OPERATION MANUAL

AC Servo Drive

FDA7000/FDA7000-H Series

Ver 1.5 (Soft. Ver. 2.40 ~)

FDA7000EX Series

Ver 1.5 (Soft. Ver. 3.29 ~)

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 Power of servo drive.

: FDA7001 ~ FDA7150 : AC 220V 50/60[Hz]

: FDA7020-H0 ~ FDA7750-H0 : AC 380V 50/60[Hz]

: FDA7020-H1 ~ FDA7150-H1 : AC 440V 50/60[Hz]

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.

♥ Never connect the encoder cable to COM port.

D. Operate servo system after auto-tuning 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
15 line incremental encoder	2-24
9 line incremental encoder	2-25
Absolute encoder 11bit	2-26
Absolute/Incremental encoder 17bit	2-27

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

: If connected in common, it may cause malfunction and damage of servo drive.

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't 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.

Contents

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.

Chapter 1. Model check and handling

1.1. Model check

1.1.1. Servo drive model classification

F D A 7 □ □ □ □ □ – H □

AC Servo Drive 7000 Series

Symbol	TYPE
None	Standard
B	BOOK

Symbol	TYPE
None	Standard
EX	Explosion proof

Symbol	Input Voltage
None	AC 220V
H0	AC 380V
H1	AC 440V

Symbol	Power(W)	Symbol	Power(W)	Symbol	Power(W)	Symbol	Power(W)	Symbol	Power(W)
001	100	010	1000	045	4500	220	22000	550	55000
002	200	015/015B	1500	075	7500	300	30000	750	75000
004/004B	400	020/020B	2000	110	11000	370	37000		
005	500	030/030B	3000	150	15000	450	45000		

1.1.2. Servo motor model classification

□ M A - □ □ □ □ □ - □ □ □ □

AC Servo Motor

Symbol	Input voltage
F	AC 220V
H	AC 380V~440V

Series

Symbol	Use
CN, CJ EX,EC	High-speed, low torque type
KF, KN EK	Medium-speed, standard type
TF, TN ET	Medium-speed, high torque type
LF, LN EL	Low-speed, large torque type

• Explosion-proof model : EX,EC,EK,ET,EL

Rated Power(W)

Symbol	Power(W)	Symbol	PowerW)	Symbol	Power(W)
01	100	12	1200	50	5000
02	200	13	1300	55	5500
03	300	15	1500	75	7500
04	400	16	1600	110	11000
05	500	20	2000	150	15000
06	600	22	2200	220	22000
07	700	30	3000	300	30000
08	800	35	3500	370	37000
09	900	40	4000	450	45000
10	1000	44	4400	550	55000
				750	75000

Encoder Type

Symbol	pulse	Type
A	2000	Incremental (15line)
B	2500	
C	3000	
D	5000	
E	6000	
F	2048	
K	2048	Incremental (9line)
H	8192	
P	131072	Absolute, Incremental 17/33bit

Oil Seal Type

Symbol	Type
0	None
1	Oil seal attached

Brake Type

Symbol	Type
0	None
1	Brake attached 40,60,80 Fr. : DC24[V] 130,180,220 Fr. : DC90[V]
2	Brake attached 130,180,220 Fr.: DC24[V]

(Note2)

Shaft Type

Symbol	Type
A	Straight &No Key
B	Straight & Key
C	Taper & Key

(Note1) When using as a serial 17bit Absolute encoder, use the battery as an option and change P01-12 (Encoder ID) to "Enc-r".

(Note2) When using a brake-attached type servo motor, you must select the brake supply voltage according to the brake type specified on the servo motor.

1.2. Servo drive specification

1.2.1. Power specification of AC 220V Series

Servo Drive Model[FDA7___]		001	002	004/ 004B	005	010	015/ 015B	020/ 020B	030/ 030B	045	075	110	150
Main circuit power	Input voltage frequency (Note1)	3 phase AC200~230V, 50/60Hz ±5% Single phase AC 230V, 50/60Hz ±5%					3 phase AC200~230V, 50/60Hz ±5%						
	Permitted voltage variance rate	3 phase AC 170~253V (Input range +10/-15%) Single phase AC 207~253V (Input range +10/-10%)					3 phase AC 170~253V(Input range +10/-15%)						
Control circuit power	Input voltage frequency	No input		Single phase AC 200~230V, 50/60Hz ±5%									
	Permitted voltage variance rate			Single phase AC 170~253V(Input range +10/-15%)									
Regenerative resistance(W/Ω)		50/50		70/50			250/ 25	500/12.5			1000/ 6.25	1600/ 4	2000/ 3
Weight[kg]		1.0	1.0	1.5	1.9	1.9	4.3	4.4	4.5	4.6	15	23	24

Note1 Indicates the input voltage and frequency range that guarantee the rated motor output and rated speed. There is no guarantee in case of voltage drop.

Note2 Regenerative resistor applied to FDA7075 ~ FDA7150 is an optional product, please purchase separately.

1.2.2. Power specification of AC 380V Series

Servo Drive Model[FDA7___-H]		020	030	045	075	110	150	220	300	370	450	550	750
Main circuit power	Input voltage frequency (Note1)	H0 : 3 phase AC 380V 50/60Hz +10%/-15%											
		H1 : 3 phase AC 440V 50/60Hz +10%/-10%											
	Permitted voltage variance rate	Input rage +10/-15%											
Control circuit power	Input voltage frequency	H0 : Single phase AC 380V, 50/60Hz ±5%											
		H1 : Single phase AC 440V, 50/60Hz ±5%											
	Permitted voltage variance rate	Input rage +10/-15%											
Regenerative resistance(W/Ω)		250/40	500/20		1600/15		2000/1 5	3600/9		5000/5			10000/5
Weight[kg]		6.0	6.2	6.4	15	23	24	35.4	51.7	52.3	52.3	55	60.0

Note1 Indicates the input voltage and frequency range that guarantee the rated motor output and rated speed. There is no guarantee in case of voltage drop.

Note2 Regenerative resistance is an optional product, please purchase separately.

1.2.3. Common specifications.

Encoder	Type	17/33bit Serial encoder, 11/13bit Absolute encoder, Incremental 2000 ~ 6000 [ppr] (15line), 8192 [ppr] (9line)
	Interface	Serial communication, Differential Line Driver
	Resolution	Maximum of 131072 [pulse] per 1 encoder revolution
	Input voltage	DC 5[V], 0.3 [A]
Drive system		Sine wave PWM control (using by IPM)
Speed control specification	Speed control range	Internal speed command 1:5000, analog speed command 1:2000
	Frequency response	600 [Hz]
	Speed command	Analog Speed Command : DC -10 ~ +10 [V] Digital Speed Command with combination SPD1 ~ SPD3
	Speed accuracy	± 0.01 % or below (rated load condition : 0 ~ 100 %) ± 0.01 % or below (rated voltage condition : ± 10 %) ± 0.1 % or below (temperature fluctuation condition: 25 ± 25 °C)
	Acceleration/ Deceleration time	Straight, S-curve (0 ~ 100 [sec])
Position control specification	Input frequency	Line drive type : 500 [kpps], open collector type : 250 [kpps]
	Input type	Direction + pulse, Forward pulse + reverse pulse 2 phase pulse (A phase + B phase)
	Input method	Open Collector, Line Driver
Torque control specification	Torque command	Analog torque Command : DC -10 ~ +10 [V] Digital torque Command with combination TRQ1 ~ TRQ3
	Torque linearity	4 [%] or below
	Speed limit	Analog Speed limit Command : DC -10 ~ +10 [V] Digital Speed limit Command with combination SPD1 ~ SPD3
Internal function	Protection	Over current, over voltage, over temperature, over speed, motor miss wiring, encoder problem, insufficient voltage, follow error, CCW/CW limit, IPM fault, memory problem, emergency stop etc.
	Monitor output	Command/current position, speed, torque (-5 ~ +5 [V])
	Dynamic brake	Built-in
	Additional function	Key JOG, 8 pattern Auto JOG alarm history, rotation direction, encoder signal division pulse out, auto-tuning, 2-notch filter, speed ripple suppress etc.
Option		Motor power cable, encoder cable, CN1 cable
		RS232/485 COM cable, absolute encoder battery pack, P-dori , user manual
Environ-mental specification	Operating temperature	0 ~ 50 [℃]
	Operating humidity	90[%] or below (no condensation)
	Storage temperature	-20 ~ +80 [℃]
	Insulation Resistance	DC 500[V] 10 [MΩ] or more

1.3. Combination table of servo drive and motor

1.3.1. AC220V series servo drive and motor

Servo Drive [FDA7_]	Servo Motor[FMA__]						
	CN/CJ Series 3000/5000 [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]
001	CJZ5 CN01 CJ01	-	-	-	-	-	-
002	CN02 CJ02	-	-	-	-	-	-
004/004B	CN03 CN04 CJ04 CN04A CN05	KN03 KN05	-	LN03	-	-	LF03
005	CN06 CN08	KN06 KN06A	TN05	LN06	-	TF05	LF06
010	CN09 CN10	KN07 KN11	TN09	LN09	KF08 KF10	TF09	LF09
015/015B	CN15	KN16	TN13	LN12 LN12A	KF15	TF13	LF12
020/020B	CN22	KN22 KN22A	TN17 TN20	LN20	KF22	TF20	LF20
030/030B	CN30 CN30A	KN35	TN30	LN30	KF35	TF30	LF30
045	CN50 CN50A	KN55	TN44	LN40 LN55	KF50	TF44	-
075			TN75				
110			TN110 (1500/2000 [rpm])				
150			TN150 (1500/2000 [rpm])				

1.3.2. AC380V series servo drive and motor

Servo drive [FDA7_]	Servo motor[HMA__]			
	CN/CJ Series 3000/5000 [rpm]	**KN Series** 2000/3000 [rpm]	**TN Series** 1500/3000 [rpm]	**LN Series** 1000/2000 [rpm]
020-H	CN09 CN10 CN15 CN22	KN11 KN16 KN22	TN09 TN13 TN20	LN12 LN20 LN22
030-H	CN30	KN35	TN30	LN30
045-H	CN40 CN50		TN44 TN55	LN40 LN44 LN55
075-H			TN70 TN75	LN55
110-H			TN100 TN110	
150-H		KN150	TN150	
220-H		KN200	TN220	
300-H			TN300	LN300
370-H			TN370	LN370
450-H			TN450	LN450
550-H			TN550	
750-H			TN750	

1.3.3. Explosion proof series servo drive and motor

Servo drive [FDA7-]	Servo motor[FMA/HMA]			
	EX/EC Series 3000/5000 [rpm]	**EK Series** 2000/3000 [rpm]	**ET Series** 1500/3000 [rpm]	**EL Series** 1000/2000 [rpm]
002EX	FMAEX02	-	-	-
004EX /004BEX	-	FMAEK05	-	-
005EX	FMAEC06 FMAEC08	FMAEK06	-	-
010EX	-	-	-	FMAEL09
015EX /015BEX	-	FMAEK16	FMAET13	-
020EX /020BEX	FMAEC22	-	FMAET20	-
030EX /030BEX	-	FMAEK30	-	-
045EX	FMAEC40	-	-	-
020EX-H	HMAEC22	HMAEK16	HMAET13 HMAET20	-
030EX-H		HMAEK30		
045EX-H	HMAEC40			

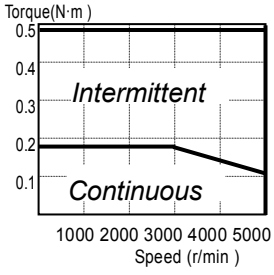
1.4. Rated specification of servo motor

1.4.1. AC220V series servo motor

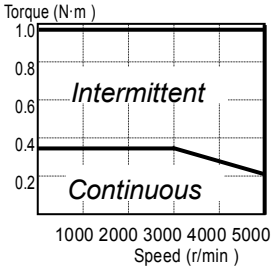
Spec. \ Model	Motor	CJZ5	CJ01	CJ02	CJ04
	Drive	7001	7001	7002	7004
Flange Size (□)		40		60	
Rated Power (W)		50	100	200	400
Rated Current (Arms)		0.81	0.90	1.80	2.65
Instantaneous Max. Current (Arms)		2.43	2.70	5.40	7.95
Rated Torque	(N·m)	0.16	0.32	0.64	1.27
	(kgf·cm)	1.62	3.25	6.5	13.0
Instantaneous Max. Torque	(N·m)	0.48	0.95	1.92	3.81
	(kgf·cm)	4.87	9.74	19.5	39.0
Rated Speed (r/min)		3000			
Maximum Speed (r/min)		5000			
Rotator Inertia (= $GD^2/4$)	($gf \cdot cm \cdot s^2$)	0.049	0.081	0.251	0.449
	($kg \cdot m^2 \times 10^{-4}$)	0.048	0.079	0.246	0.440
Allowable load inertia ratio (versus rotor)		15 times or below			
Rated Power Rate (kW/s)		5.3	12.8	16.5	36.8
Encoder	Standard	Incremental 2000~6000 P/rev			
	Option	Absolute/incremental 17/33bit, 131072 P/rev			
Weight (kg)		0.42	0.55	1.0	1.73

Torque-Speed characteristics

CJZ5



CJ01



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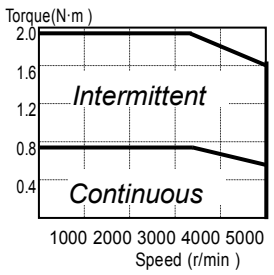
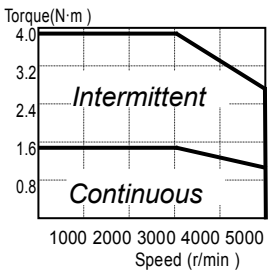


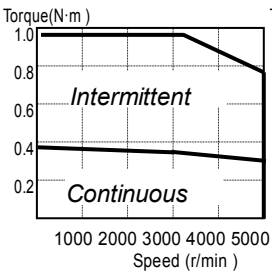
CJ04



Spec. \ Model	Motor	CN01	CN02	CN03	CN04	CN05	CN04A	CN06	CN08	CN10
	Drive	7001	7002	7004				7005		7010
Flange Size (□)		60					80			
Rated Power	(W)	100	200	300	400	500	400	600	800	1000
Rated Current	(Arms)	1.25	2.1	2.8	2.85	3.2	2.8	3.5	4.65	5.8
Instantaneous Max. Current	(Arms)	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
Instantaneous Max. 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 Speed	(r/min)	3000								
Maximum Speed	(r/min)	5000								
Rotator Inertia (= $GD^2/4$)	($gf \cdot cm \cdot s^2$)	0.061	0.095	0.129	0.163	0.208	1.1	1.5	1.77	2.11
	($kg \cdot m^2 \times 10^{-4}$)	0.06	0.093	0.126	0.160	0.204	1.08	1.47	1.74	2.07
Allowable load inertia ratio (versus rotor)		30 times or below					20time or below			
Rated Power Rate	(kW/s)	17.0	43.6	72.2	101.6	124.3	15.0	24.8	37.4	49.0
Encoder	Standard	Incremental 2000~6000 P/rev								
	Option	Absolute/incremental 17/33bit, 131072 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

CN01



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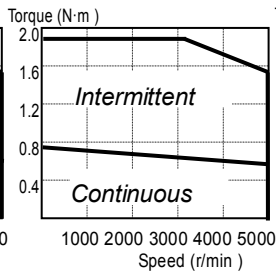

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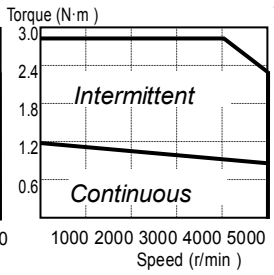

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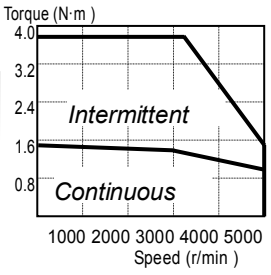

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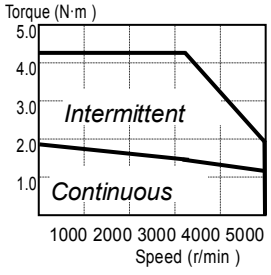

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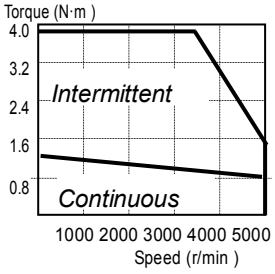

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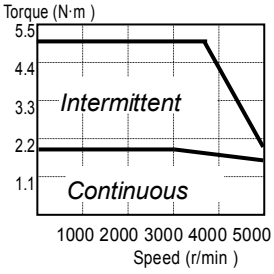

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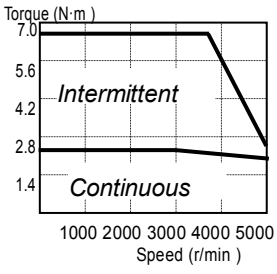

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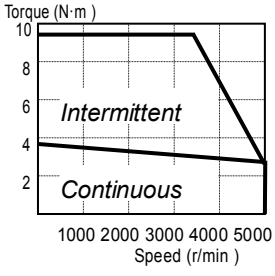
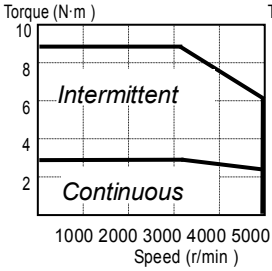


Spec. \ Model	Motor	CN09	CN15	CN22	CN30	CN30A	CN50A	KN03	KN05	KN06	KN07
	Drive	7010	7015	7020	7030	7030	7045	7004	7004	7005	7010
Flange Size (□)		130				180		80			
Rated Power	(W)	900	1500	2200	3000	3000	5000	300	450	550	650
Rated Current	(Arms)	4.6	8.8	12.1	17.2	19.2	23.3	2.5	3.1	3.7	4.6
Instantaneous Max. Current	(Arms)	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	15.9	1.43	2.15	2.63	3.10
	(kgf·cm)	29.2	48.7	71.4	97.4	97.4	162.3	14.6	21.9	26.8	31.7
Instantaneous Max. Torque	(N·m)	8.6	14.3	21	28.6	28.6	47.7	4.29	6.45	7.88	9.31
	(kgf·cm)	87.6	146	214	292	262	486.9	43.8	65.7	80.3	94.9
Rated Speed	(r/min)	3000						2000			
Maximum Speed	(r/min)	5000				4500		3000			
Rotator Inertia (= $GD^2/4$)	($gf \cdot cm \cdot s^2$)	4.12	7.63	11.12	14.63	26.1	43.8	1.1	1.5	1.77	2.11
	($kg \cdot m^2 \times 10^{-4}$)	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
Encoder	Standard	Incremental 2000~6000 P/rev									
	Option	Absolute/incremental 17/33bit, 131072 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

CN09



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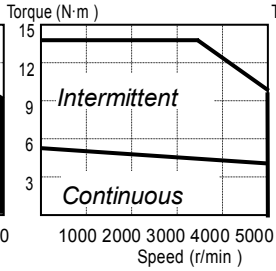
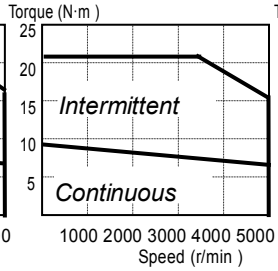
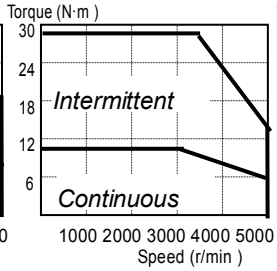


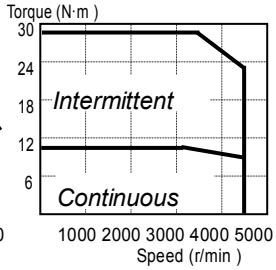
CN22



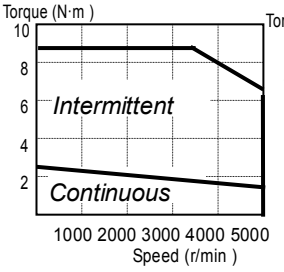
CN30



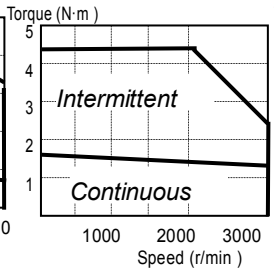
CN30A



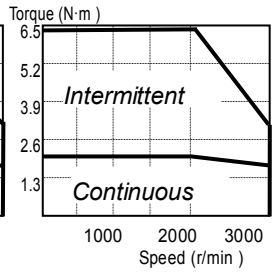
CN50A



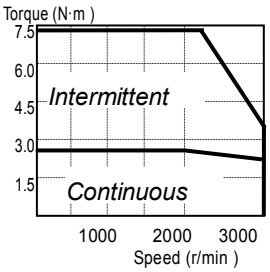
KN03



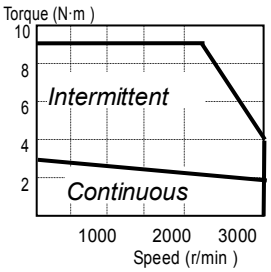
KN05



KN06



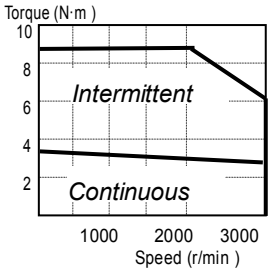
KN07



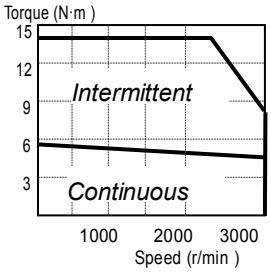
Spec. \ Model	Motor	KN06A	KN11	KN16	KN22	KN22A	KN35	KN55	KN70
	Drive	7005	7010	7015	7020	7020	7030	7045	7075
Flange Size (□)		130				180			
Rated Power	(W)	600	1100	1600	2200	2200	3500	5500	7000
Rated Current	(Arms)	3.7	6.7	10.2	14.1	15.2	20.2	31.6	36.0
Instantaneous Max. Current	(Arms)	11.1	18.1	30.3	42.3	45.6	60.6	79	90.0
Rated Torque	(N·m)	2.86	5.25	7.64	10.5	10.49	16.67	26.18	340
	(kgf·cm)	29.2	53.6	77.9	107	107	170	267	34.0
Instantaneous Max. Torque	(N·m)	8.6	14.2	22.5	31.5	31.3	50.1	65.4	83.6
	(kgf·cm)	87.6	145	230	321	321	510	667.5	852
Rated Speed	(r/min)	2000							
Maximum Speed	(r/min)	3000							
Rotator Inertia (= $GD^2/4$)	($gf \cdot cm \cdot s^2$)	4.12	7.63	11.12	14.63	26.1	43.8	67.8	100.1
	($kg \cdot m^2 \times 10^{-4}$)	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 below							
Rated Power Rate	(kW/s)	20.4	30.6	47.3	63.9	43.0	64.7	103.0	113.7
Encoder	Standard	Incremental 2000~6000 P/rev							
	Option	Absolute/incremental 17/33bit, 131072 P/rev							
Weight	(kg)	5.5	7.0	8.5	10.0	12.9	18.2	26.8	36.1

Torque-Speed characteristics

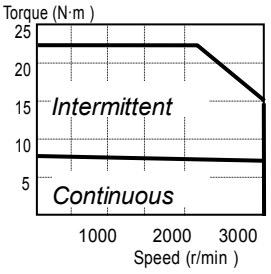
KN06A



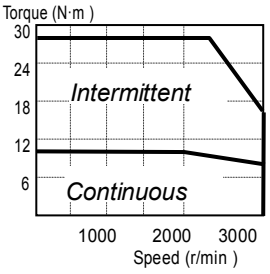
KN11



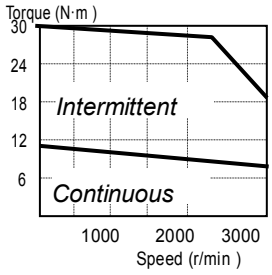
KN16



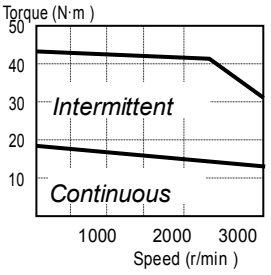
KN22



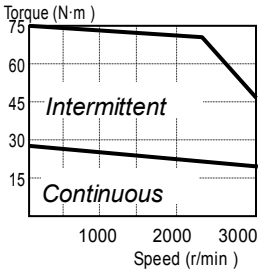
KN22A



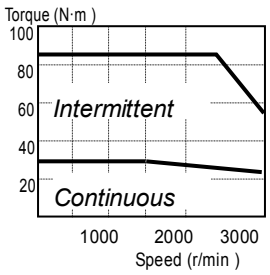
KN35



KN55



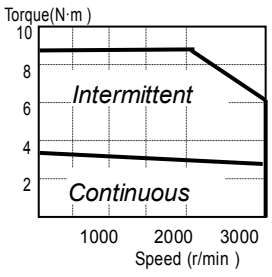
KN70



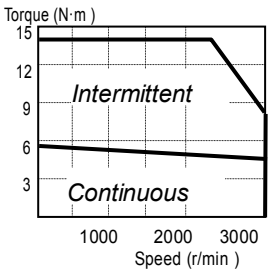
Spec. \ Model	Motor	TN05	TN09	TN13	TN17	TN20	TN30	TN44	TN55	TN75	TN110	TN150
	Drive	7005	7010	7015	7020	7020	7030	7045	7045	7075	7110	7150
Flange Size (□)		130				180					220	
Rated Power	(W)	450	850	1300	1700	1800	2900	4400	5500	7500	11000	15000
Rated Current	(Arms)	3.7	6.9	10.9	14.4	16.4	22.6	33.1	37.0	51.8	54.5	73.7
Instantaneous Max. Current	(Arms)	11.1	18.1	29.65	39.2	49.2	56.6	94.67	93.0	129.5	131	184.3
Rated Torque	(N·m)	2.87	5.41	8.27	10.8	11.5	18.6	27.9	35.0	47.7	70	95.4
	(kgf·cm)	29.3	55.2	84.4	110	117	190	285	35.7	486.9	714	974
Instantaneous Max. Torque	(N·m)	8.61	14.2	22.5	29.4	34.5	46.2	69.9	88	119.3	175	229
	(kgf·cm)	89.5	145	230	300	351	471	712.5	893	1217	1785	2434
Rated Speed	(r/min)	1500										
Maximum Speed	(r/min)	3000									2000	
Rotator Inertia (= $GD^2/4$)	($gf \cdot cm \cdot s^2$)	4.12	7.63	11.12	14.63	26.1	43.8	67.8	100.1	126.4	211	308
	($kg \cdot m^2 \times 10^{-4}$)	4.04	7.48	10.9	14.34	25.1	42.9	66.4	98.1	123.9	207	302
Allowable load inertia ratio (versus rotor)		10 times or below										
Rated Power Rate	(kW/s)	20.5	43.3	68.2	91.7	51.5	80.8	117.4	124.8	183.8	236	301
Encoder	Standard	Incremental 2000~6000 P/rev										
	Option	Absolute/incremental 17/33bit, 131072 P/rev										
Weight	(kg)	5.5	7.0	8.5	10.0	12.9	18.2	26.8	36.1	45.7	59	84

Torque-Speed characteristics

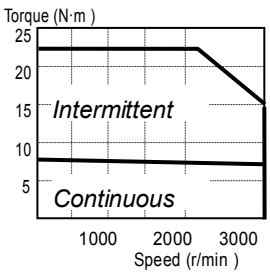
TN05



TN09



TN13



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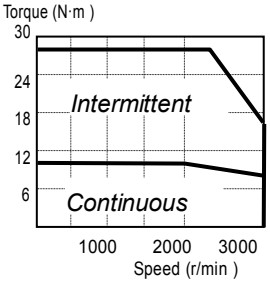
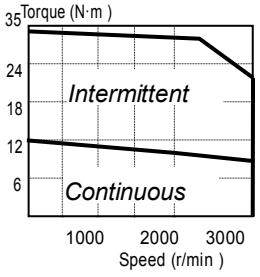
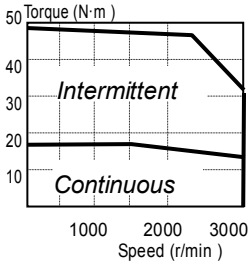


TN20



TN30



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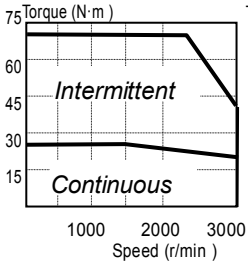
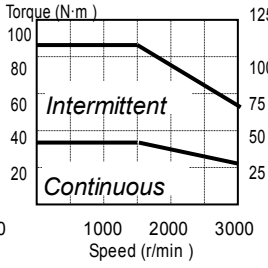
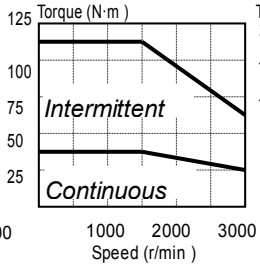


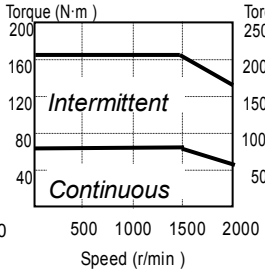
TN55



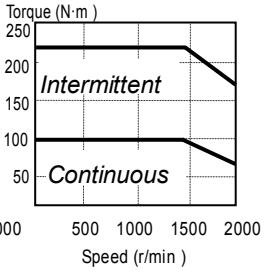
TN75



TN110



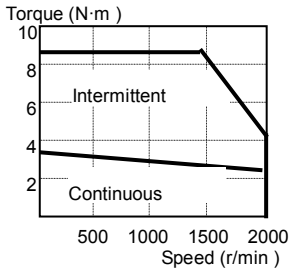
TN150



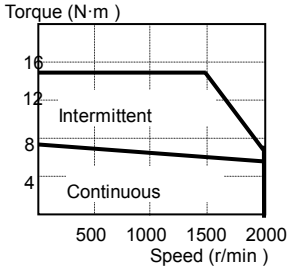
Spec. \ Model	Motor	LN03	LN06	LN09	LN12	LN12A	LN20	LN30	LN40	LN55
	Drive	7004	7005	7010	7010		7020	7030	7045	7075
Flange Size (□)		130				180				
Rated Power	(W)	300	600	900	1200	1200	2000	3000	4000	5500
Rated Current	(Arms)	2.6	4.8	7.3	9.7	8.9	17.2	24.9	32.2	36.5
Instantaneous Max. Current	(Arms)	7.8	12.0	18.76	29.0	22.2	51.6	62.34	96.6	91.3
Rated Torque	(N·m)	2.86	5.72	8.6	11.5	11.5	19.1	28.6	38.2	52.5
	(kgf·cm)	29.2	58.4	87.7	116.9	116.9	194.8	292.2	389.6	535.5
Instantaneous Max. Torque	(N·m)	8.6	14.3	22.1	34.4	28.7	57.3	71.6	114.6	131.2
	(kgf·cm)	87.6	146	226	351	292.3	584.4	730.5	1168.8	1338.8
Rated Speed	(r/min)	1000								
Maximum Speed	(r/min)	2000								
Rotator Inertia (= $GD^2/4$)	($gf \cdot cm \cdot s^2$)	4.12	7.63	11.12	14.63	26.1	43.8	67.8	100.1	126.4
	($kg \cdot m^2 \times 10^{-4}$)	4.04	7.48	10.9	14.34	25.6	42.9	66.4	98.1	123.9
Allowable load inertia ratio (versus rotor)		10 times or below								
Rated Power Rate	(kW/s)	20.5	43.3	68.2	91.7	51.4	84.9	123.4	148.6	226.9
Encoder	Standard	Incremental 2000~6000 P/rev								
	Option	Absolute/incremental 17/33bit, 131072 P/rev								
Weight	(kg)	5.5	7.0	8.5	10.0	12.9	18.2	26.8	36.1	45.7

