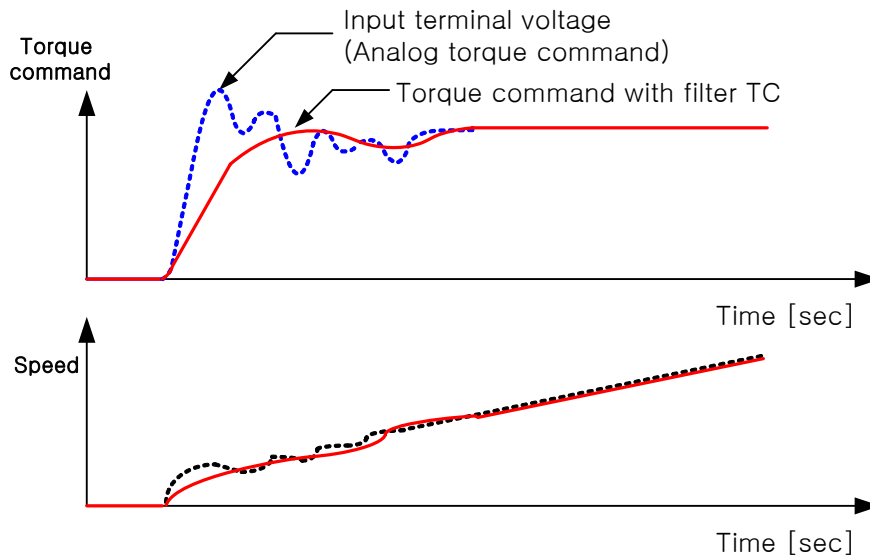
(Note) 5 : Separate GND24 (CN – 24, 25) and GND (CN1 – 1, 8, 26, 33, 34, 36).

When connect commonness, malfunction of servo drive and burnout can occur.

4.3.2 Gain adjustment of torque servo

P06-01*	Analog TRQ TC	Unit ms	Display range 0.0 ~ 2000.0	Manufactured default 0.0	Torque control
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If you suspect that machine vibration is being caused by the servo system, try to adjust the Analog TRQ TC. It can reduce the vibration. The lower the value, the better control response will be, but if set too high, it may reduce the responsiveness.



♥ For the speed limit of torque servo, 4 speed limit values are applied according to the contact point of SPD1 and SPD2 when the SPDLIM contact point is ON and the speed limit of P02-05 and P02-06 are applied when the SPDLIM contact point is OFF.

4.4 Autotuning

For the autotuning applied to FDA7000 series, the servo drive estimates the inertia of the load attached to the servo motor during operation and has the function of adjusting the speed control gain and position control gain.

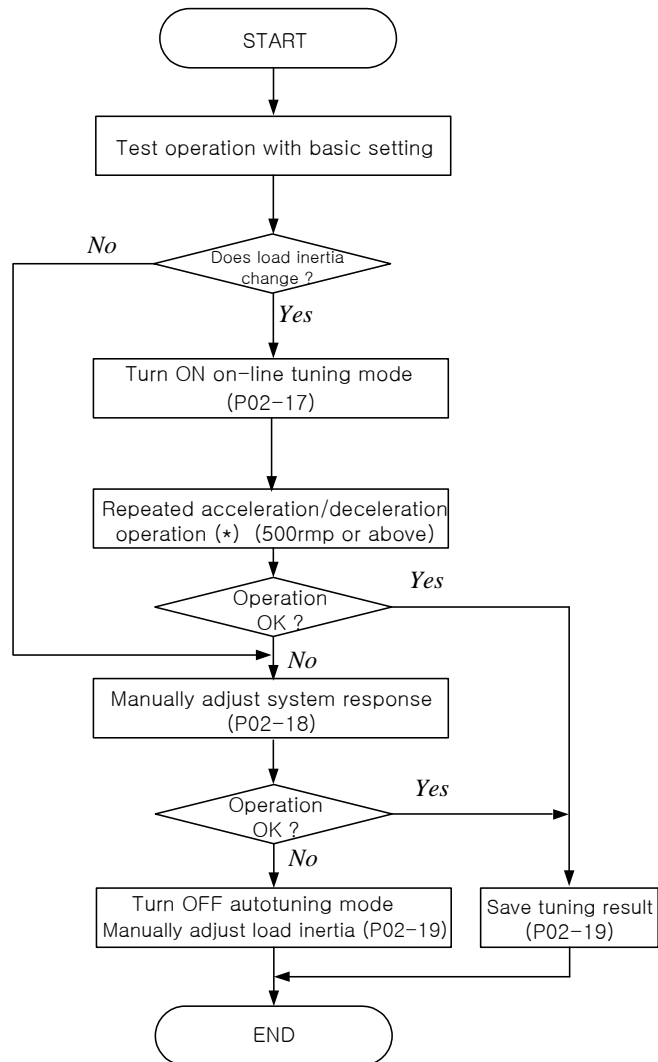
4.4.1 System response setting

The system response is set (P02-18) manually before using autotuning. The following P05-05, P05-06, P03-05, P03-06, P03-07, P03-08 and P02-16 automatically changes and when the autotuning function is set to "ON", the tuning operation is executed with the target of manually set value.

P02-18 (System response setting)	P05-05 (Position loop gain 1)	P05-06 (Position loop gain 2)	P03-05 (Speed control loop gain 1)	P03-06 (SC TC 1)	P03-07 (Speed control loop gain 2)	P03-08 (SC TC 2)	P02-16 (Command torque filter TC)
1	2.0	5.0	2.0	200.0	5.0	120.0	4.5
2	5.0	10.0	5.0	120.0	10.0	80.0	3.5
3	10.0	15.0	10.0	80.0	15.0	60.0	3.0
4	15.0	20.0	15.0	60.0	20.0	45.0	2.5
5	20.0	25.0	20.0	45.0	25.0	40.0	2.0
6	25.0	30.0	25.0	40.0	30.0	30.0	1.5
7	30.0	35.0	30.0	30.0	35.0	25.0	1.3
8	35.0	45.0	35.0	25.0	45.0	18.0	1.2
9	45.0	55.0	45.0	18.0	55.0	17.0	0.9
10	55.0	70.0	55.0	17.0	70.0	13.0	0.8
11	70.0	85.0	70.0	13.0	85.0	11.0	0.6
12	85.0	105.0	85.0	11.0	105.0	10.0	0.5
13	105.0	130.0	105.0	10.0	130.0	8.0	0.4
14	130.0	160.0	130.0	8.0	160.0	6.0	0.25
15	160.0	200.0	160.0	6.0	200.0	5.4	0.2
16	200.0	240.0	200.0	5.4	240.0	5.0	0.15
17	240.0	300.0	240.0	5.0	300.0	3.5	0.1
18	300.0	350.0	300.0	3.5	350.0	3.2	0.0
19	350.0	360.0	350.0	3.2	360.0	3.1	0.0

◆ If you set the system response to high, it increases the servo system gain to increase the response. But if the set value is too high, it can cause noise and vibration in the motor. In this case, appropriately lower the set value.

4.4.2 Autotuning setting sequence



- ♥ Autotuning is set by system response setting (P02-18) manual part, by position loop gain, speed control loop gain, SC TC and torque command filter and the system inertia ratio (P02-19) is set by the autotuning mode (P02-17).

4.4.3 Precaution during autotuning

- 1) Operate at 500[rpm] or higher speed.
- 2) Manually set the acceleration/deceleration time setting of speed shortly [ms]. If the acceleration/deceleration time is set too long, the speed deviation during the algorithm processing time is too small to make estimation.
- 3) Avoid using autotuning when operating weak belt with lower mechanical strength.
- 4) Avoid using autotuning for system with load inertia abruptly changing.
- 5) When the P02-18 (System response setting) is too low, increase the value.
- 6) It does not apply when using the torque control mode.

4.5 Precaution for absolute encoder

In the host controller, when detecting the absolute position of the machine even when the power of the servo drive is turned off, you must use an absolute type servo motor and drive. If you connect the power to the absolute type servo system, you can make a machine system that can directly enable auto operation with additional position detection operation without the difference between the absolute type drive and standard type drive is whether there is a back-up battery.

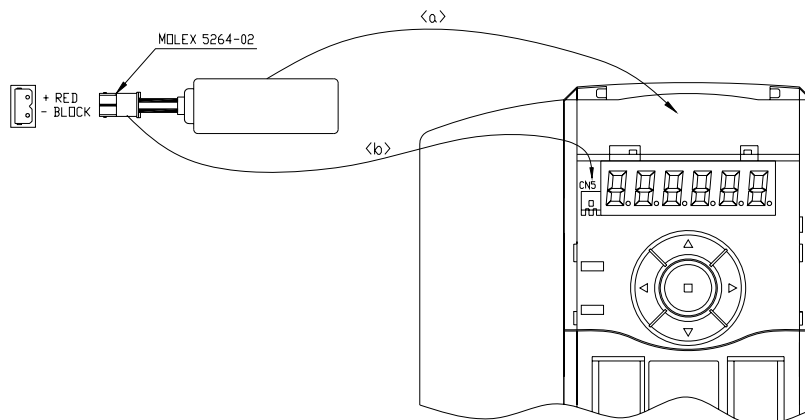
4.5.1 Battery handling

The battery supplies the back-up power to store the position information of the “Absolute encoder” even when the drive power is turned off.

1) Recommended battery specification

Connecting the battery to the host controller	Connecting the battery to the servo drive
Lithium battery Tekcell SB-AA0 type 3.6V 2400mAh	1. Connector attached type 2. Main unit: Lithium battery Tekcell SB-AA0 type 3.6V 2400mAh (Connect to CN5 of servo drive)

2) Battery connection



<a> : Open the cover and insert the battery unit in the arrow direction.

 : Connect the connector to CN5.

3) Battery replacement

The encoder battery alarm is generated when the battery voltage drops under 2.7 V. The alarm is generated by receiving the data from the absolute encoder when the power is connected to the servo drive. If the servo drive control power is ON and the battery voltage is dropped, the alarm will not be generated.

♥ Battery replacement method

- Replace the battery when the control power of the servo drive is ON. If you replace the battery when the servo drive control power is OFF, the absolute encoder must be initialized.
- After replacing the battery, turn the control power of the servo drive OFF.
- Check the condition after turning the control power of the servo drive ON.



Caution

- Wire the battery to the one of the servo drive side or the host controller side. It is dangerous when you connect to both sides because it can create a short circuit.

4.5.2 Absolute value encoder initialization

1) When the absolute value encoder requires initialization

- During first operation
- When the encoder cable is separate from the servo drive
- After replacing the battery
- When the absolute encoder related alarm is generated

2) Absolute value encoder initialization (reset) method

- 17bit serial absolute value encoder: When it sets the origin by itself, set the parameter (P01-20) to "ON" and it will change to "ON =>OFF" to initialize the current position. (Multi-Turn data reset). When the absolute value related alarm is generated, execute alarm reset by using alarm reset contact point (ALMRST).
- When it sets the origin by itself, set the parameter (P01-20) to "ON" and it will change to "ON =>OFF" to initialize the current position. Or connect the power to encoder terminal ERST (CN2-20) and Vcc terminal (CN2-19) for more than 4 seconds.

Chapter 5

Servo operating

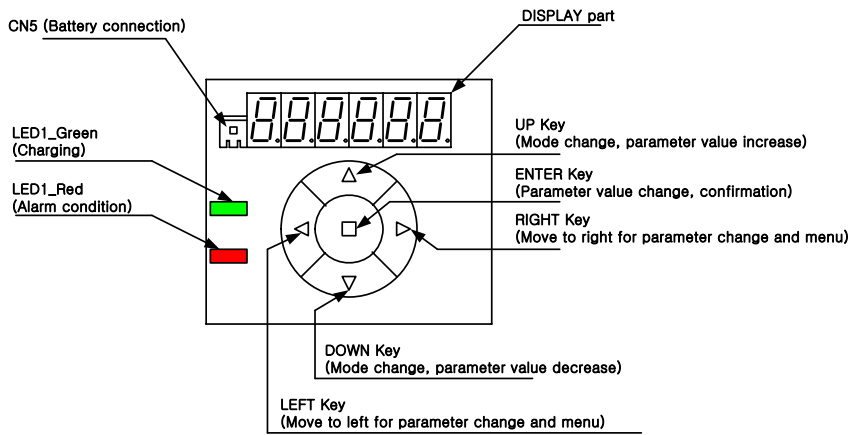
Chapter 5 explains the operation of the loader for servo operation to set the servo parameter and display the status.

5.1 Basic of loader	5-1
5.2 Operation of internal mount loader	5-2
5.3 Operation of digital loader	5-9

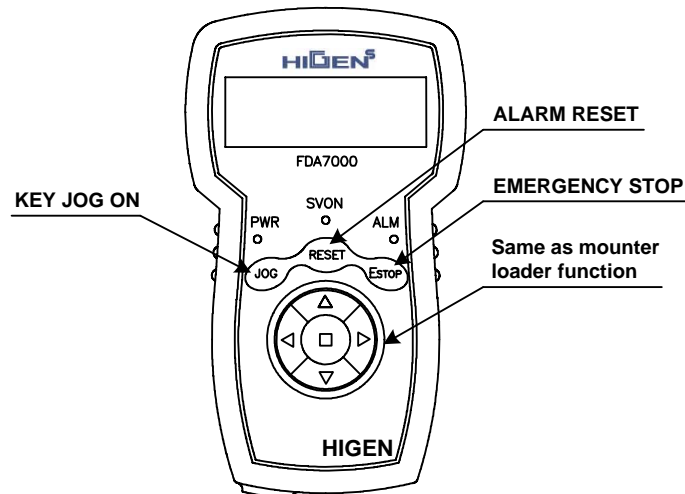


5.1 Basics of loader

You should install the servo motor and drive according to the installation condition. After connect the power supply circuit and motor wiring. You should check the motor parameter (P01--). Use the loader to check that motor parameter is set to normal running condition. This parameter show to you the basic information for the servo motor which is connected to the drive. Then you must monitor the group indicating the motor status (StE--) to check whether various commands and limits values are properly set. And if this is your first time operating the unit, you must verify the stability through autotuning or test operation of Jog and Auto Jog. Autotuning operation can be done online and you do not need to execute this operation when the gain of stable control system is ensured offline.



[Overview diagram of internal mounter loader]

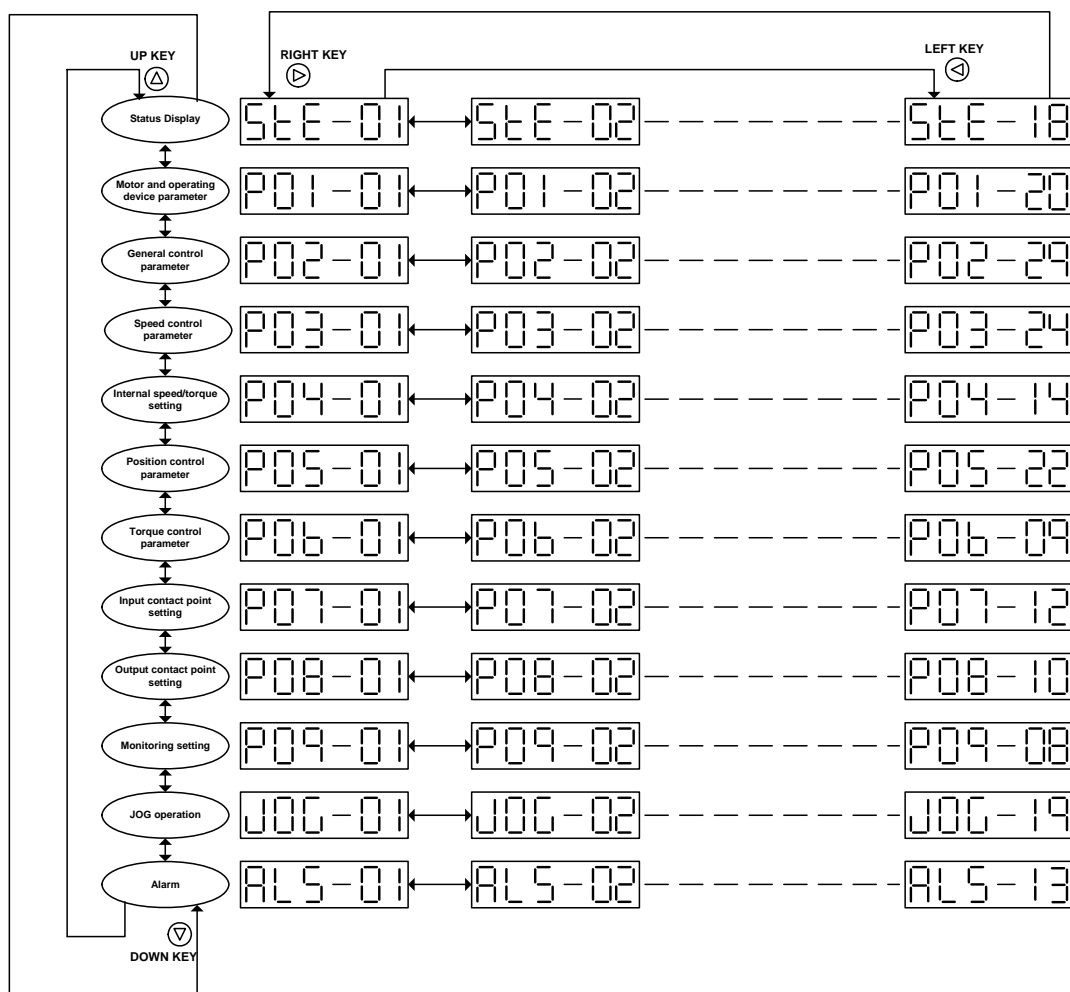


[Overview diagram of digital loader]

5.2 Operation of internal mount loader

5.2.1 Display flow

If the power is correctly supplied, the mount loader display on the front panel of the servo drive a message. The internal mount loader is composed of 7 segment LED and 6 digits. You can set the parameter, display the status, check the sequence and alarm record by the loader. The key function of the loader is composed of X-Y coordination system which have vertical axis (Up and Down button) and horizontal axis (Right and Left button). The following diagram shows an overview aspect for loader menu.



♥ When the power is initially connected, the displayed screen differs depending on the coordinate (StE-01) parameter. For example, if StE -01 = 1203, 12 refers to the StE menu and 03 to the StE -03.

[1st and 2nd digit value]

Name of higher menu	P01 mode	P02 mode	P03 mode	P04 mode	P05 mode	P06 mode	P07 mode	P08 mode	P09 mode	JOG mode	ALS mode	StE mode
1 st and 2 nd digit value	01	02	03	04	05	06	07	08	09	10	11	12

Refer to each parameter item for the menu number of 3rd and 4th digit.

5.2.2 Parameter change

1) Parameter change

UP : Positive direction mode change, increase in blinking value

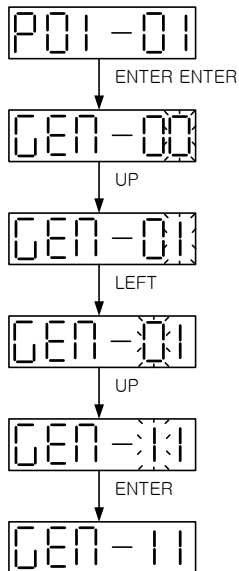
DOWN : Negative direction mode change, decrease in blinking value

LEFT : Move blinking value to left

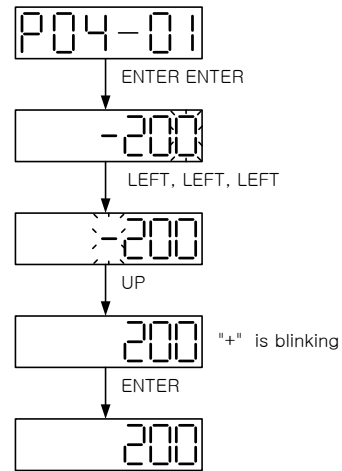
RIGHT : Move blinking value to right

ENTER : Display parameter value, start and end of parameter change

※ Enter motor ID (00 → 11)



※ Enter digital input speed 1 (-200 → +200)

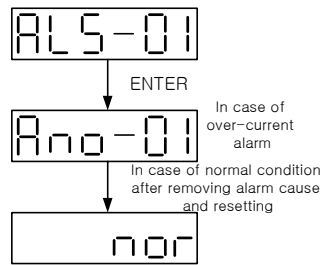


◆ When changing the parameter “-” sign indicates the blinking value but “+” sign does not indicate anything.

5.2.3 Alarm related processing part

1) Currently generated alarm display menu

ENTER : Indicated generated alarm value



Currently generated alarm display menu shows the currently generated alarms. Even though it is free to move to the next menu, the alarm cannot be reset and the motor cannot be operated.

2) Alarm reset menu

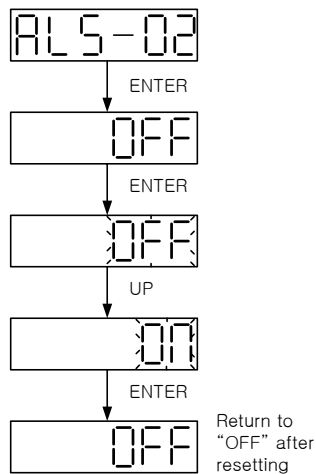
UP : ON/OFF change

DOWN : ON/OFF change

LEFT : Move menu

RIGHT : Move menu

ENTER : Start and end of parameter change (Current alarm cancel function operation)

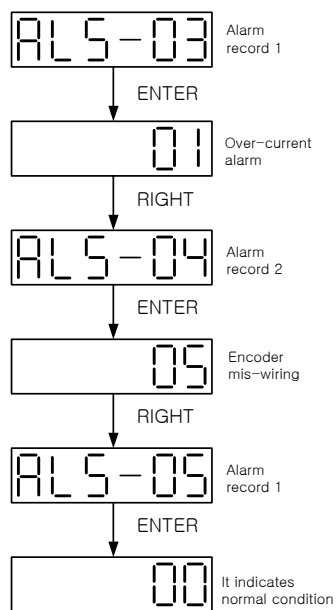


As the function to reset the alarm generated in the current system, the alarm reset menu is the same function as external input reset.

3) Alarm record display menu

Alarm record display menu saves the latest 10 alarms in each menu in the sequence of ALS-03 ~ ALS-12. The following diagram is the case assuming that the over-current (01) alarm is generated after the encoder mis-wiring (05) alarm is generated during servo operation.

Emergency stop alarm (emc_stop) is not saved in the alarm record and each alarm record menu value is "00" for normal operation.



5.2.4 Jog operation

1) Key jog mode setting (JOG-01)

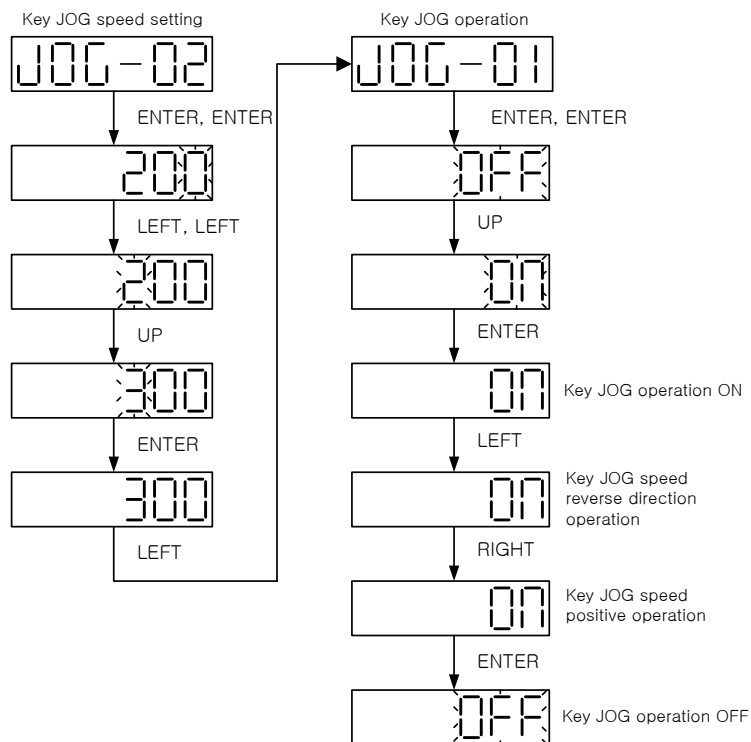
UP : Positive direction mode change, increase blinking value

DOWN : Negative direction mode change, decrease in blinking value

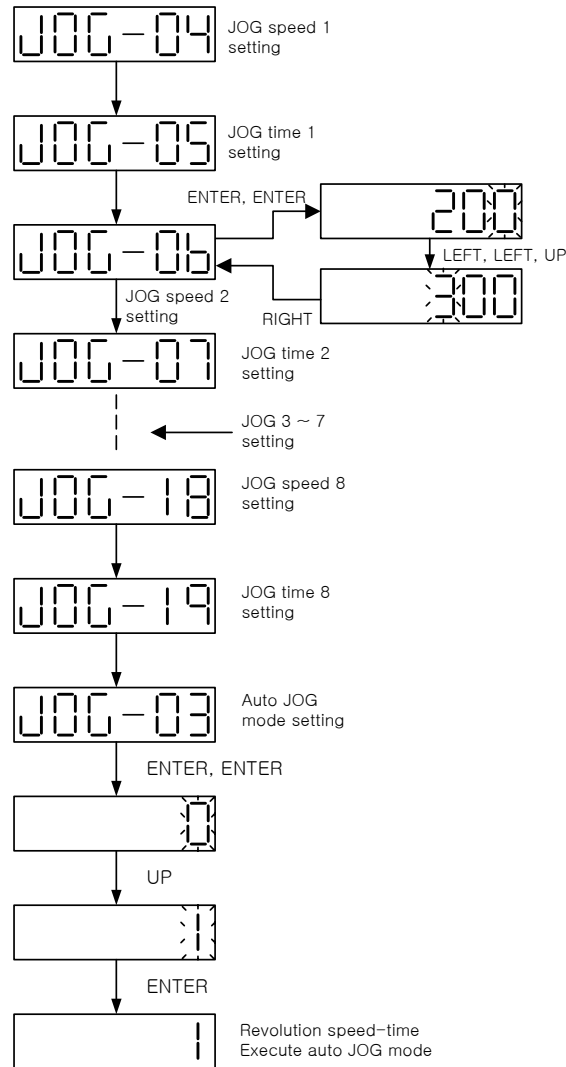
LEFT : Command reverse direction revolution, move blink to left when entering key jog speed (JOG-02)

RIGHT : Command positive direction revolution, move blink to left when entering key jog speed (JOG-02)

ENTER : Indicates parameter value, start and end of parameter change



2) Auto jog mode setting

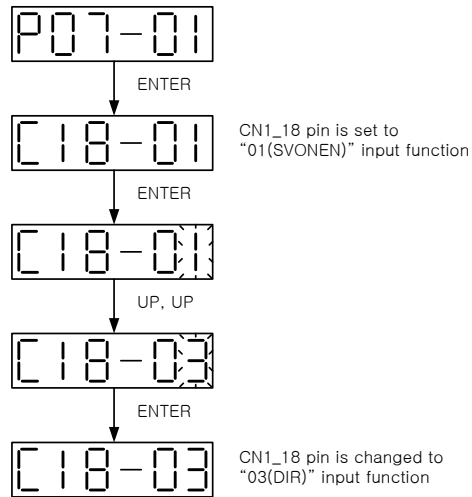


Auto jog mode supports 8-steps repeated pattern operations, and the 1st auto jog mode that sets the revolution speed [rpm] and revolution time [sec] and 2nd auto jog mode that sets the revolution time [rpm] and revolutions [rev] are supported.

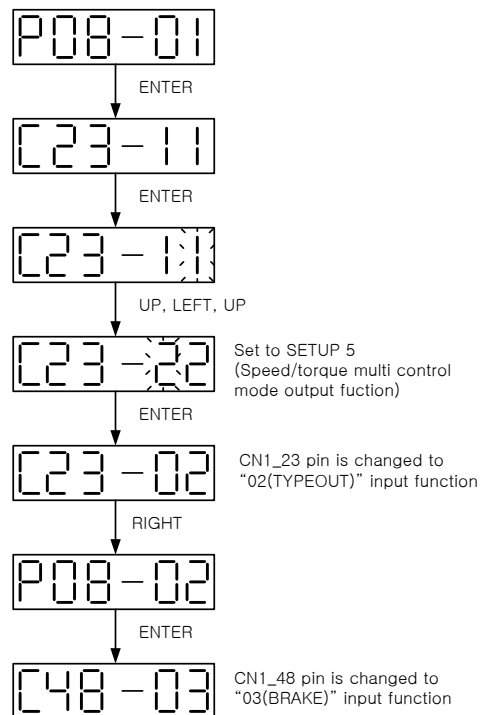
JOG-03 Set value	Operation explanation
0	Do not use auto jog mode
1	Use auto jog mode for revolution speed – revolution time
2	Use auto jog mode for revolution speed – revolutions

5.2.5 I/O contact point function parameter setting

1) Input contact point function setting (P07 mode)



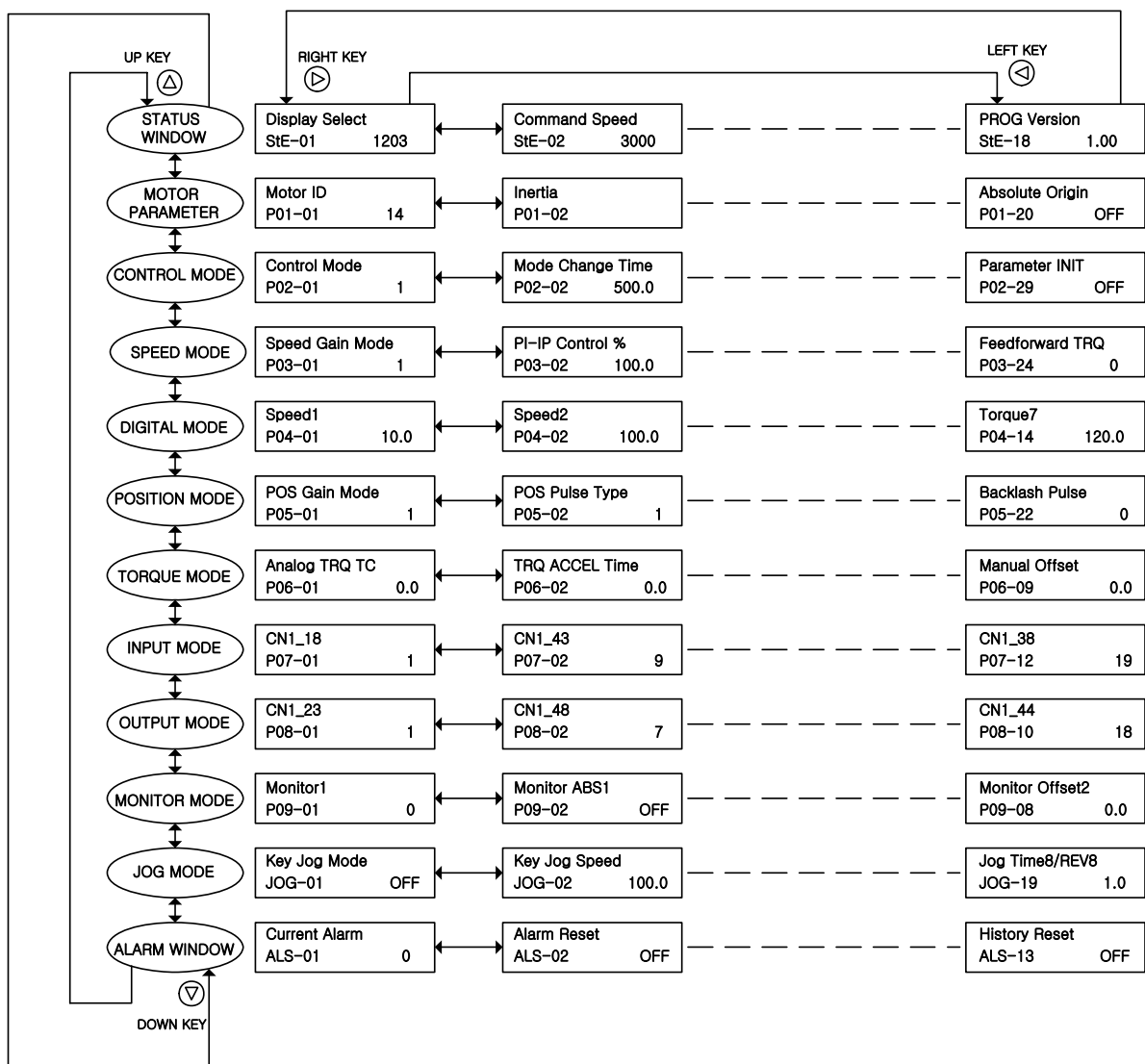
2) Output contact point function setting (P08 mode)



5.3 Operation of digital loader

5.3.1 Display flow

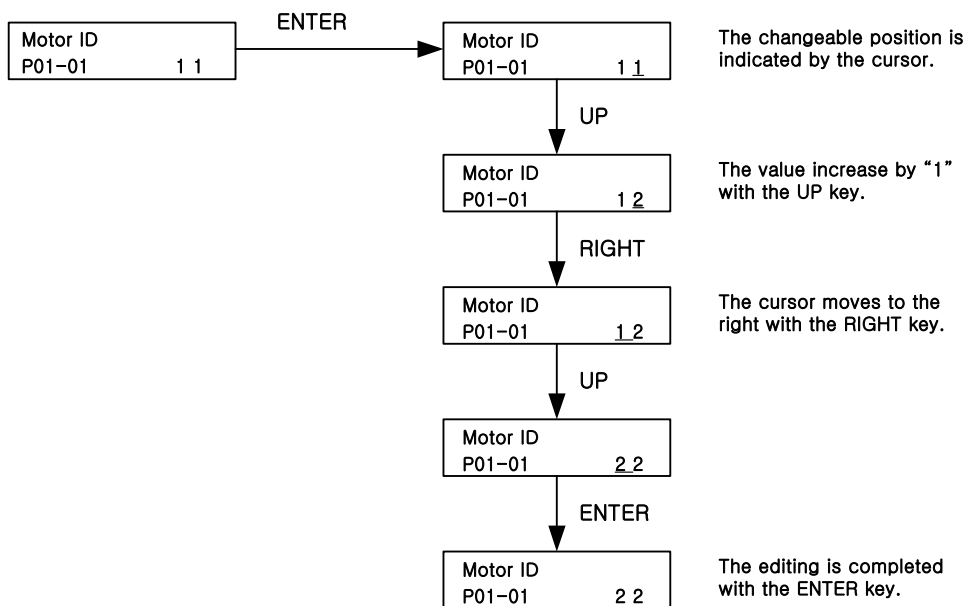
If the power is supplied and connected to digital loader correctly, LCD window of the digital loader display a message. The digital loader has LCD window and function key on front panel. You can set the parameter, display the status, check the sequence and alarm record by the loader. The following diagram shows an overview aspect for digital loader menu.



5.3.2 Parameter change

Even though the changeable range differs by the menu, the operating method is the same, and the case of P01-01[Motor ID] is used as a representative example.

- JOG Key : Key Jog ON
- RESET Key : Alarm reset
- ESTOP Key : Emergency stop
- UP Key : Mode change (increase), increase parameter value
- DOWN Key : Mode change (decrease), decrease parameter value
- RIGHT Key : Move right when changing menu and parameter
- LEFT Key : Move left when changing menu and parameter
- ENTER Key : Change parameter, confirm parameter



Chapter 6

Troubleshooting and check

Chapter 6 explains the method of action and check for the issues that can occur during servo operation.

6.1 Troubleshooting	6-1
6.2 Check.....	6-4



6.1 Troubleshooting

6.1.1 Servo motor

Symptom	Cause	Inspection	Corrective Actions
Motor does not start.	Parameter mis-setting	Check the parameter of motor, encoder, encoder type, control mode etc.	Reset parameter. (Refer to Chapter 3)
	Overload	Check the revolution condition of the machine.	Readjust the machine device.
	Motor defect	Measure the motor lead terminal with a tester.	For normal voltage, replace the motor.
	Loose screw	Check the connection part with drive.	Tighten loose parts.
	External mis-wiring Cable disconnection	Check motor and encoder wiring.	Rework on the wiring. Replace the cable.
	Encoder defect	Check the output wave shape.	Replace the encoder. (Request for repair)
Motor revolution is unstable	Wiring connection defectiveness	Check the connection of the motor lead terminal.	Correct the wiring.
	Low input voltage	Check the drive input voltage.	Correct the power.
	Overload	Check the machine condition.	Remove any particle on the revolution part and supply lubricant (or grease)
Motor is over-heated.	High ambient temperature	Check the surrounding temperature of the motor installation part. (40℃ or below)	Reduce ambient temperature to 40℃ max.
	Contamination on motor surface	Check whether there are any alien particles on the motor surface.	Clean dust and oil dirt.
	Overload	Check the load rate of the drive. Check the acceleration/deceleration frequency.	Reduce load. Increase acceleration/deceleration time.
	Low magnetic power of magnet	Check the comparator voltage and voltage wave shape.	Replace the motor.
Abnormal noise is generated.	Coupling defect	Check the screw condition of the coupling and copper core of the connection part etc.	Readjust the coupling.
	Bearing problem	Check the bearing vibration and abnormal noise.	Contact our company.
	Parameter mis-setting(Motor/encoder ID, inertia ratio, gain, TC)	Check the control parameter.	Refer to parameter setting method in chapter 3.