Torque-Speed characteristics

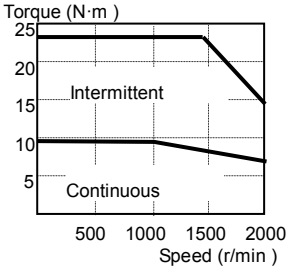
LN03



LN06



LN09



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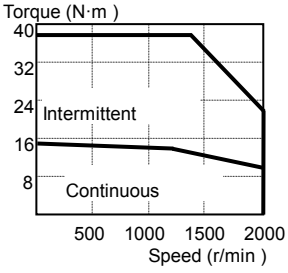
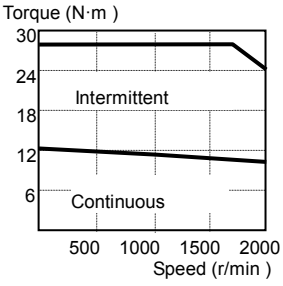
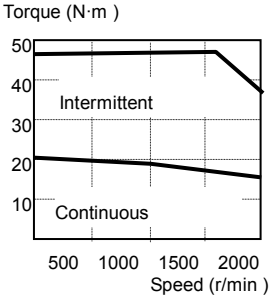


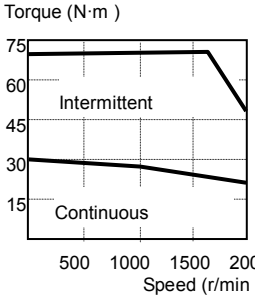
LN12A



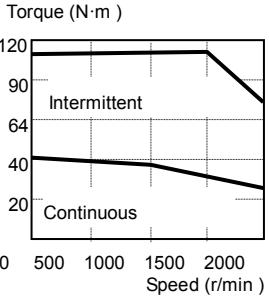
LN20



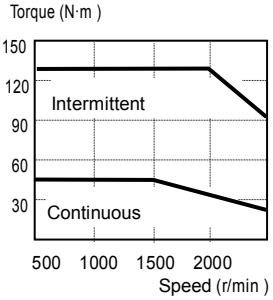
LN30



LN40



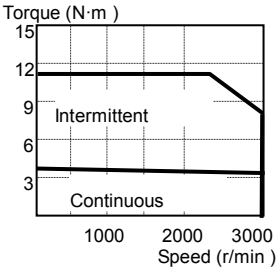
LN55



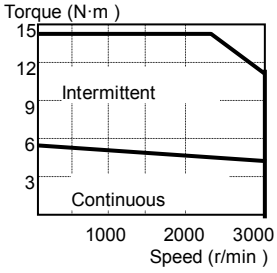
Spec. \ Model	Motor	KF08	KF10	KF15	KF22	KF35	KF50
	Drive	7010		7015	7020	7030	7045
Flange Size (□)		130			180		
Rated Power	(W)	750	1000	1500	2200	3500	5000
Rated Current	(Arms)	5.3	6.2	9.2	14.1	20.5	33.8
Instantaneous Max. Current	(Arms)	15.9	18.6	27.6	42.3	61.5	101.4
Rated Torque	(N·m)	3.58	4.77	7.16	10.5	16.7	23.9
	(kgf·cm)	36.53	48.7	73.1	107	170	244
Instantaneous Max. 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 Speed	(r/min)	2000					
Maximum Speed	(r/min)	3000					
Rotator Inertia (= $GD^2/4$)	($gf \cdot cm \cdot s^2$)	10.5	15.5	25.3	65.3	100.5	159.1
	($kg \cdot m^2 \times 10^{-4}$)	10.3	15.2	24.8	64.0	98.5	156
Allowable load inertia ratio (versus rotor)		5 times or below					
Rated Power Rate	(kW/s)	12.3	15.0	20.7	17.2	28.2	36.4
Encoder	Standard	Incremental 2000~6000 P/rev					
	Option	Absolute/incremental 17/33bit, 131072 P/rev					
Weight	(kg)	8.2	11.6	15.8	17.2	27.4	38.3

Torque-Speed characteristics

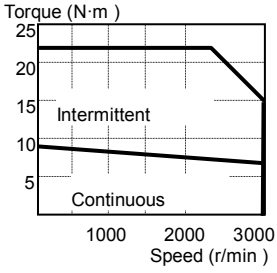
KF08



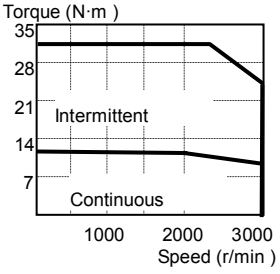
KF10



KF15



KF22



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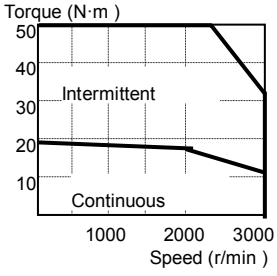

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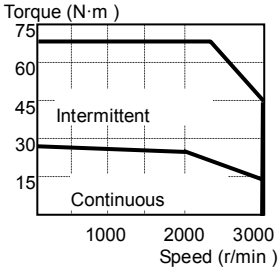
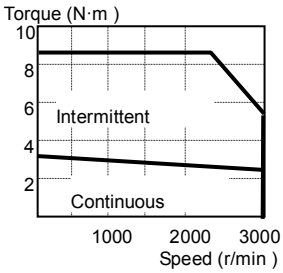


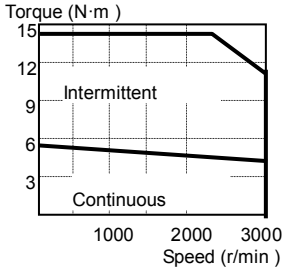
Spec. \ Model	Motor	TF05	TF09	TF13	TF20	TF30	TF44
	Drive	7005	7010	7015	7020	7030	7045
Flange Size (□)		130			180		
Rated Power	(W)	450	850	1300	1800	2900	4400
Rated Current	(Arms)	4.0	7.0	10.7	14.8	21.7	34.5
Instantaneous Max. Current	(Arms)	12.0	19.0	31.7	44.4	65.1	95.83
Rated Torque	(N·m)	2.87	5.41	8.27	11.5	18.5	27.9
	(kgf·cm)	29	55	85	117	188	285
Instantaneous Max. Torque	(N·m)	8.61	14.7	24.5	34.4	55.4	77.5
	(kgf·cm)	89.5	150	250	351	565	790
Rated Speed	(r/min)	1500					
Maximum Speed	(r/min)	3000					
Rotator Inertia (= $GD^2/4$)	($gf \cdot cm \cdot s^2$)	10.5	15.5	25.3	65.3	100.5	159.1
	($kg \cdot m^2 \times 10^{-4}$)	10.3	15.2	24.8	64.0	98.5	156
Allowable load inertia ratio (versus rotor)		5 times or below					
Rated Power Rate	(kW/s)	7.85	19.1	28.0	20.5	35.2	50.0
Encoder	Standard	Incremental 2000~6000 P/rev					
	Option	Absolute/incremental 17/33bit, 131072 P/rev					
Weight	(kg)	8.2	11.6	15.8	17.2	27.4	38.3

Torque-Speed characteristics

TF05



TF09



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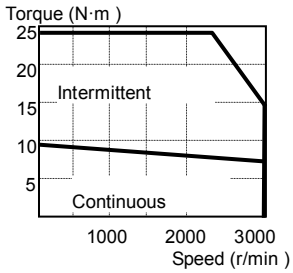
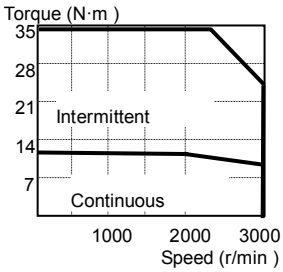
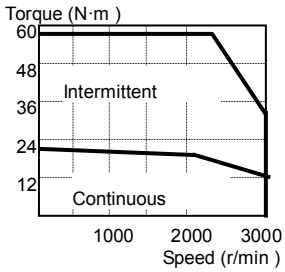


TF20



TF30



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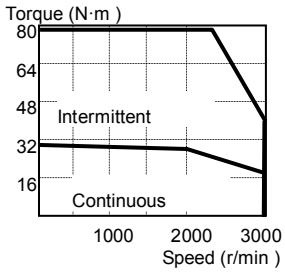
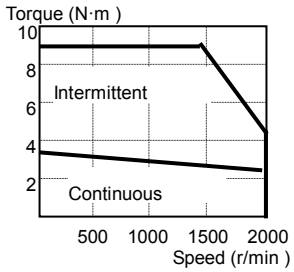


Spec. \ Model	Motor	LF03	LF06	LF09	LF12	LF20	LF30
	Drive	7004	7005	7010	7010	7020	7030
Flange Size (□)		130			180		
Rated Power (W)		300	600	900	1200	2000	3000
Rated Current (Arms)		2.5	4.7	7.2	9.8	16.0	24.3
Instantaneous Max. Current (Arms)		7.5	13.65	19.21	29.32	48.0	67.34
Rated Torque	(N·m)	2.84	5.68	8.62	11.5	19.1	28.4
	(kgf·cm)	29	58	88	117	195	290
Instantaneous Max. Torque	(N·m)	8.7	16.5	23.0	34.4	57.3	78.7
	(kgf·cm)	90	169	235	351	585	803
Rated Speed (r/min)		1000					
Maximum Speed (r/min)		2000					
Rotator Inertia (= $GD^2/4$)	($gf \cdot cm \cdot s^2$)	10.5	15.5	25.3	65.3	100.5	159.1
	($kg \cdot m^2 \times 10^{-4}$)	10.3	15.2	24.8	64.0	98.5	156
Allowable load inertia ratio (versus rotor)		5 times or below					
Rated Power Rate (kW/s)		7.85	21.3	30.0	20.5	37.0	51.8
Encoder	Standard	Incremental 2000~6000 P/rev					
	Option	Absolute/incremental 17/33bit, 131072 P/rev					
Weight (kg)		8.2	11.6	15.8	17.2	27.4	38.3

Torque-Speed characteristics

LF03



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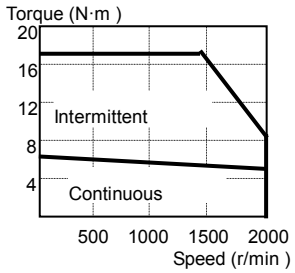
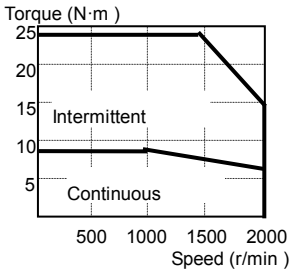
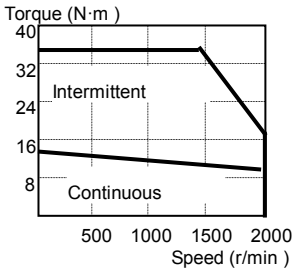


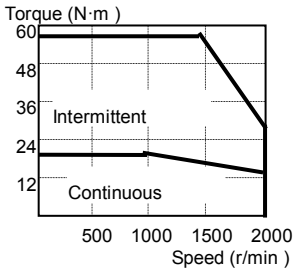
LF09



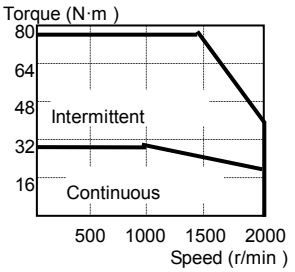
LF12



LF20



LF30

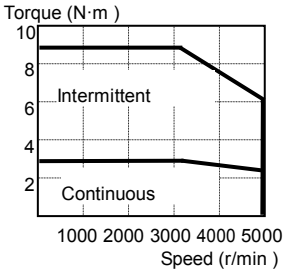


1.4.2. AC380V series servo motor

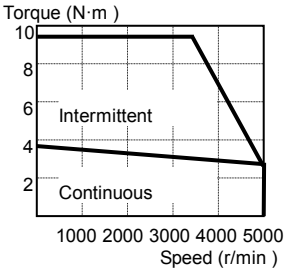
Model / Spec.	Motor	CN09	CN10	CN15	CN22	CN30	CN30A	CN50A
	Drive	7020-H				7030-H		7045-H
Flange Size (□)		130	80	130			180	
Rated Power	(W)	900	1000	1500	2200	3000	3000	5000
Rated Current	(Arms)	3.38	2.94	5.0	7.4	10.0	10.0	14
Instantaneous Max. Current	(Arms)	10.2	8.8	15.0	22.2	30.0	30.0	42.0
Rated Torque	(N·m)	2.86	3.18	4.77	7.0	9.54	9.54	15.9
	(kgf·cm)	29.2	32.4	48.7	71.4	97.3	97.3	162.2
Instantaneous Max. Torque	(N·m)	8.6	9.53	14.3	21	28.6	28.6	47.7
	(kgf·cm)	87.7	97.2	145.9	214.2	291.7	291.7	486.5
Rated Speed	(r/min)	3000						
Maximum Speed	(r/min)	5000					4500	
Rotator Inertia (= $GD^2/4$)	($gf \cdot cm \cdot s^2$)	4.08	2.14	7.65	11.12	14.59	26.1	43.8
	($kg \cdot m^2 \times 10^{-4}$)	4.0	2.1	7.5	10.9	14.3	25.6	42.9
Allowable load inertia ratio (versus rotor)		10 times or below						
Rated Power Rate	(kW/s)	20.44	48.14	30.33	44.94	63.62	35.54	58.9
Encoder	Standard	Incremental 2000~6000 P/rev						
	Option	Absolute/incremental 17/33bit, 131072 P/rev						
Weight	(kg)	5.5	3.7	7.0	8.5	10.0	12.9	18.2

Torque-Speed characteristics

CN09



CN10



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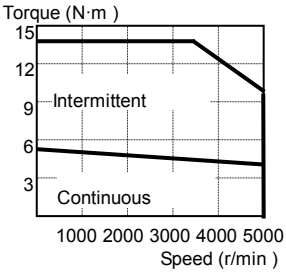
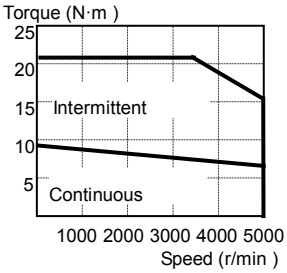
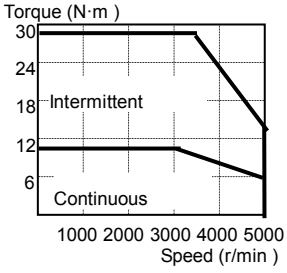


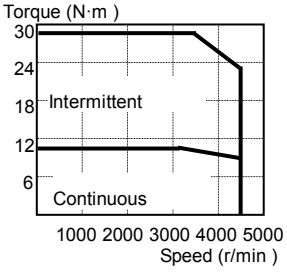
CN22



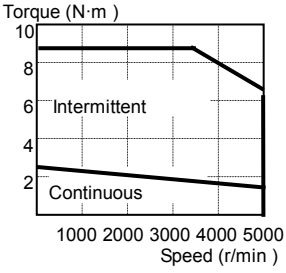
CN30



CN30A



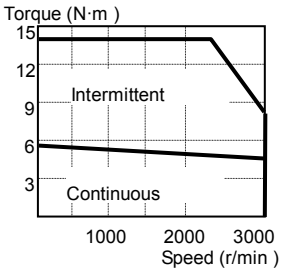
CN50A



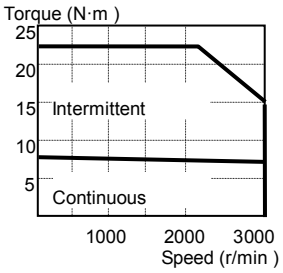
Model / Spec.	Motor / Drive	KN11 / 7010-H	KN16 / 7015-H	KN22 / 7020-H	KN22A / 7020-H	KN35 / 7030-H	KN55 / 7045-H	KN70 / 7075-H
Flange Size (□)		130			180			
Rated Power	(W)	1100	1600	2200	2200	3500	5500	7000
Rated Current	(Arms)	3.9	5.8	7.95	8.14	11.68	18.53	23.04
Instantaneous Max. Current	(Arms)	10.5	17.1	23.9	20.3	29.2	46.3	57.6
Rated Torque	(N·m)	5.28	7.64	10.5	10.5	16.7	26.2	33.4
	(kgf·cm)	53.9	77.9	107.1	107.1	170.3	267.2	340.7
Instantaneous Max. Torque	(N·m)	14.2	22.5	31.5	26.2	41.7	65.4	83.5
	(kgf·cm)	144.8	229.5	321.3	267.2	425.3	667.1	851.7
Rated Speed	(r/min)	2000						
Maximum Speed	(r/min)	3000						
Rotator Inertia (= $GD^2/4$)	($gf \cdot cm \cdot s^2$)	7.65	11.12	14.59	26.1	43.8	67.7	100.1
	($kg \cdot m^2 \times 10^{-4}$)	7.50	10.90	14.30	25.6	42.9	66.4	98.1
Allowable load inertia ratio (versus rotor)		10 times or below						
Rated Power Rate	(kW/s)	37.16	53.53	77.07	43.05	64.98	103.34	113.67
Encoder	Standard	Incremental 2000~6000 P/rev						
	Option	Absolute/incremental 17/33bit, 131072 P/rev						
Weight	(kg)	7.0	8.5	10.0	12.9	18.2	26.8	36.1

Torque-Speed characteristics

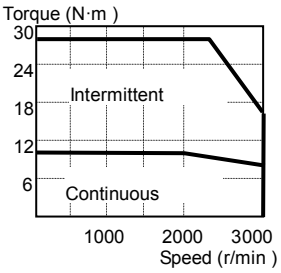
KN11



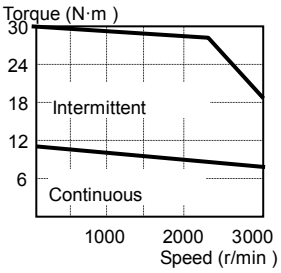
KN16



KN22



KN22A



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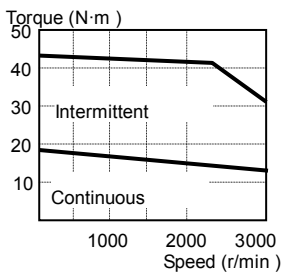

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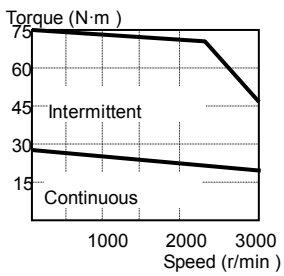
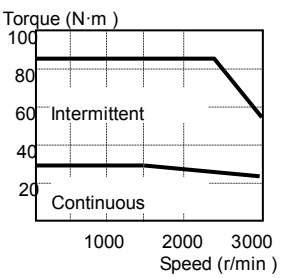


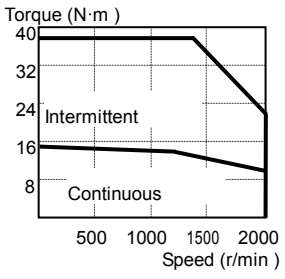
KN70



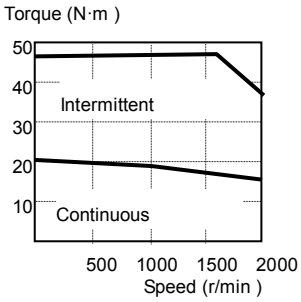
Model / Spec.	Motor / Drive	LN12 / 7010-H	LN20 / 7020-H	LN30 / 7030-H	LN40 / 7045-H	LN55 / 7075-H	LN300 / 7300-H	LN370 / 7370-H	LN450 / 7450-H
Flange Size (□)		130	180				280		
Rated Power	(W)	1200	2000	3000	4000	5500	30000	37000	45000
Rated Current	(Arms)	6.12	8.42	14.2	22.3	23.8	75	98.09	112.28
Instantaneous Max. Current	(Arms)	6.12	8.42	14.2	22.3	23.8	162	235	276
Rated Torque	(N·m)	18.3	25.3	42.7	67	64.3	358	441	537
	(kgf·cm)	11.5	19.1	28.6	42.03	52.5	3651.6	4498.2	5477.4
Instantaneous Max. Torque	(N·m)	117.3	194.8	291.7	428.71	535.5	752	930	1182
	(kgf·cm)	34.4	57.3	86	126.09	141.75	7670.4	9486	12056.4
Rated Speed	(r/min)	1000	1000	1000	1000	1000	800	800	800
Maximum Speed	(r/min)	2000	2000	2000	2000	2000	1300	1300	1300
Rotator Inertia (= $GD^2/4$)	($gf \cdot cm \cdot s^2$)	14.6	43.8	67.7	102.51	126.378	1217.88	1843.14	2238.90
	($kg \cdot m^2 \times 10^{-4}$)	14.3	42.9	66.4	100.50	123.9	1194.00	1807.00	2195.00
Allowable load inertia ratio (versus rotor)		10 times or below							
Rated Power Rate	(kW/s)	92.45	85.00	123.14	175.7	226.9	1072.97	1075.83	1313.23
Encoder	Standard	Incremental 2000~6000 P/rev					Absolute/incremental 17/33bit, 131072 P/rev		
	Option	Absolute/incremental 17/33bit, 131072 P/rev							
Weight	(kg)	10.0	18.2	26.8	45.7	45.7	196	206	230

Torque-Speed characteristics

LN12



LN20



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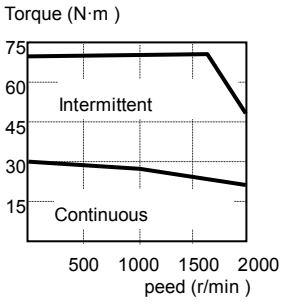

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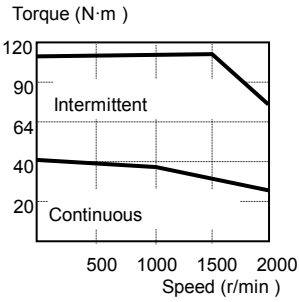

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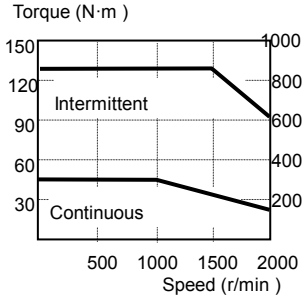
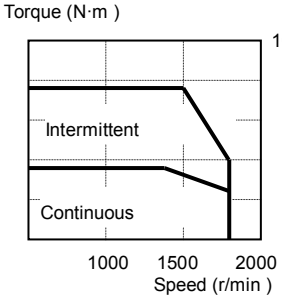
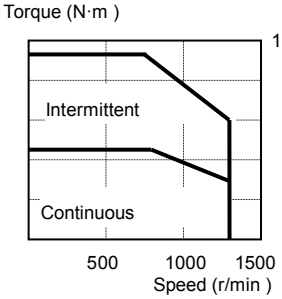


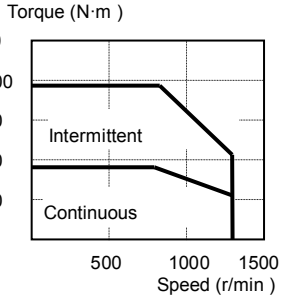
LN300



LN370



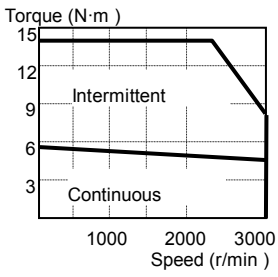
LN450



Model / Spec.	Motor / Drive	TN09 / 7010-H	TN20 / 7020-H	TN30 / 7030-H	TN44 / 7045-H	TN55 / 7045-H	TN75N / 7075-H	TN110 / 7110-H	TN150 / 7150-H
Flange Size (□)		130	180					220	
Rated Power	(W)	850	1800	2900	4400	5500	7500	11000	15000
Rated Current	(Arms)	3.95	8.9	14.16	16.8	20.9	24.47	35.8	38.06
Instantaneous Max. Current	(Arms)	12.8	27.4	41.8	50.4	68	68	89.5	93.24
Rated Torque	(N·m)	5.41	11.5	18.6	28	35	47.8	70	95.4
	(kgf·cm)	55.2	117.3	189.7	285.60	357	487.56	714	973.08
Instantaneous Max. Torque	(N·m)	16.23	34.5	54.8	84.0	114.58	133.84	175	224.38
	(kgf·cm)	165.5	351.9	559.0	856.8	1168.72	1365.17	1785	2288.67
Rated Speed	(r/min)	1500	1500	1500	1500	1500	1500	1500	1500
Maximum Speed	(r/min)	3000	3000	3000	3000	3000	3000	2000	2000
Rotator Inertia (= $GD^2/4$)	($gf \cdot cm \cdot s^2$)	7.63	26.1	43.8	67.8	100.062	126.4	201.5	314.5
	($kg \cdot m^2 \times 10^{-4}$)	7.48	25.1	42.9	66.4	98.1	124	197.5	308.2
Allowable load inertia ratio (versus rotor)		10 times or below							
Rated Power Rate	(kW/s)	39.1	51.5	80.8	117.4	124.8	184.3	236.0	295.1
Encoder	Standard	Incremental 2000~6000 P/rev							
	Option	Absolute/incremental 17/33bit, 131072 P/rev							
Weight	(kg)	7.0	12.9	18.2	26.8	36.1	45.7	59	84

Torque-Speed characteristics

TN09



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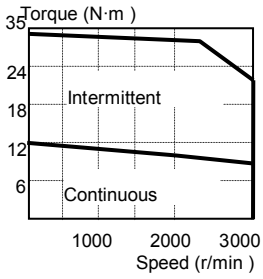

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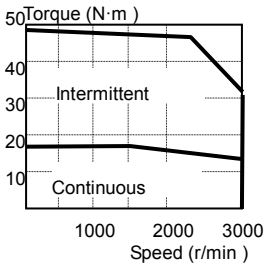

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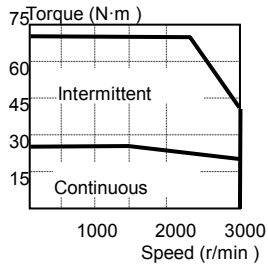

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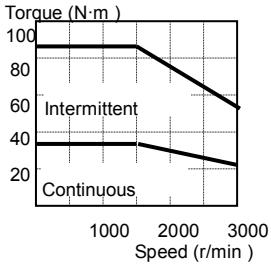
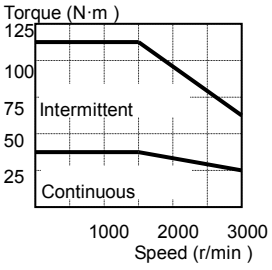
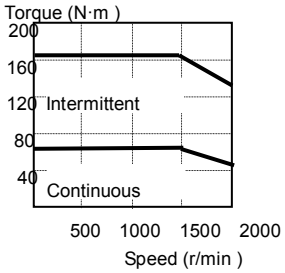


TN75



TN110



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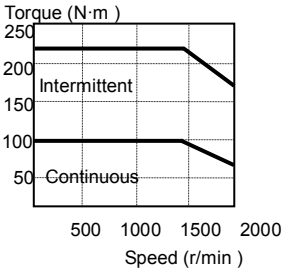
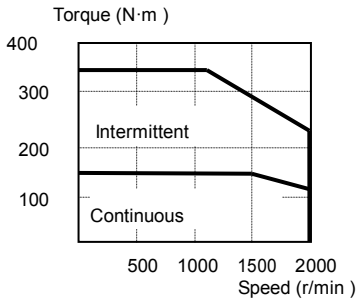


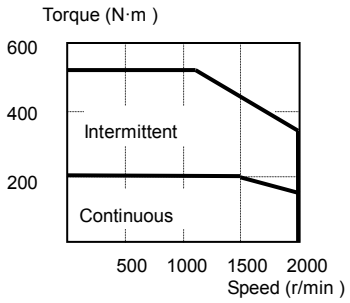
Model / Spec.	Motor	TN220	TN300	TN370	TN450	TN550	TN750
	Drive	7220-H	7300-H	7370-H	7450-H	7550-H	7750-H
Flange Size (□)		250			280		
Rated Power	(W)	22000	30000	3700	45000	55000	75000
Rated Current	(Arms)	45	62	77	102	119	141
Instantaneous Max. Current	(Arms)	112.5	155	192.5	280	345	395
Rated Torque	(N·m)	140	191	236	286	350	477
	(kgf·cm)	1428	1948.2	2407.2	2917.2	3570	4865.4
Instantaneous Max. Torque	(N·m)	350	478	589	715	875	1192
	(kgf·cm)	3570	4875.6	6007.8	7293	8925	12158.4
Rated Speed	(r/min)	1500	1500	1500	1500	1500	1500
Maximum Speed	(r/min)	2000	2000	2000	2000	2000	2000
Rotator Inertia (= $GD^2/4$)	($gf \cdot cm \cdot s^2$)	412.8	473.9	620.6	1147.72	1217.88	2238.90
	($kg \cdot m^2 \times 10^{-4}$)	404.7	464.6	608.5	1125.22	1194.00	2195.00
Allowable load inertia ratio (versus rotor)		10 times or below					
Rated Power Rate	(kW/s)	484.1	784.9	915	726.64	1025.55	1036.16
Encoder	Standard	Absolute/incremental 17/33bit, 131072 P/rev					
	Option						
Weight	(kg)	93	107	117	165	196	230