6. Troubleshooting and check



6.1.2 Servo drive

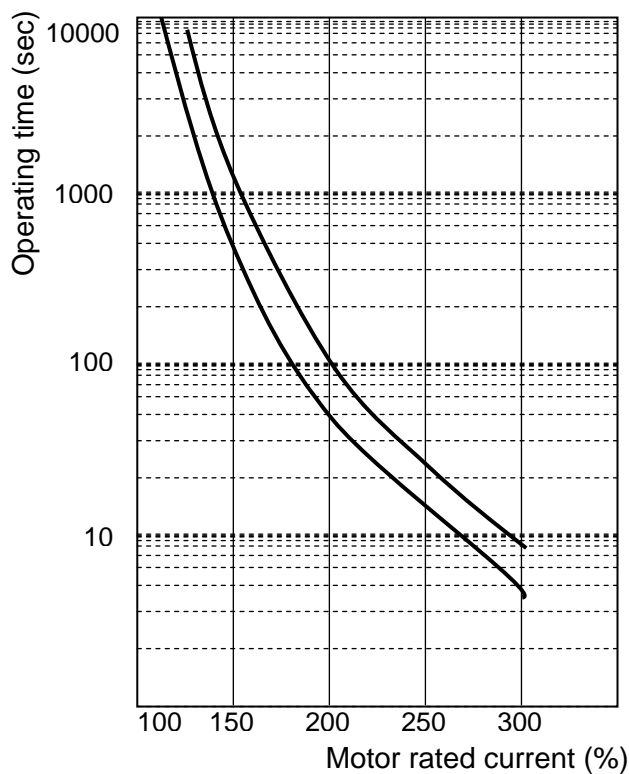
When an alarm occurs in servo drive and error signal output contact point (ALARM) goes OFF and the motor is stopped by dynamic brake.

Display	Content	Cause	Corrective Actions
nor	Normal condition		
Ano-00 EMER STOP	Emergency stop	Turn external ESTOP contact point input OFF.	Check external DC 24V power. Check ESTOP contact point ON status
Ano-01 OVER CURNT	Over-current	Servo drive output terminal (U, V, W) short circuit, output over-current	Check output terminal wiring, re-operate after resetting, replace drive when O.C continues
Ano-02 OVER VOLT	AC link over-voltage	Input over-voltage (280V or above) Regenerated resistance burnt, Overload GD ²	Use input voltage of 230V or below Replace brake resistance, increase acceleration/deceleration time, replace servo drive
Ano-03 OVER LOAD	Overload	Mechanical overload Motor mis-wiring	Check load condition, check motor and encoder wiring
Ano-04 POWER FAIL	Main power issue	Main power blocked when SERVO is ON	Check 3 phase main power (R, S, T) input condition
Ano-05 LINE FAIL	Mis-wiring of motor and encoder	Motor and encoder related set value error, motor and encoder mis-wiring, encoder defect, mechanical overload	Check motor, encoder, wiring and set value, remove overload
Ano-06 OVER SPEED	Over-speed	Over-gain, parameter set value error, over gravity load	Adjust gain Check parameter (P03-15, P03-16) Remove over gravity load
Ano-07 FOLLOW ERR	Over-error of position tracking	Abrupt acceleration/deceleration, gain set value error, command pulse over-frequency (300kpps or above), mis-wiring, mechanical overload	Adjust position gain, increase menu (P05-09) set value, adjust command pulse frequency, check motor and encoder wiring.
Ano-08 Output NC	Output(U,V,W) missing	Output (U, V, W) missing	Check motor wiring, replace servo drive
Ano-09 PPR ERROR	Encoder pulse rate setting error	Encoder ID setting error	Accurately set the encoder ID (P01-12)
Ano-10 ABS DATA	Absolute value encoder data transmission error	Absolute value encoder data transmission error	Re-transmit the absolute value encoder data after resetting.
Ano-11 ABS BATT	Battery Alarm	Battery voltage is 2.8V or below	Replace battery (3.6V)
Ano-12 ABS MDER	ABS encoder multi turn data transmission error	ABS encoder multi turn data transmission error	Re-transmit the absolute value encoder data after resetting.

6. Troubleshooting and check



Ano-13 Output EC	Output U,V,W Mis-wiring	Output U, V, W mis-wiring (Error Connection)	Check motor wiring, replace servo drive
Err - 01	Set value input error	Trial of entry of parameter that cannot be changed when servo is ON, change in parameter locking condition	Change the set value after servo is OFF, cancel parameter lock setting menu (P01-19)
Err - 02	Set value error	Parameter setting error	Input value within set range.



Rated current (%)	Overload operation time		
	Min.	Max.	Set value
100	∞		
120	∞		
150	300	1500	760
200	60	150	107
250	20	40	30
300	6	15	7

[Servo drive overload characteristics curve]

(note) If Ano-03 (OVER LOAD) happens often, refer servo drive overload characteristic-curve and re-establish suitable load of servo motor.

6.2 Check



Caution

• When checking the unit, always turn off the power and wait for more than 10 minutes to pass before checking the unit because charged voltage can remain in DC Link capacitor to cause an accident.

- Check any pieces of wire, dust, particles accumulated inside and clean appropriately.
- Check whether the screw of the terminal is loose and check whether they are tightened.
- Check if there are problems of parts (discoloration, damage, disconnection).

For the connection test of the control circuit, use the high resistance range on the tester, and do not use a megger or buzzer.

- Check whether the cooling fan is operating normally.
- Check if there are any abnormal sounds (motor bearing, brake part).
- Check whether there are any damages or cracks to the cables (Especially detector cable).

Especially during operation, execute periodical checks according to the using condition during operation.

- Check and correct any misalignment of center of load connecting axis.

Chapter 7

Connection with host controller

Chapter 7 shows the example of connection with representative host controller.

7.1 Example of connection with host controller	7-1
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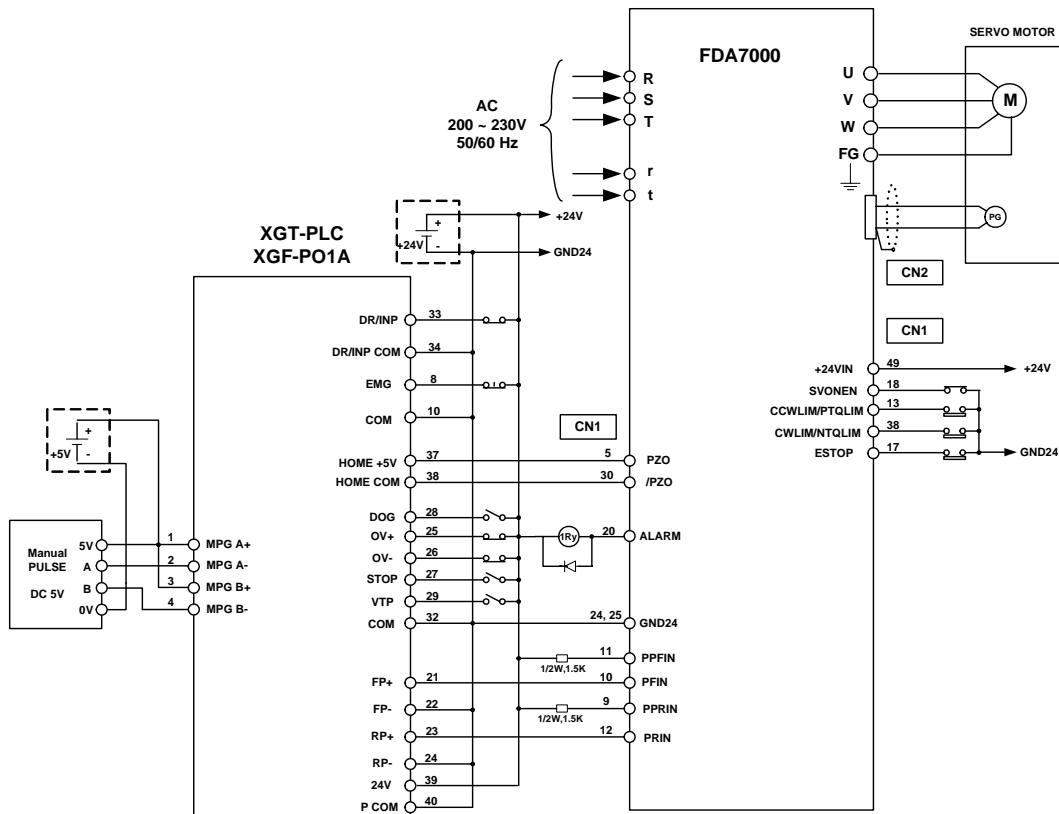


7. Connection with host controller

7.1 Example of connection with host controller

Connect with LS Industrial System XGT-Series position decision unit XGF-PO1A

→ This is an example of position control mode servo system operation.



(Note) After connecting the power, it takes about 1-2 seconds until the alarm signal leads to normal operation. Consider this when designing the power connection sequence. Also the alarm signal operates alarm detection relay 1Ry to turn on the main circuit power of servo drive.

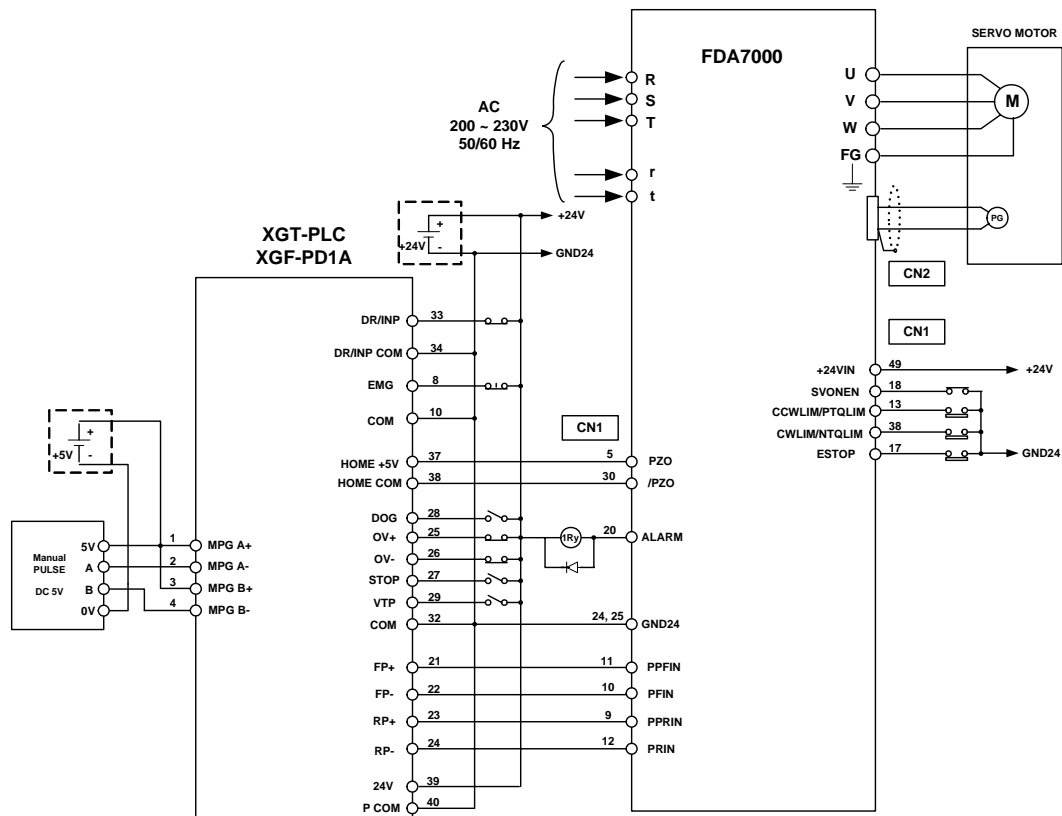
It only has the signals related to LS Industrial Systems XGF-PO1A and FDA7000 Series

(Note) The above connection is only shown in case of P07-01=27(Position control mode)

7. Connection with host controller

Connect with LS Industrial System XGT-Series position decision unit XGF-PD1A

→ This is an example of position control mode servo system operation.



(Note) After connecting the power, it takes about 1-2 seconds until the alarm signal leads to normal operation. Consider this when designing the power connection sequence. Also the alarm signal operates alarm detection relay 1Ry to turn on the main circuit power of servo drive.

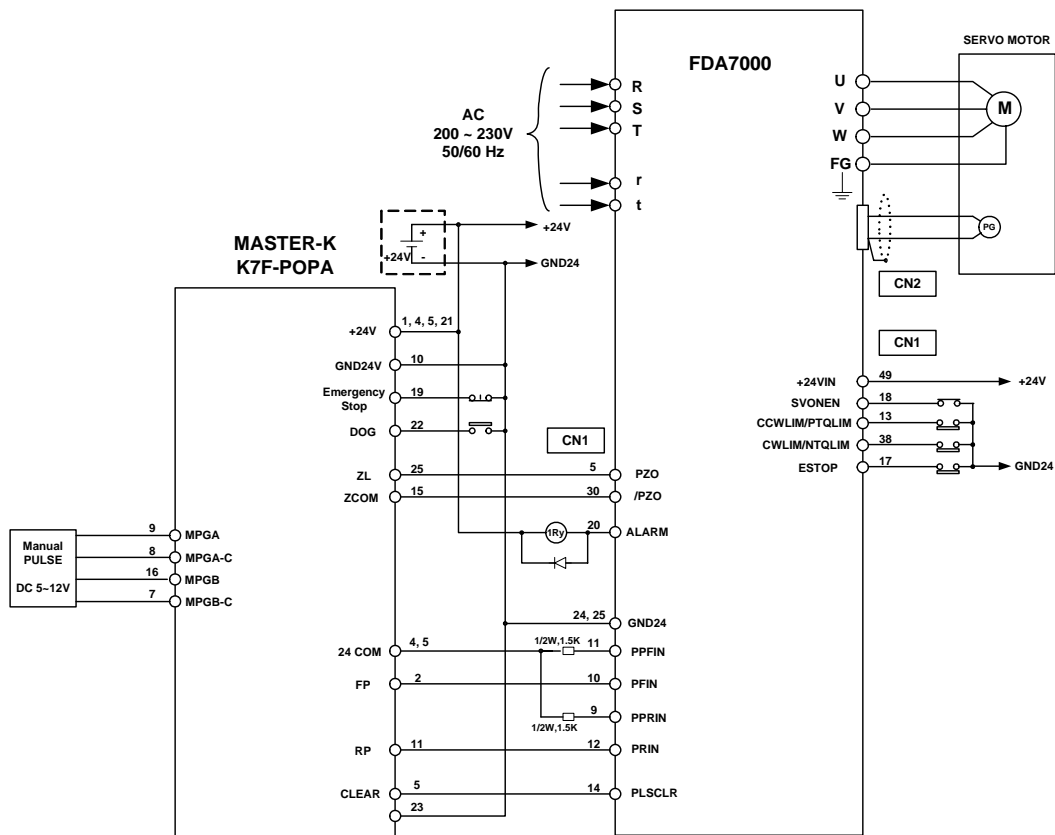
It only has the signals related to LS Industrial Systems XGF-PD1A and FDA7000 Series

(Note) The above connection is only shown in case of P07-01=27(Position control mode)

7. Connection with host controller

Connect with LS Industrial System MASTER-K position decision unit K7F-POPA

→ This is an example of position control mode servo system operation.



(Note) After connecting the power, it takes about 1-2 seconds until the alarm signal leads to normal operation. Consider this when designing the power connection sequence. Also the alarm signal operates alarm detection relay 1Ry to turn on the main circuit power of servo drive.

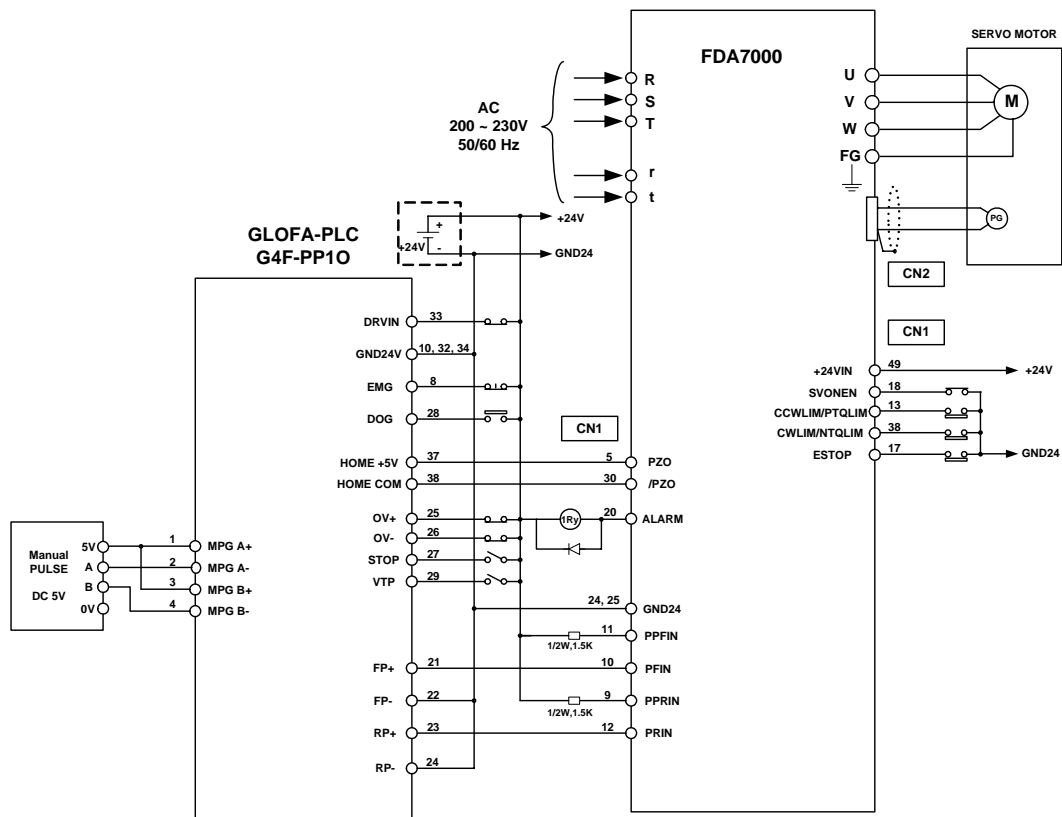
It only has the signals related to LS Industrial Systems K7F-POPA and FDA7000 Series

(Note) The above connection is only shown in case of P07-01=27(Position control mode)

7. Connection with host controller

Connection with LS Industrial Systems GLOFA-PLC position decision unit G4F-PP10

→ This is an example of position control mode servo system operation.