Torque-Speed characteristics

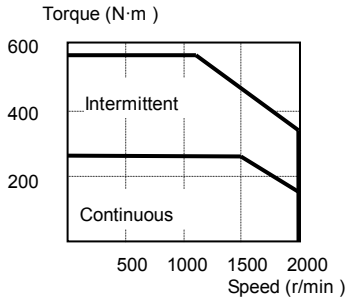
TN220



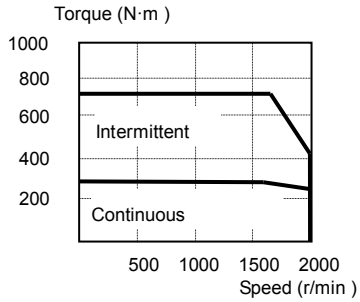
TN300



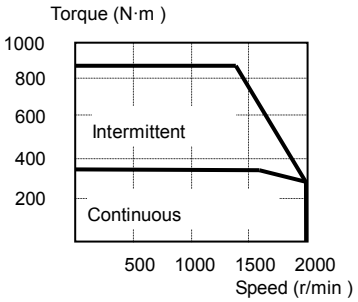
TN370



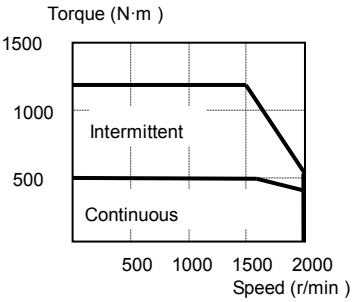
TN450



TN550



TN750

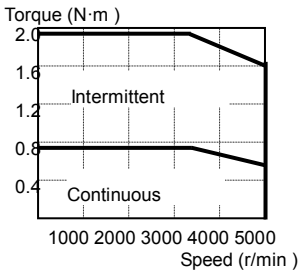


1.4.3. AC 220V Explosion proof series servo motor

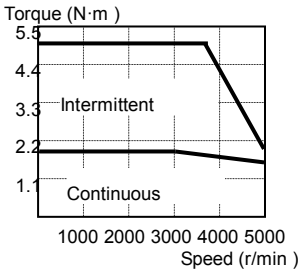
Spec. \ Model	Motor	EX02	EC06	EC08	EC22	EC40	EK05	EK06
	Drive	7002EX	7005EX		7020EX	7045EX	7005EX	
Flange Size (□)		60	80	80	130	130	80	80
Rated Power (W)		200	450	800	2200	4000	450	550
Rated Current (Arms)		1.8	3.1	4.65	12.1	16.55	3.1	3.7
Instantaneous Max. Current (Arms)		5.4	9.3	12.54	36.3	41.44	9.3	10.7
Rated Torque	(N·m)	0.64	1.91	2.54	7.0	12.7	2.15	2.57
	(kgf·cm)	6.5	19.5	26.0	71.4	129.54	21.9	26.2
Instantaneous Max. Torque	(N·m)	1.92	5.3	6.85	21	31.8	6.45	7.42
	(kgf·cm)	1.95	54.5	70.2	214	324.36	65.7	72.7
Rated Speed (r/min)		3000					2000	
Maximum Speed (r/min)		5000					3000	
Rotator Inertia (= $GD^2/4$)	($gf \cdot cm \cdot s^2$)	0.246	1.5	1.77	11.12	21.62	1.5	1.77
	($kg \cdot m^2 \times 10^{-4}$)	0.241	1.47	1.74	10.9	21.2	1.47	1.74
Allowable load inertia ratio (versus rotor)		15 time or below	20 times or below		20 times or below		20 times or below	
Rated Power Rate (kW/s)		16.5	31.3	37.4	45.1	76.0	31.3	38.0
Encoder	Standard	Incremental 2000 P/rev	Absolute/incremental 17/33bit, 131072 P/rev					
	Option							
Weight (kg)		2.8	4.26	5.5	22	30	4.26	5

Torque-Speed characteristics

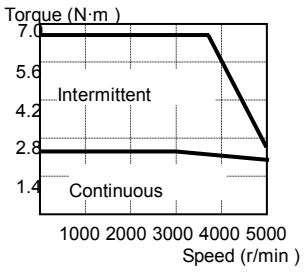
EX02



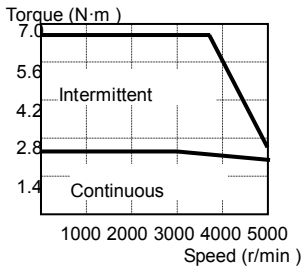
EC06



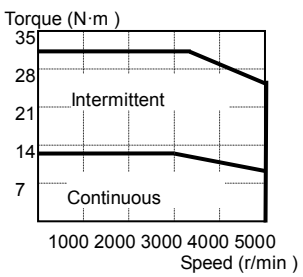
EC08



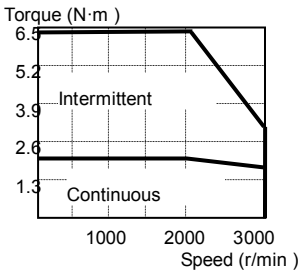
EC22



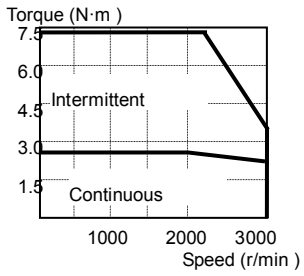
EC40



EK05



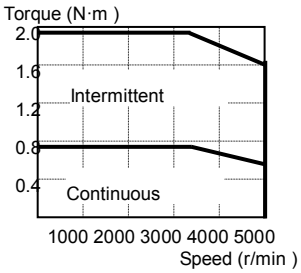
EK06



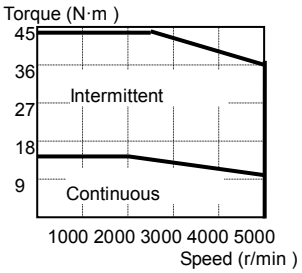
Spec. \ Model	Motor / Drive	EK16 / 7015EX	EK30 / 7030EX	EL09 / 7010EX	ET13 / 7015EX	ET20 / 7020EX
Flange Size (□)		150	150	130	130	180
Rated Power (W)		1600	3000	900	1300	1800
Rated Current (Arms)		10.2	20.6	7.3	10.9	16.4
Instantaneous Max. Current (Arms)		30.0	61.9	18.76	29.65	49.2
Rated Torque	(N·m)	7.64	14.3	8.6	8.27	11.5
	(kgf·cm)	77.9	145.86	87.7	84.4	117
Instantaneous Max. Torque	(N·m)	22.5	43	22.1	22.5	34.5
	(kgf·cm)	230	438.6	226	230	351
Rated Speed (r/min)		2000	2000	1000	1500	
Maximum Speed (r/min)		3000	5000	2000	3000	
Rotator Inertia (= $GD^2/4$)	($gf \cdot cm \cdot s^2$)	11.12	22.44	11.12	11.12	26.1
	($kg \cdot m^2 \times 10^{-4}$)	10.9	22	10.9	10.9	25.1
Allowable load inertia ratio (versus rotor)		10 times or below				
Rated Power Rate (kW/s)		53.5	92.6	68.2	62.8	51.5
Encoder	Standard	Absolute/incremental 17/33bit, 131072 P/rev				
	Option					
Weight (kg)		22	30	22	22	27

Torque-Speed characteristics

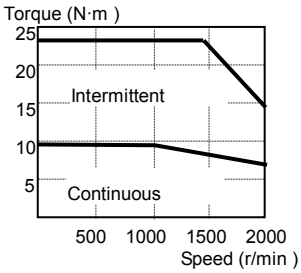
EK16



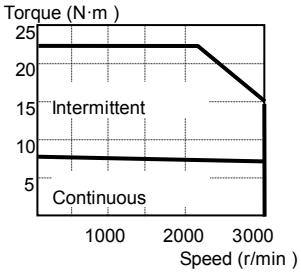
EK30



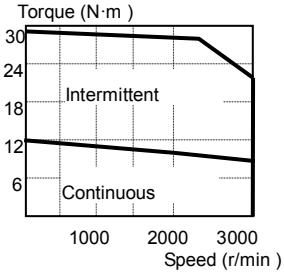
EL09



ET13



ET20

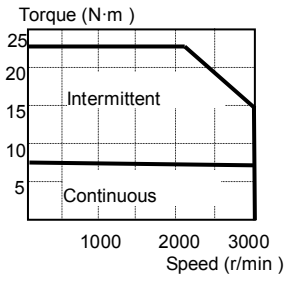


1.4.4. AC 380V Explosion proof series servo motor

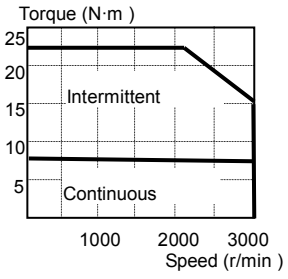
Model / Spec.	Motor	ET13	EK16	EC22	ET20	EK30	EC40
	Drive	7015EX	7015EX	7020EX	7020EX	7030EX	7045EX
Flange Size (□)		150					
Rated Power (W)		1300	1600	2200	1800	3000	4000
Rated Current (Arms)		8.4	5.81	7.4	8.9	16	13.6
Instantaneous Max. Current (Arms)		25.1	17.1	22.2	26.7	48.1	34.1
Rated Torque	(N·m)	8.28	7.64	7	11.5	14.3	12.7
	(kgf·cm)	84.4	77.9	71.4	117	145.86	129.54
Instantaneous Max. Torque	(N·m)	22.5	22.5	21	34.5	43	31.8
	(kgf·cm)	230	230	214	351	438.6	324.4
Rated Speed (r/min)		1500	2000	3000	1500	2000	3000
Maximum Speed (r/min)		3000	3000	5000	3000	5000	4500
Rotator Inertia (= $GD^2/4$)	($gf \cdot cm \cdot s^2$)	11.12	14.63	11.12	26.1	22.4	22.4
	($kg \cdot m^2 \times 10^{-4}$)	10.9	14.34	10.9	25.1	22	22
Allowable load inertia ratio (versus rotor)		10 times or below					
Rated Power Rate (kW/s)		62.8	53.5	45.1	51.5	91.3	76
Encoder	Standard	Absolute/incremental 17/33bit, 131072 P/rev					
	Option						
Weight (kg)		22	22	22	27	30	30

Torque-Speed characteristics

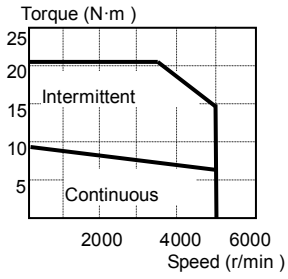
ET13



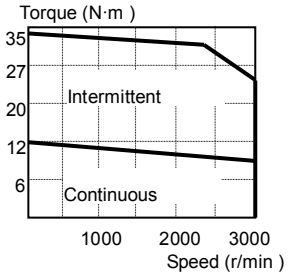
EK16



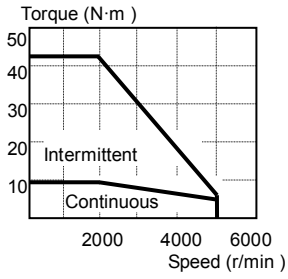
EC22



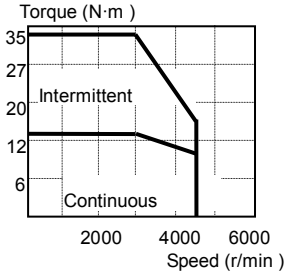
ET20



EK30



EC40



1.5. Installation

1.5.1. Installation of servo drive

1) Operating environment

Ambient temperature	0-50℃ (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℃ 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.

1.5.2. Servo motor installation

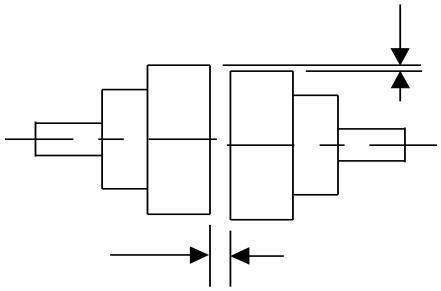
1) Operating environment

Ambient temperature	0-40℃ (There should be no freezing)
Ambient humidity	80% RH or lower (There should be no vapor)
External vibration	X, Y = 19.6 ㎨ (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 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.

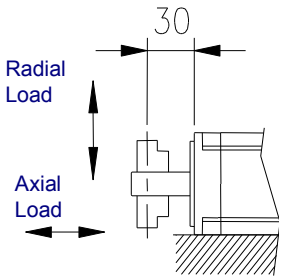
Check 4 places in turn. The difference between maximum and minimum should be 0.03 or lower.



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.

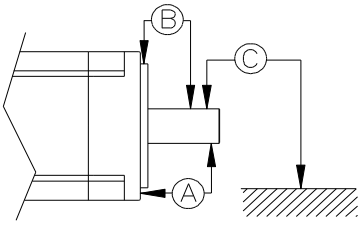
MOTOR MODEL		RADIAL LOAD		AXIAL LOAD		REFERENCE DIAGRAM
Series	Type	N	Kgf	N	kgf	
CN	CN01~CN05 EX02	196	20	68	7	
	CN06~CN08 EC06~EC08	245	25	98	10	
	CN09~CN15	490	50	196	20	
	CN20~CN30 EC22~EC40	686	70	343	35	
	CN30A~CN50A	1470	150	490	50	
KN	KN03~KN07 EK05~EK06	245	25	98	10	
	KF08~KN11	490	50	196	20	
	KF15~KN22 EK16	686	70	343	35	
	KN22A~KN55 EK30	1470	150	490	50	
TN	TN05~TN09	490	50	196	20	
	TN13~TN17 ET12	686	70	343	35	
	TN20~TN75 ET20	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

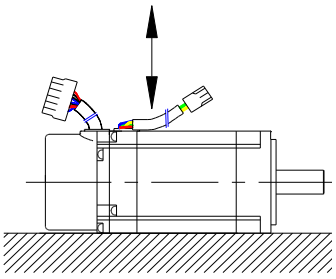
The accuracies of the shaft and attachments of the AC servo motor are shown on the following table.

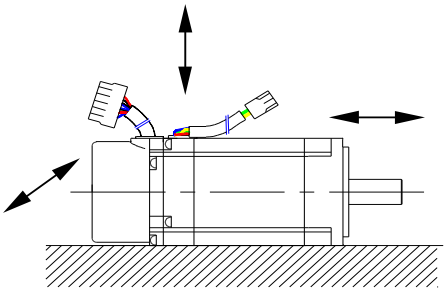
Item	Accuracy (T.I.R.)	Reference Diagram
Perpendicularity of flange attachment plane and output shaft (A)	0.04mm	
Eccentricity of flange fitting outer diameter (B)	0.04mm	
Vibration of shaft end (C)	0.02mm	

(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.

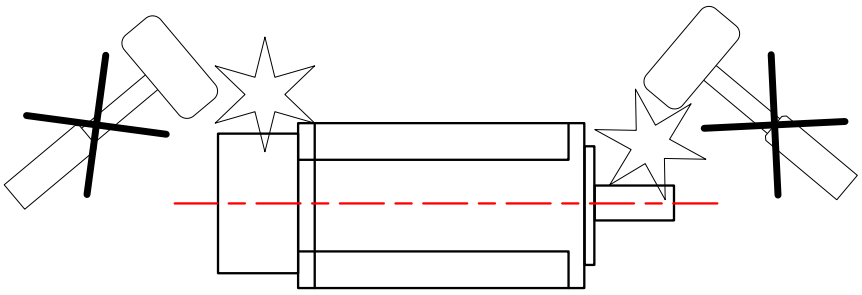
1.6. Handling

1.6.1. Handling precaution

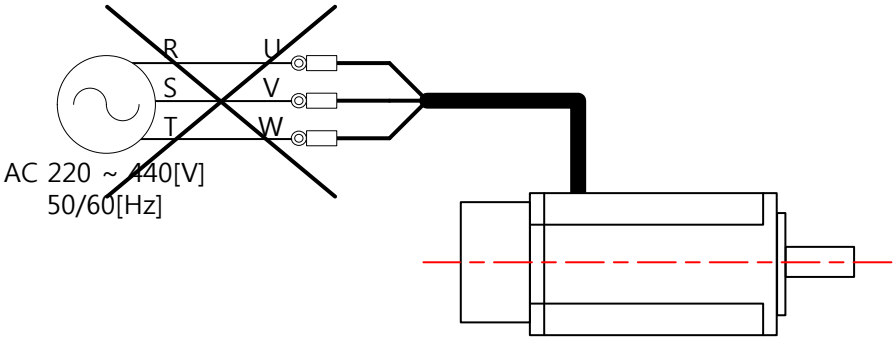
: Mishandling can lead to unexpected accidents or damage. The key items are listed as follows. Reference the related details and use the drive correctly.

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.

3) Operation

- The brake of the motor is intended to hold when the motor is powered off.
  If the brake is operated while the motor is rotating, the brake will be broken.
- Install circuit breaker(NFB) and magnetic contactor (M / C) to power supply R, S, T.
  When an alarm occurs and an abnormal current flows, cut off the circuit to prevent the secondary fire.

4) Maintenance

- “High Voltage” remains in the drive for some time after power down.

◆ Carry out wiring work or inspection after the power has been turned off for 10 minutes or more and the CHARGE lamp is turned off. It may cause electric shock.

- Do not touch the regenerative resistor, servo motor, etc. for a while after the power is turned off. It may cause burns.
- Mega-testing your drive may damage servo drive.
- The encoder of the motor cannot be removed. Never remove the cover, etc.

1.7. Safety Symbols and Cautions

Thank you for using HIGEN MOTOR Co.,Ltd. Servo Drive and Servo motor.

The contents of the "Symbols and Precautions on Safety" section are for the safe and proper use of FDA7000 Series AC servo drive. Before use, be sure to read the “Safety Symbols and Cautions” carefully before using the product.

“Safety Symbols and Precautions” describes important precautions that must be observed in the precautions for use, transportation and installation, wiring, commissioning and adjustment, maintenance checks, usage, and abnormalities. Please keep it where you can see it anytime.

General Precautions

- The user manual may be arbitrarily changed to improve the product, change specifications, or improve the convenience of use. This change updates the year and month of the user's manual and is issued as a revision.
- When ordering the instruction manual due to damage or loss, please contact our distributor or our nearest office listed on the back cover.
- Modification of the product by the customer is beyond the scope of our warranty and we are not responsible for it.
- Some ratings, specifications, and dimensions may change without notice to improve the performance of the product.

Safety Symbol

In order to use the product correctly and safely, the grades of safety and cautions are divided into `` Danger '' and `` Caution '', and they are collectively recorded.
The actual usage of this product and the safety precautions for each method are listed in each section.

⚠ Danger : **When a high risk of death or serious injury is expected due to incorrect handling of the product.**

⚠ Caution : **When a low risk of minor injury or property damage is expected due to incorrect handling of the product.**

*

A. Electric shock prevention

⚠ Danger
• Do not open the cover of servo drive while energizing and driving. It may cause electric shock. • Do not operate with the cover of servo drive removed. High voltage terminals and charging parts are exposed, which may cause electric shock • Do not remove the surface cover except wiring and regular inspections immediately after the power is turned off. The inside of servo drive is charged and may cause electric shock.. • Wait 10 minutes or more after turning off the power and check the charging lamp is turned off before wiring and checking. • Connect the ground terminal of the earth and the motor to the ground terminal of the drive with the shortest distance. Connect to Class 3 ground (100 ohm or less) to prevent electric shock and product malfunction. • Wiring and inspection should be done by a qualified technician. • Install the product before wiring. It may cause electric shock or injury. • Do not touch the servo drive with wet hands. It may cause electric shock or injury. • Damaged wires can result in electric shock. Do not place heavy objects on the wires or pull the wires forcibly.

B. Fire Protection

⚠ Caution
• Install the servo motor, servo drive and regenerative resistor on non-flammable materials. Installation on or near flammable materials may cause fire. • If the servo drive is broken, immediately turn off the power of the servo drive. If a large amount of current continues to flow, it may cause a fire. • If overload and overcurrent occur frequently, be sure to cool the servo motor and servo drive sufficiently before restarting. • If an overvoltage alarm occurs frequently, the regenerative resistor may overheat and cause a fire. If overvoltage alarms occur frequently or do not clear, immediately shut off power.

C. Injury prevention

⚠Caution
•Do not apply voltage to each terminal except those specified in the user's manual. It may cause bursting or damage. •Make sure there is no error in the terminal connections. It may cause bursting or damage. •Do not touch the servo drive, servo motor, and regenerative resistor because they are hot during powering and shortly after the power is turned off. It may cause burns.

D. Various Precautions

Please read the following notes carefully. If handled incorrectly, it may cause unexpected malfunction, injury or electric shock.

(1) Carrying, installation

⚠Caution
•Carry it in the correct way, depending on the weight of the product. It may cause injury. •Do not stack the servo drive above the limit. •Install the product where it can withstand weight. •Do not install or operate a servo drive that is damaged or missing parts. •Do not lift the surface cover when transporting. The product may fall off or malfunction. •Do not rest your weight on, or place heavy objects on the product. •Observe the installation direction. •Do not insert any conductive material such as screws or metal pieces and flammable foreign materials such as oil into the servo drive. •Since the servo drive is a precision device, do not drop it or subject it to strong impact. •Do not strike the encoder, the detector attached to the motor. If you hit the shaft with strong force or the motor falls to the floor, the encoder may be damaged. •Use in the environmental conditions of Note 1. If operating in unsatisfactory condition, it may cause malfunction or failure of servo drive.

<Note 1>

Environment	Operating temperature	0℃~ +50℃ (Where not to freeze) (In-cabinet temperature specification below + 40 ° C)
	Operating humidity	90%RH or below (No condensation)
	Storage temperature	-15℃~ +65℃*
	Installation conditions	Indoors (no corrosive gas, flammable gas, oil mitt, dust free place)
	Elevation / Vibration	1000m or less above sea level / Within X, Y, Z axis 2.0G

(2) Wiring

⚠ Caution
•Use wires that meet the specifications. The servo motor may not work. •Do not install a phase advance capacitor, surge absorber, or radio noise filter on the servo drive output side. •Connect the output side (terminal U, V, W, FG) correctly. The motor may malfunction. •When attaching the DC relay for control output signal to the control output signal, pay attention to the direction of the surge absorption diode. The signal cannot be output due to a fault, and the protection circuit does not operate during an emergency stop. Refer to the instruction manual for the diode direction.

(3) Commissioning and Adjustment

⚠ Caution
•Check and adjust each parameter before operation. Unexpected movements may occur depending on the machine.

(4) How to use

⚠ Caution
•Install circuit brakes(NFB) and magnetic contactors (M/C) to power supply R, S, T. When an alarm occurs and an abnormal current flows, shut off the circuit to prevent secondary accidents. •Do not start or stop the servo drive frequently using the magnetic contactor on the power supply side. It may cause the failure of the servo drive. •Reduce the effects of electromagnetic interference with a noise filter, etc. It may cause the failure of electronic equipment used near the servo drive. •Do not use any load other than the servo motor on the servo drive output. Connecting other electrical equipment to the servo drive output may damage the equipment. •If the alarm reset is performed while the operation signal is input, the motor will suddenly rotate, so check that the operation signal is off and then reset the alarm. •In case of operating the servo drive after long term storage, check and commission. •When parameter initialization is performed, each parameter is set to the factory default value. Be sure to set the necessary parameters before operating. •Do not modify the servo motor and servo drive. We are not responsible for any problems caused by modifications. •Install an external emergency stop circuit to stop the operation immediately and to turn off the power.

(5) Abnormal operation protection

⚠ Caution
•Install a safety device such as an emergency brake so that the mechanical device does not become dangerous when the servo drive fails. •Do not disassemble or repair the servo drive or servo motor by yourself. •Use a servo motor that matches the capacity of the servo drive.

(6) Maintenance check. Parts exchange

⚠ Caution
•Electrolytic capacitors have a reduced capacity due to deterioration. It is recommended to replace the electrolytic capacitor every 10 years when using it in a normal environment to prevent secondary accidents caused by malfunctions. Please contact our sales team. •Do not perform a mega test (insulation resistance measurement) on the servo drive. It may cause failure.

(7) Waste disposal

⚠ Caution
•Dispose of as general industrial waste.

(8) Caution

⚠ Caution
•All illustrations in this manual are depicted with the cover removed for safety, or the safety barrier removed. When operating the product, make sure that the cover and the obstruction are intact. Please drive accordingly.

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.

Chapter 2. Wiring and connection

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.

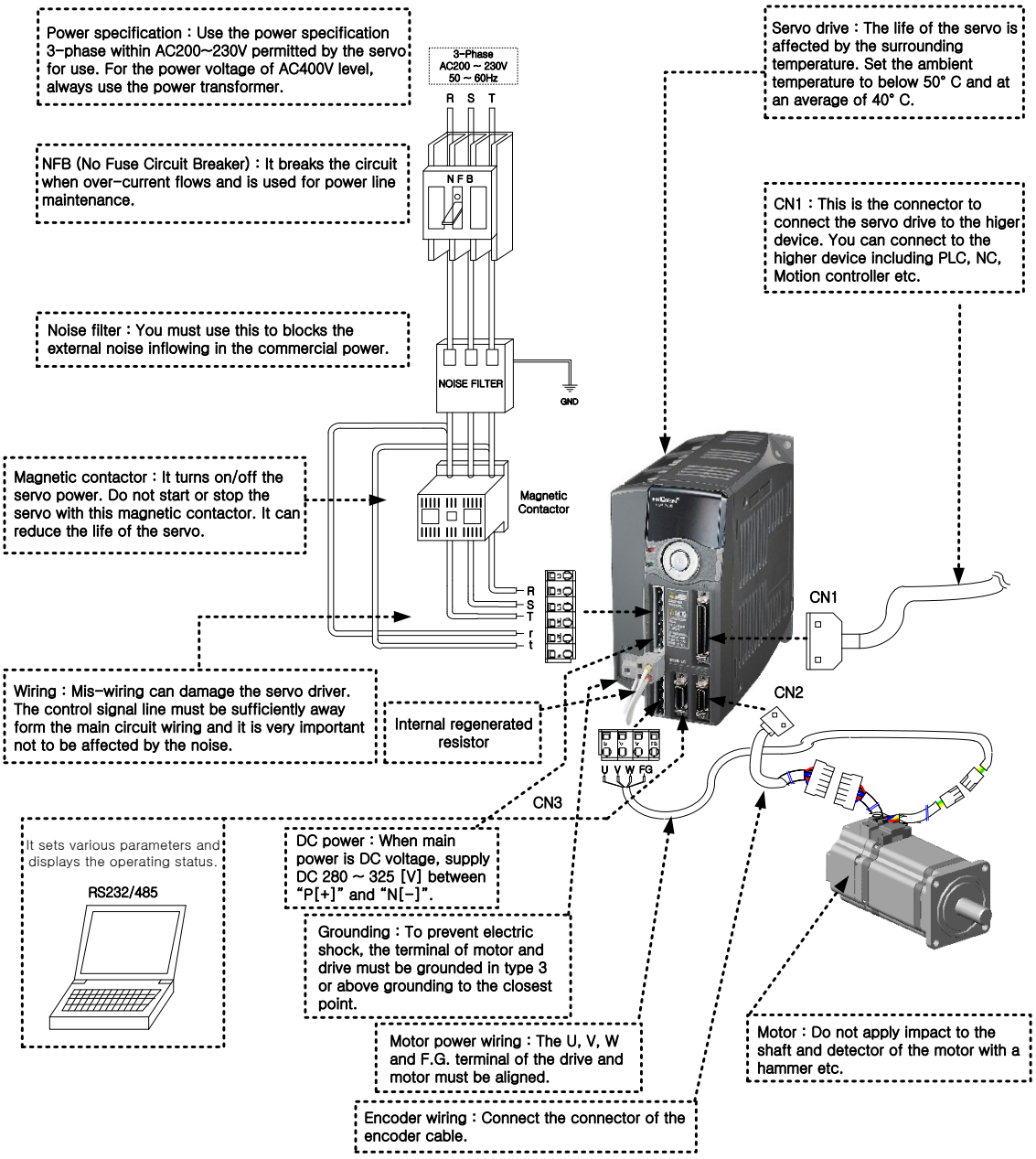
⚠ Danger

- 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 again 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. Connection of AC220V Series



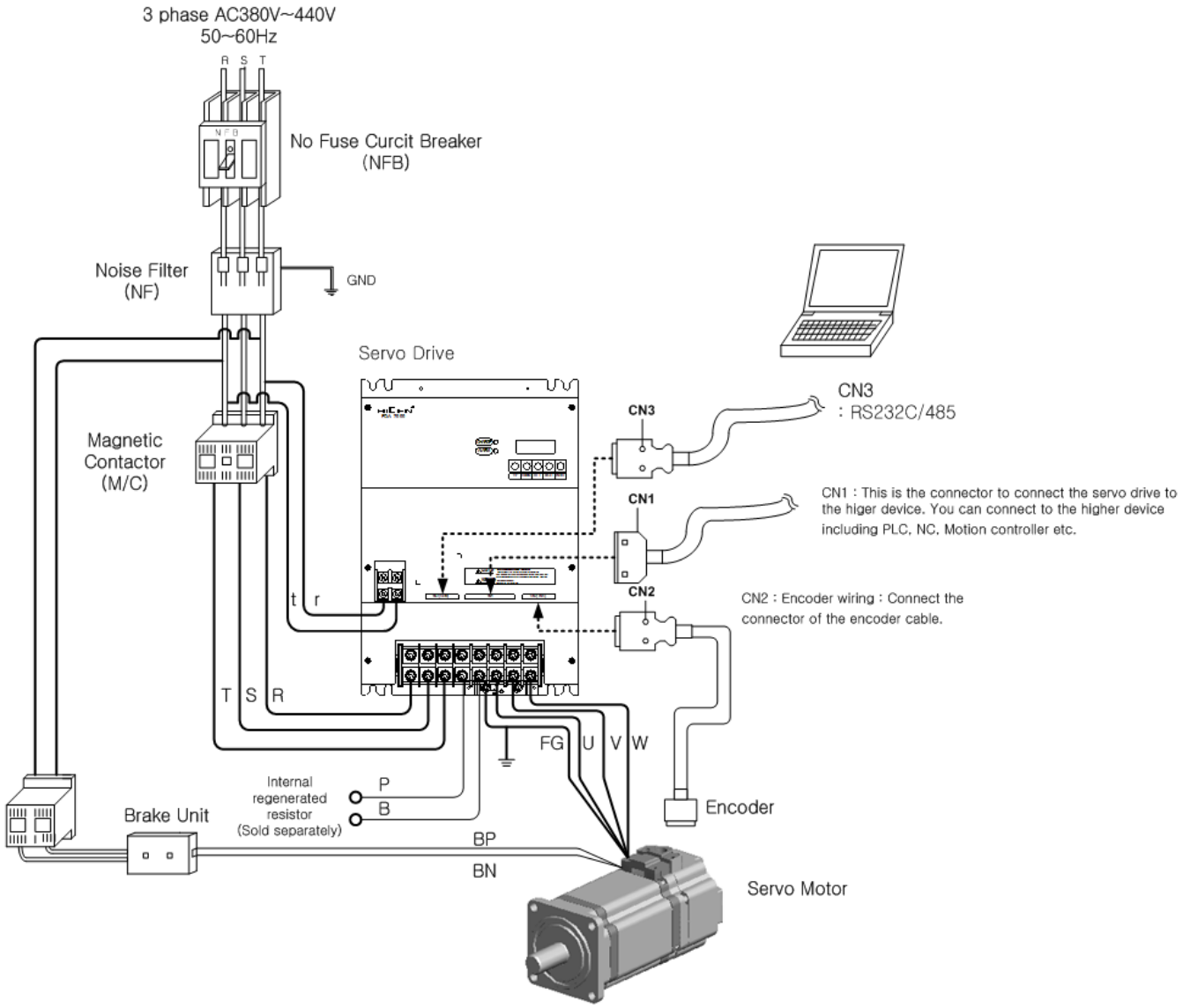
◆ **At the U, V and W terminal, connect the U, V and W phase of the servo motor.**

◆ **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[-]". (FDA7001 ~ FDA7010)**

◆ **Don't supply AC power supply between "P[+]" and "N[-]".**

2.1.2. Connection of AC380V Series



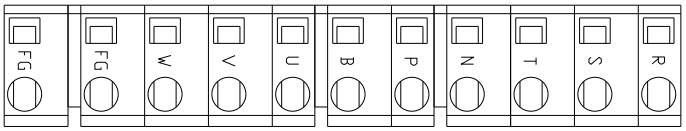
◆ **Use within the power specification allowed by the servo. If the power voltage is higher than the allowable value, be sure to use a power transformer.**
FDA7000-H0 : AC 380V, FDA7000-H1 : AC 440V

◆ **Use the brake power supply independently. When used with input / output contact input power, it causes malfunction of contact operation.**

◆ **To prevent electric shock and suppress noise, ground the motor and drive terminals with the 3rd or more types of ground at the shortest distance.**

2.2. Connection terminal of AC220V Series servo drive

2.2.1. Small type servo drive



[FDA7001 ~ FDA7002 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[-]".