(Note) After connecting the power, it takes about 1-2 seconds until the alarm signal leads to normal operation. Consider this when designing the power connection sequence. Also the alarm signal operates alarm detection relay 1Ry to turn on the main circuit power of servo drive.

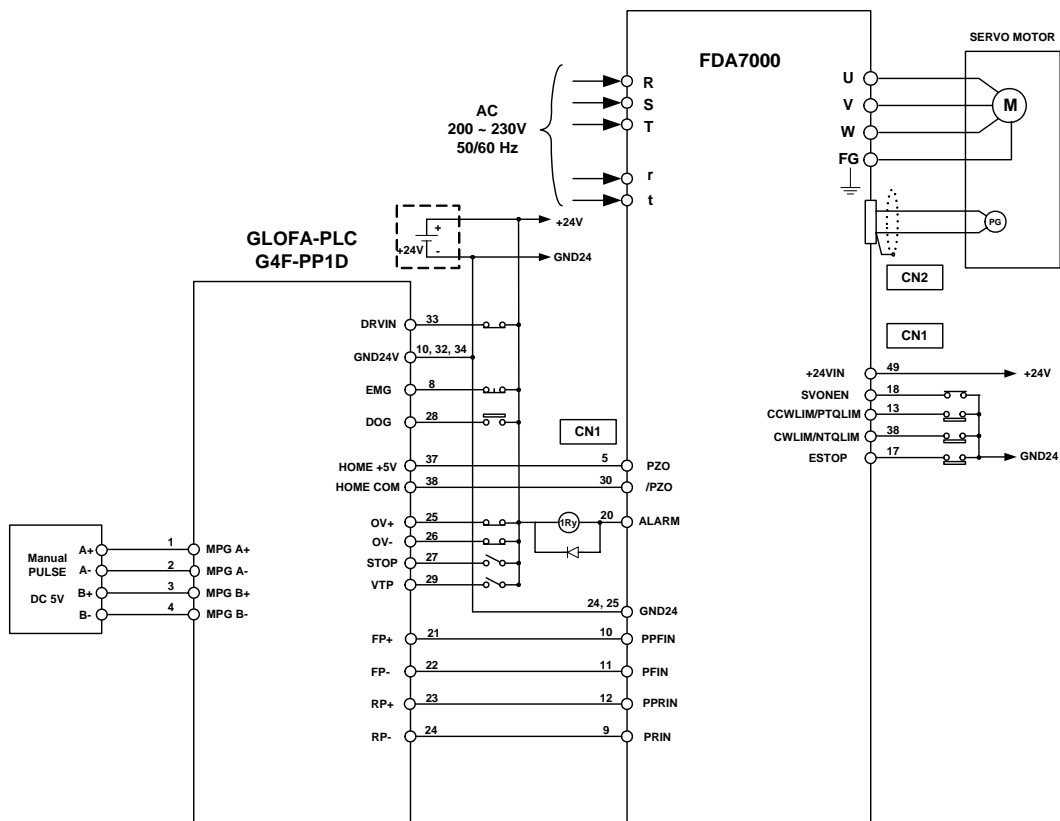
It only has the signals related to LS Industrial Systems G4F-PP10 and FDA7000 Series

(Note) The above connection is only shown in case of P07-01=27 (Position control mode).

7. Connection with host controller

Connection with LS Industrial Systems GLOFA-PLC position decision unit G4F-PP1D.

→ This is an example of position control mode servo system operation.



(Note) After connecting the power, it takes about 1-2 seconds until the alarm signal leads to normal operation. Consider this when designing the power connection sequence. Also the alarm signal operates alarm detection relay 1Ry to turn on the main circuit power of servo drive.

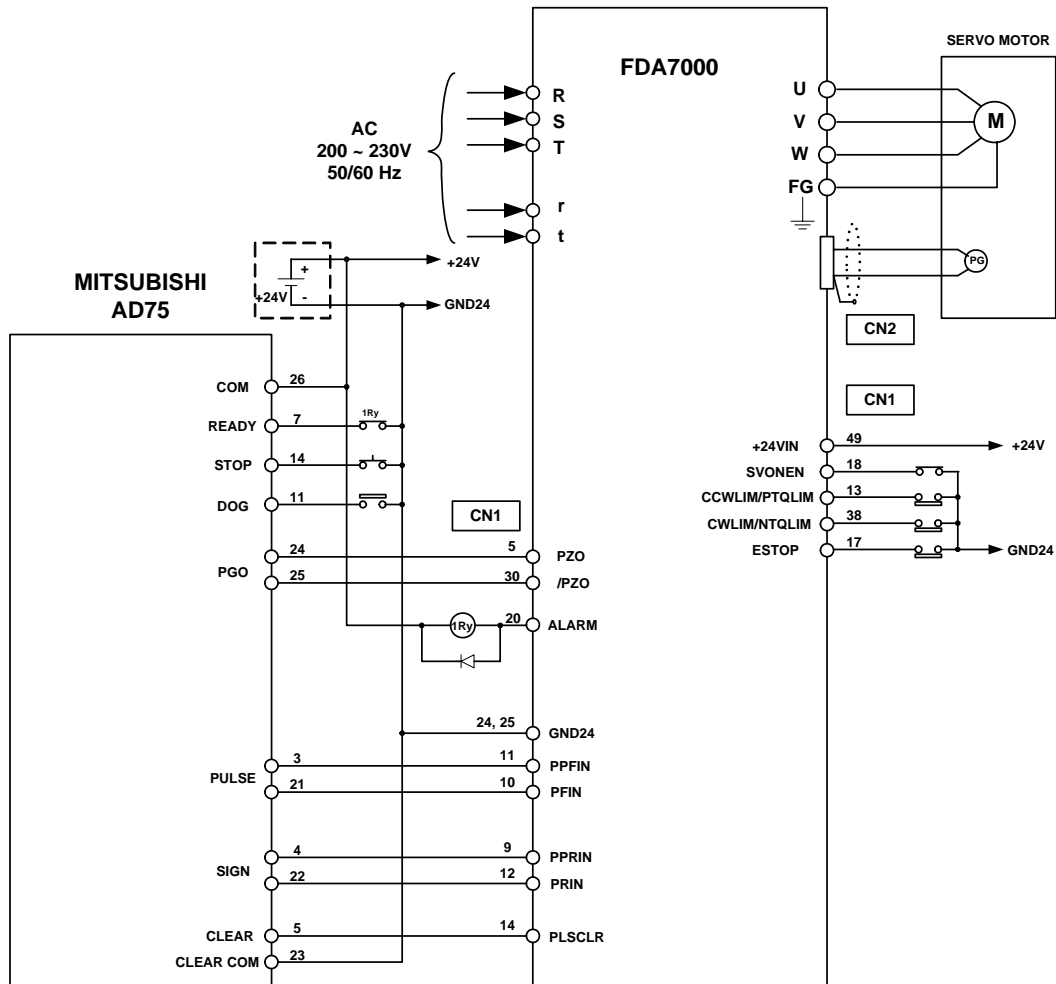
It only has the signals related to LS Industrial Systems G4F-PP1D and FDA7000 Series

(Note) The above connection is only shown in case of P07-01=27 (Position control mode).

7. Connection with host controller

Connection with Mitsubishi Electric position decision unit AD75

→ This is an example of position control mode servo system operation.



(Note) After connecting the power, it takes about 1-2 seconds until the alarm signal leads to normal operation. Consider this when designing the power connection sequence. Also the alarm signal operates alarm detection relay 1Ry to turn on the main circuit power of servo drive.

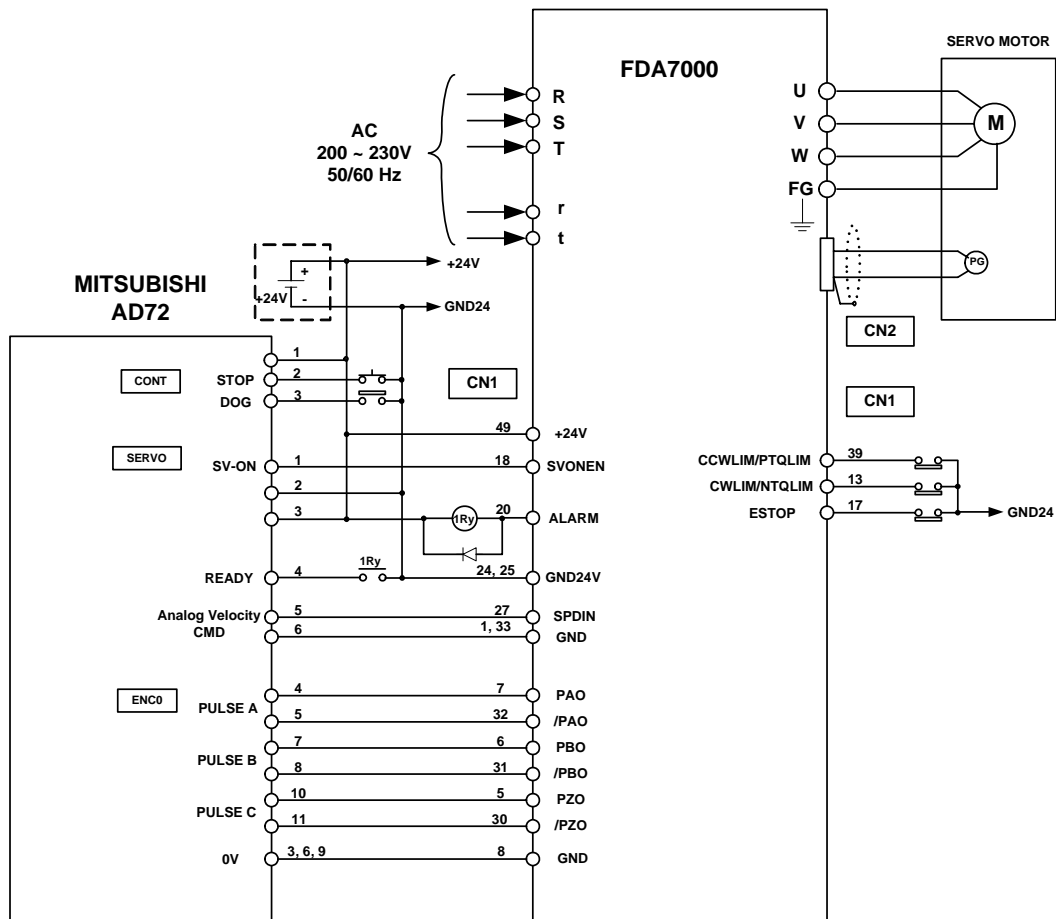
It only has the signals related to Mitsubishi AD75 and FDA7000 Series

(Note) The above connection is only shown in case of P07-01=27 (Position control mode).

7. Connection with host controller

Connection with Electric position decision unit AD72

→ This is an example of speed control mode servo system operation.



(Note) After connecting the power, it takes about 1-2 seconds until the alarm signal leads to normal operation. Consider this when designing the power connection sequence. Also the alarm signal operates alarm detection relay 1Ry to turn on the main circuit power of servo drive.

It only has the signals related to Mitsubishi AD72 and FDA7000 Series

(Note) The above connection is only shown in case of P07-01=26 (Speed control mode).

Chapter 8

External View

Chapter 8 displays the external view of the servo drive.

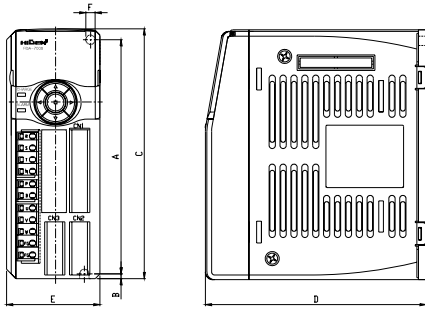
8.1 External view of servo drive	8-1
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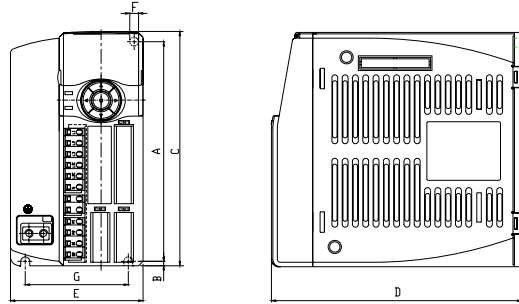
8. External view

8.1 External view of servo drive

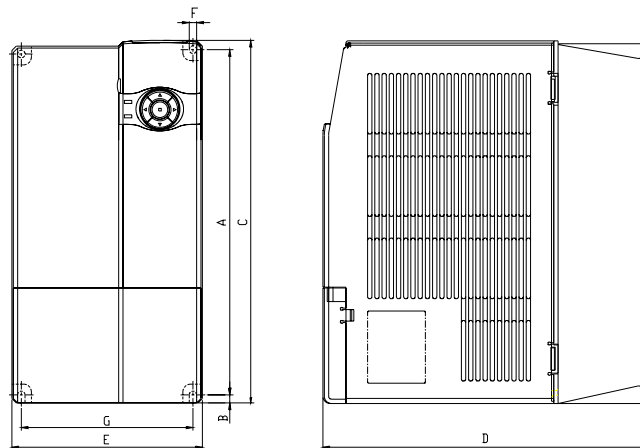
[External view A]



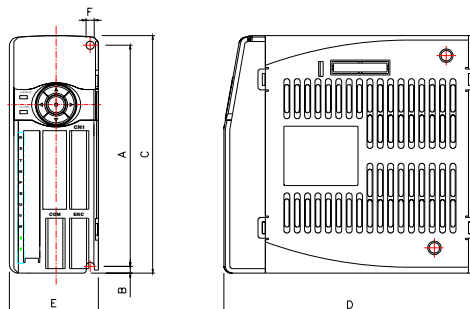
[External view B]



[External view C]

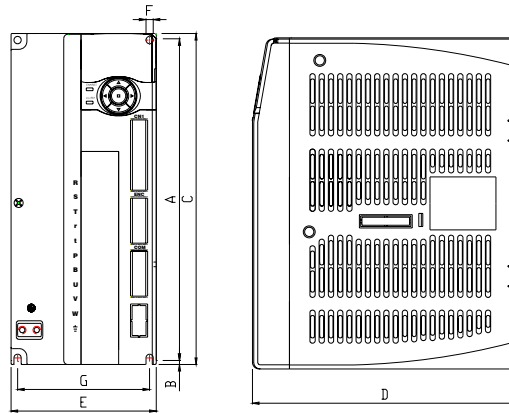


[External view D]



8. External view

[External view E]



Model	A	B	C	D	E	F	G	Weight [Kg]	Cooling method	Remarks
FDA7001	149	4.5	160	140	60	5.0	-	1.0	Self cooling	view A
FDA7002	149	4.5	160	140	60	5.0	-	1.0		
FDA7004	150	3.0	160	170	90	6.0	70	1.5		view B
FDA7005	150	3.0	160	170	90	6.0	70	1.9		
FDA7008	150	3.0	160	170	90	6.0	70	1.9	Forced cooling (FAN)	view C
FDA7010	150	3.0	160	170	90	6.0	70	1.9		
FDA7015	239	5.5	251	225	132	5.2	119	4.3		
FDA7020	239	5.5	251	225	132	5.2	119	4.4		
FDA7030	239	5.5	251	225	132	5.2	119	4.5		
FDA7045	239	5.5	251	225	132	5.2	119	4.6		
FDA7004B	149	4.0	160	170	60	5.5	-	1.2	Self cooling	view D
FDA7015B	240	5.0	250	200	110	5.5	100	4.2	Forced cooling (FAN)	view E
FDA7020B	240	5.0	250	200	110	5.5	100	4.3		
FDA7030B	240	5.0	250	200	110	5.5	100	4.4		

Appendix I

Servo system application

Appendix I explains the application cases that can be utilized when applying the servo system.

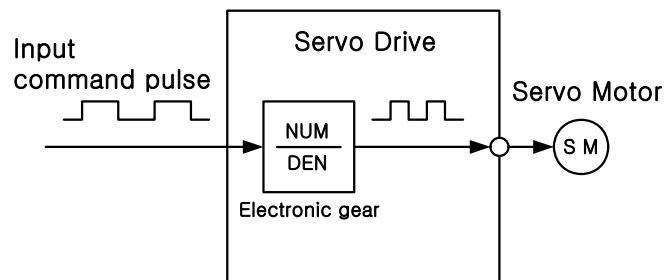
I .1 Position control application	I -1
I .2 Examples of other applications	I -3



1.1 Position control application

The electronic gear enable the workpiece movement distance per input reference command pulse from the host controller to be set to any value. One reference command pulse from the host controller, that is the minimum position data unit, is called a command unit.

[Electronic gear ratio setting]



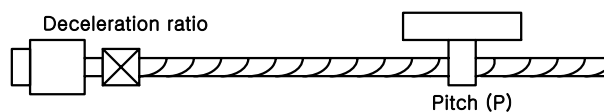
$$\text{Electronic gear ratio} \left(\frac{\text{NUM}}{\text{DEN}} \right) = \frac{\text{Number of motor encoder pulse} \times 4}{\text{Command unit}} \times \text{Reduction ratio}$$

- ♥ Reduction ratio is load shaft revolution over motor shaft revolution
- ♥ The command unit shows the minimum command unit of the position data to move the load.
- ♥ Encoder pulse rate

Encoder type	Number of motor encoder pulse (ppr)
Incremental encoder	2000 ~ 6000
Absolute 11bit	2048
Serial 17bit	32768

※ Setting method of electronic gear

- ① Check the mechanical specification including reduction ratio, ball screw pitch etc.



- ② Determine the minimum unit(command unit) of the position data while feeds load per pulse.
: When moving the table by 0.001[mm] for 1[Pulse], the command unit is 0.001[mm].