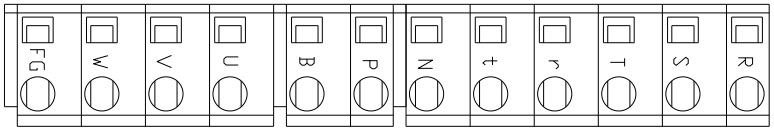
6) Don't supply AC power between "P[+]" and "N[-]".

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	P3B4010-DA(10A) level product	
External regenerated resistance	50W 50Ω	

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

♥ NOISE FILTER : Woonyoung(http://woonyoung.com), OKY (http://www.oky.co.kr), ORIENT(http://www.suntronix.com)

2.2.2. Medium type servo drive



[FDA7004/7004B ~ FDA7010 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	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	P3B4010-DA(10A) level product			NFZ-4030SG (30A)level product
Regenerated resistance	50W 50Ω External resister	70W 50Ω Internal resister		

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

♥ NOISE FILTER : Woonyoung(http://woonyoung.com), OKY (http://www.oky.co.kr), ORIENT(http://www.suntronix.com)

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

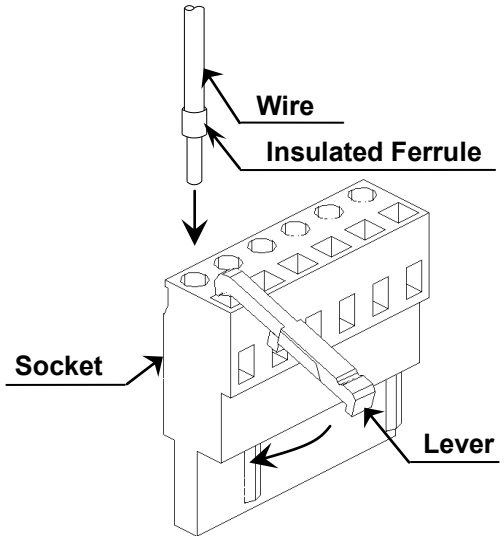
ⓐ After checking the wire thickness indicated in 2.2.1, remove the wire coating.

- 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	ϕ0.5 ~ ϕ0.8[mm]
Twisted wire	AWG28 ~ AWG12

ⓑ 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.

ⓒ Open the terminal (plug) wire inserting hole with the lever as shown in the following picture.

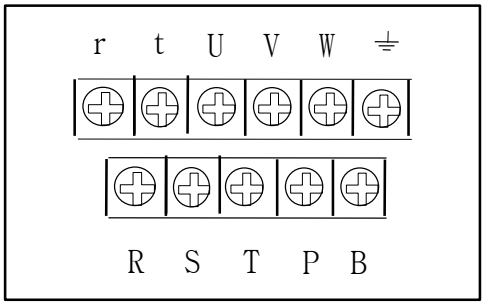


ⓓ Insert the core part of the wire to the opening part. Release the lever after inserting the wire.

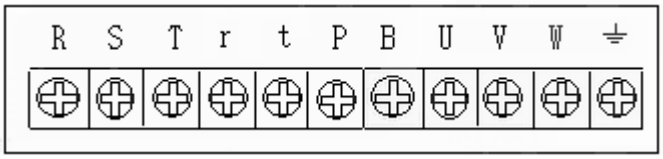
ⓔ Lightly pull it out to see whether there is any problem in the connected condition of the socket and the wire.

ⓕ When the coating of the wire is not completely inserted, it can cause electric shock. Therefore check whether there are any exposed core wires.

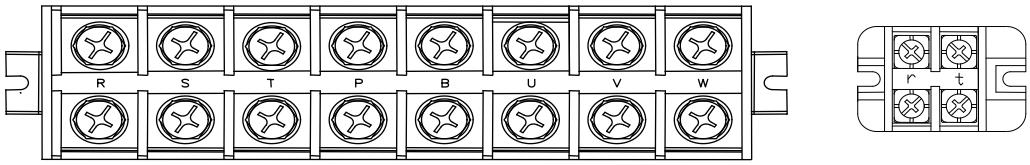
2.2.3. Large type servo drive



[FDA7015 ~ FDA7045 Terminal]



[FDA7015B ~ FDA7030B Terminal]



(a) Main Circuit Terminal (b) Control Circuit Terminal

[FDA7075 ~ FDA7150 Terminal]

The usage and wiring method of FDA7015~7150, FDA7015B~7030B 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.

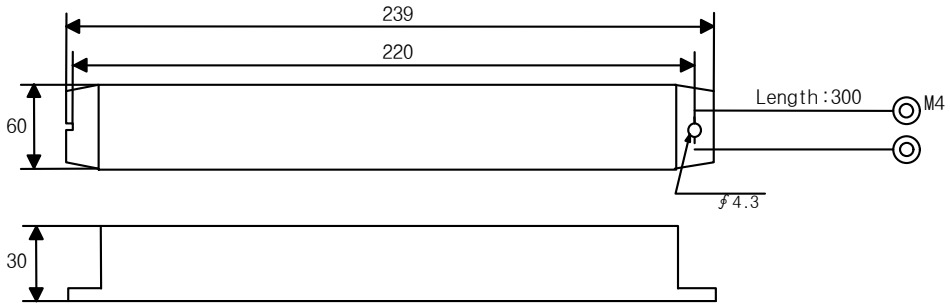
4) At the U, V and W terminal, connect the U, V and W phase of the servo motor.

5) Ground the FG terminal. Connect the grounding wire of the servo motor with this terminal.

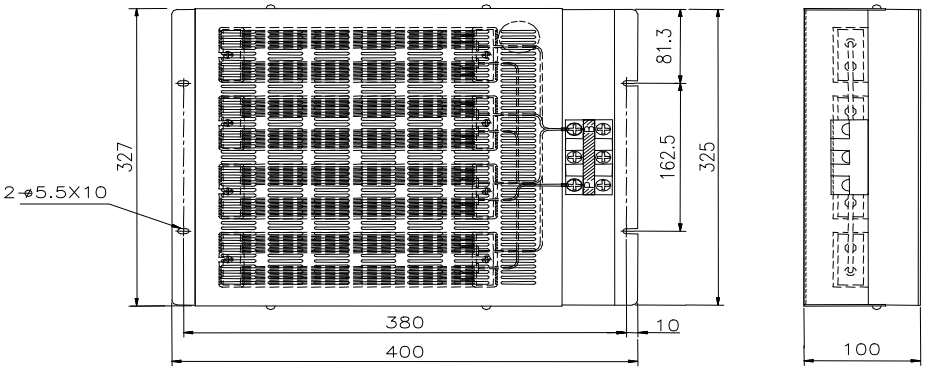
AC SERVO operating device	FDA7015/ FDA7015B	FDA7020/ FDA7020B	FDA7030/ FDA7030B	FDA7045	FDA7075	FDA7110	FDA7150
Wire thickness	AWG #12 (3.5mm^2)		AWG #10 (5.5mm^2)		AWG #8 (8mm^2)	AWG #6 (14mm^2)	AWG #4 (22mm^2)
Open/close device	GMC-40(35A)		GMC-50(50A)		GMC-85(80A)		GMC-100(100A)
Breaker	ABS33b (10A)	ABS33b (20A)	ABS33b(30A)		ABS53b (50A)	ABS63b (60A)	ABS103b(100A)
Noise filter	NFZ-4030SG(30A)			NFZ4040 SG(40A)	FT3RE-4060 (60A)		FT3RE-4080 (80A)
External regenerated resistance	250W 25Ω (Drawing A)	250W 25Ω parallel 2 units (Drawing A)			250W 25Ω parallel 4 units (Drawing B)	800W 8Ω parallel 2 units (Drawing C)	1kW 6Ω parallel 2 units (Drawing C)

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

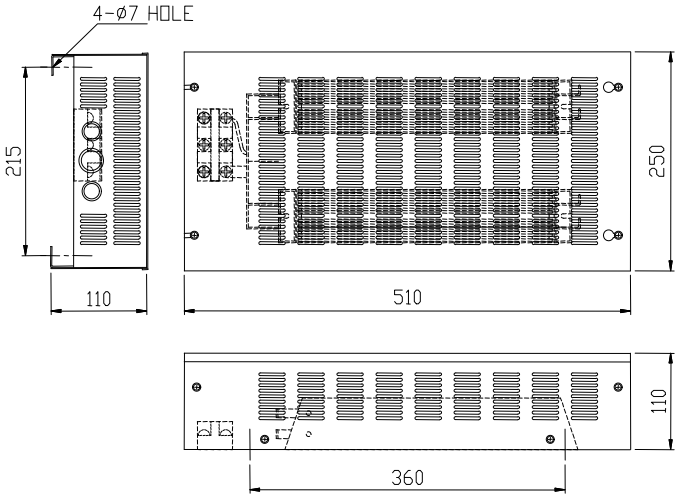
♥ NOISE FILTER : Woonyoung(http://woonyoung.com), OKY (http://www.oky.co.kr), ORIENT(http://www.suntronix.com)



<Drawing A>



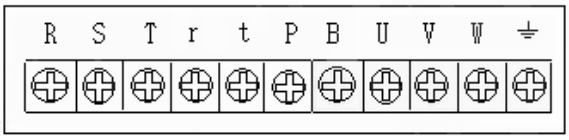
<Drawing B> Order Code : FDA500010S(1000W/6.25Ω)



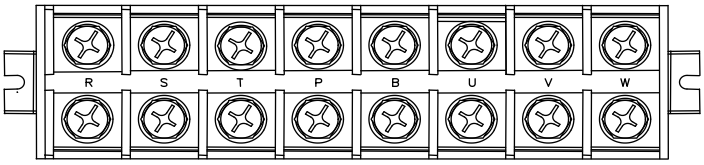
<Drawing C> Order Code : FDA600010S (FDA7110, 1600W/4 Ω)
FDA600011S (FDA7150, 2000W/3 Ω)

2.3. Connection terminal of AC380V series servo drive

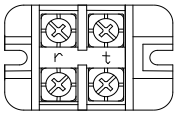
2.3.1. Large type servo drive



[FDA7020-H ~ FDA7045-H Terminal]



(a) Main Circuit Terminal



(b) Control Circuit Terminal

[FDA7075-H ~ FDA7150-H Terminal]

The usage and wiring method of FDA7020-H~FDA7150-H are as follows.

1) As the main power of the power circuit, connect the R,S and T terminal to 3 phase AC380~440[V]. Please check the voltage specifications before wiring the power.

2) Connect single-phase AC380~440[V] to the control circuit terminals r and t according to the model's voltage specification.

3) Connect the regenerated resistance between the terminals P and B.

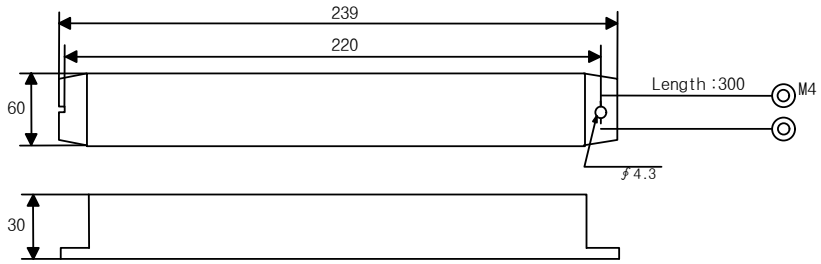
4) At the U, V and W terminal, connect the U, V and W phase of the servo motor.

5) Ground the FG terminal. Connect the grounding wire of the servo motor with this terminal.

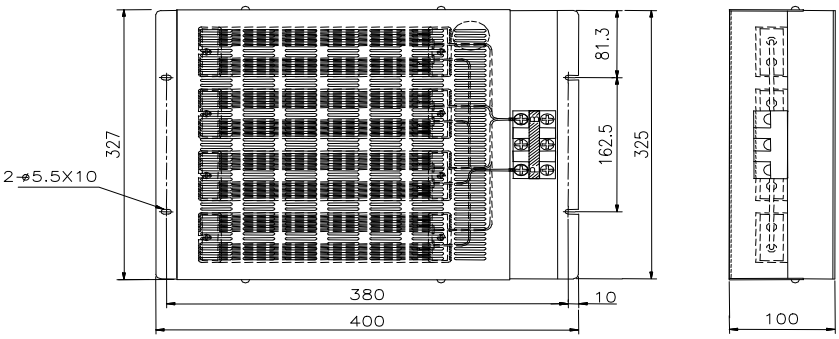
AC SERVO operating device	FDA7020-H	FDA7030-H	FDA7045-H	FDA7075-H	FDA7110-H	FDA7150-H
Wire thickness	AWG #12 (3.5mm^2)	AWG #11 (4.2mm^2)		AWG #8 (8mm^2)	AWG #6 (14mm^2)	AWG #4 (22mm^2)
Open/close device	GMC-12 (13A)	GMC-40(35A)		MC-40(40A)		MC-50(50A)
Breaker	ABS33b (10A)	ABS33b (20A)		ABS53b (40A)		ABS53b (50A)
Noise filter	ET3RE-4030 (30A)			ET3RB-4040		ET3RB-4060
External regenerated resistance	250W 40Ω (Drawing A)	250W 40Ω parallel 2 units (Drawing A)		1.6kW 15Ω (Drawing C)		2kW 15Ω (Drawing C)

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

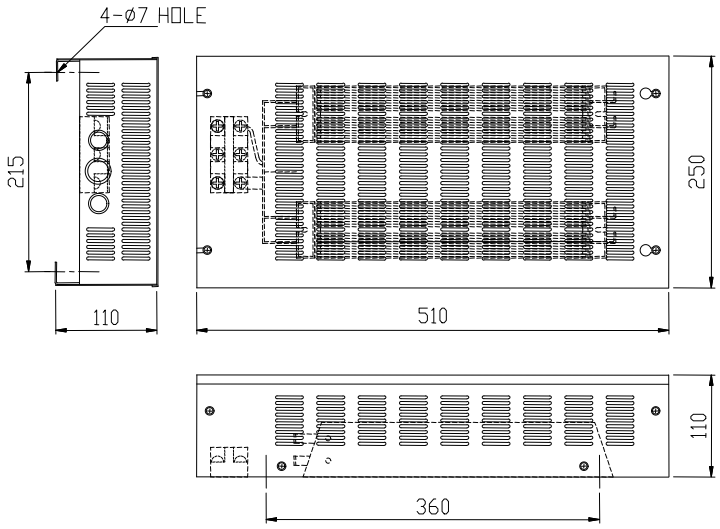
♥ NOISE FILTER : Woonyoung(http://woonyoung.com), OKY (http://www.oky.co.kr), ORIENT(http://www.suntronix.com)



< Drawing A>

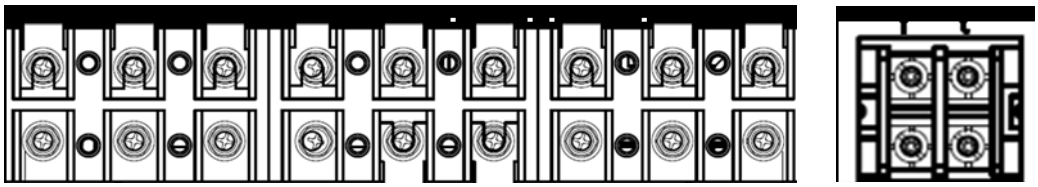


< Drawing B> Order Code : FDA500010S(1000W/6.25Ω)



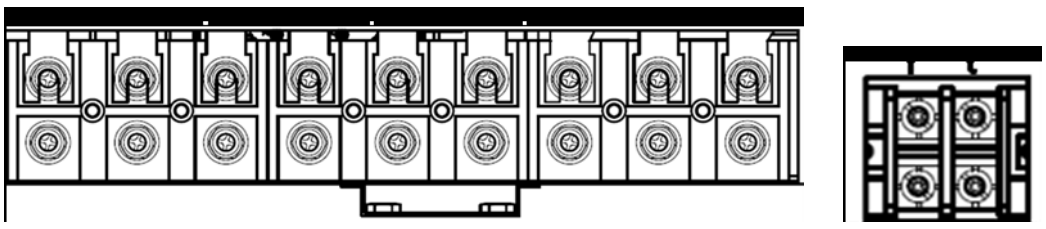
< Drawing C> Order Code : FDA600010S (FDA7110, 1600W/4 Ω)
FDA600011S (FDA7150, 2000W/3 Ω)

2.3.2. Extra large type servo drive



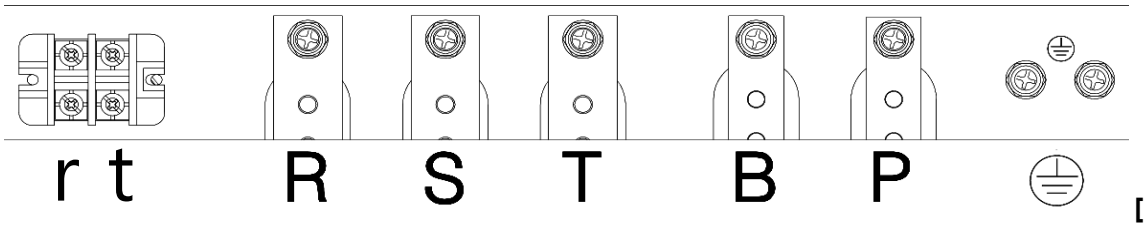
(a) Main Circuit Terminal (b) Control Circuit Terminal

[FDA7220-H Terminal]

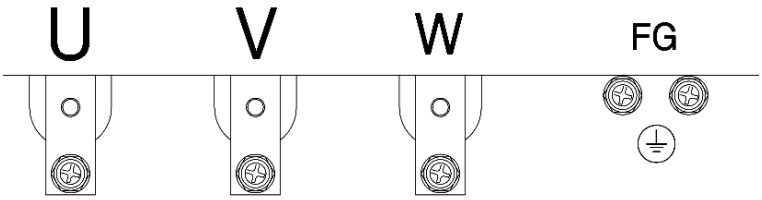


(a) Main Circuit Terminal (b) Control Circuit Terminal

[FDA7300-H ~ FDA7450-H Terminal]



FDA7550-H ~ FDA7750-H Upper Terminal]



[FDA7550-H ~ FDA7750-H Bottom Terminal]

The usage and wiring method of FDA7220-H ~ FDA7750-H are as follows.

1) As the main power of the power circuit, connect the R,S and T terminal to 3 phase AC380~440[V]. Please check the voltage specifications before wiring the power.

2) Internal fan power is connected to R and T terminals.

3) Connect single-phase AC380~440[V] to the control circuit terminals r and t according to the model's voltage specification.

4) Connect the regenerated resistance between the terminals P and B.

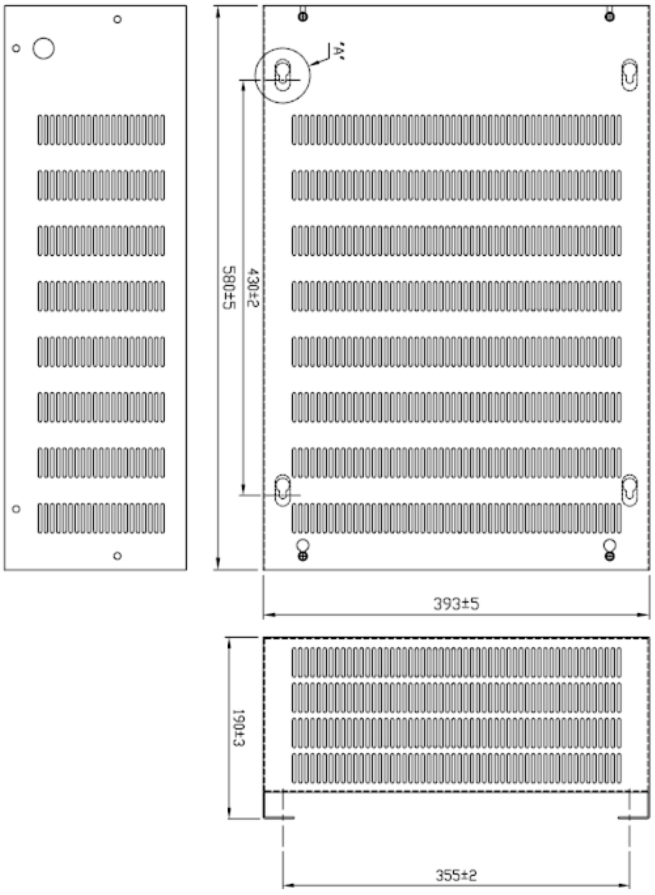
5) At the U, V and W terminal, connect the U, V and W phase of the servo motor.

6) Ground the FG terminal. Connect the grounding wire of the servo motor with this terminal.

AC SERVO operating device	FDA7220-H	FDA7300-H	FDA7370-H	FDA7450-H	FDA7550-H	FDA7750-H
Wire thickness	AWG #6 (14mm^2)	AWG #4 (22mm^2)	AWG #3 (27mm^2)	AWG #2 (34mm^2)	AWG #1/0 (53.5mm2)	AWG #2/0 (67.4mm^2)
Open/close device	MC-65a	MC-80a	MC-100a	MC-130a	GMC-150	GMC-180
Breaker	ABS63b (60A)	ABS103b (75A)	ABS103b (100A)	ABS203b (175A)	ABS-203b (175A)	ABS423b (200A)
Noise filter	FT3RB-4060	FT3RB-4080	FT3RB-4100	FT3RB-4120	FB3RE-4150	FB3RE-4200
External regenerated resistance	3.6kW, 9 Ω (Drawing D)		5kW 5Ω (Drawing D)		5kW 5Ω (Drawing D)	10kW 5Ω (Drawing D)

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

♥ NOISE FILTER : Woonyoung(http://woonyoung.com), OKY (http://www.oky.co.kr), ORIENT(http://www.suntronix.com)



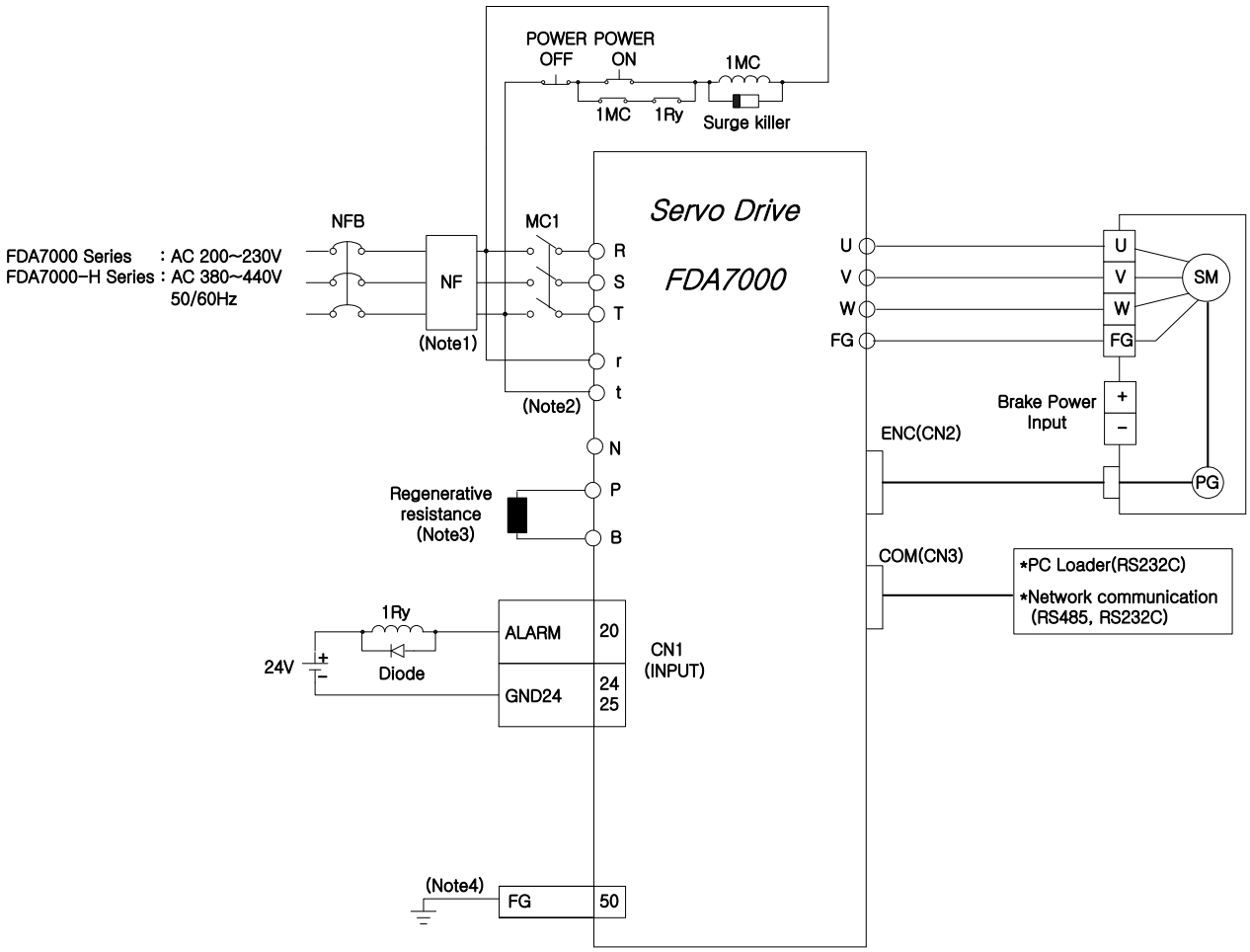
< Drawing C> Order Code : Please contact our sales office.

2.4. Power handling

2.4.1. Wiring

If you turn the power on and off frequently, the peripheral elements of the main circuit will deteriorate because a large charging current (charging time 0.3 to 0.5 seconds) flows when the main power is turned on. Therefore, be sure to use STOP contact for motor operation and stop, and SVONEN contact for emergency stop.

The figure below is an example of wiring of power



(Note1) A noise filter (NF) must be installed to block noise from the outside and to protect the servo drive peripherals.

(Note2) In case of FDA7001~7002, it is not necessary to connect power to the power terminals "r, t" of the control circuit.

In case of FDA7004~7150, connect AC220V to power terminal “r, t” of control circuit.

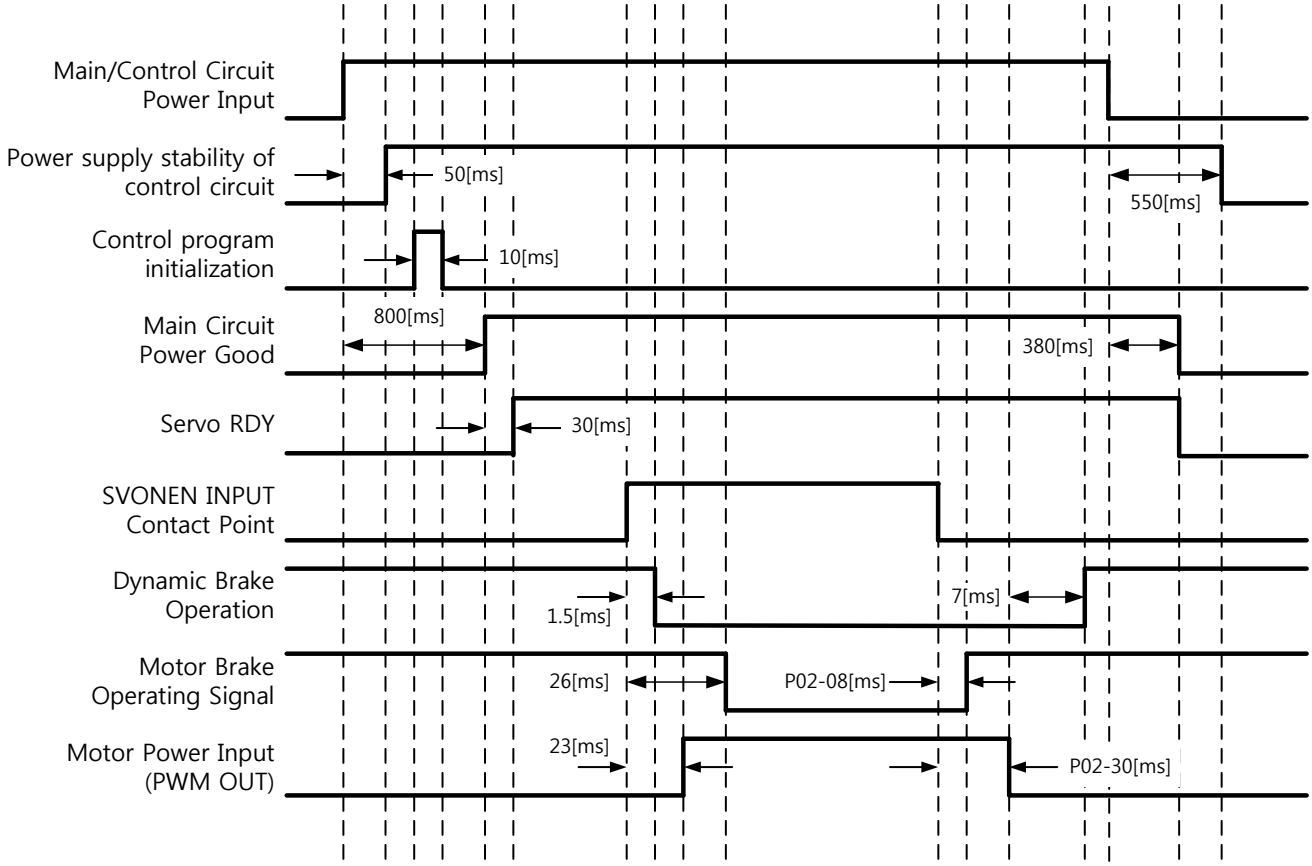
In case of FDA7004, connect AC220V to power terminal “r, t” of control circuit according to model. Be sure to check the power specification of the model.

(Note3) In case of FDA7004 ~ FDA7010 model, regenerative resistor is installed inside servo drive. In case of For FDA7015-7150 and FDA7020-H~7750-H, the regenerative resistor must be installed externally. In case of FDA7075 ~ 7150, FDA7075-H ~ 7750-H, please contact our sales office because regenerative resistance is sold separately.

(Note4) Be sure to ground the ground wire of CN1 cable to FG (Frame Ground) terminal.

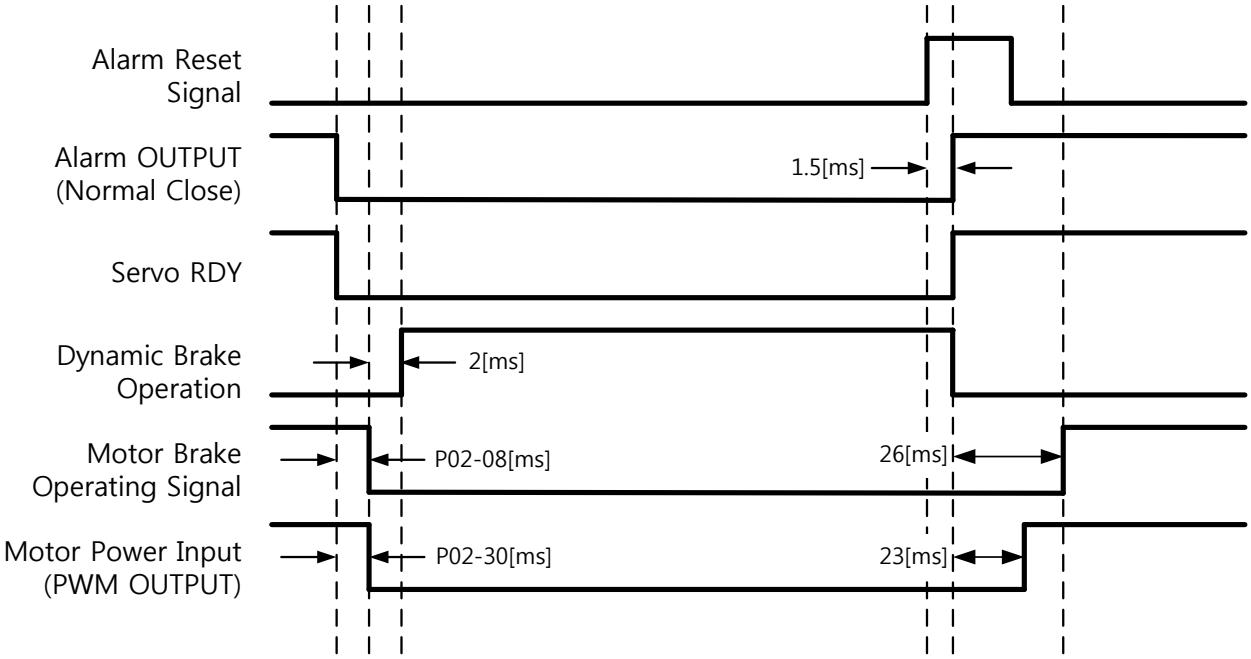
2.4.2. Timing chart of power

The timing of servo drive operation can be checked according to the power on / off and SVONEN input contact status. Check the operation timing when wiring the power and brake.



2.4.3 Timing chart of alarm

The timing of servo drive operation can be checked according to the alarm status. If an alarm has occurred, reset the alarm after turning off the SVONEN input contact and removing the cause of the alarm.



2.5. CN1 I/O signal explanation

2.5.1. CN1 terminal arrangement

CN1 is the connector located on the top right part of the front side of the servo drive. 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	OPCRIN
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	OPC_ZO
25	GND24

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

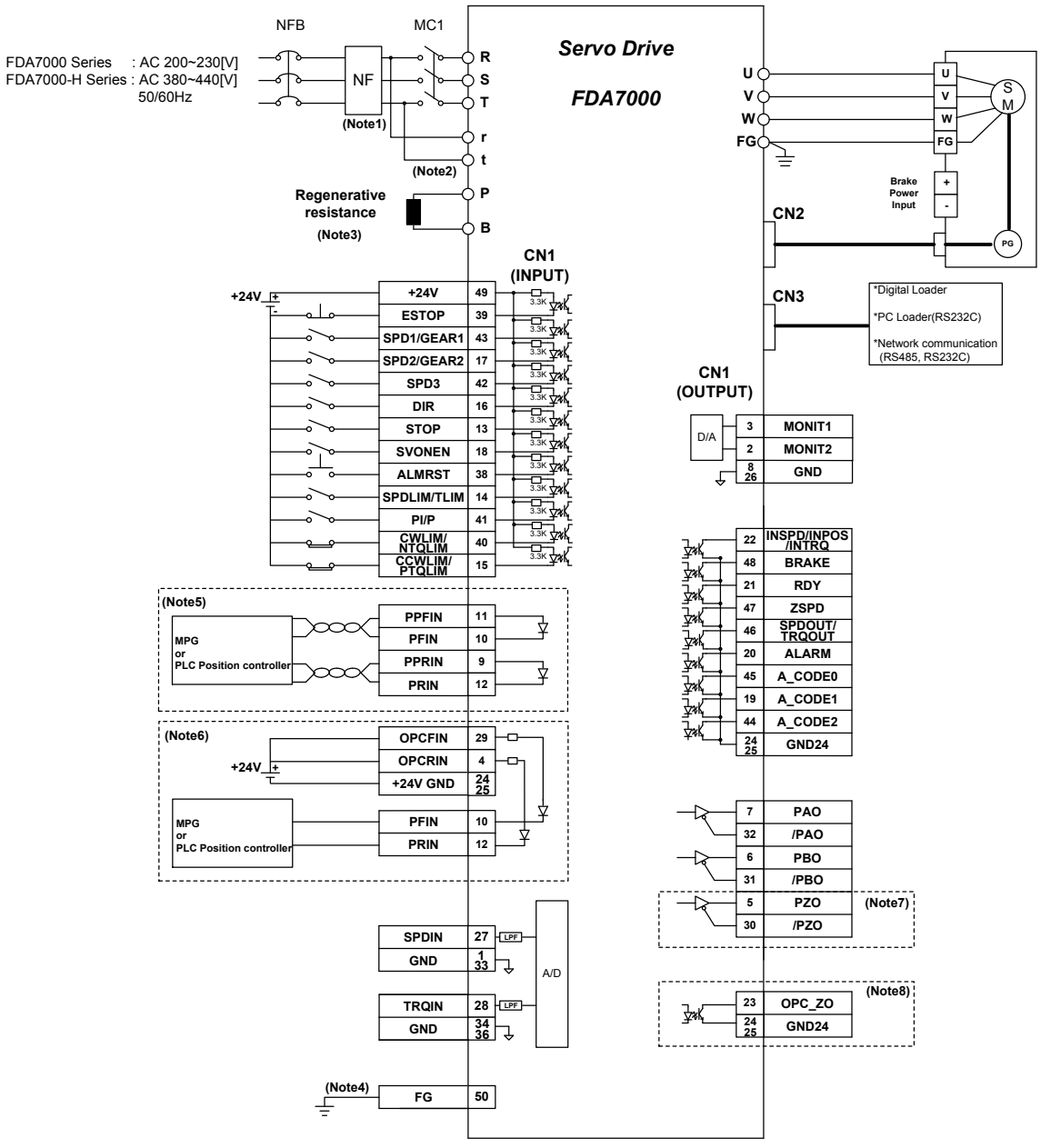
26	GND
28	TRQIN
30	/PZO
32	/PAO
34	GND
36	GND
38	ALMRST
40	CWLIM/ NTQLIM
42	SPD3
44	A_CODE2
46	SPDOUT/ TRQOUT
48	BRAKE
50	FG

♥ 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

2.5.2. CN1 I/O wiring



(Note1) A noise filter (NF) must be installed to block noise from the outside and to protect the servo drive peripherals.

(Note2) In case of FDA7001~7002, it is not necessary to connect power to the power terminals "r, t" of the control circuit. In case of FDA7004~7150, connect AC220V to power terminal “r, t” of control circuit. In case of FDA7004, connect AC220V to power terminal “r, t” of control circuit according to model. Be sure to check the power specification of the model.

(Note3) In case of FDA7004 ~ FDA7010 model, regenerative resistor is installed inside servo drive. In case of For FDA7015-7150 and FDA7020-H~7750-H, the regenerative resistor must be installed externally. In case of FDA7075 ~ 7150, FDA7075-H ~ 7750-H, please contact our sales office because regenerative resistance is sold separately.

(Note4) Be sure to ground the ground wire of CN1 cable to FG (Frame Ground) terminal.

(Note5) This is the wiring when position command pulse is connected by line drive method.

(Note6) This is the wiring when connecting position command pulse with open collector method.

(Note7) This is the wiring when connecting Z phase pulse with line drive method..

(Note8) This is the wiring method when connecting Z phase pulse with open collector method.

(Note9) GND24 (CN1-24, 25) and GND (CN1-1, 8, 26, 33, 34, 36) must be connected separately. If two grounds are connected in common, the servo drive may malfunction or break down.

2.5.3. Input signal function table (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.

2.5.4. Output signal function table (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/INPOS/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.

2.5.5. Fixed I/O signal function table

Signal content	Name	Pin no.	Function and usage explanation
F+ input pulse F- input pulse R+ input pulse R- input pulse	PPFIN PFIN PPRIN PRIN	11 10 9 12	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.
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.
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.

2.5.6. Analog input/output signal

The analog signal is based on 0 [V] (GND terminal) of the control circuit power supply. Connect the GND terminal of the analog signal and the GND terminal of CN1. The analog speed command input (CN1-27) rotates the motor at the speed determined by the ± Analog 10 [V] Speed(P03-15, 16) menu. When +10 [V] is input, it rotates at the speed set in P03-15 in the forward direction (CCW), and when -10 [V] is input, it rotates at the speed set in P03-16 in the reverse direction (CW). The analog torque limit input (CN1-28) is activated when the analog torque limit function (CN1-14) input contact turns on.

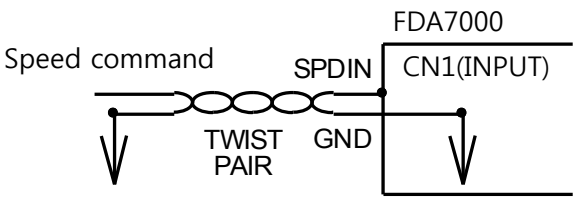
The analog torque limit value can be set in analog 10 [V] torque (P06-07). The torque limit command input uses the absolute value of the voltage, so it is the same as the operation at 10 [V] even at -10 [V]. When wiring analog signals, twist the GND and signal lines using twisted pair wires to minimize the influence of noise. The functions of each analog signal are shown in the table below.

PIN	SPDIN (CN1-27)	TRQIN (CN1-28)	MONIT1 (CN1-3)	MONIT2 (CN1- 2)
Function	Speed command*1 Speed limit*2 -10 ~ 10[V] Input	Torque command*1,*3 Torque limit*2 -10 ~ 10[V] Input	Monitor out 1 -5 ~ +5 [V] Output	Monitor out 2 -5 ~ +5 [V] Output

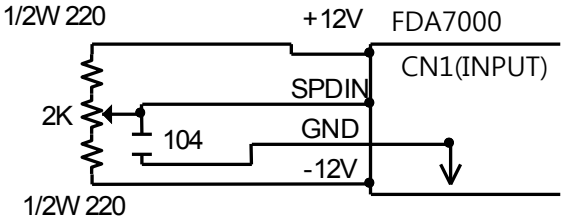
*1 : Speed control mode, *2 : Torque control mode, *3 : Position control mode

In order to apply speed command, speed limit, torque limit and torque command with variable resistor, ± 12 [V] power is supplied through CN1 connector. The output capacity of this power supply is 30 [mA] maximum. Do not exceed the maximum output capacity. The pin assignments of the power supply are shown in the table below.

PIN	+ 12 V (CN1-35)	- 12 V (CN1-37)	GND (CN1-1,8,26,33,34,36)
Function	+ 12 [V]	- 12 [V]	0 [V]



[Wiring of analog command]



[Wiring of CN1 power]

2.6. Encoder wiring and signal explanation

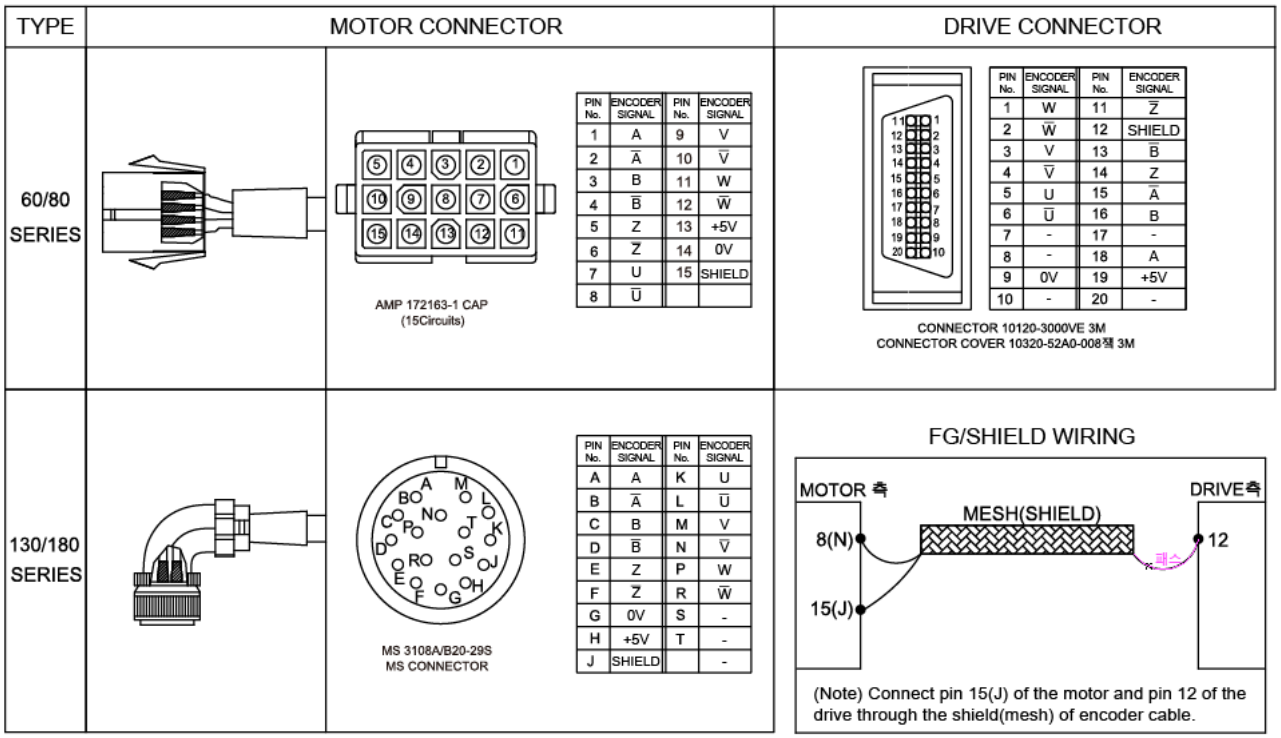
CN2 is the connector located on the bottom right side of the front cover of the servo drive. This connector is used for connecting the servo drive and the encoder of the servo motor. The PIN arrangement shown from the connector in the user's point of view is as follows. The encoder signals may differ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

◆ Connector for CN2 is optional.

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

◆ Cable specification : AWG24 X 9Pair TWIST, SHIELD CABLE(Maximum length 20m)
: AWG22 X 9Pair TWIST, SHIELD CABLE(Maximum length 30m)

2.6.1. 15line Incremental encoder



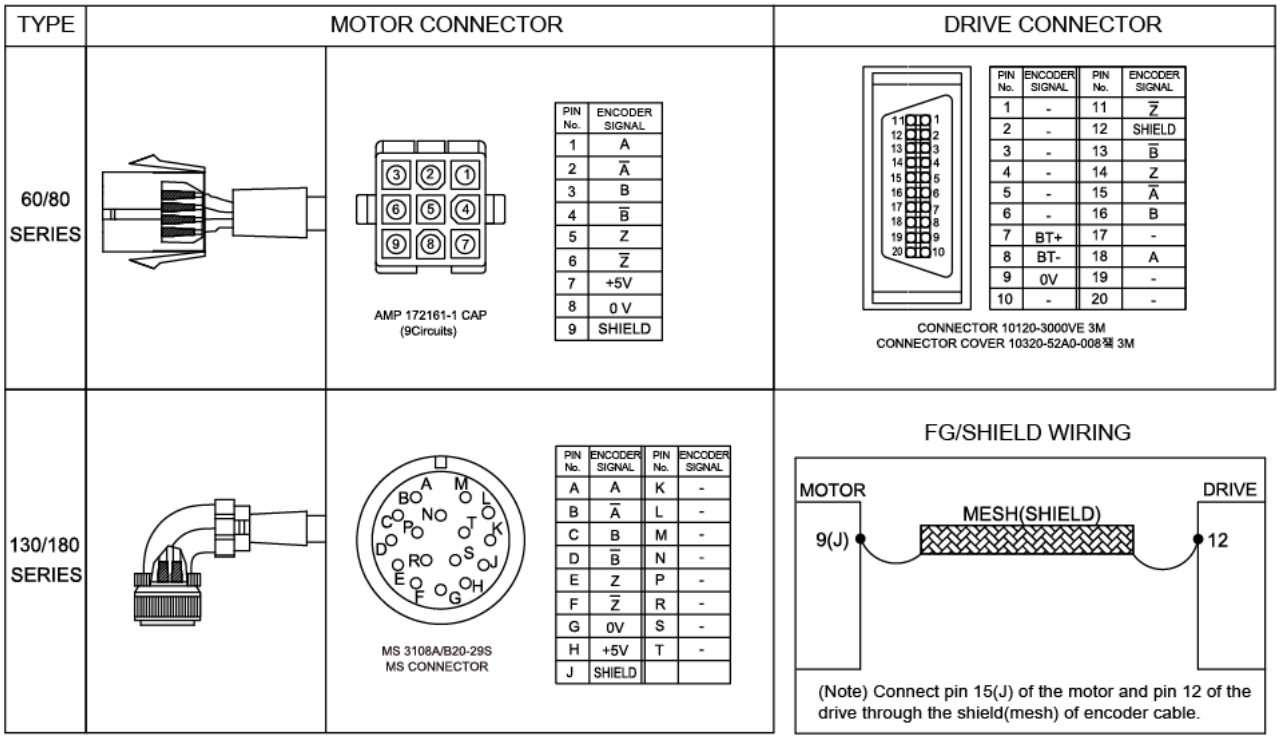
PIN No.	ENCODER SIGNAL	PIN No.	ENCODER SIGNAL
1	A	9	$\overline{V}$
2	$\overline{A}$	10	$\overline{V}$
3	B	11	W
4	$\overline{B}$	12	$\overline{W}$
5	Z	13	+5V
6	$\overline{Z}$	14	0V
7	U	15	SHIELD
8	$\overline{U}$		

PIN No.	ENCODER SIGNAL	PIN No.	ENCODER SIGNAL
1	W	11	$\overline{Z}$
2	$\overline{W}$	12	SHIELD
3	V	13	$\overline{B}$
4	$\overline{V}$	14	Z
5	U	15	$\overline{A}$
6	$\overline{U}$	16	B
7	-	17	-
8	-	18	A
9	0V	19	+5V
10	-	20	-

PIN No.	ENCODER SIGNAL	PIN No.	ENCODER SIGNAL
A	A	K	U
B	$\overline{A}$	L	$\overline{U}$
C	B	M	V
D	$\overline{B}$	N	$\overline{V}$
E	Z	P	W
F	$\overline{Z}$	R	$\overline{W}$
G	0V	S	-
H	+5V	T	-
J	SHIELD		-

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

2.6.2. 9line Incremental encoder



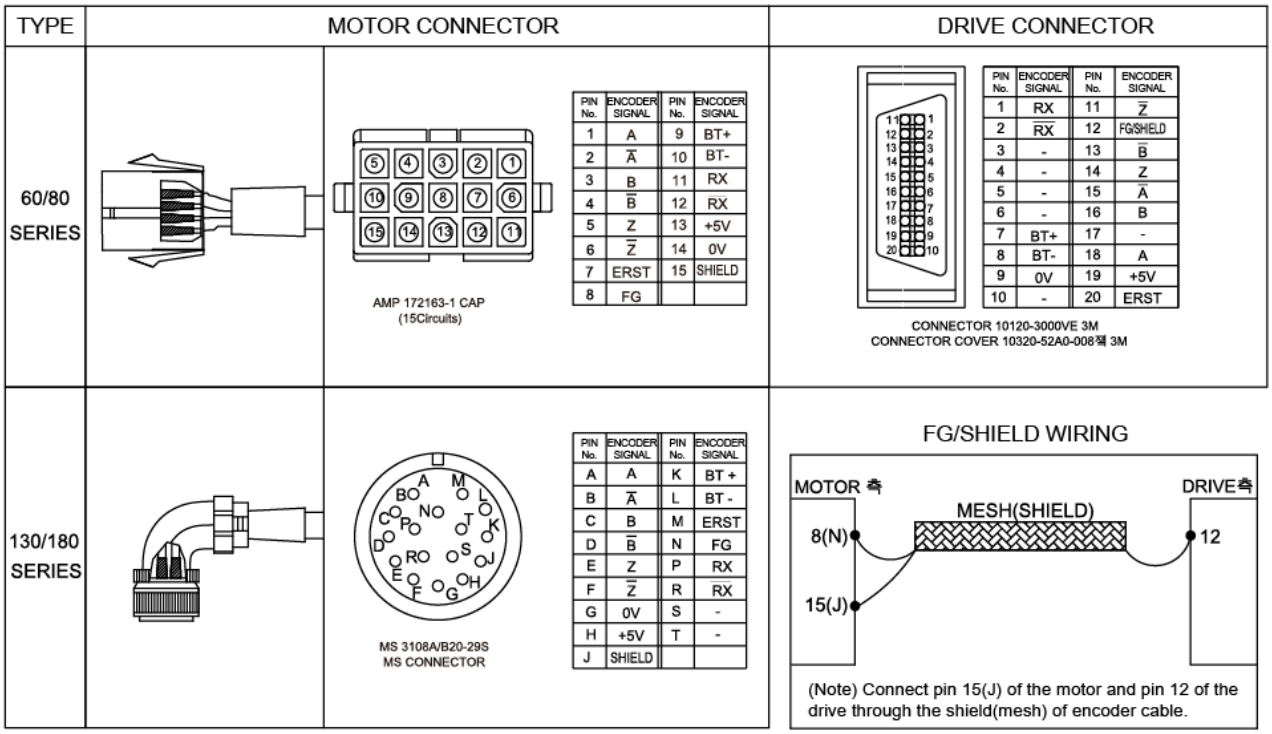
PIN No.	ENCODER SIGNAL
1	A
2	$\overline{A}$
3	B
4	$\overline{B}$
5	Z
6	$\overline{Z}$
7	+5V
8	0 V
9	SHIELD

PIN No.	ENCODER SIGNAL	PIN No.	ENCODER SIGNAL
1	-	11	$\overline{Z}$
2	-	12	SHIELD
3	-	13	$\overline{B}$
4	-	14	Z
5	-	15	$\overline{A}$
6	-	16	B
7	BT+	17	-
8	BT-	18	A
9	0V	19	-
10	-	20	-

PIN No.	ENCODER SIGNAL	PIN No.	ENCODER SIGNAL
A	A	K	-
B	$\overline{A}$	L	-
C	B	M	-
D	$\overline{B}$	N	-
E	Z	P	-
F	$\overline{Z}$	R	-
G	0V	S	-
H	+5V	T	-
J	SHIELD		

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			
2			
3			
4			
5			
6			
7			
8			
9	GND	8	G
10	Vcc(DC 5V)	7	H
11	/PZ	6	F
12	Shield	9	J
13	/PB	4	D
14	PZ	5	E
15	/PA	2	B
16	PB	3	C
17			
18	PA	1	A
19			
20			

2.6.3. 11bit absolute encoder



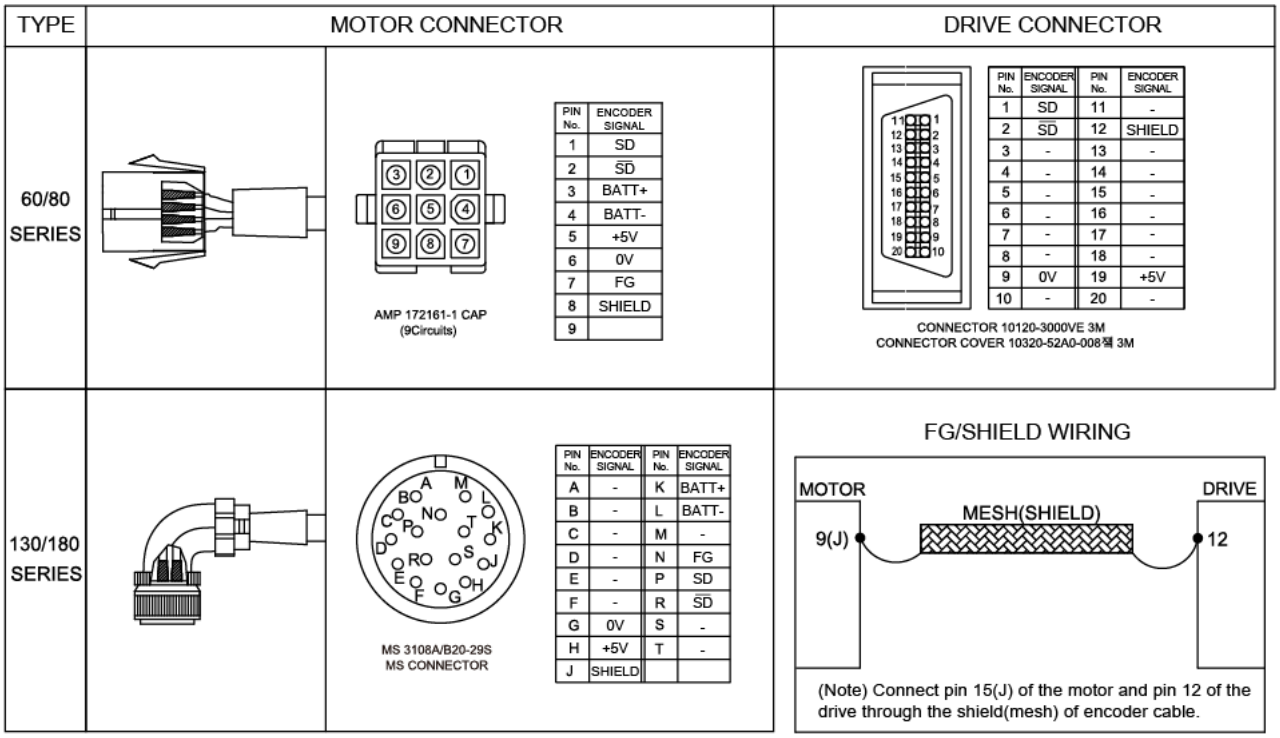
PIN No.	ENCODER SIGNAL	PIN No.	ENCODER SIGNAL
1	A	9	BT+
2	$\overline{A}$	10	BT-
3	B	11	RX
4	$\overline{B}$	12	RX
5	Z	13	+5V
6	$\overline{Z}$	14	0V
7	ERST	15	SHIELD
8	FG		

PIN No.	ENCODER SIGNAL	PIN No.	ENCODER SIGNAL
1	RX	11	$\overline{Z}$
2	$\overline{RX}$	12	FG/SHIELD
3	-	13	$\overline{B}$
4	-	14	Z
5	-	15	$\overline{A}$
6	-	16	B
7	BT+	17	-
8	BT-	18	A
9	0V	19	+5V
10	-	20	ERST

PIN No.	ENCODER SIGNAL	PIN No.	ENCODER SIGNAL
A	A	K	BT +
B	$\overline{A}$	L	BT -
C	B	M	ERST
D	$\overline{B}$	N	FG
E	Z	P	RX
F	$\overline{Z}$	R	RX
G	0V	S	-
H	+5V	T	-
J	SHIELD		

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			
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

2.6.4. 17bit absolute/incremental encoder



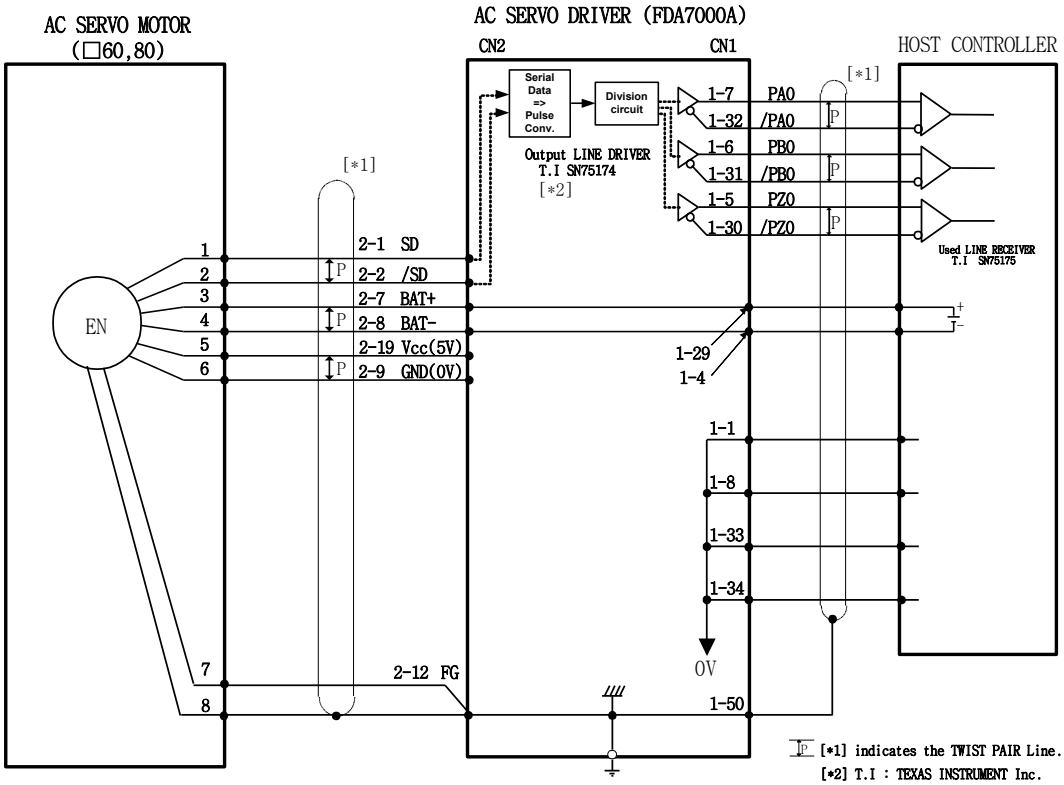
PIN No.	ENCODER SIGNAL
1	SD
2	$\overline{SD}$
3	BATT+
4	BATT-
5	+5V
6	0V
7	FG
8	SHIELD
9	

PIN No.	ENCODER SIGNAL	PIN No.	ENCODER SIGNAL
1	SD	11	-
2	$\overline{SD}$	12	SHIELD
3	-	13	-
4	-	14	-
5	-	15	-
6	-	16	-
7	-	17	-
8	-	18	-
9	0V	19	+5V
10	-	20	-

PIN No.	ENCODER SIGNAL	PIN No.	ENCODER SIGNAL
A	-	K	BATT+
B	-	L	BATT-
C	-	M	-
D	-	N	FG
E	-	P	SD
F	-	R	$\overline{SD}$
G	0V	S	-
H	+5V	T	-
J	SHIELD		

ENC 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
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			

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

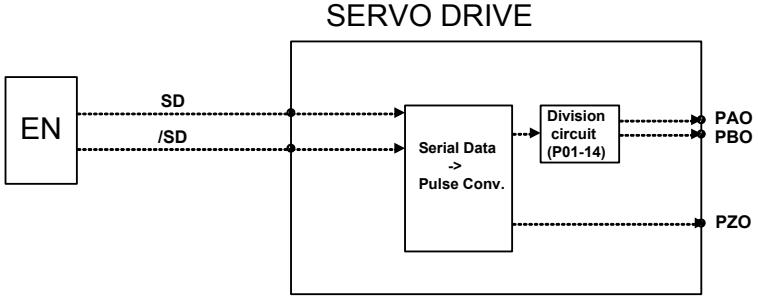


◆ Applied cable specification: AWG24 x 9Pair TWIST, SHIELD CABLE (Maximum length 20m)

◆ You do not need to connect the incremental 17bit encoder no. 7 (BT+) and no. 8 (BT-) terminals,

2.6.5. 17bit absolute encoder data transmission

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



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

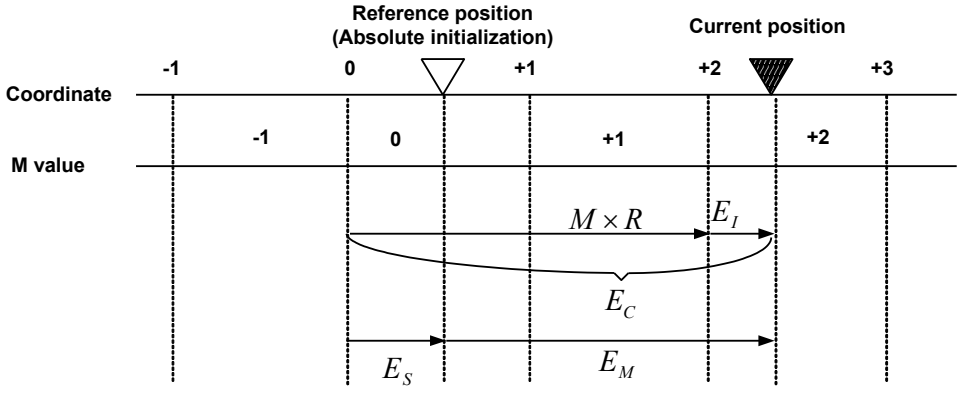
Data transmission method	Asynchronous
Baud Rate	9600[bps]
Start bit	1 bit
Stop bit	1 bit
Parity	Excellent
Character Code	ASCII Code 7 bit
Data Format	8 Character

♥ Outputted revolution in line 5.