- ③ Obtain the load feed rate per load axis rotation in the unit of command.
 : Command unit = 0.001[mm], ball screw pitch = 5[mm],
 Load feed per load axis revolution [Command unit] = 5/0.001 = 5000[Command unit]

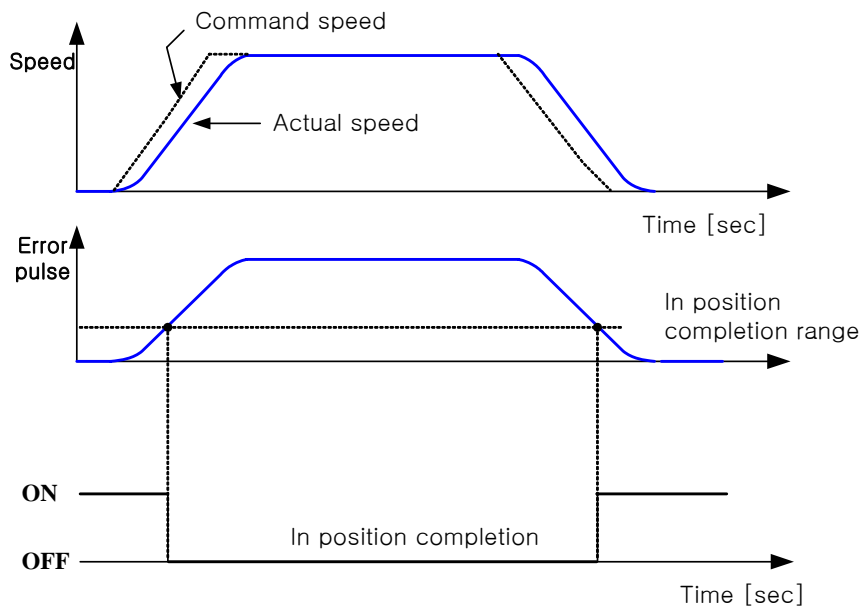
- ④ Get electronic gear ration in case of reduction ratio $\left(\frac{b}{a}\right)$

$$\text{Electronic gear ratio} \left(\frac{\text{NUM}}{\text{DEN}}\right) = \frac{\text{Number of motor encoder pulse} \times 4}{\text{Command unit}} \times \text{Reduction ratio}$$

- ⑤ The result of calculating the electronic gear ratio must be between 0.05~20.
- ⑥ Set the applicable parameter.

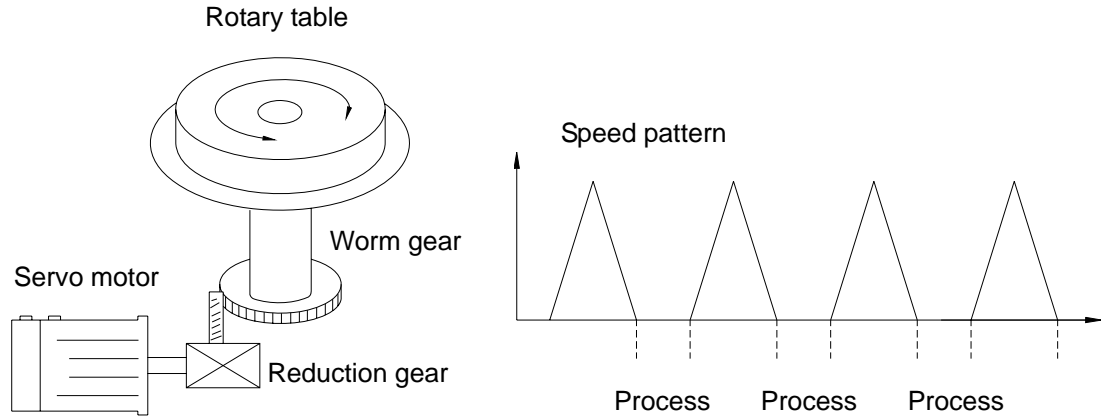
[Position completion range setting]

In position control mode, the positioning completed signal in output when the difference between the number of command pulse output by the host controller and the movement distance of the servo motor in less than value set in user menu P08.



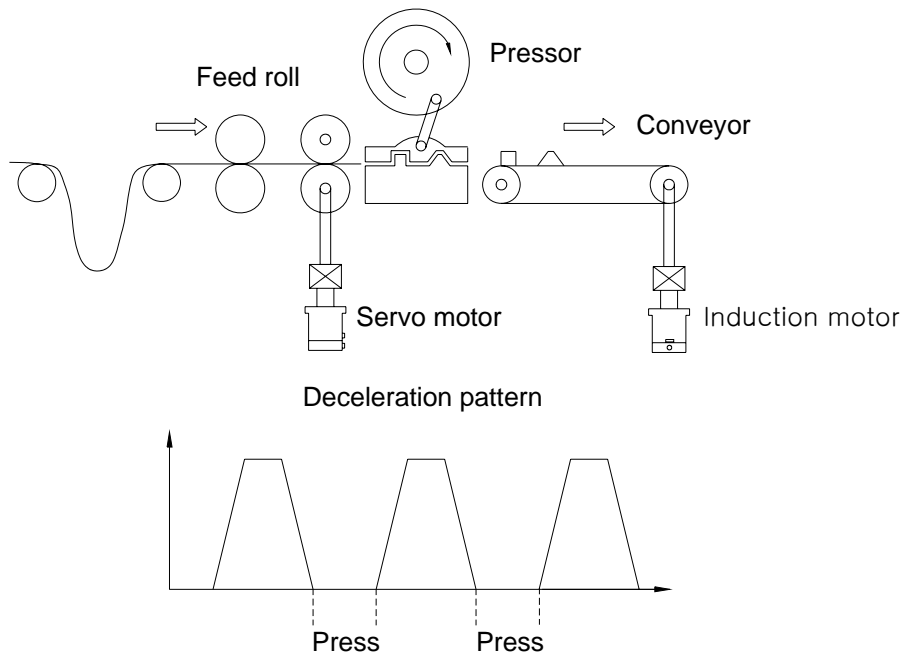
1.2 Example of other application

A. Rotary table



- Prepare the motion program in the host controller.
- Enter the operating signal and operate the angle.
- After angle operation, position decision completion signal(INPOS) is sent out externally.

B. Roll feeder



- Set the feed to the work.
 - Operate the position according to the feed start signal input from the press.
 - By using the position decision completion signal, execute the press work.
- (The position decision completion signal and feed start signal can be interlocked on the sequence.)

Appendix II

Noise control

Appendix II explains the noise control.

II .1 Wiring Precautions.....	II -1
II .2 Wiring for noise control	II -1



II.1 Wiring Precautions

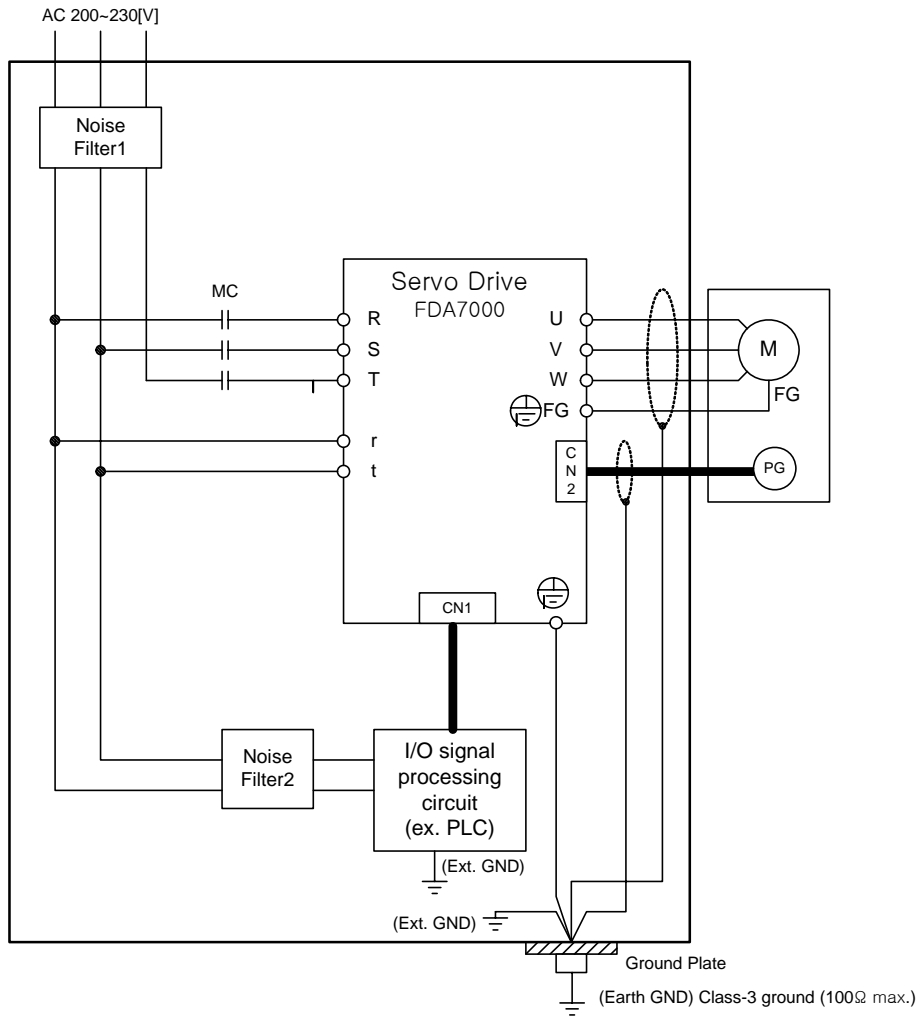
The FDA7000 servo drive uses high-speed switching in the main circuit. It may receive switching noise from these high-speed switching elements if wiring or grounding around the servo drive is not correct. To protect the servo drive system from the external noise install the noise filter in appropriate place as much as possible. To ensure safe and suitable operation, keep the following precautions.

- ① For wiring for reference inputs and encoders, use the specified cables.
 - Use the cables as short as possible.
- ② For ground wire, as thick a cable as possible.
 - At least class - 3 ground (100Ω max.) is recommended.
 - Ground to one point common only.
- ③ Do not bend or apply tension to cables.
- ④ Use a noise filter to prevent noise interference. FDA7000 is designed as an industrial device, it provides no mechanism to prevent noise interference.
- ⑤ To prevent malfunction due to the noise, take the following actions.
 - Location the input reference device and noise filter as close to the servo drive as possible.
 - Install a surge protector in the relay, solenoid and electromagnetic contactor coils.
 - The distance between a power line and a signal line must be at least 30 cm.
 - Do not put the power line and signal line in the same duct or bundle them together.
 - Do not share the power supply with an electric welding machine or electrical discharge machine. When the servo drive is placed near a high frequency generator, install a noise filter and isolation transformer on the input side of the power supply line.

II.2 Wiring for noise control

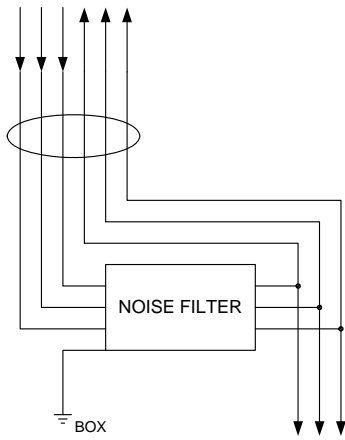
Always connect servo motor FG terminal to the drive frame ground terminal. If the servo motor is grounded via the machine, a switching noise current from the drive power unit through servo motor stray capacitance. The above grounding is required to prevent the adverse effects of the switching noise.

※ Example of wiring connected with ground connection

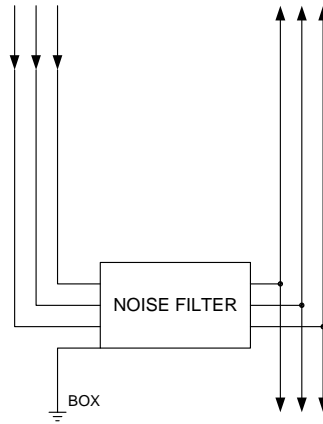


- Use the thick wire with a thickness at least 3.5[mm²] for ground to the casing.

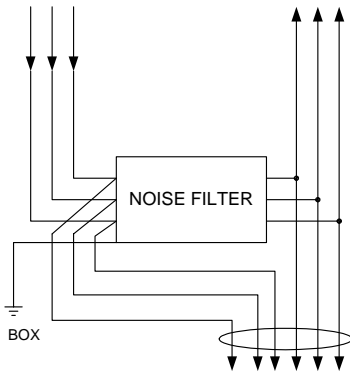
※ Example of noise filter wiring



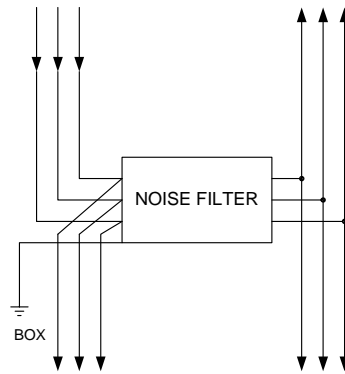
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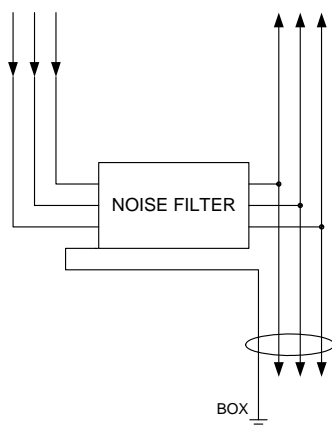


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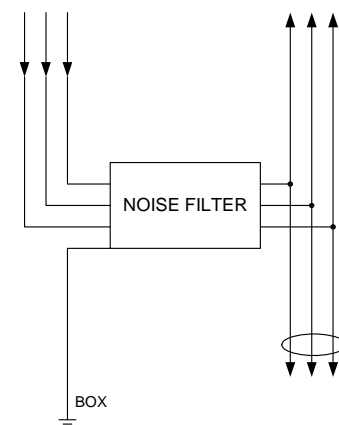


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[Do not put the input and output line in the same duct or bundle them together.]



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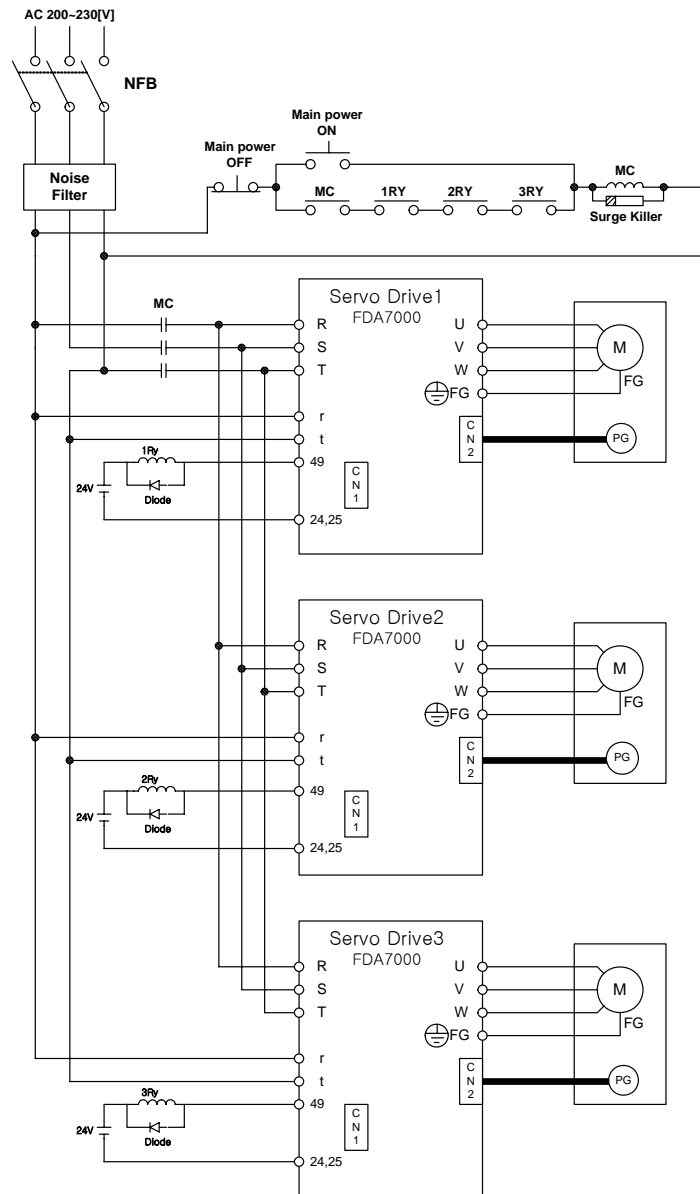


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[Do not accommodate the noise filter ground line, output lines and other signal lines in the same duct or bundle them together.]

※ Example of wiring when using multiple units of servo drives.

Multiple servos can share a single circuit breaker or noise filter. Always select a NFB or noise filter that has enough capacity for the total power capacity of that system.



※ Recommended noise filter

Servo drive	FDA7001 ~ FDA7030/30B	FDA7045
NOISE FILTER	NFZ-4030SG (30A)	NFZ-4040SG (40A)

♥ Recommended manufacturer: Samil Components (www.samilemc.com)

Appendix III

Parameter table

Appendix III shows the full table of parameters mentioned in the manual.