② Absolute data content

ⓐ Serial data : This indicates where the motor axis is positioned after several revolutions from the reference position (Absolute encoder initialized value).

ⓑ 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)

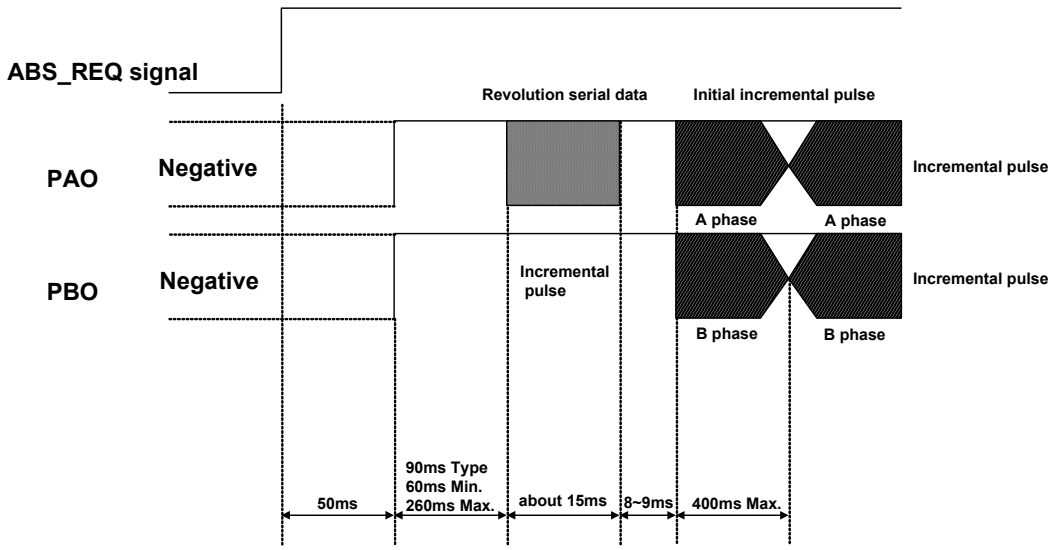
③ Absolute data transmission sequence

ⓐ Maintain the ABS_REQ signal to "H" Level.

ⓑ After 50ms, it switches to standby condition to receive the serial data. The up/down counter for incremental pulse count is cleared to "0".

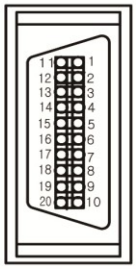
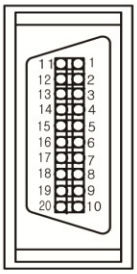
ⓒ It receives the serial data 8 byte.

ⓓ After receiving the initial serial data and about 400ms past, it operates as general incremental encoder.

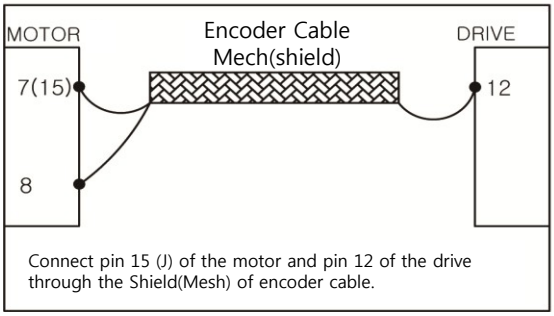


2.6.6. Wiring of FDA7000EX (Explosion proof)

Explosion-proof servo motor FMAEX series consists of a cable plug type encoder connector on the motor side. □ 70 and 90 series are equipped with 15-wire incremental encoder. □ 150 series are equipped with 17-bit absolute / incremental encoder. Refer to the table below to wire correctly. Please contact the Servo Sales Team for further details.

<table>
<tr><th>TYPE</th><th>MOTOR side</th><th>Drive side</th></tr>
<tr><td>60/ 70
SERIES</td><td>15line Incremental Encoder
<table>
<tr><th>PIN</th><th>Encoder</th><th>PIN</th><th>Encoder</th></tr>
<tr><td>1</td><td>A</td><td>9</td><td>V</td></tr>
<tr><td>2</td><td>$\overline{A}$</td><td>10</td><td>$\overline{V}$</td></tr>
<tr><td>3</td><td>B</td><td>11</td><td>W</td></tr>
<tr><td>4</td><td>$\overline{B}$</td><td>12</td><td>$\overline{W}$</td></tr>
<tr><td>5</td><td>Z</td><td>13</td><td>+5V</td></tr>
<tr><td>6</td><td>$\overline{Z}$</td><td>14</td><td>0V</td></tr>
<tr><td>7</td><td>U</td><td>15</td><td>SHIELD</td></tr>
<tr><td>8</td><td>$\overline{U}$</td><td></td><td></td></tr>
</table></td><td> 
<table>
<tr><th>PIN</th><th>Encoder</th><th>PIN</th><th>Encoder</th></tr>
<tr><td>1</td><td>W</td><td>11</td><td>$\overline{Z}$</td></tr>
<tr><td>2</td><td>$\overline{W}$</td><td>12</td><td>SHIELD</td></tr>
<tr><td>3</td><td>V</td><td>13</td><td>$\overline{B}$</td></tr>
<tr><td>4</td><td>$\overline{V}$</td><td>14</td><td>Z</td></tr>
<tr><td>5</td><td>U</td><td>15</td><td>$\overline{A}$</td></tr>
<tr><td>6</td><td>$\overline{U}$</td><td>16</td><td>B</td></tr>
<tr><td>7</td><td>–</td><td>17</td><td>PTC(–)</td></tr>
<tr><td>8</td><td>–</td><td>18</td><td>A</td></tr>
<tr><td>9</td><td>0V</td><td>19</td><td>+5V</td></tr>
<tr><td>10</td><td>–</td><td>20</td><td>PTC(+)</td></tr>
</table>
CONNECTOR 10120-3000VE 3M
CONNECTOR COVER 10320-52A0-008형 3M</td></tr>
<tr><td>150
SERIES</td><td>17bit Serial Encoder
<table>
<tr><th>PIN</th><th>Encoder</th><th>1~30M</th></tr>
<tr><td>1</td><td>SD</td><td>1</td></tr>
<tr><td>2</td><td>$\overline{SD}$</td><td>1</td></tr>
<tr><td>3</td><td>BATT+</td><td>1</td></tr>
<tr><td>4</td><td>BATT–</td><td>1</td></tr>
<tr><td>5</td><td>Vcc</td><td>3</td></tr>
<tr><td>6</td><td>0 V</td><td>2</td></tr>
<tr><td>7</td><td>FG</td><td>1</td></tr>
<tr><td>8</td><td>SHIELD</td><td>1</td></tr>
</table></td><td> 
<table>
<tr><th>PIN</th><th>Encoder</th><th>1~30M</th><th>PIN</th><th>Encoder</th><th>1~30M</th></tr>
<tr><td>1</td><td>SD</td><td>1</td><td>11</td><td>–</td><td>–</td></tr>
<tr><td>2</td><td>$\overline{SD}$</td><td>1</td><td>12</td><td>SHIELD</td><td>1</td></tr>
<tr><td>3</td><td>–</td><td>–</td><td>13</td><td>–</td><td>–</td></tr>
<tr><td>4</td><td>–</td><td>–</td><td>14</td><td>–</td><td>–</td></tr>
<tr><td>5</td><td>–</td><td>–</td><td>15</td><td>–</td><td>–</td></tr>
<tr><td>6</td><td>–</td><td>–</td><td>16</td><td>–</td><td>–</td></tr>
<tr><td>7</td><td>–</td><td>–</td><td>17</td><td>–</td><td>–</td></tr>
<tr><td>8</td><td>–</td><td>–</td><td>18</td><td>–</td><td>–</td></tr>
<tr><td>9</td><td>0V</td><td>2</td><td>19</td><td>+5V</td><td>3</td></tr>
<tr><td>10</td><td>–</td><td>–</td><td>20</td><td>–</td><td>–</td></tr>
</table>
CONNECTOR 10120-3000VE 3M
CONNECTOR COVER 10320-52A0-008형 3M</td></tr>
</table>

Wiring of shield and FG



♥ In case of incremental 17bit encoder, there is no need to connect the 7th (BT +) and 8th (BT-) terminals.

♥ For battery connection of absolute 17-bit encoder, refer to "4.6.1 Battery Handling".

ENC PIN No.	Signal	MOTOR(□70,90 Series) Encoder Connector PIN No.	Signal	MOTOR(□150 Series) Encoder Connector PIN No.
1	PW	11	SD	1
2	/PW	12	/SD	2
3	PV	9		
4	/PV	10		
5	PU	7		
6	/PU	8		
7			BATT+	3
8			BATT-	4
9	GND	14	GND	6
10				
11	/PZ	6		
12	Shield.	15	Shield.	7, 8
13	/PB	4		
14	PZ	5		
15	/PA	2		
16	PB	3		
17	PTC(-)	17		
18	PA	1		
19	Vcc(DC 5V)	13	Vcc(DC 5V)	5
20	PTC(+)	16		

2.7. COM(CN3) wiring and signal explanation

2.7.1. COM(CN3) wiring

COM (CN3) is a connector located at the lower left of the front of the FDA7000. This connector is used to make a serial communication between FDA7000 and the host or peripheral.

Pin assignments and names of COM (CN3) connectors are as shown below.

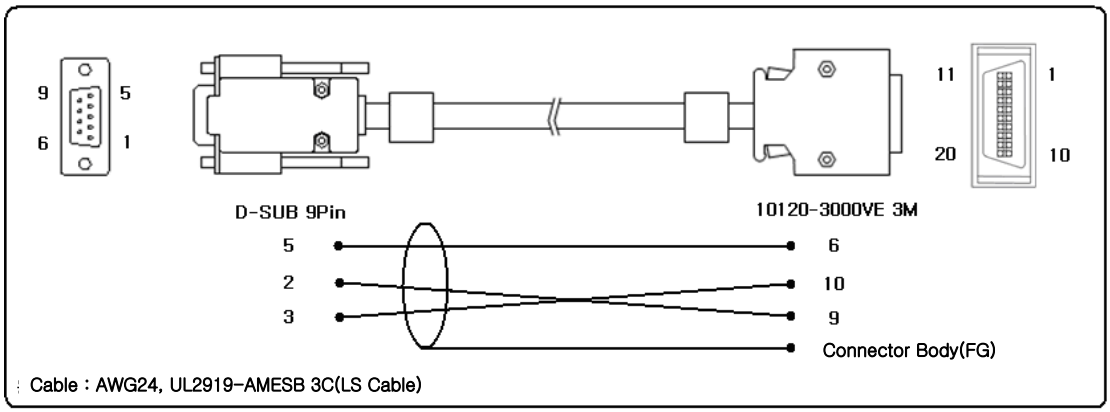
2	-	1	-	12	-	11	-
4	+12V	3	-12V	14	-	13	-
6	GND	5	+5V	16	NC	15	+5V
8	NXD-485	7	PXD-485	18	NC	17	GND
10	RXD-232	9	TXD-232	20	+5V	19	Rt

[User Connector side]

◆ The connector for COM (CN3) is optional.

- Manufacturer: 3M, CASE Part Name: 10320-52F0-008,
  Connector (for soldering): 10120-3000VE

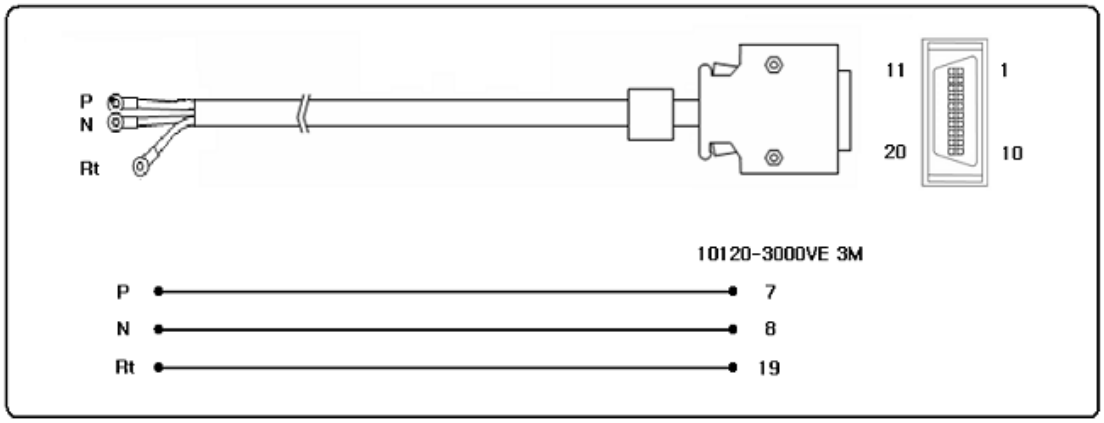
2.7.2. Wiring of RS232C Common Cable



[PC Serial Port] **[Servo Drive COM(CN3) Connector]**

◆ When wiring the RS232C communication cable, solder the cable's shield only to the body of the 10120-3000VE connector and do not connect to the body of the D-SUB 9Pin connector. (If both connectors are soldered, it may cause communication failure.)

2.7.3. Wiring of RS485 Common Cable



[Upper System] **[Servo Drive COM(CN3) Connector]**

- **The servo drive has a built-in terminating resistor (120Ω).**
- **You can connect terminal resistor by shorting Rt (No.19) terminal and P (No.7) terminal.**
- **When connecting several servo drives, be sure to connect the terminating resistor only to the last servo drive.**

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”.

Chapter 3. Parameter setting

The menu setting can be executed with the internal mount loader. Refer to Chapter 5 for details on how to use the internal mount 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[StE-]

StE-01	Display Select	Unit -	Setting range 100~ 1330	Manufactured default 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.

[First and second space value]

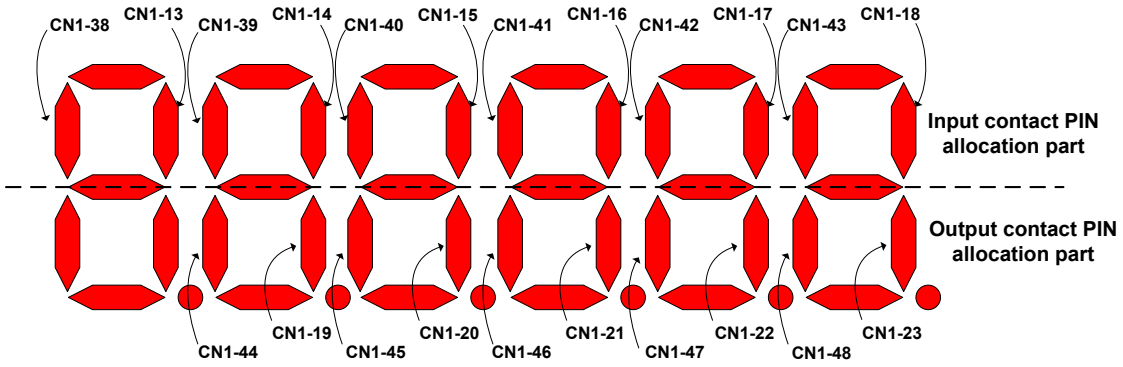
Upper menu name	P01	P02	P03	P04	P05	P06	P07	P08	P09	JOG	ALS	StE
1st and 2nd value	01	02	03	04	05	06	07	08	09	10	11	12

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

StE-02	Command Speed	Unit rpm	Setting range -9999.9 ~ 9999.9	Manufactured default -	Speed/position control
StE-03	Motor Speed	Unit rpm	Setting range -9999.9 ~ 9999.9	Manufactured default -	Speed/Torque/ Position control
StE-04	CCW Speed Limit	Unit rpm	Setting range 0.0 ~ 9999.9	Manufactured default -	Speed/Torque/ Position control
StE-05	CW Speed Limit	Unit rpm	Setting range -9999.9 ~ 0.0	Manufactured default -	Speed/Torque/ Position control
StE-06	Command Pulse	Unit pulse	Setting range -99999 ~ 99999	Manufactured default -	Position control
StE-07	Feedback Pulse	Unit pulse	Setting range -99999 ~ 99999	Manufactured default -	Position control
StE-08	Error Pulse	Unit pulse	Setting range -99999 ~ 99999	Manufactured default -	Position control
StE-09	Command Torque	Unit %	Setting range -300.0 ~ 300.0	Manufactured default -	Speed/Torque/ Position control
StE-10	Load Rate	Unit %	Setting range -300.0 ~ 300.0	Manufactured default -	Speed/Torque/ Position control
StE-11	Max Load Rate	Unit %	Setting range -300.0 ~ 300.0	Manufactured default -	Speed/Torque/ Position control

StE-12	CCW TRQ LMT	Unit %	Setting range 0.0 ~ 300.0	Manufactured default -	Speed/Torque/ Position control
StE-13	CW TRQ LMT	Unit %	Setting range -300.0 ~ 0.0	Manufactured default -	Speed/Torque/ Position control
StE-14	Inertia Ratio	Unit -	Setting range 0.0 ~ 50.0	Manufactured default 2.0	Speed/Torque/ Position control
StE-15	MULTI Turns	Unit rev	Setting range -32768~32768	Manufactured default -	Speed/Torque/ Position control
StE-16	Single Turn	Unit -	Setting range 0~131071	Manufactured default -	Speed/Torque/ Position control
StE-17	I/O Status	Unit -	Setting range 0 ~ 999999	Manufactured default -	Speed/Torque/ Position control

<For internal mount loader >



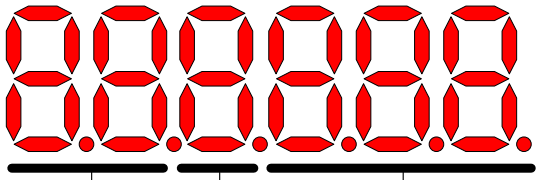
The PIN allocation based on the manufactured default is as follows.

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

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

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

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



Input Voltage

Sym.	Voltage
L1	AC 110V
S	AC 220V
H0	AC 380V
H1	AC 440V

Power

Sym.	Power	Sym.	Power
_	100~400W	h	7.5kW
=	500W~1kW	E	11kW
≡	1.5~4.5kW	F	15kW

Firmware Virsion

Sym.	Virsion
2.00~2.99	Standard
3.00~9.99	Spectial Order

StE-19	Single Turns DEG	Unit DEG	Setting range 0.000 ~ 359.999	Manufactured default	Speed/Torque/ Position control

When using a 17bit serial encoder, the position unit for one revolution is displayed as dgree.

StE-20	Warning Status	Unit -	Setting range 0 ~ 1023	Manufactured default	Speed/Torque/ Position control

Combination of current warnings on the servo drive is displayed in hexadecimal.

(E.g. 0000 = no alerts currently occurring, 0005 = 1, 3 alerts)

The bit allocation of the warning content is shown below.

	Bit-9									Bit-0
No.	10	9	8	7	6	5	4	3	2	1
Warning	Reser -ved	Reser -ved	Reser -ved	Reser -ved	Reser -ved	Reser -ved	Reser -ved	Reser -ved	Reser -ved	**Low-Battery**

StE-21	CYCLE TIME	Unit ms	Setting range 0 ~ 99999.9	Manufactured default 0.0	Speed/Torque/ Position control

Enter the time for calculating the StE-22 [Cycle Average Load Factor].

StE-22	CYCLE LOAD RATE	Unit %	Setting range -300.0 ~ 300.0	Manufactured default	Speed/Torque/ Position control

The average load rate for the time set by StE-22 [Cycle Time] is displayed.

StE-23	DC LINK VOLTAGE	Unit Vdc	Setting range 0.0 ~ 999.9	Manufactured default	Speed/Torque/ Position control

It displays the DC voltage charged inside the servo drive when the 3-phase main circuit power supply R, S, T is turned on.

* Allowable Voltage Fluctuation Rate

AC 220V ► DC 240.4V ~ 357.7V

AC 380V ► DC 483.6V ~ 617.9V

AC 440V ► DC 560.0V ~ 780.5V

3.2. Motor and operating device setting[P01-]

P01-01*	Motor ID	Unit -	Setting range GEN - 00 ~ 500	Manufactured default By capacity	Speed/Torque/ Position control

Set the motor ID to use. P01-02 ~ P01-10 (Except P01-07 and P01-08), the motor parameter, masked.

Motor ID applicable to FDA7000 series[AC 220V Standard Series]

ID	Model	ID	Model	ID	Model	ID	Model	ID	Model
00	Manual	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	CJZ5	25	TF44	45	LF30	65	KN11	85	LN20
06	CJ01	26		46		66	KN16	86	LN30
07		27		47		67	KN22	87	LN40
08	CJ02	28		48	CN40	68	KN22A	88	TN110
09	CJ04	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	LN55
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		97	
18		38		58	CN30A	78	TN55	98	KN70
19		39		59	CN50A	79	KN55	99	TN75N

Motor ID applicable to FDA7000-H series[AC 380V Standard Series]

ID	Model	ID	Model	ID	Model	ID	Model	ID	Model
147	CN70	165	KN11	183	LN12	171	TN09	293	TN220
148	CN40	166	KN16	185	LN20	172	TN13	294	TN300
149	CN50	167	KN22	186	LN30	174	TN20	295	TN370
153	CN10	168	KN22A	187	LN40	175	TN30	301	TN450
154	CN09	169	KN35	191	LN44	176	TN44	302	TN550
155	CN15	179	KN55	192	LN55	178	TN55	203	TN750
156	CN22	198	KN70	311	LN300	399	TN75N		
157	CN30	392	KN150	312	LN370	188	TN110		
158	CN30A	393	KN200	313	LN450	189	TN150		
159	CN50A								

Motor ID applicable to FDA7000EX[AC 220V Explosion proof Series]

ID	Model	ID	Model	ID	Model	ID	Model	ID	Model
		103	EC06	106	EL09	109	EC22	112	EK30
101	EX02	104	EK06	107	ET13			113	EC40
102	EK05	105	EC08	108	EK16	111	ET20		

* Explosion-proof models other than FDA7002EX are equipped with motor ID auto loading function, so there is no need to set motor ID separately.

Motor ID applicable to FDA7000EX-H[AC 380V Explosion proof Series]

ID	형 명	ID	형 명	ID	형 명	ID	형 명	ID	형 명
114	ET13	118	ET20	121	EC22	124		127	
115	EK16	119	EK30	122		125		128	
		120	EC40	123		126		129	

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

P01-07	Rated Speed	Unit rpm	Setting range 0.0 ~ 9999.0	Manufactured default By motor type	Speed/Torque/ Position control
P01-08	MAX Speed	Unit rpm	Setting range 0.0 ~ 9999.0	Manufactured default By motor type	Speed/Torque/ Position control
P01-09	Rated TRQ	Unit kgfcm	Setting range 0.0 ~ 9999.0	Manufactured default By motor type	Speed/Torque/ Position control
P01-10	Pole Number	Unit Pole	Setting range 2 ~ 98	Manufactured default By motor type	Speed/Torque/ Position control
P01-11*	Drive ID	Unit -	Setting 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 [FDA7-]	001	002	004/ 004B	005	010	015/ 015B	020/ 020B	030/ 030B	045	075 ~ 750
P01-11 [Drive ID]	1	2	4	5	10	15	20	30	45	Unchanged

P01-12*	Encoder ID	Unit -	Setting range Enc - 0 ~ R	Manufactured default Enc - A	Speed/Torque/ Position control

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	Setting range 1 ~ 32768	Manufactured default 2000	Speed/Torque/ Position control

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	Setting range 1 ~ 131072	Manufactured default By model	Speed/Torque/ Position control

Pulse input from the encoder of the motor can be output to the outside as the set division pulse.

*** The number of divided output pulses cannot exceed the encoder pulse number.**

*** Set 17bit serial encoder according to the following conditions.**

(1) Enter a multiple of 4 within the range of “8192 ~ 131072”.

(2) The maximum frequency of the divided pulse that can be output from the servo drive is 1.638Mpps. (Mpps = Mega Pulse Per Second)

(3) The maximum speed available according to the number of divided output pulses is as shown in the following formula.

Maximum Speed = (39312 * 104) / (P01-14 setting value)

However, the smaller of the calculated value and the maximum speed of the motor becomes the maximum speed.

P01-14 setting value	Maximum Speed (RPM)
131072	3000
78624	5000

P01-15*	COM Baud Rate	Unit -	Setting range 0 ~ 15	Manufactured default 0	Speed/Torque/ Position control

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 -	Setting range 0 ~ 2	Manufactured default 0	Speed/Torque/ Position control

This feature is only used for Special Order products.

P01-17*	Serial I/O	Unit -	Setting range 0 ~ 2	Manufactured default 0	Speed/Torque/ Position control

Set this when using the I/O contact point by communication.

Setting value	Contents
0	I / O contact using only CN1 connector
1	I / O contact using only communication (RS232C / 485)
2	Use I / O contact by using with CN1 connector communication (RS232C / 485) CN1: Use CW/CCWLIM, ESTOP, STOP Contact Point communication (RS232C/RS485): Use all I / O contacts except CW / CCWLIM, ESTOP, STOP

P01-18*	Serial ID	Unit -	Setting range 1 ~ 31	Manufactured default 1	Speed/Torque/ Position control
P01-19	Parameter Lock	Unit -	Setting range ON/OFF	Manufactured default OFF	Speed/Torque/ Position control
P01-20*	Absolute Origin	Unit -	Setting range ON/OFF	Manufactured default OFF	Speed/Torque/ Position control

*** 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.**

P01-21 *	ABS Protocol	Unit -	Setting range 1~3	Manufactured default 3	Speed/Torque/ Position control

When using 17-bit absolute encoder, set the absolute data transfer protocol using the port of the divided output pulse.

*** For more information, refer to "2.6.5 17bit absolute encoder data transmission".**

P01-22 *	Modbus Protocol	Unit -	Setting range 0~1	Manufactured default 0	Speed/Torque/ Position control

Set the serial communication protocol.

Setting value	Contents
0	Extended Mode Bus (HIGEN Standard): Data Field Configuration 4 bytes
1	Standard Modbus: Data Field Configuration 2bytes

For more information, please refer to MODBUS MANUAL on our website (http://www.higenmotor.co.kr).

P01-23 *	Single turn offset	Unit -	Setting range 0 ~ 131072	Manufactured default 0	Speed/Torque/ Position control

When P01-20 [Absolute origin] is ON, the current single-turn data is automatically saved in this parameter and initialized with StE-16 [Single-turn data] = 0.

P01-24	Parameter RAM Save	Unit -	Setting range 0 ~ 3	Manufactured default 0	Speed/Torque/ Position control

You can change the storage area of specific parameters. Parameters stored in the RAM area are returned to their initial values when the power is turned on again. If you frequently set parameters using Modbus communication, they can be used to protect ROM life.

*** FDA7000 Servo Drive Internal ROM Write Life: 100,000 Times**

Value	Function
0	Save all parameters to ROM
1	Save digital input speed / torque (P04-01 ~ P04-14) setting to RAM
2	Save Electronic gear ratio (P05-12~P05-19)) setting to RAM
3	Save digital input speed / torque (P04-01 ~ P04-14) and Electronic gear ratio (P05-12~P05-19)) setting to RAM

3.3. General control parameter setting[P02-]

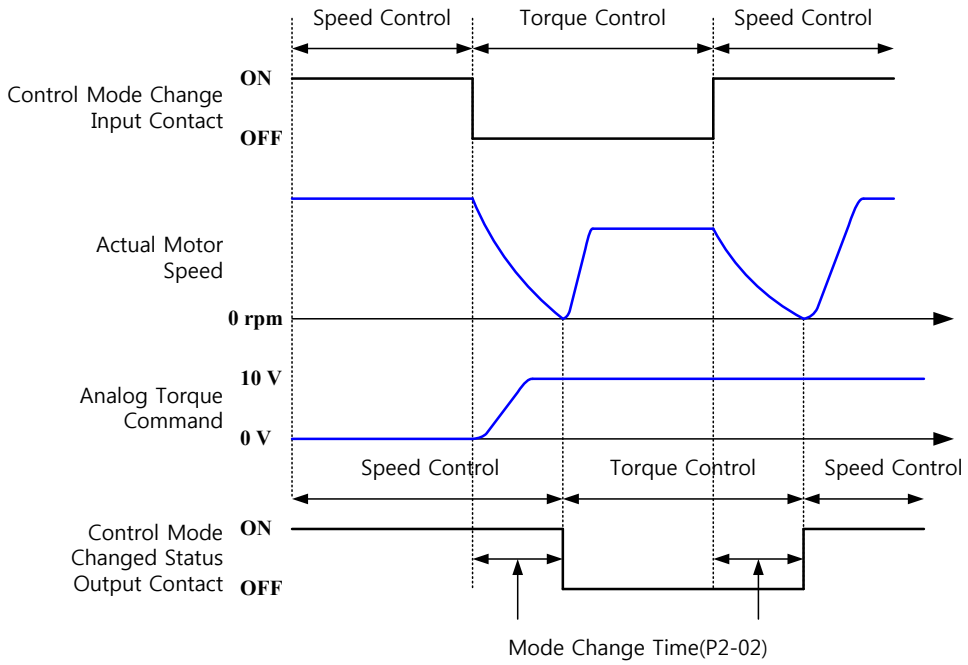
P02-01*	Control Mode	Unit -	Setting range 0 ~ 5	Manufactured default 1	Speed/Torque/ Position control

The conversion of the control mode using parameters cannot be changed while in the servo on state. When control mode is set to complex control mode(P02-01=3~5), control mode can be changed during motor operation according to control mode conversion input contact.

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	Setting range 100.0 ~ 10000.0	Manufactured default 500.0	Speed/Torque/ Position control

When the servo drive is set to the compound control mode and the control mode conversion input contact is on, the servo motor is decelerated within the set control mode conversion time and the control mode is changed in the zero speed area. When control mode conversion is completed, the control mode conversion status output contact turns ON.



P02-03	CCW TRQ LMT	Unit %	Setting range 0.0 ~ 300.0	Manufactured default 300.0	Speed/Torque/ Position control
P02-04	CW TRQ LMT	Unit %	Setting range -300.0 ~ 0.0	Manufactured default -300.0	Speed/Torque/ Position control
P02-05	CCW Speed Limit	Unit rpm	Setting range 0.0 ~ 6000.0	Manufactured default Maximum value of applied motor	Speed/Torque/ Position control
P02-06	CW Speed Limit	Unit rpm	Setting range -6000.0 ~ 0.0	Manufactured default -Maximum value of applied motor	Speed/Torque/ Position control
P02-07	Brake Speed	Unit rpm	Setting range 0.0 ~ 9999.9	Manufactured default 50.0	Speed/Torque/ Position control
P02-08	Brake Time	Unit ms	Setting 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.

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

P02-09	DB Mode	Unit -	Setting range 0 ~ 3	Manufactured default 2	Speed/Torque/ Position control

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

P02-10	Notch Filter 1	Unit -	Setting range 0 ~ 2	Manufactured default 0	Speed/Torque/ Position control

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	Setting range 50.0 ~ 2000.0	Manufactured default 300.0	Speed/Torque/ Position control

This sets the notch filter frequency 1 to reduce the resonance of the machinery.

P02-12	NF Bandwidth 1	Unit %	Setting range 10.0 ~ 99.9	Manufactured default 95.0	Speed/Torque/ Position control

It shows the certain gain bandwidth where the notch filter 1 operate to reduce the resonance of machinery.

P02-13	Notch Filter2	Unit -	Setting range 0 ~ 1	Manufactured default 0	Speed/Torque/ Position control

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	Setting range 50.0 ~ 2000.0	Manufactured default 500.0	Speed/Torque/ Position control

This sets the notch filter frequency 2 to reduce the resonance of the machinery.

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

Set the filter time constant for the torque command inside the servo drive. If vibration occurs in the machine due to noise, etc., the vibration may be suppressed by adjusting the filter time constant. If the time constant of the torque command filter is too large, the response of the servo system will be reduced. The smaller the value, the more responsive control is, but the effect of vibration suppression is less. Set the appropriate time constant according to the machine condition.

*** Manufactured default : FDA7001 ~ FDA7004 : 0.9**
FDA7005 ~ FDA7010 : 1.3
FDA7015 ~ FDA7750 : 2.0

P02-17	Auto Tuning	Unit -	Setting range 0 ~ 1	Manufactured default 0	Speed/Torque/ Position control

Set the mode to auto-tuning the system's inertia ratio.

*** Refer to page 4-19 for how to use.**

P02-18	System Response	Unit -	Setting range 1 ~ 19	Manufactured default By capacity	Speed/Torque/ Position control

The system response setting is to set the response to the target of the machine system.

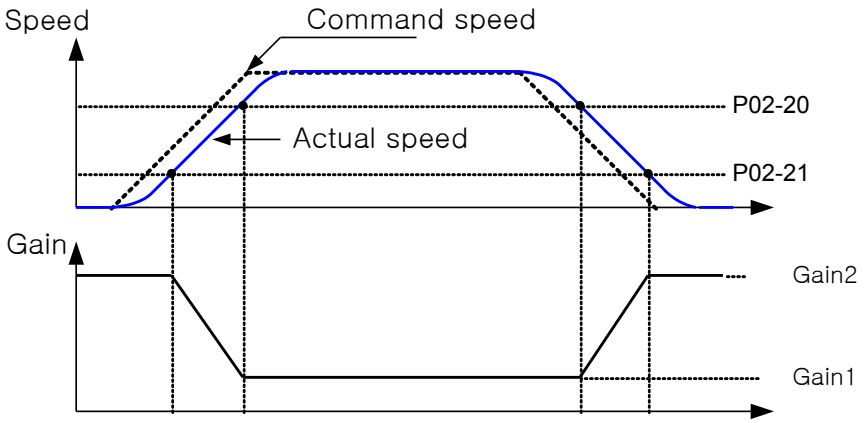
P02-18 (System response)	P05-05 (Position loop gain 1)	P05-06 (Position loop gain 2)	P03-05 (Speed loop gain 1)	P03-06 (SC TC1)	P03-07 (Speed loop gain 2)	P03-08 (SC TC2)	P02-16 (Command torque filter TC)
1	2.0	5.0	2.0	200.0	5.0	120.0	4.5
2	5.0	10.0	5.0	120.0	10.0	80.0	3.5
3	10.0	15.0	10.0	80.0	15.0	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

P02-19	Inertia Ratio	Unit -	Setting range 1.0 ~ 50.0	Manufactured default 2.0	Speed/Torque/ Position control

$$Inertia\ Ratio = \frac{System\ Inertia\ (\ Motor\ Inertia + Load\ inertia\ )}{Motor\ Inertia}$$

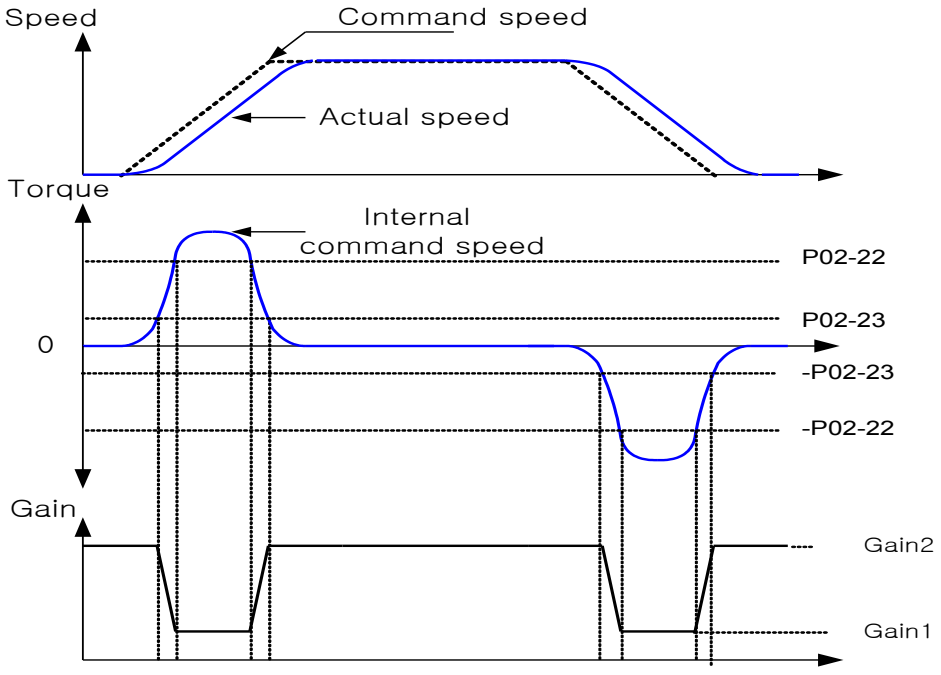
P02-20	Gain ADJ Speed 1	Unit rpm	Setting range 100.0 ~ 5000.0	Manufactured default 800.0	Speed/Torque/ Position control
P02-21	Gain ADJ Speed 2	Unit rpm	Setting range 10.0 ~ 500.0	Manufactured default 100.0	Speed/Torque/ Position control

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



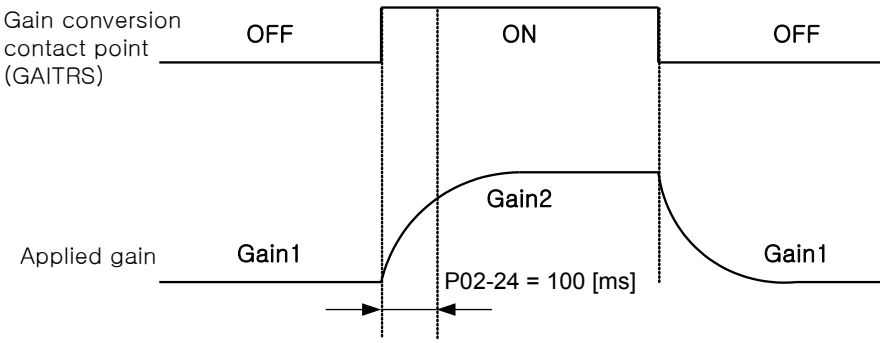
P02-22	Gain ADJ TRQ 1	Unit %	Setting range 50.0 ~ 300.0	Manufactured default 150.0	Speed/Torque/ Position control
P02-23	Gain ADJ TRQ 2	Unit %	Setting range 0.0 ~ 300.0	Manufactured default 50.0	Speed/Torque/ Position control

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	Setting range 0.0 ~ 10000.0	Manufactured default 100.0	Speed/Torque/ Position control

When executing the control gain conversion by the external input contact point, it decides the control gain conversion time.



P02-25	Temporary Stop	Unit -	Setting range ON / OFF	Manufactured default OFF	Speed/Torque/ Position control

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.

P02-26	Emergency Stop	Unit -	Setting range ON / OFF	Manufactured default OFF	Speed/Torque/ Position control

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 -	Setting range ON / OFF	Manufactured default OFF	Speed/Torque/ Position control

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 -	Setting range ON / OFF	Manufactured default OFF	Speed/Torque/ Position control

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 -	Setting range ON/OFF	Manufactured default OFF	Speed/Torque/ Position control

P02-30	Servo OFF Delay time	Unit ms	Setting range 0.0 ~ 1000.0	Manufactured default 10.0	Speed/Torque/ Position control

When using the servo motor to control a vertical movement machine, the structure movable part may be moved toward the downward depanding 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 -	Setting range ON / OFF	Manufactured default OFF	Speed/Torque/ Position control

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.

P02-32	CCW Limit	Unit -	Setting range ON / OFF	Manufactured default OFF	Speed/Torque/ Position control

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.

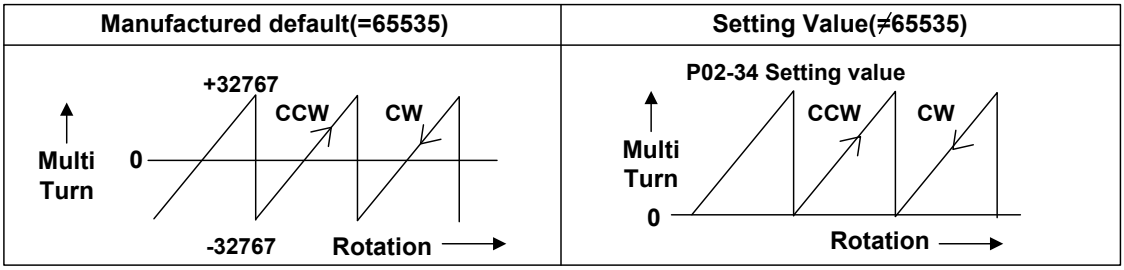
P02-33	Servo ON/OFF	Unit -	Setting range ON / OFF	Manufactured default OFF	Speed/Torque/ Position control

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.

P02-34	MULTI Turns Limit	Unit rev	Setting range 0~65535	Manufactured default 65535	Speed/Torque/ Position control

Multiturn limit setting is a parameter to set the upper limit of multi-turn data from encoder when absolute encoder is used (P01-12 = ENC-R). When the rotation amount exceeds the set value, the encoder rotation amount returns to zero. The range of multi-turn data differs from the factory settings and other settings.



Other than the factory setting (≠ 65535) When the motor rotates in the reverse direction from the multi-rotation data 0, the multi-turn data changes to the setting value of P02-34. When the multi-turn data rotates in the forward direction at the setting value of P02-34, the multi-turn data changes to zero. For P02-34, set the value of (Multiple desired rotation-1).

*** Changing the multiturn limit is not necessary except for special applications. This parameter is related to the host controller, so special care should be taken.**

P02-35	ABS BATT DETEC	Unit -	Setting range 0~1	Manufactured default 0	Speed/Torque/ Position control

When using absolute encoder, the battery voltage drop (3.1 ± 0.1 [V] or less) can be selected as alarm or warning.

P02-36	LOW BATT FILTER	Unit ms	Setting range 10~10000	Manufactured default 100	Speed/Torque/ Position control

This parameter sets the filter time constant for abnormal alarm occurrence due to noise signal or cable mounting condition when using absolute encoder. The larger the value is selected, the less sensitive the battery alarm is caused by the noisy signal.

P02-37	Power Fail Mode	Unit -	Setting range 0~1	Manufactured default 0	Speed/Torque/ Position control

Select whether to output alarm or automatic reset when the power returns to normal when the power fail alarm occurs due to an error in the main circuit power (R, S, T terminals).

Value	Alarm OUTPUT(CN1)	Display	Current Alarm number	Alarm Auto Reset	Alarm History
0	Output	Marked	Marked	Impossible	Impossible
1	No Output	Marked	Marked	Possible	Possible

* If you set P02-37 = 1, you can check the alarm status by reading the current alarm number through serial communication.

P02-38	Reverse Rotation Mode	Unit -	Setting range ON/OFF	Manufactured default OFF	Speed/Torque/ Position control

In case of using 17bit serial encoder, the direction of motor rotation and encoder division output can be reversed.

* When using reverse mode, direction selection parameter (P02-27) is ignored.

Direction / Value	Forward rotation	Reverse rotation
OFF	 CCW Rotation B phase lead division output	 CW Rotation A phase lead division output
ON	 CW Rotation B phase lead division output	 CCW Rotation A phase lead division output

P02-39 *	Extra DB Control	Unit -	Setting range 0 ~ 2	Manufactured default OFF	Speed/Torque/ Position control

The signal for controlling the dynamic brake installed outside the servo drive can be output.

* **To use this function, set DB MODE (P02-09) parameter first, and set Function No. (20) to the desired CN1 pin number using P08 menu.**

*** This function only applies to Special Order products that can connect external DB.**

Value	Function
0	Do not use external DB control
1	External DB Control Signal Output (Normal Open Type)
2	External DB Control Signal Output (Normal Close Type)

P02-40 *	ENC CNT ERR TC	Unit ms	Setting range 0 ~ 10000	Manufactured default 5	Speed/Torque/ Position control

When a 17-bit serial encoder is used, the count error detection time of the encoder can be set.

*** If P02-40 = 0, the count error alarm function is disabled.**

[When using FDA7000EX(Explosion-Proof) Series]

P02-40	Motor OVER TEMP	Unit -	Setting range ON / OFF	Manufactured default OFF	Speed/Torque/ Position control

Some explosion-proof motor models have a built-in temperature sensor (PTC), and an alarm (Ano-22) is output when the motor overheats. If you do not use the over temperature alarm with this sensor, you can disable the alarm function by setting P02-40 = ON.

If P02-40 = ON, the temperature sensor signal of the motor is not connected to the drive, an alarm (AL-22) will occur.

OFF	Enable motor over temperature alarm
ON	Disable the motor over temperature alarm function

[When using FDA7002EX(Explosion-Proof)]

P02-41	Motor OVR TEMP TC	Unit ms	Setting range 100 ~ 9000	Manufactured default 100	Speed/Torque/ Position control

You can set the overheat alarm detection time of the motor with a built-in temperature sensor.

3.4. Speed control parameter setting[P03-]

P03-01*	Speed Gain Mode	Unit -	Setting range 1 ~ 5	Manufactured default 1	Speed control

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 %	Setting range 0.0 ~ 100.0	Manufactured default 100.0	Speed/position control
P03-03	Friction COMPEN	Unit %	Setting 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.

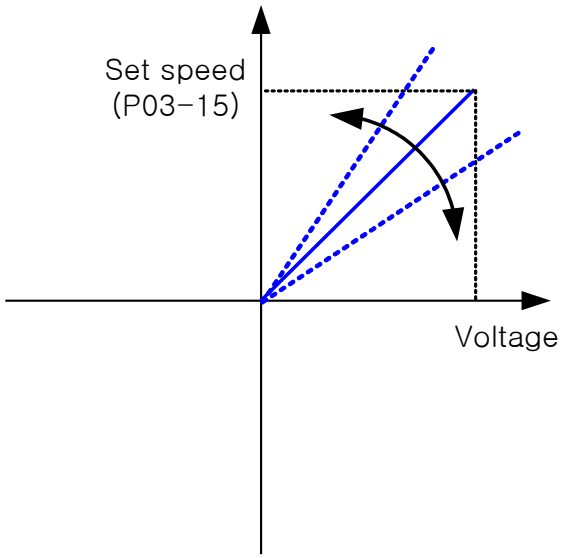
P03-04	Load COMPEN	Unit %	Setting range 0.0 ~ 100.0	Manufactured default 0.0	Speed/position control

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	Setting range 0.0 ~ 1000.0	Manufactured default By capacity	Speed/position control
P03-06	SC TC 1	Unit ms	Setting range 0.0 ~ 10000.0	Manufactured default By capacity	Speed/position control
P03-07	SC Loop Gain 2	Unit Hz	Setting range 0.0 ~ 1000.0	Manufactured default By capacity	Speed/position control

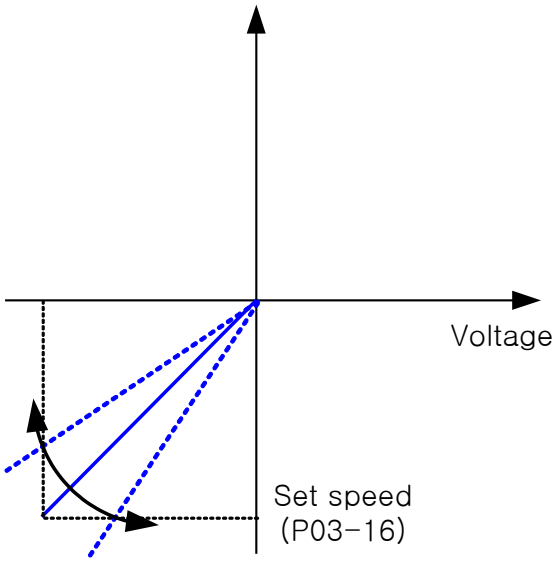
P03-08	SC TC 2	Unit ms	Setting range 0.0 ~ 10000.0	Manufactured default By capacity	Speed/position control
P03-09	Analog CMD TC	Unit ms	Setting range 0.0 ~ 2000.0	Manufactured default 0.0	Speed control
P03-10	ACCEL Time	Unit ms	Setting range 0.0 ~ 90000.0	Manufactured default 0.0	Speed control
P03-11	DECEL Time	Unit ms	Setting range 0.0 ~ 90000.0	Manufactured default 0.0	Speed control
P03-12*	S-Mode TC	Unit ms	Setting range 0.0 ~ 9000.0	Manufactured default 0.0	Speed control
P03-13	In Speed Range	Unit rpm	Setting range 0.0 ~ 9999.9	Manufactured default 10.0	Speed control
P03-14	Zero Speed Range	Unit rpm	Setting range 0.0 ~ 9999.9	Manufactured default 10.0	Speed control
P03-15*	+ 10[V] RPM	Unit rpm	Setting range 0.0 ~ 9999.9	Manufactured default Applied motor rated speed	Speed/Torque control

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	Setting range -9999.9 ~ 0.0	Manufactured default -Applied motor rated speed	Speed/Torque control

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



P03-17	Auto Offset	Unit -	Setting range ON / OFF	Manufactured default OFF	Speed/Torque control

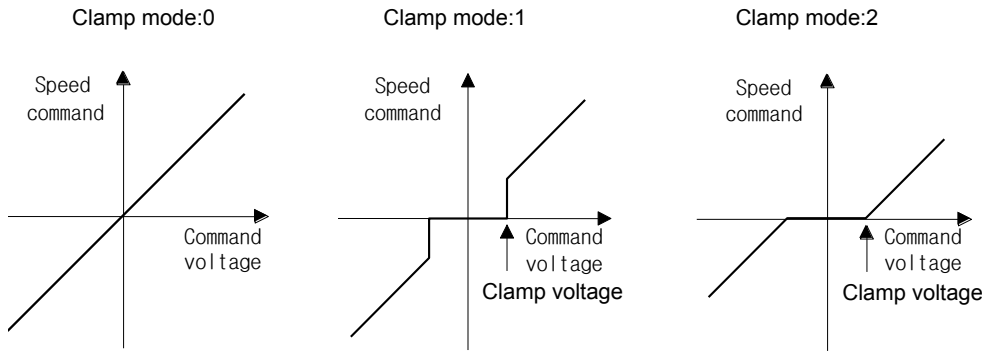
It automatically adjusts the offset voltage of the servo drive for the analog 0 [V] input of the host controller. At first, servo off and then supply the zero speed voltage to the speed input pin of CN1 connector. And then set P03-17 on and adjust the offset voltage automatically so that it can detect 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	Setting range -1000.0 ~ 1000.0	Manufactured default 0.0	Speed/Torque control
P03-19*	Override ENB	Unit -	Setting 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 -	Setting range 0 ~ 2	Manufactured default 0	Speed control

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.



P03-21	Clamp Voltage	Unit mV	Setting range -1000.0 ~ 1000.0	Manufactured default 0.0	Speed control
P03-22*	F/Back TC	Unit ms	Setting range 0.0 ~ 2000.0	Manufactured default 0.0	Speed control
P03-23	Zero SPD VIB REJ	Unit rpm	Setting range 0.0 ~ 1000.0	Manufactured default 0.1	Speed/position control
P03-24*	Feedforward TRQ	Unit -	Setting range 0 ~ 2	Manufactured default 0	Speed/position control

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)

P03-25	Alarm Reset Delay Time	Unit [ms]	Setting range 0 ~ 99999	Manufactured default 0	Speed/Torque/ Position control

When the servo motor rotates below 10 rpm or in the stall state, it activates the alarm function of overload, over current and over temperature. And the alarm can be cleared only after the set cooling time (P03-25) has elapsed from the alarm occurrence time.

If you enter P03-25 = 0 [ms], the alarm function for the stall status is deactivated.

*** Alarm code: Overload Ano-19, Overcurrent Ano-20, Overtemperature Ano-21**

*** If the corresponding alarm occurs, check the restraint state of the servomotor by checking the machine.**

3.5. Input contact point digital speed and torque setting[P04-]

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

3.6. Position control parameter setting[P05-]

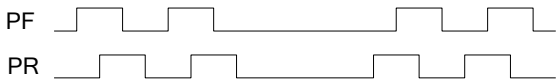
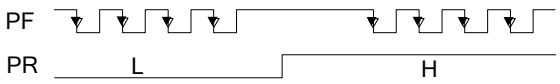
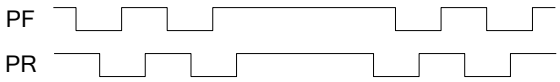
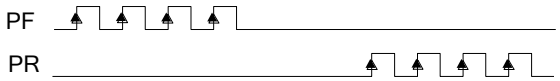
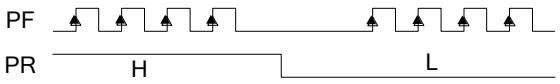
P05-01*	POS Gain Mode	Unit -	Setting range 1 ~ 5	Manufactured default 1	Position control

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 -	Setting range 0 ~ 5	Manufactured default 1	Position control

Set the position command pulse mode.

	[Pulse Logic]	Command pulse row mode In CCW direction / In CW direction	Remark
Negative Logic	0		A phase + B phase
	1		CCW pulse CW pulse
	2		Direction + Pulse
Positive Logic	3		A phase + B phase
	4		CCW pulse CW pulse
	5		Direction + Pulse

P05-03	Position control Speed Mode	Unit -	Setting range ON / OFF	Manufactured default OFF	Position/speed control

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 %	Setting range 0.0 ~ 100.0	Manufactured default 0.0	Position control
P05-05	PC P Gain 1	Unit Hz	Setting range 0.0 ~ 500.0	Manufactured default By capacity	Position control
P05-06	PC P Gain 2	Unit Hz	Setting range 0.0 ~ 500.0	Manufactured default By capacity	Position control

P05-07	PI-P Pulse ERR	Unit pulse	Setting 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	Setting range 0 ~ 99999	Manufactured default 100	Position control
P05-09	Follow ERR	Unit pulse	Setting range 0 ~ 99999	Manufactured default 30000	Position control
P05-10	POS CMD TC	Unit ms	Setting range 0.0 ~ 2000.0	Manufactured default 0.0	Position control
P05-11	FF TC	Unit ms	Setting range 0.0 ~ 2000.0	Manufactured default 0.0	Position control
P05-12*	ELCTR Gear NUM 1	Unit -	Setting range 1 ~ 99999	Manufactured default 1	Position control
P05-13*	ELCTR Gear DEN 1	Unit -	Setting range 1 ~ 99999	Manufactured default 1	Position control
P05-14*	ELCTR Gear NUM 2	Unit -	Setting range 1 ~ 99999	Manufactured default 1	Position control
P05-15*	ELCTR Gear DEN 2	Unit -	Setting range 1 ~ 99999	Manufactured default 2	Position control
P05-16*	ELCTR Gear NUM 3	Unit -	Setting range 1 ~ 99999	Manufactured default 1	Position control
P05-17*	ELCTR Gear DEN 3	Unit -	Setting range 1 ~ 99999	Manufactured default 4	Position control
P05-18*	ELCTR Gear NUM 4	Unit -	Setting range 1 ~ 99999	Manufactured default 1	Position control
P05-19*	ELCTR Gear DEN 4	Unit -	Setting range 1 ~ 99999	Manufactured default 8	Position control
P05-20	Bias SPD COMPEN	Unit rpm	Setting range -1000.0 ~ 1000.0	Manufactured default 0.0	Position control

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	Setting range 0 ~ 500	Manufactured default 10	Position control

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	Setting range 0 ~ 99999	Manufactured default 0	Position control
P05-23	POSITION ERROR CLEAR	Unit -	Setting range ON/OFF	Manufactured default OFF	Position control

It is used when the position deviation is not cleared even in the servo off state in the position control mode. If P05-23 is set to ON, the motor rotor will move to the initial position of the rotor when the servo is turned off to clear the position deviation when the servo is turned on even if the position deviation caused by the motor rotor movement occurs in the servo off state. It's possible.

3.7. Torque control parameter setting[P06-]

P06-01*	Analog TRQ TC	Unit ms	Setting range 0.0 ~ 2000.0	Manufactured default 0.0	Torque control

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.

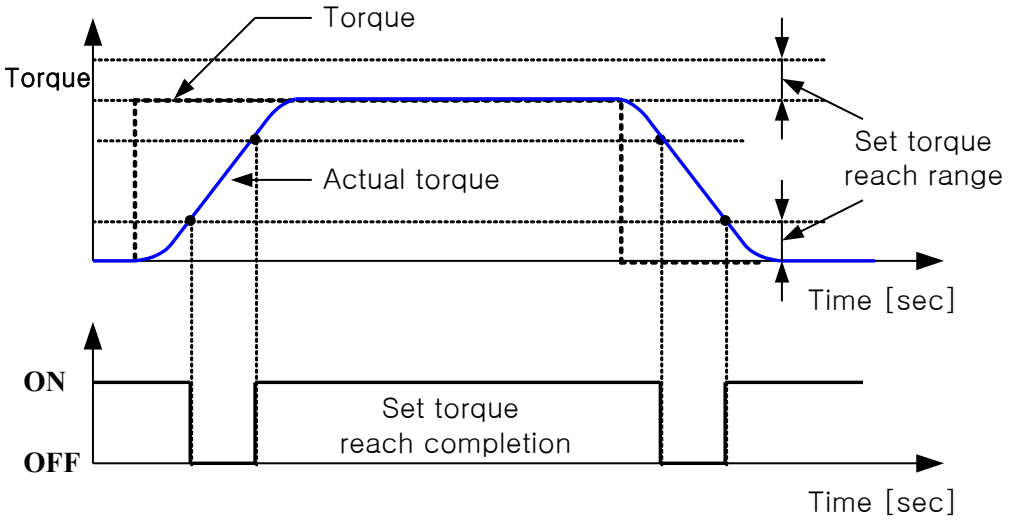
P06-02	TRQ ACCEL Time	Unit ms	Setting range 0.0 ~ 9000.0	Manufactured default 0.0	Torque control
P06-03	TRQ DECEL Time	Unit ms	Setting range 0.0 ~ 9000.0	Manufactured default 0.0	Torque control

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

P06-04*	TRQ S-Mode	Unit ms	Setting range 0.0 ~ 2000.0	Manufactured default 0.0	Torque control

If you adjust the S-mode operation time constant under the condition of satisfying the operattion characteristics of the machine system, you can reduce the vibration and impact of the machinery.

P06-05	In TRQ Range	Unit %	Setting range 0.0 ~ 100.0	Manufactured default 10.0	Torque control



P06-06	Stop TRQ Range	Unit %	Setting range 0.0 ~ 100.0	Manufactured default 10.0	Torque control
P06-07	10[V] TRQ	Unit %	Setting 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 -	Setting range ON / OFF	Manufactured default OFF	Speed/Torque control

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

3.8. Input contact point function setting[P07-]

P07-01*	CN1_18 Digital INPUT 1	Unit -	Setting range 0 ~ 30	Manufactured default 1	Speed/Torque/ Position control

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.

[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)

P07-13	DIGITAL IN DELAY	Unit ms	Setting range 1 ~ 500	Manufactured default 1	Speed/Torque/ Position control

You can set the input time of digital input contacts except SVONEN, E-STOP, CWLIM, CCWLIM, STOP.

Ex) When inputting with P07-13 = 10, it is recognized only when the digital input contact is kept over 10ms.

P07-14	SAFETY IN DELAY	Unit ms	Setting range 1 ~ 500	Manufactured default 1	Speed/Torque/ Position control

Input time of safety related input contacts such as SVONEN, E-STOP, CWLIM, CCWLIM, STOP can be set.

Ex) When inputting P07-14 = 10, it is recognized only when the safety switch input contact is kept for 10 ms or more.

※ 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

※ 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

※ 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

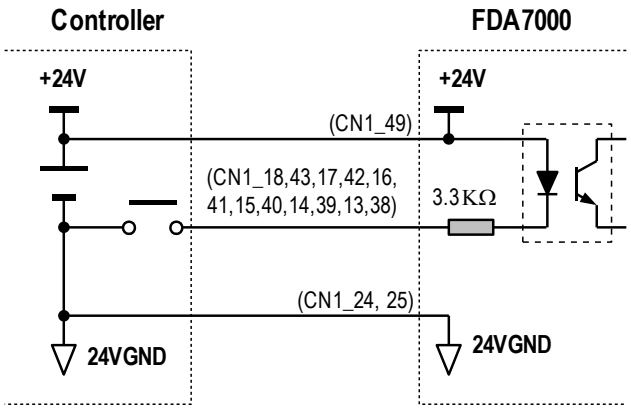
(When P7-01 is set to 30 (Position/torque multi control mode))

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

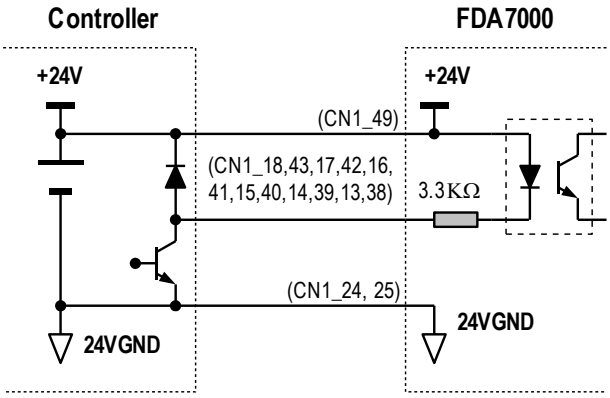
[Wiring method of input contact]

In case of using contact input such as relay or switch, connect with servo drive as follows.