III.1 Parameter table	III-1
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III.1 Parameter table

Parameter No.	Menu explanation	Unit	Setting range	Default set value	Control type
StE-01	Display select	-	100 ~ 1330	1203	Speed/Torque/Position
StE-02	Command Speed	rpm	-9999.9 ~ 9999.9	-	Speed/Position
StE-03	Motor Speed	rpm	-9999.9 ~ 9999.9	-	Speed/Torque/Position
StE-04	CCW Speed Limit	rpm	0.0 ~ 9999.9	-	Speed/Torque/Position
StE-05	CW Speed Limit	rpm	-9999.9 ~ 0.0	-	Speed/Torque/Position
StE-06	Command Pulse	pulse	-99999 ~ 99999	-	Position
StE-07	Feedback Pulse	pulse	-99999 ~ 99999	-	Position
StE-08	Error Pulse	pulse	-99999 ~ 99999	-	Position
StE-09	Command Torque	%	-300.0 ~ 300.0	-	Speed/Torque/Position
StE-10	Load Rate	%	-300.0 ~ 300.0	-	Speed/Torque/Position
StE-11	Max Load Rate	%	-300.0 ~ 300.0	-	Speed/Torque/Position
StE-12	CCW TRQ LMT	%	0.0 ~ 300.0	-	Speed/Torque/Position
StE-13	CW TRQ LMT	%	-300.0 ~ 0.0	-	Speed/Torque/Position
StE-14	Inertia Ratio	-	0.0 ~ 50.0	2.0	Speed/Torque/Position
StE-15	MULTI Turns	rev	0 ~ 999999	-	Speed/Torque/Position
StE-16	Single Turn	-	0 ~ 999999	-	Speed/Torque/Position
StE-17	I/O Status	-	0 ~ 999999	-	Speed/Torque/Position
StE-18	PROG Version	-	0.0 ~ 99.99	-	Speed/Torque/Position
P01-01*	Motor ID	-	GEN - 00 ~ 99	By capacity	Speed/Torque/Position
P01-02	Inertia	gfcms ²	0.01 ~ 999.99	By motor type	Speed/Torque/Position
P01-03	TRQ Constant	Kgfcms/A	0.1 ~ 999.99	By motor type	Speed/Torque/Position
P01-04	Phase Inductance	mH	0.001 ~ 99.999	By motor type	Speed/Torque/Position
P01-05	Phase Resistance	Ω	0.01 ~ 99.999	By motor type	Speed/Torque/Position
P01-06	Rated Current	A(rms)	0.01 ~ 999.99	By motor type	Speed/Torque/Position
P01-07	Rated Speed	rpm	0.0 ~ 9999.0	By motor type	Speed/Torque/Position
P01-08	MAX Speed	rpm	0.0 ~ 9999.0	By motor type	Speed/Torque/Position
P01-09	Rated TRQ	kgfcm	0.0 ~ 9999.0	By motor type	Speed/Torque/Position
P01-10	Pole Number	Pole	2 ~ 98	By motor type	Speed/Torque/Position
P01-11*	Drive ID	-	0 ~ 45	By drive type	Speed/Torque/Position
P01-12*	Encoder ID	-	Enc-0 ~ R	Enc-A	Speed/Torque/Position
P01-13*	Encoder Pulse	ppr	1 ~ 32768	2000	Speed/Torque/Position
P01-14	Pulse Out Rate	ppr	1 ~ 131072	2000	Speed/Torque/Position
P01-15*	COM Baud Rate	-	0 ~ 15	0	Speed/Torque/Position
P01-16*	Serial Select	-	0 ~ 2	0	Speed/Torque/Position
P01-17*	Serial I/O	-	0 ~ 2	0	Speed/Torque/Position
P01-18*	Serial ID	-	1 ~ 31	1	Speed/Torque/Position
P01-19	Parameter Lock	-	ON/OFF	OFF	Speed/Torque/Position
P01-20*	Absolute Origin	-	ON/OFF	OFF	Speed/Torque/Position
P02-01*	Control Mode	-	0 ~ 5	1	Speed/Torque/Position
P02-02	Mode Change Time	ms	100.0 ~ 10000.0	500.0	Speed/Torque/Position
P02-03	CCW TRQ LMT	%	0.0 ~ 300.0	300.0	Speed/Torque/Position
P02-04	CW TRQ LMT	%	-300.0 ~ 0.0	-300.0	Speed/Torque/Position
P02-05	CCW Speed Limit	rpm	0.0 ~ 6000	Max. motor speed	Speed/Torque/Position
P02-06	CW Speed Limit	rpm	-6000.0 ~ 0.0	Max. motor speed	Speed/Torque/Position
P02-07	Brake Speed	rpm	0.0 ~ 9999.9	50.0	Speed/Torque/Position
P02-08	Brake Time	ms	0.0 ~ 10000.0	50.0	Speed/Torque/Position
P02-09	DB Mode	-	0 ~ 3	2	Speed/Torque/Position
P02-10	Notch Filter 1	-	0 ~ 2	0	Speed/Torque/Position
P02-11	NF Frequency 1	Hz	50.0 ~ 2000.0	300.0	Speed/Torque/Position
P02-12	NF Bandwidth 1	%	10.0 ~ 99.9	95.0	Speed/Torque/Position
P02-13	Notch Filter 2	-	0 ~ 1	0	Speed/Torque/Position
P02-14	NF Frequency 2	Hz	50.0 ~ 2000.0	500.0	Speed/Torque/Position

Appendix III Parameter table



P02-15	NF Bandwidth 2	%	10.0 ~ 99.9	95.0	Speed/Torque/Position
P02-16	TRQ Filter TC	ms	0.0 ~ 1000.0	By capacity	Speed/Torque/Position
P02-17	Auto Tuning	-	0 ~ 1	0	Speed/Torque/Position
P02-18	System Response	-	1 ~ 19	By capacity	Speed/Torque/Position
P02-19	Inertia Ratio	-	1.0 ~ 50.0	2.0	Speed/Torque/Position
P02-20	Gain ADJ Speed 1	rpm	100.0 ~ 5000.0	800.0	Speed/Torque/Position
P02-21	Gain ADJ Speed 2	rpm	10.0 ~ 500.0	100.0	Speed/Torque/Position
P02-22	Gain ADJ TRQ 1	%	50.0 ~ 300.0	150.0	Speed/Torque/Position
P02-23	Gain ADJ TRQ 2	%	0.0 ~ 300.0	50.0	Speed/Torque/Position
P02-24	Contact Gain TC	ms	0.0 ~ 10000.0	100.0	Speed/Torque/Position
P02-25	Temporary Stop	-	ON/OFF	OFF	Speed/Torque/Position
P02-26	Emergency Stop	-	ON/OFF	OFF	Speed/Torque/Position
P02-27	Direction Select	-	ON/OFF	OFF	Speed/Torque/Position
P02-28	Ripple COMPEN	-	ON/OFF	OFF	Speed/Torque/Position
P02-29*	Parameter INIT	-	ON/OFF	OFF	Speed/Torque/Position
P02-30	Servo OFF delay time	ms	0.0 ~ 1000.0	10.0	Speed/Torque/Position
P02-31	CW Limit	-	ON/OFF	OFF	Speed/Torque/Position
P02-32	CCW Limit	-	ON/OFF	OFF	Speed/Torque/Position
P02-33	Servo ON/OFF	-	ON/OFF	OFF	Speed/Torque/Position
P03-01*	Speed Gain mode	-	1 ~ 5	1	Speed
P03-02	PI-IP control %	%	0.0 ~ 100.0	100.0	Speed/Position
P03-03	Friction COMPEN	%	0.0 ~ 100.0	0.0	Speed/Position
P03-04	Load COMPEN	%	0.0 ~ 100.0	0.0	Speed/Position
P03-05	SC Loop Gain 1	Hz	0.0 ~ 1000.0	By capacity	Speed/Position
P03-06	SC TC 1	ms	0.0 ~ 10000.0	By capacity	Speed/Position
P03-07	SC Loop Gain 2	Hz	0.0 ~ 1000.0	By capacity	Speed/Position
P03-08	SC TC 2	ms	0.0 ~ 10000.0	By capacity	Speed/Position
P03-09	Analog CMD TC	ms	0.0 ~ 2000.0	0.0	Speed
P03-10	ACCEL Time	ms	0.0 ~ 90000.0	0.0	Speed/Position
P03-11	DECEL Time	ms	0.0 ~ 90000.0	0.0	Speed/Position
P03-12*	S-Mode TC	ms	0.0 ~ 9000.0	0.0	Speed/Position
P03-13	In Speed Range	-	0.0 ~ 9999.9	10.0	Speed
P03-14	Zero Speed Range	Hz	0.0 ~ 9999.9	10.0	Speed
P03-15*	+ 10[V] RPM	rpm	0.0 ~ 9999.9	Max. motor speed	Speed/Torque
P03-16*	-10[V] RPM	rpm	-9999.9 ~ 0.0	Max. motor speed	Speed/Torque
P03-17	Auto Offset	-	ON/OFF	OFF	Speed/Torque
P03-18	Manual Offset	ms	-1000.0 ~ 1000.0	0.0	Speed/Torque
P03-19*	Override ENB	-	ON/OFF	OFF	Speed
P03-20	Clamp Mode	-	0 ~ 2	0	Speed
P03-21	Clamp Voltage	mV	-1000.0 ~ 1000.0	0.0	Speed
P03-22*	F/Back TC	ms	0.0 ~ 2000.0	0.0	Speed
P03-23	Zero SPD VIB REJ	rpm	0.0 ~ 1000.0	0.1	Speed/Position
P03-24*	Feedforward TRQ	-	0 ~ 2	0	Speed/Position
P04-01	Digital input speed 1	rpm	-9999.9 ~ 9999.9	10.0	Speed/Torque
P04-02	Digital input speed 2	rpm	-9999.9 ~ 9999.9	100.0	Speed/Torque
P04-03	Digital input speed 3	rpm	-9999.9 ~ 9999.9	200.0	Speed/Torque
P04-04	Digital input speed 4	rpm	-9999.9 ~ 9999.9	500.0	Speed/Torque
P04-05	Digital input speed 5	rpm	-9999.9 ~ 9999.9	1000.0	Speed/Torque
P04-06	Digital input speed 6	rpm	-9999.9 ~ 9999.9	2000.0	Speed/Torque
P04-07	Digital input speed 7	rpm	-9999.9 ~ 9999.9	3000.0	Speed/Torque
P04-08	Digital input torque 1	%	-300.0 ~ 300.0	0.0	Torque
P04-09	Digital input torque 2	%	-300.0 ~ 300.0	2.0	Torque
P04-10	Digital input torque 3	%	-300.0 ~ 300.0	20.0	Torque
P04-11	Digital input torque 4	%	-300.0 ~ 300.0	50.0	Torque
P04-12	Digital input torque 5	%	-300.0 ~ 300.0	75.0	Torque
P04-13	Digital input torque 6	%	-300.0 ~ 300.0	100.0	Torque
P04-14	Digital input torque 7	%	-300.0 ~ 300.0	120.0	Torque
P05-01*	POS Gain Mode	-	1 ~ 5	1	Position

Appendix III Parameter table



P05-02*	POS Pulse Type	-	0 ~ 5	1	Position
P05-03	Speed Mode	-	ON/OFF	OFF	Position/Speed
P05-04	Feedforward	%	0.0 ~ 100.0	0.0	Position
P05-05	PC P Gain1	Hz	0.0 ~ 500.0	By capacity	Position
P05-06	PC P Gain2	Hz	0.0 ~ 500.0	By capacity	Position
P05-07	PI-P Pulse ERR	pulse	0 ~ 99999	0	Position
P05-08	In Position	pulse	0 ~ 99999	100	Position
P05-09	Follow ERR	pulse	0 ~ 99999	30000	Position
P05-10	POS CMD TC	ms	0.0 ~ 2000.0	0.0	Position
P05-11	FF TC	ms	0.0 ~ 2000.0	0.0	Position
P05-12*	ELCTR Gear NUM 1	-	1 ~ 99999	1	Position
P05-13*	ELCTR Gear DEN 1	-	1 ~ 99999	1	Position
P05-14*	ELCTR Gear NUM 2	-	1 ~ 99999	1	Position
P05-15*	ELCTR Gear DEN 2	-	1 ~ 99999	2	Position
P05-16*	ELCTR Gear NUM 3	-	1 ~ 99999	1	Position
P05-17*	ELCTR Gear DEN 3	-	1 ~ 99999	4	Position
P05-18*	ELCTR Gear NUM 4	-	1 ~ 99999	1	Position
P05-19*	ELCTR Gear DEN 4	-	1 ~ 99999	8	Position
P05-20	Bias SPD COMPEN	rpm	-1000.0 ~ 1000.0	0.0	Position
P05-21	Bias Pulse Band	pulse	0 ~ 500	10	Position
P05-22	Backlash Pulse	pulse	0 ~ 99999	0	Position
P06-01*	Analog TRQ TC	ms	0.0 ~ 2000.0	0.0	Torque
P06-02	TRQ ACCEL Time	ms	0.0 ~ 9000.0	0.0	Torque
P06-03	TRQ DECEL Time	ms	0.0 ~ 9000.0	0.0	Torque
P06-04*	TRQ S-Mode	ms	0.0 ~ 2000.0	0.0	Torque
P06-05	In TRQ Range	%	0.0 ~ 100.0	10.0	Torque
P06-06	Stop TRQ Range	%	0.0 ~ 100.0	10.0	Torque
P06-07	10[V] TRQ	%	0.0 ~ 300.0	100.0	Speed/Torque
P06-08	Auto Offset	-	ON/OFF	OFF	Speed/Torque
P06-09	Manual Offset	mV	-1000.0 ~ 1000.0	0.0	Speed/Torque
P07-01*	Digital INPUT 1	-	0 ~ 30	1	Speed/Torque/Position
P07-02*	Digital INPUT 2	-	0 ~ 20	9	Speed/Torque/Position
P07-03*	Digital INPUT 3	-	0 ~ 20	10	Speed/Torque/Position
P07-04*	Digital INPUT 4	-	0 ~ 20	11	Speed/Torque/Position
P07-05*	Digital INPUT 5	-	0 ~ 20	3	Speed/Torque/Position
P07-06*	Digital INPUT 6	-	0 ~ 20	4	Speed/Torque/Position
P07-07*	Digital INPUT 7	-	0 ~ 20	13	Speed/Torque/Position
P07-08*	Digital INPUT 8	-	0 ~ 20	14	Speed/Torque/Position
P07-09*	Digital INPUT 9	-	0 ~ 20	12	Speed/Torque/Position
P07-10*	Digital INPUT 10	-	0 ~ 20	16	Speed/Torque/Position
P07-11*	Digital INPUT 11	-	0 ~ 20	15	Speed/Torque/Position
P07-12*	Digital INPUT 12	-	0 ~ 20	19	Speed/Torque/Position
P08-01*	Digital OUTPUT 1	-	0 ~ 30	0	Speed/Torque/Position
P08-02*	Digital OUTPUT 2	-	0 ~ 18	3	Speed/Torque/Position
P08-03*	Digital OUTPUT 3	-	0 ~ 18	6	Speed/Torque/Position
P08-04*	Digital OUTPUT 4	-	0 ~ 18	5	Speed/Torque/Position
P08-05*	Digital OUTPUT 5	-	0 ~ 18	7	Speed/Torque/Position
P08-06*	Digital OUTPUT 6	-	0 ~ 18	9	Speed/Torque/Position
P08-07*	Digital OUTPUT 7	-	0 ~ 18	14	Speed/Torque/Position
P08-08*	Digital OUTPUT 8	-	0 ~ 18	15	Speed/Torque/Position
P08-09*	Digital OUTPUT 9	-	0 ~ 18	16	Speed/Torque/Position
P08-10*	Digital OUTPUT 10	-	0 ~ 18	17	Speed/Torque/Position
P09-01	Monitor1	-	0 ~ 5	0	Speed/Torque/Position
P09-02	Monitor ABS 1	-	ON/OFF	OFF	Speed/Torque/Position
P09-03	Monitor Scale 1	-	0.1 ~ 2000.0	1.0	Speed/Torque/Position

P09-04	Monitor Offset 1	mV	-1000.0 ~ 1000.0	0.0	Speed/Torque/Position
P09-05	Monitor 2	-	0 ~ 5	1	Speed/Torque/Position
P09-06	Monitor ABS 2	-	ON/OFF	OFF	Speed/Torque/Position
P09-07	Monitor Scale 2	-	0.1 ~ 2000.0	1.0	Speed/Torque/Position
P09-08	Monitor Offset 2	mV	-1000.0 ~ 1000.0	0.0	Speed/Torque/Position
JOG-01	Key Jog Mode	-	ON/OFF	OFF	Speed/Torque/Position
JOG-02	Key Jog Speed	rpm	-9999.9 ~ 9999.9	100.0	Speed/Torque/Position
JOG-03	Auto Jog Mode	-	0 ~ 2	0	Speed/Torque/Position
JOG-04	Jog Speed 1	rpm	-9999.9 ~ 9999.9	100.0	Speed/Torque/Position
JOG-05	Jog Time1/REV1	[sec]/[rev]	0.00 ~ 5000.00	1.00	Speed/Torque/Position
JOG-06	Jog Speed 2	rpm	-9999.9 ~ 9999.9	-100.0	Speed/Torque/Position
JOG-07	Jog Time2/REV2	[sec]/[rev]	0.00 ~ 5000.00	1.00	Speed/Torque/Position
JOG-08	Jog Speed 3	rpm	-9999.9 ~ 9999.9	200.0	Speed/Torque/Position
JOG-09	Jog Time3/REV3	[sec]/[rev]	0.00 ~ 5000.00	1.00	Speed/Torque/Position
JOG-10	Jog Speed 4	rpm	-9999.9 ~ 9999.9	-200.0	Speed/Torque/Position
JOG-11	Jog Time4/REV4	[sec]/[rev]	0.00 ~ 5000.00	1.00	Speed/Torque/Position
JOG-12	Jog Speed 5	rpm	-9999.9 ~ 9999.9	400.0	Speed/Torque/Position
JOG-13	Jog Time5/REV5	[sec]/[rev]	0.00 ~ 5000.00	1.00	Speed/Torque/Position
JOG-14	Jog Speed 6	rpm	-9999.9 ~ 9999.9	-400.0	Speed/Torque/Position
JOG-15	Jog Time6/REV6	[sec]/[rev]	0.00 ~ 5000.00	1.00	Speed/Torque/Position
JOG-16	Jog Speed 7	rpm	-9999.9 ~ 9999.9	800.0	Speed/Torque/Position
JOG-17	Jog Time7/REV7	[sec]/[rev]	0.00 ~ 5000.00	1.00	Speed/Torque/Position
JOG-18	Jog Speed 8	rpm	-9999.9 ~ 9999.9	-800.0	Speed/Torque/Position
JOG-19	Jog Time8/REV8	[sec]/[rev]	0.00 ~ 5000.00	1.00	Speed/Torque/Position
ALS-01	Current Alarm	-	-	nor	Speed/Torque/Position
ALS-02	Alarm Reset	-	ON/OFF	OFF	Speed/Torque/Position
ALS-03	Alarm History 1	-	0 ~ 32	0	Speed/Torque/Position
ALS-04	Alarm History 2	-	0 ~ 32	0	Speed/Torque/Position
ALS-05	Alarm History 3	-	0 ~ 32	0	Speed/Torque/Position
ALS-06	Alarm History 4	-	0 ~ 32	0	Speed/Torque/Position
ALS-07	Alarm History 5	-	0 ~ 32	0	Speed/Torque/Position
ALS-08	Alarm History 6	-	0 ~ 32	0	Speed/Torque/Position
ALS-09	Alarm History 7	-	0 ~ 32	0	Speed/Torque/Position
ALS-10	Alarm History 8	-	0 ~ 32	0	Speed/Torque/Position
ALS-11	Alarm History 9	-	0 ~ 32	0	Speed/Torque/Position
ALS-12	Alarm History 10	-	0 ~ 32	0	Speed/Torque/Position
ALS-13	History Reset	-	ON/OFF	OFF	Speed/Torque/Position

♥ The parameter with the (*) symbol cannot be changed when the SVONEN input contact point is "ON".

Appendix V

Servo motor specification

Appendix V explains the servo motor specification.

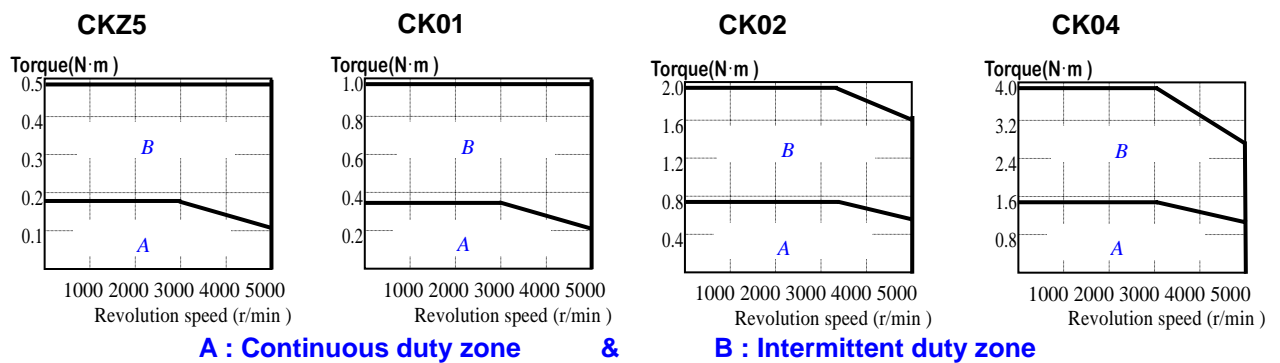
V.1 Servo motor specification	V-1
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V.1 Servo motor specification

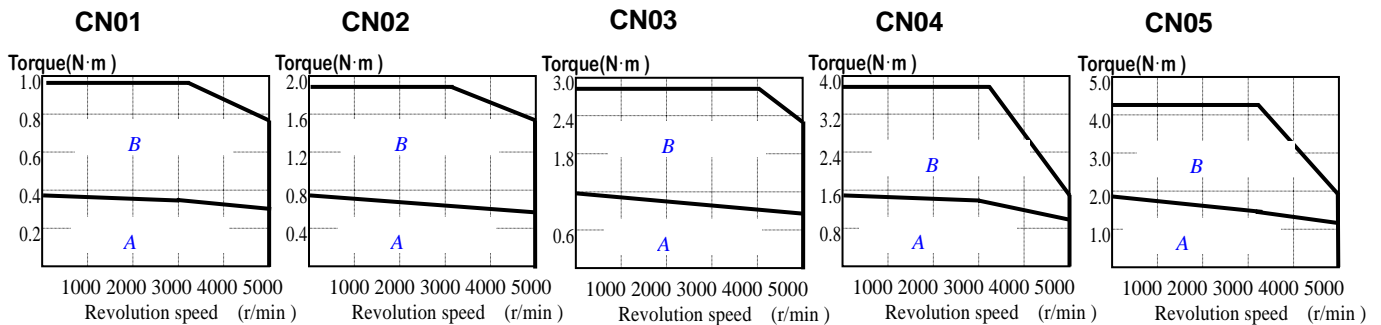
Motor [FMA -]	CKZ5	CK01	CK02	CK04
Drive [FDA70-]	01	01	02	04/04B
Flange Size (□)	40		60	
Rated output (W)	50	100	200	400
Rated current A(rms)	0.81	0.9	1.8	2.65
Max. instantaneous current A(rms)	2.43	2.7	5.4	7.95
Rated torque	(N·m)	0.16	0.32	0.64
	(kgf·cm)	1.62	3.25	6.5
Max. Instantaneous torque	(N·m)	0.48	0.95	1.92
	(kgf·cm)	4.87	9.74	19.5
Rated rpm (r/min)	3000			
Max. rpm (r/min)	5000			
Rotator inertia (= GD ² /4)	(gf·cm·s ²)	0.049	0.081	0.246
	(kg·m ² × 10 ⁻⁴)	0.048	0.079	0.241
Allowable load inertia ratio (versus rotor)	15 times or below			
Rated power rate (kW/s)	5.3	12.8	16.5	36.8
Detector type	Incremental	17/33 bit 131072[p/rev.] or 2000 ~ 6000[p/rev.]		
	Absolute	17/33 bit 131072[p/rev.] or 11/13 bit 2048[p/rev.]		
Weight (kg)	0.42	0.55	1.0	1.73

Torque - speed characteristics

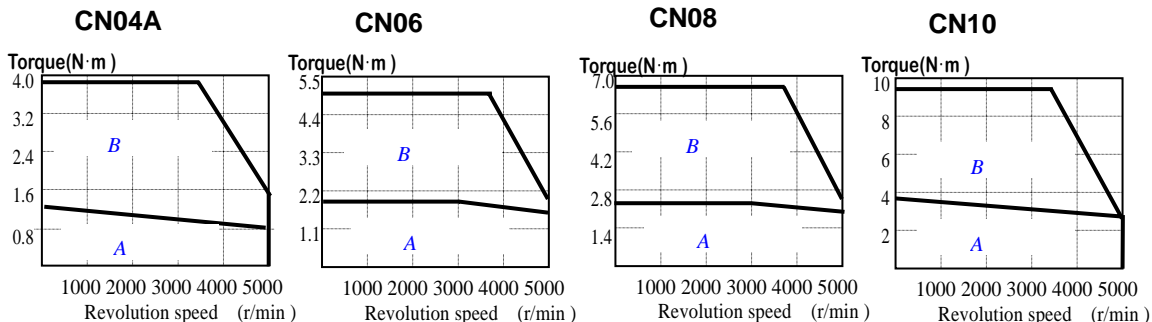


Motor [FMA -]	CN01	CN02	CN03	CN04	CN05	CN04A	CN06	CN08	CN10	
Drive [FDA70-]	01	02	04/04B			05		10		
Flange Size (□)	60					80				
Rated output (W)	100	200	300	400	500	400	600	800	1000	
Rated current A(rms)	1.25	2.1	2.8	2.85	3.2	2.8	3.5	4.65	5.8	
Max. instantaneous current A(rms)	3.75	6.3	8.4	8.55	9.6	8.4	10.5	12.54	17.4	
Rated torque	(N·m)	0.32	0.64	0.96	1.27	1.59	1.27	1.91	2.54	3.18
	(kgf·cm)	3.25	6.5	9.75	13.0	16.2	13.0	19.5	26.0	32.5
Max. instantaneous torque	(N·m)	0.96	1.92	2.88	3.81	4.77	3.81	5.3	6.85	9.53
	(kgf·cm)	9.75	19.5	29.3	39.0	48.7	39.0	54.5	70.2	97.5
Rated rpm (r/min)	3000									
Max. rpm (r/min)	5000									
Rotator inertia (= GD ² /4)	(gf·cm·s ²)	0.061	0.095	0.126	0.160	0.204	1.1	1.5	1.77	2.11
	(kg·m ² × 10 ⁻⁴)	0.06	0.093	0.129	0.163	0.208	1.08	1.47	1.74	2.07
Allowable load inertia ratio(Versus rotor)	30 times or below					20 times or below				
Rated power rate (kW/s)	17.0	43.6	73.9	103.5	126.1	15.0	24.8	37.4	49.0	
Detector type	Incremental	17/33 bit 131072[p/rev.] or 2000 ~ 6000[p/rev.]								
	Absolute	17/33 bit 131072[p/rev.] or 11/13 bit 2048[p/rev.]								
Weight (kg)	0.85	1.14	1.43	1.73	2.03	2.1	2.55	3.1	3.7	

Torque - speed characteristics



A : Continuous duty zone & B : Intermittent duty zone

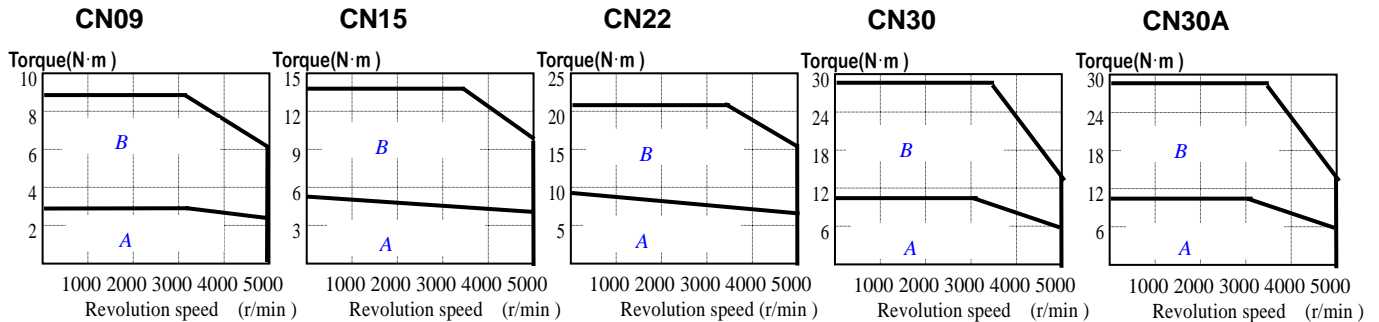


Appendix V Servo motor specification

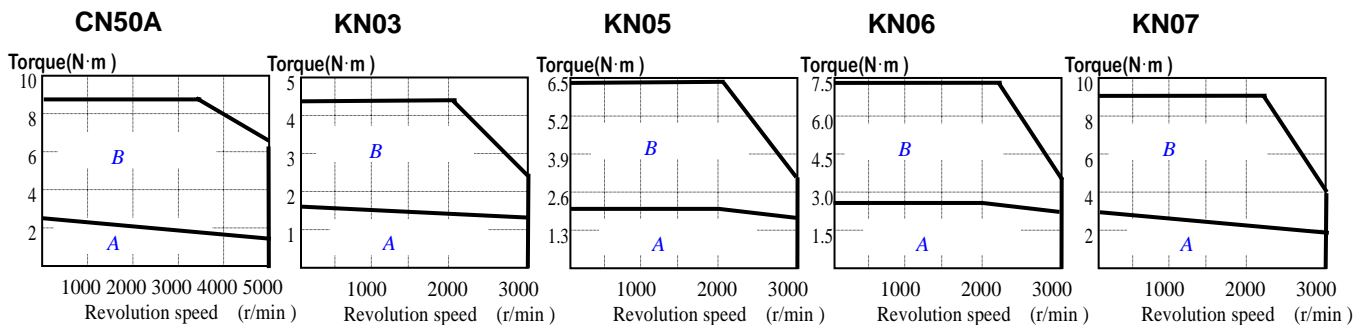


Motor [FMA -]	CN09	CN15	CN22	CN30	CN30A	CN50A	KN03	KN05	KN06	KN07	
Drive [FDA70-]	10	15/15B	20/20B	30/30B		45	04/04B		05	10	
Flange Size (□)	130				180		80				
Rated output (W)	900	1500	2200	3000	3000	5000	300	450	550	650	
Rated current A(rms)	4.6	8.8	12.1	17.2	19.2	23.3	2.5	3.1	3.7	4.6	
Max. instantaneous current A(rms)	13.8	26.4	36.3	51.6	57.6	69.9	7.5	9.3	10.7	13.8	
Rated torque	(N·m)	2.86	4.77	7.0	9.54	9.54	1.43	2.15	2.57	3.04	
	(kgf·cm)	29.2	48.7	71.4	97.4	97.4	14.6	21.9	26.2	31	
Max. instantaneous torque	(N·m)	8.6	14.3	21	28.6	28.6	4.29	6.45	7.42	9.12	
	(kgf·cm)	87.6	146	214	292	292	43.8	65.7	72.7	93	
Rated rpm (r/min)	3000					2000					
Max. rpm (r/min)	5000				4500		3000				
Rotator inertia (= GD ² /4)	(gf·cm·s ²)	4.12	7.63	11.12	14.63	26.1	43.8	1.1	1.5	1.77	2.11
	(kg·m ² ×10 ⁻⁴)	4.04	7.48	10.9	14.34	25.6	42.9	1.08	1.47	1.74	2.07
Allowable load inertia ratio(Versus rotor)	10 times or below					20 times or below					
Rated power rate (kW/s)	20.4	30.6	45.1	63.9	35.7	58.9	18.9	31.3	38.0	44.6	
Detector type	Incremental	17/33 bit 131072[p/rev.] or 2000 ~ 6000[p/rev.]									
	Absolute	17/33 bit 131072[p/rev.] or 11/13 bit 2048[p/rev.]									
Weight (kg)	5.5	7.0	8.5	10.0	12.9	18.2	2.1	2.55	3.1	3.7	

Torque - speed characteristics

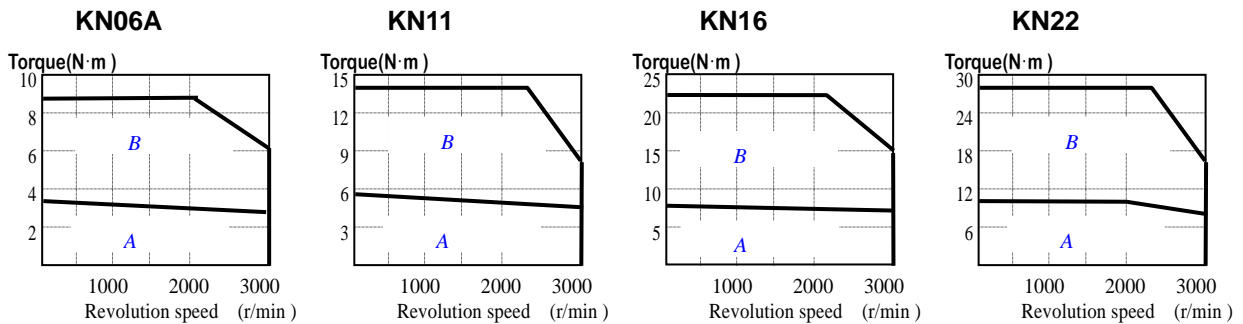


A : Continuous duty zone & **B : Intermittent duty zone**

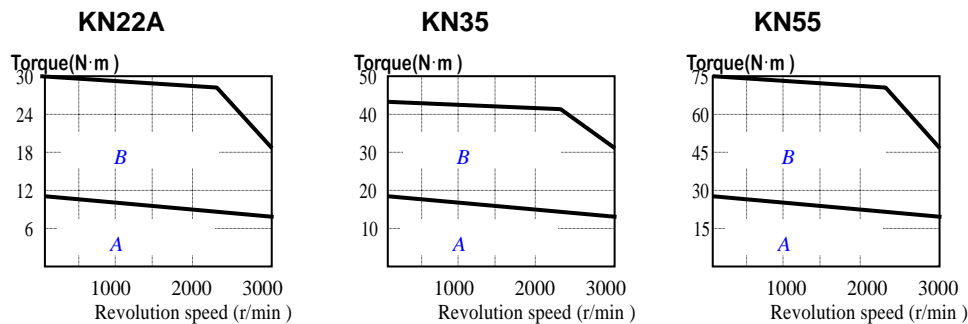


Motor [FMA -]	KN06A	KN11	KN16	KN22	KN22A	KN35	KN55	
Drive [FDA70-]	05	10	15/15B	20/20B		30/30B	45	
Flange Size (□)	130				180			
Rated output (W)	600	1100	1600	2200	2200	3500	5500	
Rated current A(rms)	3.7	6.7	10.2	14.1	15.2	20.2	31.6	
Max. instantaneous current A(rms)	11.1	18.1	30.0	42.3	45.6	60.6	79	
Rated torque	(N·m)	2.86	5.25	7.64	10.5	10.49	16.67	26.18
	(kgf·cm)	29.2	53.6	77.9	107	107	170	267
Max. instantaneous torque	(N·m)	8.6	14.2	22.5	31.5	31.3	50.1	65.4
	(kgf·cm)	87.6	145	230	321	321	510	667.5
Rated rpm (r/min)	2000							
Max. rpm (r/min)	3000							
Rotator inertia (= GD ² /4)	(gf·cm·s ²)	4.12	7.63	11.12	14.63	26.1	43.8	67.8
	(kg·m ² × 10 ⁻⁴)	4.04	7.48	10.9	14.34	25.6	42.9	66.4
Allowable load inertia ratio(Versus rotor)	10 times or less							
Rated power rate (kW/s)	20.4	30.6	53.5	76.7	43.0	64.7	103.0	
Detector type	Incremental	17/33 bit 131072[p/rev.] or 2000 ~ 6000[p/rev.]						
	Absolute	17/33 bit 131072[p/rev.] or 11/13 bit 2048[p/rev.]						
Weight (kg)	5.5	7.0	8.5	10.0	12.9	18.2	26.8	

Torque - speed characteristics

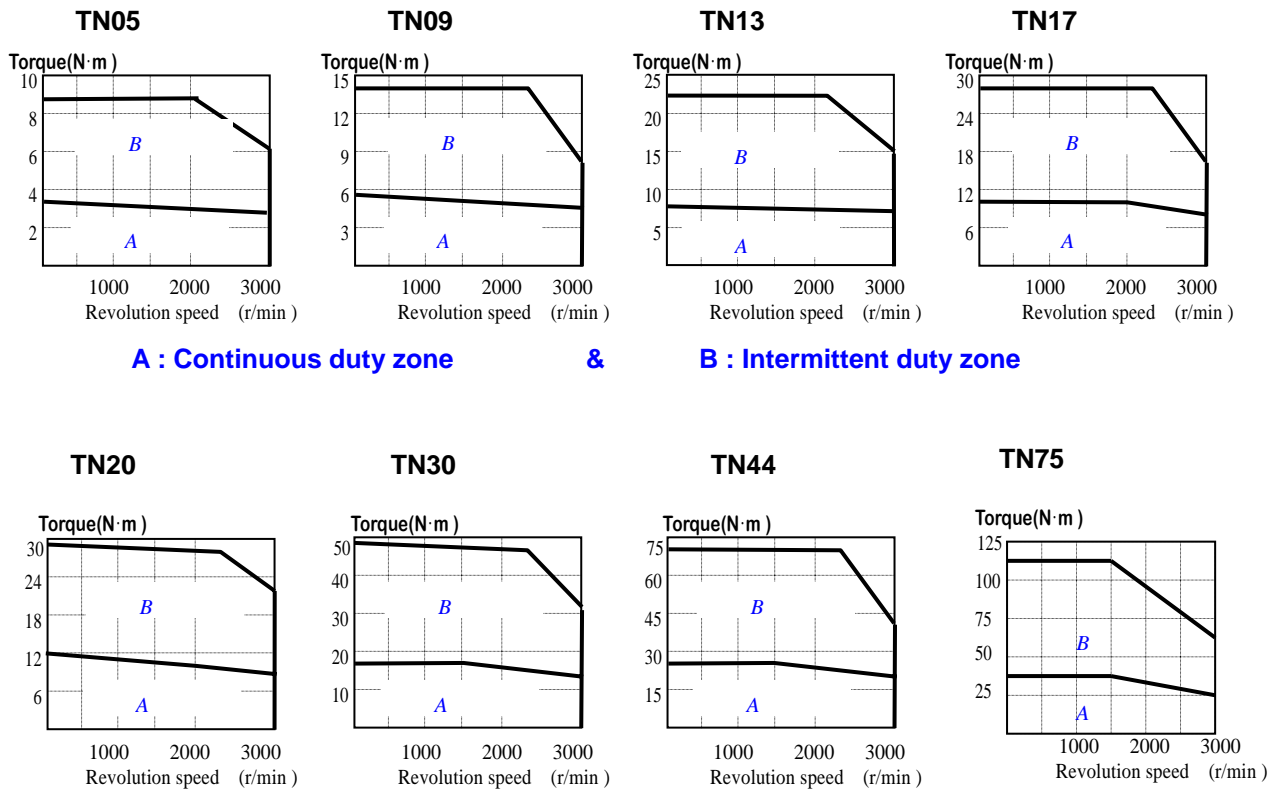


A : Continuous duty zone & B : Intermittent duty zone



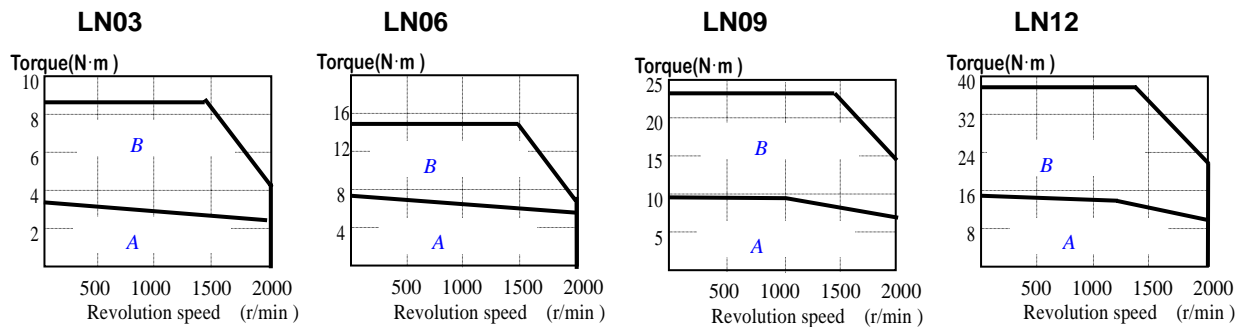
Motor [FMA -]	TN05	TN09	TN13	TN17	TN20	TN30	TN44	TN75	
Drive [FDA70-]	05	10	15/15B	20/20B	30/30B	45	75		
Flange Size (□)	130				180				
Rated output (W)	450	850	1300	1700	1800	2900	4400	7500	
Rated current A(rms)	3.7	6.9	10.9	14.4	16.4	22.6	33.1	49.6	
Max. instantaneous current A(rms)		18.1	29.65	39.2		56.6	94.67	124.1	
Rated torque	(N·m)	2.87	5.41	8.27	10.8	11.5	18.6	27.9	47.7
	(kgf·cm)	29.3	55.2	84.4	110	117	190	285	486.9
Max. instantaneous torque	(N·m)	8.61	14.2	22.5	29.4	34.5	46.6	79.8	119.3
	(kgf·cm)	89.5	145	230	300	351	475	815.1	1217
Rated rpm (r/min)	1500								
Max. rpm (r/min)	3000								
Rotator inertia (= GD ² /4)	(gf·cm·s ²)	4.12	7.63	11.12	14.63	26.1	43.8	67.8	126.4
	(kg·m ² × 10 ⁻⁴)	4.04	7.48	10.9	14.34	25.1	42.9	66.4	123.9
Allowable load inertia ratio(Versus rotor)	10 times or less								
Rated power rate (kW/s)	20.5	39.1	62.8	81.1	51.5	80.8	117.4	183.8	
Detector type	Incremental	17/33 bit 131072[p/rev.] or 2000 ~ 6000[p/rev.]							
	Absolute	17/33 bit 131072[p/rev.] or 11/13 bit 2048[p/rev.]							
Weight (kg)	5.5	7.0	8.5	10.0	12.9	18.2	26.8	45.7	

Torque - speed characteristics

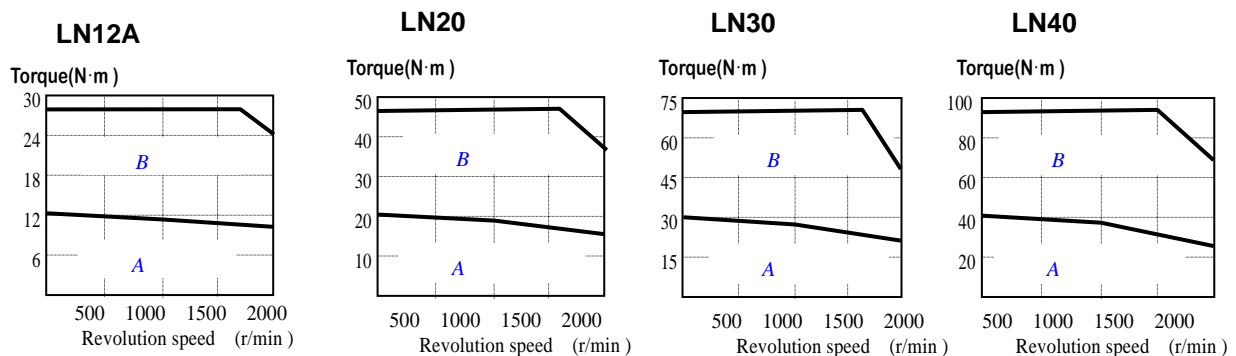


Motor [FMA -]	LN03	LN06	LN09	LN12	LN12A	LN20	LN30	LN40	
Drive [FDA70-]	04/04B	05	10	12	12	20/20B	30/30B	45	
Flange Size (□)	130				180				
Rated output (W)	300	600	900	1200	1200	2000	3000	4000	
Rated current A(rms)	2.6	4.8	7.3	9.7	8.9	17.2	24.9	32.2	
Max. instantaneous current A(rms)	7.8	12.0	18.76	29.0	22.2	51.6	62.34	96.6	
Rated torque	(N·m)	2.86	5.72	8.6	11.5	11.5	19.1	28.6	38.2
	(kgf·cm)	29.2	58.4	87.7	117	116.9	194.8	292.2	389.6
Max. instantaneous torque	(N·m)	8.6	14.3	22.1	34.4	28.7	57.3	71.6	114.6
	(kgf·cm)	87.6	146	226	351	292.3	584.4	730.5	1168.8
Rated rpm (r/min)	1000								
Max. rpm (r/min)	2000								
Rotator inertia (= GD ² /4)	(gf·cm·s ²)	4.12	7.63	11.12	14.63	26.1	43.8	67.8	100.1
	(kg·m ² × 10 ⁻⁴)	4.04	7.48	10.9	14.34	25.6	42.9	66.4	98.1
Allowable load inertia ratio(Versus rotor)	10 times or less								
Rated power rate (kW/s)	20.5	43.3	68.2	91.7	51.4	84.9	123.4	148.6	
Detector type	Incremental	17/33 bit 131072[p/rev.] or 2000 ~ 6000[p/rev.]							
	Absolute	17/33 bit 131072[p/rev.] or 11/13 bit 2048[p/rev.]							
Weight (kg)	5.5	7.0	8.5	10.0	12.9	18.2	26.8	36.1	

Torque - speed characteristics

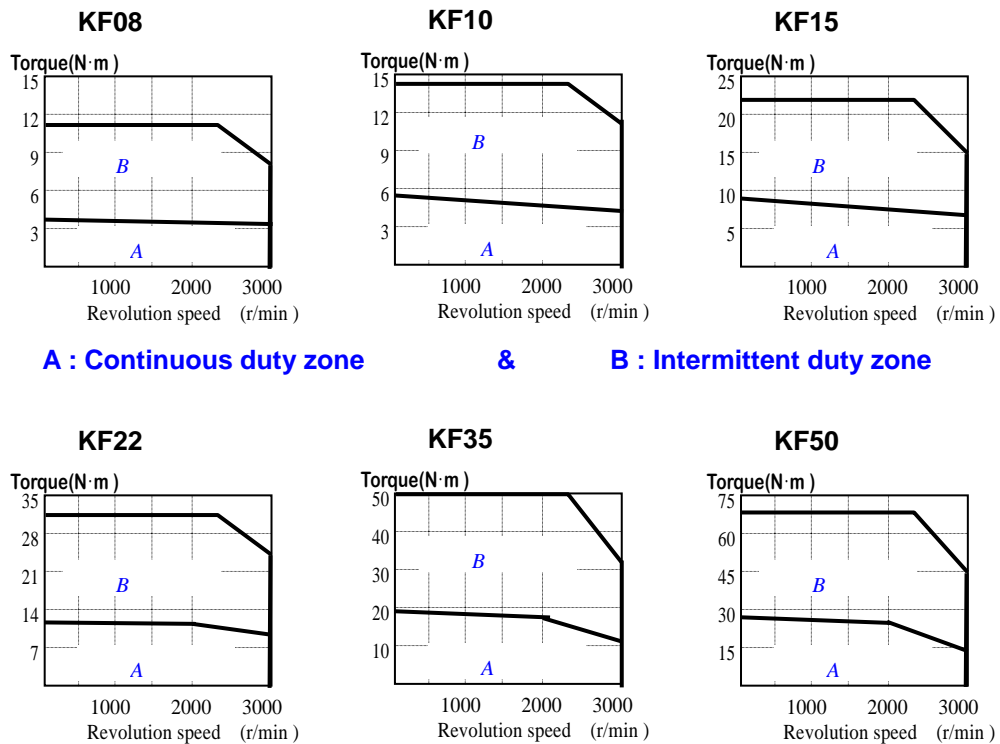


A : Continuous duty zone & B : Intermittent duty zone



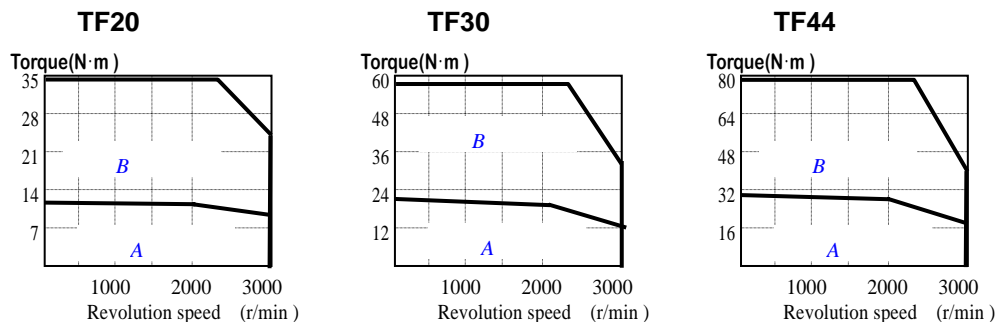
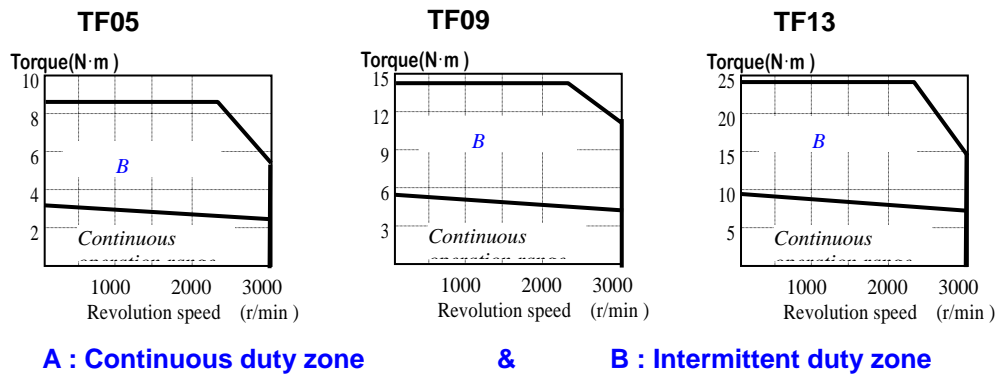
Motor [FMA -]	KF08	KF10	KF15	KF22	KF35	KF50	
Drive [FDA70-]	10		15/15B	20/20B	30/30B	45	
Flange Size (□)	130			180			
Rated output (W)	750	1000	1500	2200	3500	5000	
Rated current A(rms)	5.3	6.2	9.2	14.1	20.5	33.8	
Max. instantaneous current A(rms)	15.9	18.6	27.6	42.3	61.5	101.4	
Rated torque	(N·m)	3.58	4.77	7.16	10.5	16.7	23.9
	(kgf·cm)	36.53	48.7	73.1	107	170	244
Max. instantaneous torque	(N·m)	10.74	14.31	21.56	31.4	50.0	71.7
	(kgf·cm)	109.5	146.0	220.0	321	510	732
Rated rpm (r/min)	2000						
Max. rpm (r/min)	3000						
Rotator inertia (= GD ² /4)	(gf·cm·s ²)	10.5	15.5	25.3	65.3	100.5	159.1
	(kg·m ² × 10 ⁻⁴)	10.3	15.2	24.8	64.0	98.5	156
Allowable load inertia ratio(Versus rotor)	10 times or less						
Rated power rate (kW/s)	12.3	15.0	20.7	17.2	28.2	36.4	
Detector type	Incremental	17/33 bit 131072[p/rev.] or 2000 ~ 6000[p/rev.]					
	Absolute	17/33 bit 131072[p/rev.] or 11/13 bit 2048[p/rev.]					
Weight (kg)	8.2	11.6	15.8	17.2	27.4	38.3	

Torque - speed characteristics



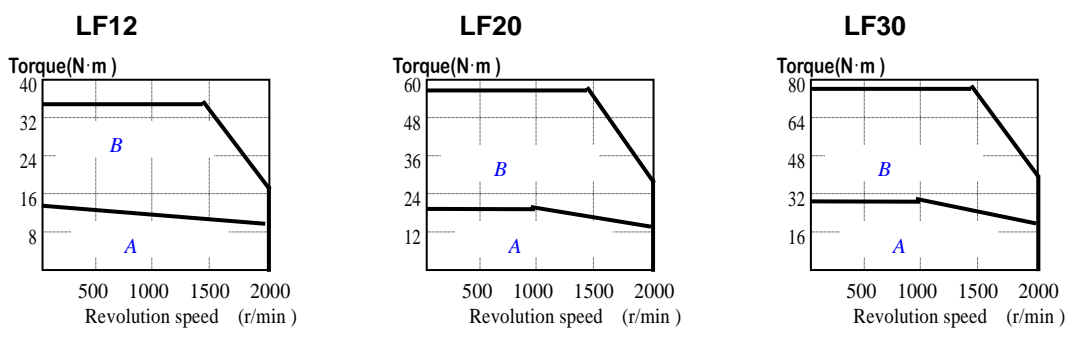
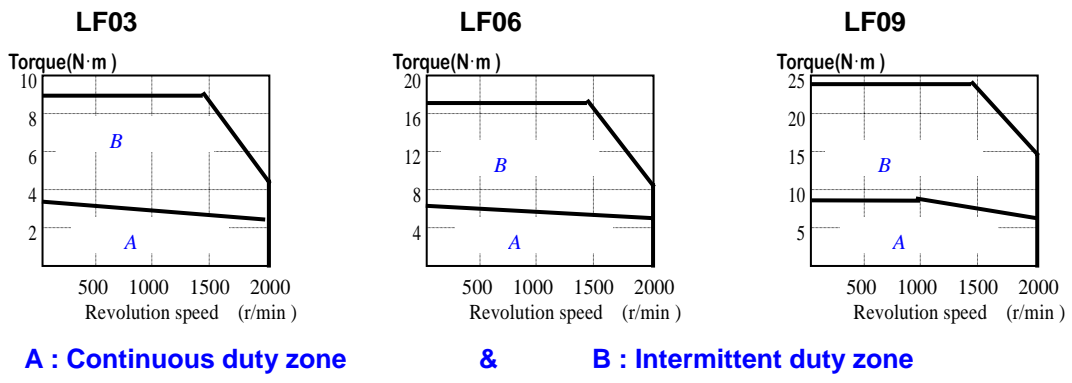
Motor [FMA -]	TF05	TF09	TF13	TF20	TF30	TF44	
Drive [FDA70-]	05	10	15/15B	20/20B	30/30B	45	
Flange Size (□)	130			180			
Rated output (W)	450	850	1300	1800	2900	4400	
Rated current A(rms)	4.0	7.0	10.7	14.8	21.7	34.5	
Max. instantaneous current A(rms)	12.0	19.0	31.7	44.4	65.1	95.83	
Rated torque	(N·m)	2.87	5.41	8.27	11.5	18.6	27.9
	(kgf·cm)	29	55	85	117	190	285
Max. instantaneous torque	(N·m)	8.61	14.7	24.5	34.4	55.9	77.5
	(kgf·cm)	89.5	150	250	351	570	790
Rated rpm (r/min)	1500						
Max. rpm (r/min)	3000						
Rotator inertia (= GD ² /4)	(gf·cm·s ²)	10.5	15.5	25.3	65.3	100.5	159.1
	(kg·m ² × 10 ⁻⁴)	10.3	15.2	24.8	64.0	98.5	156
Allowable load inertia ratio(Versus rotor)	10 times or less						
Rated power rate (kW/s)	7.85	19.1	28.0	20.5	35.2	50.0	
Detector type	Incremental	17/33 bit 131072[p/rev.] or 2000 ~ 6000[p/rev.]					
	Absolute	17/33 bit 131072[p/rev.] or 11/13 bit 2048[p/rev.]					
Weight (kg)	8.2	11.6	15.8	17.2	27.4	38.3	

Torque - speed characteristics



Motor [FMA -]	LF03	LF06	LF09	LF12	LF20	LF30	
Drive [FDA70-]	04/04B	05	10	12	20/20B	30/30B	
Flange Size (□)	130			180			
Rated output (W)	300	600	900	1200	2000	3000	
Rated current A(rms)	2.5	4.7	7.2	9.8	16.0	24.3	
Max. instantaneous current A(rms)	7.5	13.65	19.21	29.32	48.0	67.34	
Rated torque	(N·m)	2.84	5.68	8.62	11.5	19.1	28.4
	(kgf·cm)	29	58	88	117	195	290
Max. instantaneous torque	(N·m)	8.7	16.5	23.0	34.4	57.3	78.7
	(kgf·cm)	90	169	235	351	585	803
Rated rpm (r/min)	1000						
Max. rpm (r/min)	2000						
Rotator inertia (= GD ² /4)	(gf·cm·s ²)	10.5	15.5	25.3	65.3	100.5	159.1
	(kg·m ² × 10 ⁻⁴)	10.3	15.2	24.8	64.0	98.5	156
Allowable load inertia ratio(Versus rotor)	10 times or less						
Rated power rate (kW/s)	7.85	21.3	30.0	20.5	37.0	51.8	
Detector type	Incremental	17/33 bit 131072[p/rev.] or 2000 ~ 6000[p/rev.]					
	Absolute	17/33 bit 131072[p/rev.] or 11/13 bit 2048[p/rev.]					
Weight (kg)	8.2	11.6	15.8	17.2	27.4	38.3	

Torque - speed characteristics



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The logo for HIGEN, featuring the word "HIGEN" in a bold, blue, sans-serif font. The letter "I" is stylized with a square outline around it.

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