At this time, use an external power supply of +24 [V], 50 [mA] or higher.



When using the input contact as a PLC or a photo coupler, connect it with the servo drive as follows. At this time, use an external power supply of +24 [V], 50 [mA] or higher.



3.9. Output contact point function setting[P08-]

P08-01*	CN1_23 Digital OUTPUT 1	Unit -	Setting range 25~30	Manufactured default 0	Speed/Torque/ Position control

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 -	Setting range 0~23	Manufactured default 3	Speed/Torque/ Position control
P08-03*	CN1_22 Digital OUTPUT 3	Unit -	Setting range 0 ~ 23	Manufactured default 6	Speed/Torque/ Position control

In case of FDA7000 model, manufactured default P08-03 = 21 (STOP status).

P08-04*	CN1_47 Digital OUTPUT 4	Unit -	Setting range 0 ~ 23	Manufactured default 5	Speed/Torque/ Position control
P08-05*	CN1_21 Digital OUTPUT 5	Unit -	Setting range 0 ~ 23	Manufactured default 7	Speed/Torque/ Position control
P08-06*	CN1_46 Digital OUTPUT 6	Unit -	Setting range 0 ~ 23	Manufactured default 9	Speed/Torque/ Position control

P08-07*	CN1_20 Digital OUTPUT 7	Unit -	Setting range 0 ~ 23	Manufactured default 14	Speed/Torque/ Position control
P08-08*	CN1_45 Digital OUTPUT 8	Unit -	Setting range 0 ~ 23	Manufactured default 15	Speed/Torque/ Position control
P08-09*	CN1_19 Digital OUTPUT 9	Unit -	Setting range 0 ~ 23	Manufactured default 16	Speed/Torque/ Position control
P08-10*	CN1_44 Digital OUTPUT 10	Unit -	Setting range 0 ~ 23	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.

[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
19	WARNING	Warning status output (OFF when warning occurs and ON when normal operation)

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20	EXT DB	External DB Control Signal Output (P02-09 DB mode setting, P02-39 output type selection)
21	START/STOP	Output status of STOP input * This function applies only to the **FDA7000EX** model.

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20	START/STOP	Output status of STOP input * This function applies only to the **FDA7000EX** model.
23	EXT DB	External DB Control Signal Output (P02-09 DB mode setting, P02-39 output type selection)

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)

※ 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

※ 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

※ 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

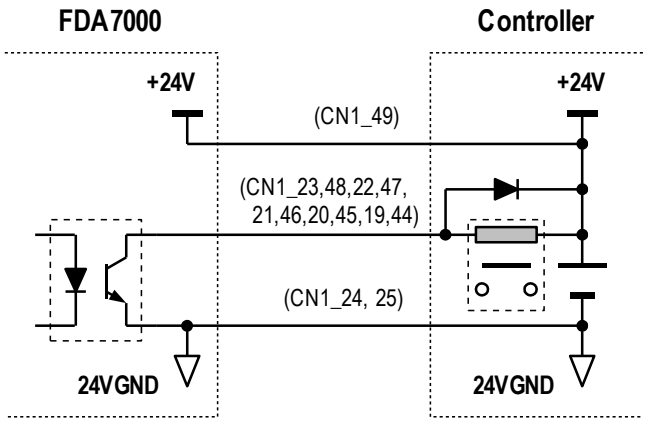
※ Position/torque multi control mode internal setting function table

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

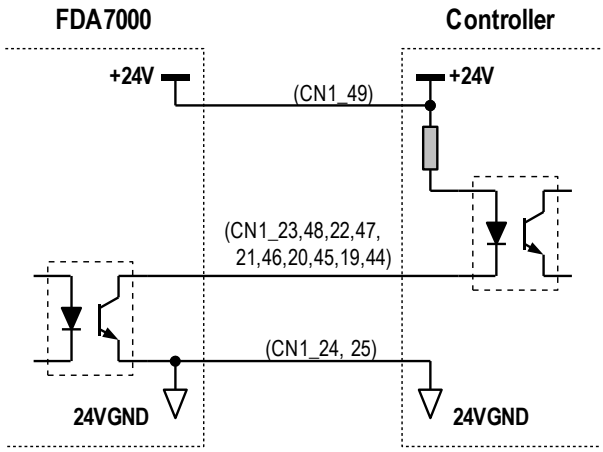
Parameter	Output pin	Function number	Function acronym	Function explanation
P08-01	CN1-23	2	TYPEOUT	Control mode conversion output
P08-02	CN1-48	3	BRAKE	Brake operation signal output
P08-03	CN1-22	7	RDY	Servo ready status output
P08-04	CN1-47	6	INSPD/INPOS /INTRQ	Set speed reach completion output
P08-05	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

[Wiring method of output contact]

When output contact of FDA7000 series is combined with contact type device such as relay of external controller, connect as follows.



When output contact of FDA7000 series is combined with open collector input like PLC of external controller, connect as follows.



3.10. Analog monitor function setting[P09-]

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 -	Setting range 0 ~ 5	Manufactured default 0	Speed/Torque/ Position control
P09-05	Monitor 2	Unit -	Setting 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 Instantaneous Max. Torque is +5[V].

P09-02	Monitor ABS 1	Unit -	Setting range ON / OFF	Manufactured default OFF	Speed/Torque/ Position control
P09-06	Monitor ABS 2	Unit -	Setting 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 -	Setting range 0.1 ~ 2000.0	Manufactured default 1.0	Speed/Torque/ Position control
P09-07	Monitor Scale 2	Unit -	Setting 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 : Instantaneous Max. Torque / 5[V]

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

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

3.11. Jog operation parameter setting[JOG-]

JOG-01	Key Jog Mode	Unit -	Setting 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	Setting range -9999.9 ~ 9999.9	Manufactured default 100.0	Speed/Torque/ Position control

This sets the operation speed of the key jog mode.

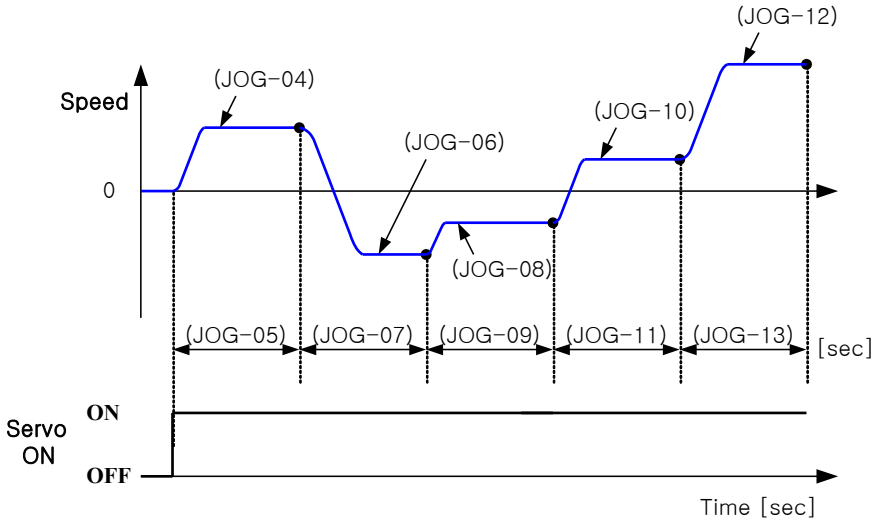
JOG-03	Auto Jog Mode	Unit -	Setting range 0 ~ 2	Manufactured default 0	Speed/Torque/ Position control

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].

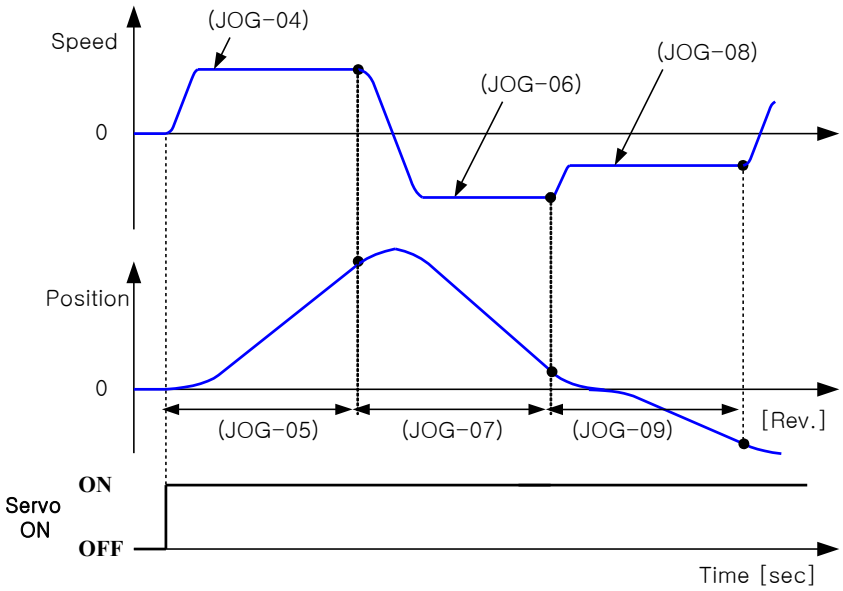
Set value	Operation explanation
0	Do not use auto jog mode
1	Revolution speed-Use revolution time auto jog mode
2	Revolution speed –Use revolution auto jog mode

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

JOG-06	Jog Speed 2	Unit rpm	Setting range -9999.9 ~ 9999.9	Manufactured default -100.0	Speed/Torque/ Position control
JOG-07	Jog Time2/REV2	Unit [sec]/[rev]	Setting range e 0.00 ~ 5000.00	Manufactured default 1.00	Speed/Torque/ Position control
JOG-08	Jog Speed 3	Unit rpm	Setting range -9999.9 ~ 9999.9	Manufactured default 200.0	Speed/Torque/ Position control
JOG-09	Jog Time3/REV3	Unit [sec]/[rev]	Setting range 0.00 ~ 5000.00	Manufactured default 1.00	Speed/Torque/ Position control
JOG-10	Jog Speed 4	Unit rpm	Setting range -9999.9 ~ 9999.9	Manufactured default -200.0	Speed/Torque/ Position control
JOG-11	Jog Time4/REV4	Unit [sec]/[rev]	Setting range 0.00 ~ 5000.00	Manufactured default 1.00	Speed/Torque/ Position control
JOG-12	Jog Speed 5	Unit rpm	Setting range -9999.9 ~ 9999.9	Manufactured default 400.0	Speed/Torque/ Position control
JOG-13	Jog Time5/REV5	Unit [sec]/[rev]	Setting range 0.00 ~ 5000.00	Manufactured default 1.00	Speed/Torque/ Position control
JOG-14	Jog Speed 6	Unit rpm	Setting range -9999.9 ~ 9999.9	Manufactured default -400.0	Speed/Torque/ Position control
JOG-15	Jog Time6/REV6	Unit [sec]/[rev]	Setting range 0.00 ~ 5000.00	Manufactured default 1.00	Speed/Torque/ Position control
JOG-16	Jog Speed 7	Unit rpm	Setting range -9999.9 ~ 9999.9	Manufactured default 800.0	Speed/Torque/ Position control
JOG-17	Jog Time7/REV7	Unit [sec]/[rev]	Setting range 0.00 ~ 5000.00	Manufactured default 1.00	Speed/Torque/ Position control
JOG-18	Jog Speed 8	Unit rpm	Setting range -9999.9 ~ 9999.9	Manufactured default -800.0	Speed/Torque/ Position control
JOG-19	Jog Time8/REV8	Unit [sec]/[rev]	Setting 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-]

ALS-01	Current Alarm	Unit -	Setting 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
14	ABS LOW BATT	Absolute Encoder Battery Low Voltage Alarm	1	1	1	1
15	ERASE FAIL	Flash rom Erase failed alarm	0	0	0	0
16	WRITE FAIL	Flash rom Write failed alarm	0	0	0	1
17	PARAMETER INIT ERR	Flash ROM initialization failure alarm	0	0	1	0
18	OVER TEMP	Over temperature alarm	0	0	1	1
19	STALL O.L:	Stall Over load alarm	0	1	0	0
20	STALL O.C	Stall Over Current alarm	0	1	0	1
21	STALL O.T	Stall Over temperature alarm	0	1	1	0
27	ENC CNT ERR	17bit serial encoder count error alarm	0	1	1	0

[Additional Alarm for FDA7000EX Series]

22	OVER HEAT	Explosion-proof motor overheat alarm	1	0	1	1
23	MOTOR ID ERR	Motor ID read failed	1	0	1	1

ALS-02	Alarm Reset	Unit -	Setting 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 occurrend 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

This is the menu that stores and shows the alarm history. The user cannot set this arbitrarily.

ALS-13	History Reset	Unit -	Setting range ON/OFF	Manufactured default OFF	Speed/Torque/ Position control

It resets and initializes the occurred alarm history.

Chapter 5

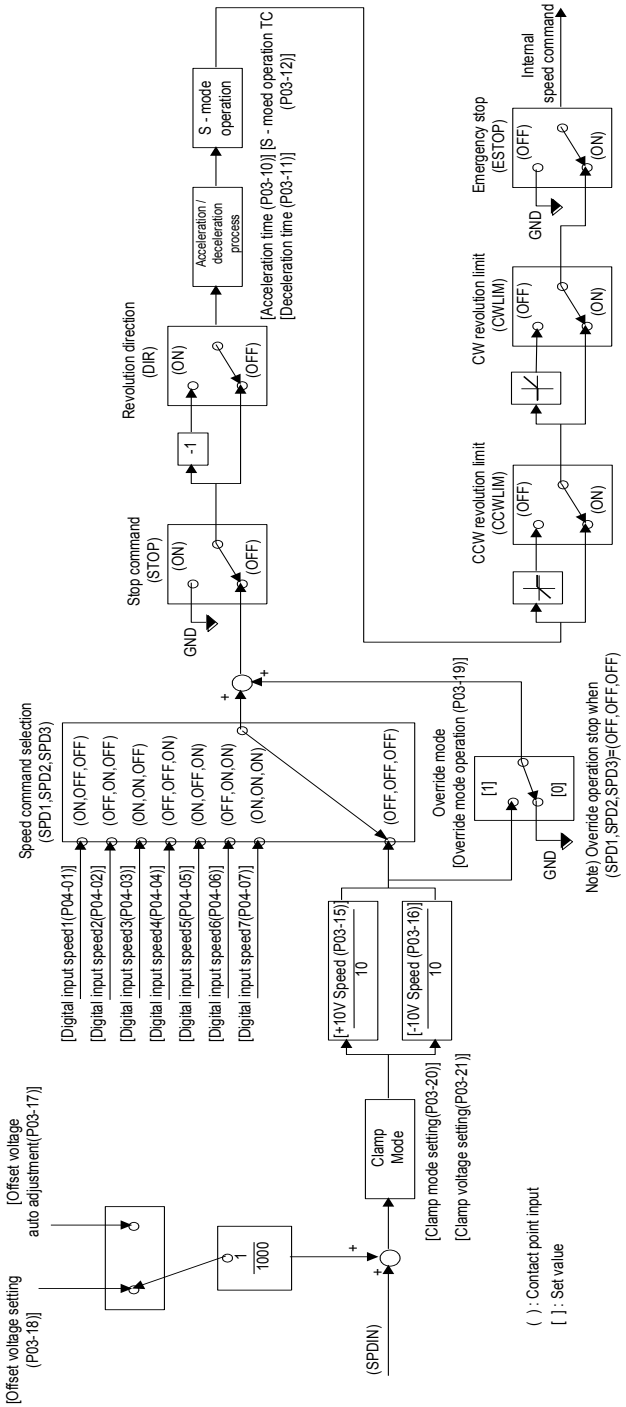
Servo operating

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

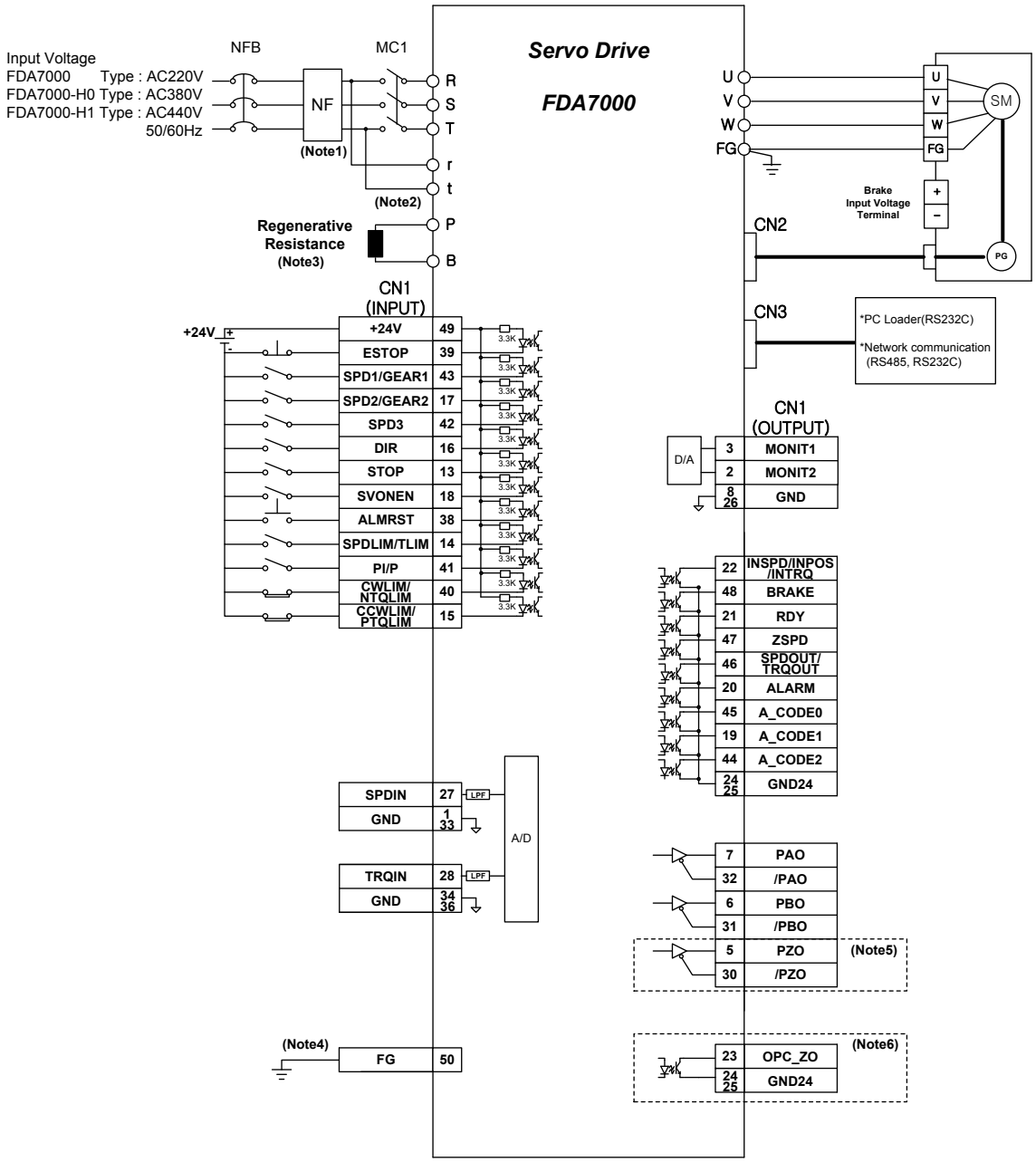
Chapter 4. Servo using method and Gain adjustment

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.



4.1.1. 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).

(Note1) Be sure to use Noise Filter (NF) to prevent noise from entering the outside.

(Note2) Supply power to the r and t terminals as shown below.

FDA7004 ~ FDA7150 : AC 220V

FDA7020-H0 ~ FDA7750-H0 : AC 380V

FDA7020-H1 ~ FDA7750-H1 : AC 440V

FDA7001 ~ 02 type does not have control circuit power r, t terminals.

(Note3) The regenerative resistor of FDA7004 ~ FDA7010 is built-in and is mounted inside the drive. The regenerative resistance of FDA7001, 7002, 7004B and FDA7015 ~ 7750 models is a separate type. Please apply after confirming the capacity. Please contact our sales team for regenerative resistance of models FDA7075 ~ 7750.

(Note4) Be sure to ground the ground wire of CN1 cable to FG (Frame Ground) terminal.

(Note5) Apply the Z phase pulse when outputting by line drive method.

(Note6) Apply the Z phase pulse when outputting by open collector method.

(Note7) Be sure to connect GND24 (CN1-24, 25) and GND (CN1-1, 8, 26, 33, 34, 36) separately.
In case of common connection, malfunction or damage of servo drive may occur.

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

When the servo drive set to speed control mode, this sets the speed control gain.

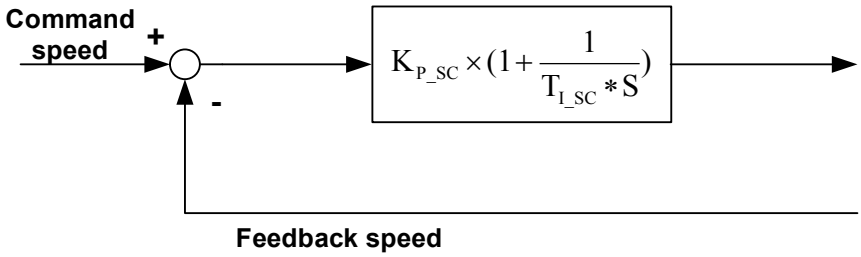
Set value	Operation explanation
1	Use speed controller gain 1 (P03-05, P03-06).
2	Use speed controller gain 2 (P03-07, P03-08).
3	Apply variable gain using gain 1 (P03-05, P03-06) and gain 2 (P03-07, P03-08) according to set speed (P02-20, P02-21) for the speed controller gain.
4	Apply variable gain 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	Setting range 0.0 ~ 1000.0	Manufactured default By capacity	Speed/torque control
P03-07	SC Loop Gain2	Unit Hz	Setting 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	Setting range 0.0 ~ 10000.0	Manufactured default By capacity	Speed/torque control
P03-08	SC TC2	Unit ms	Setting range 0.0 ~ 10000.0	Manufactured default By capacity	Speed/torque control



K_{P_SC} = SC Loop Gain

T_{I_SC} = SC TC

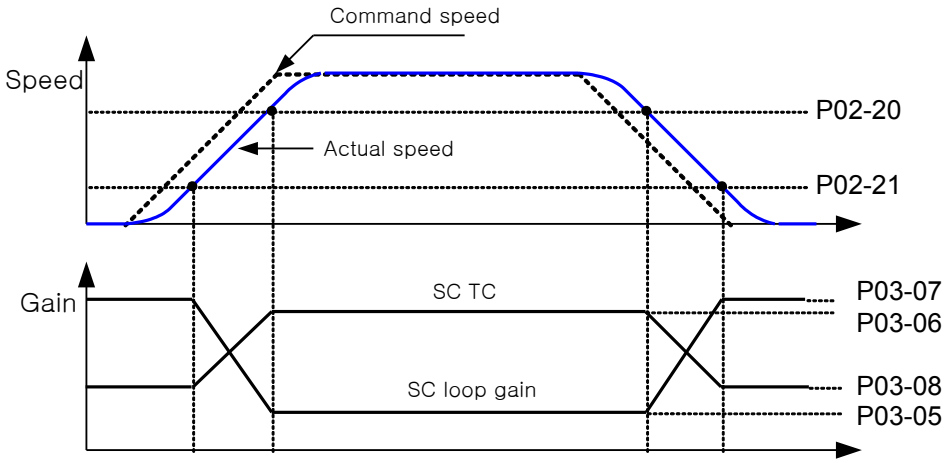
4) This sets the inertia ratio.

P02-19	Inertia Ratio	Unit -	Setting range 1.0~ 50.0	Manufactured default 2.0	Speed/Torque/ Position control

$$\text{Load inertia} = \frac{\text{System inertia(Motor inertia+ Load inertia)}}{\text{Motor inertia}}$$

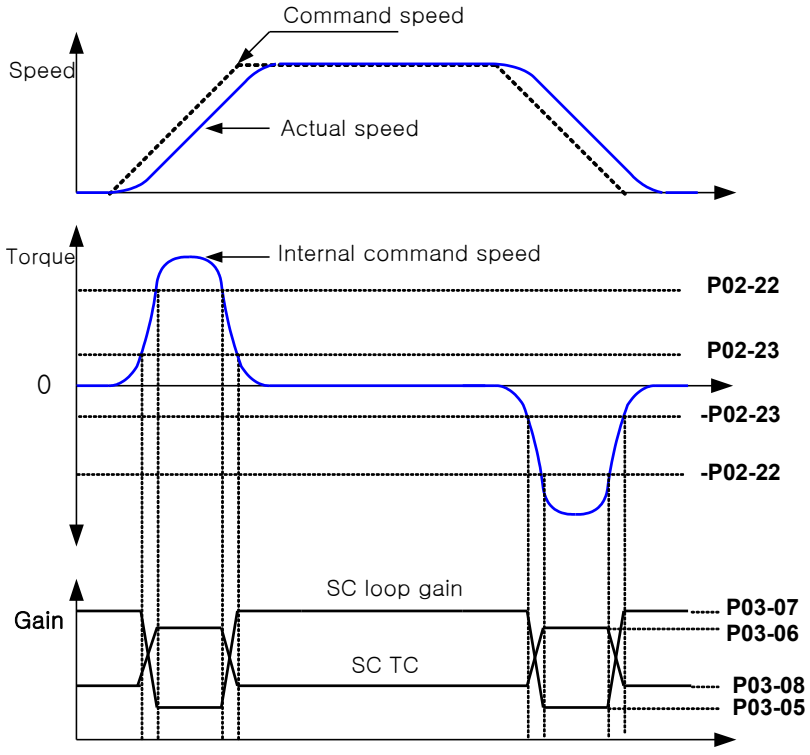
5) When P03-01=”3”, the variable gain is applied based on the following gain adjustment speed 1 and 2.

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

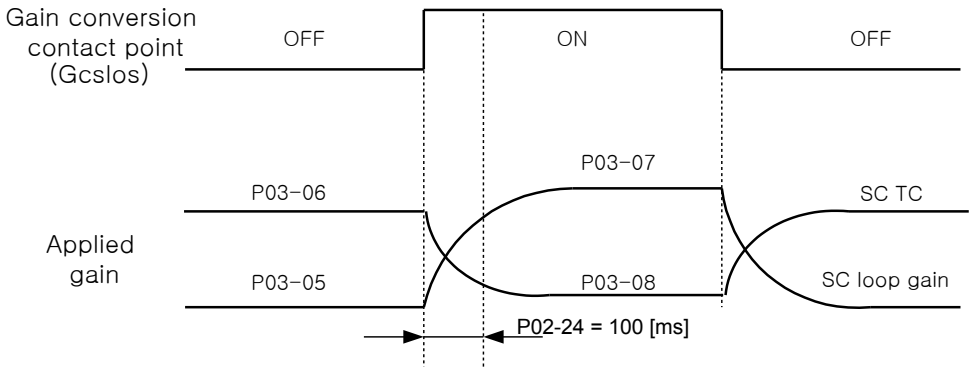
P02-22	Gain ADJ TRQ1	Unit %	Setting range 0.0 ~ 300.0	Manufactured default 150.0	Speed/Torque/ Position control
P02-23	Gain ADJ TRQ1	Unit %	Setting range 0.0 ~ 300.0	Manufactured default 50.0	Speed/Torque/ Position control



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	Setting 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.



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

P03-02	PI-IP Control %	Unit %	Setting range 0.0 ~ 100.0	Manufactured default 100.0	Speed control

[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.

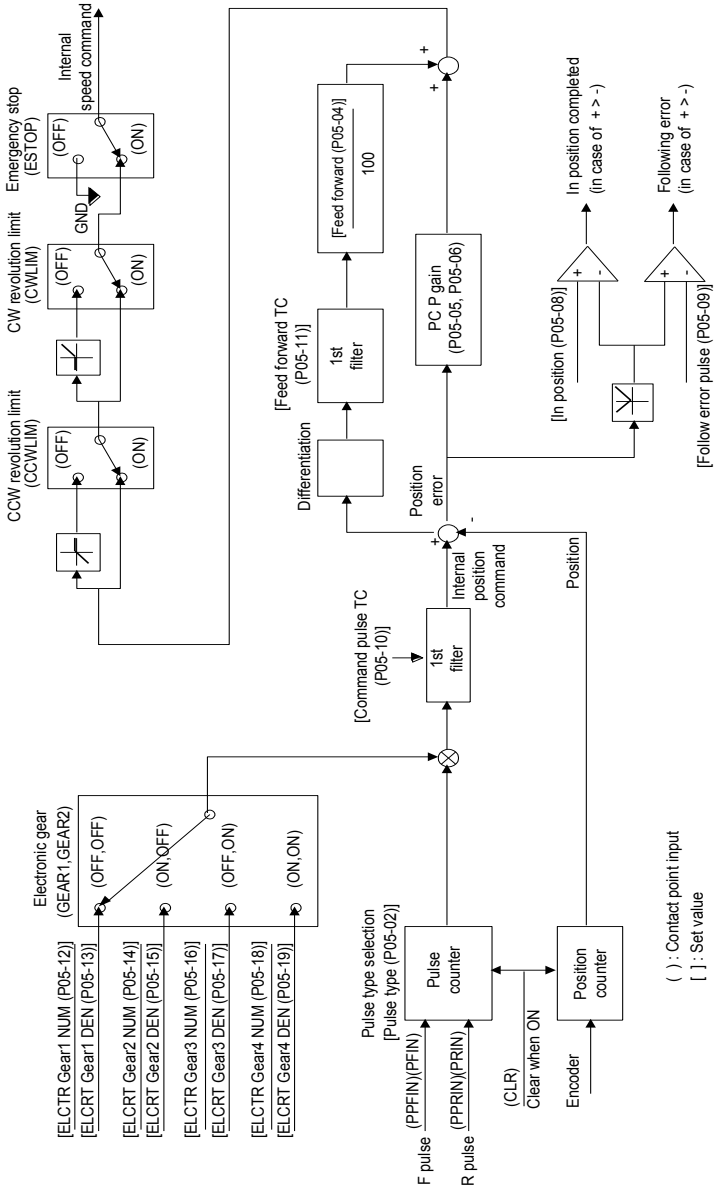
You can adjust the controller set ratio with the desired performance by considering the responsiveness and overshoot.

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

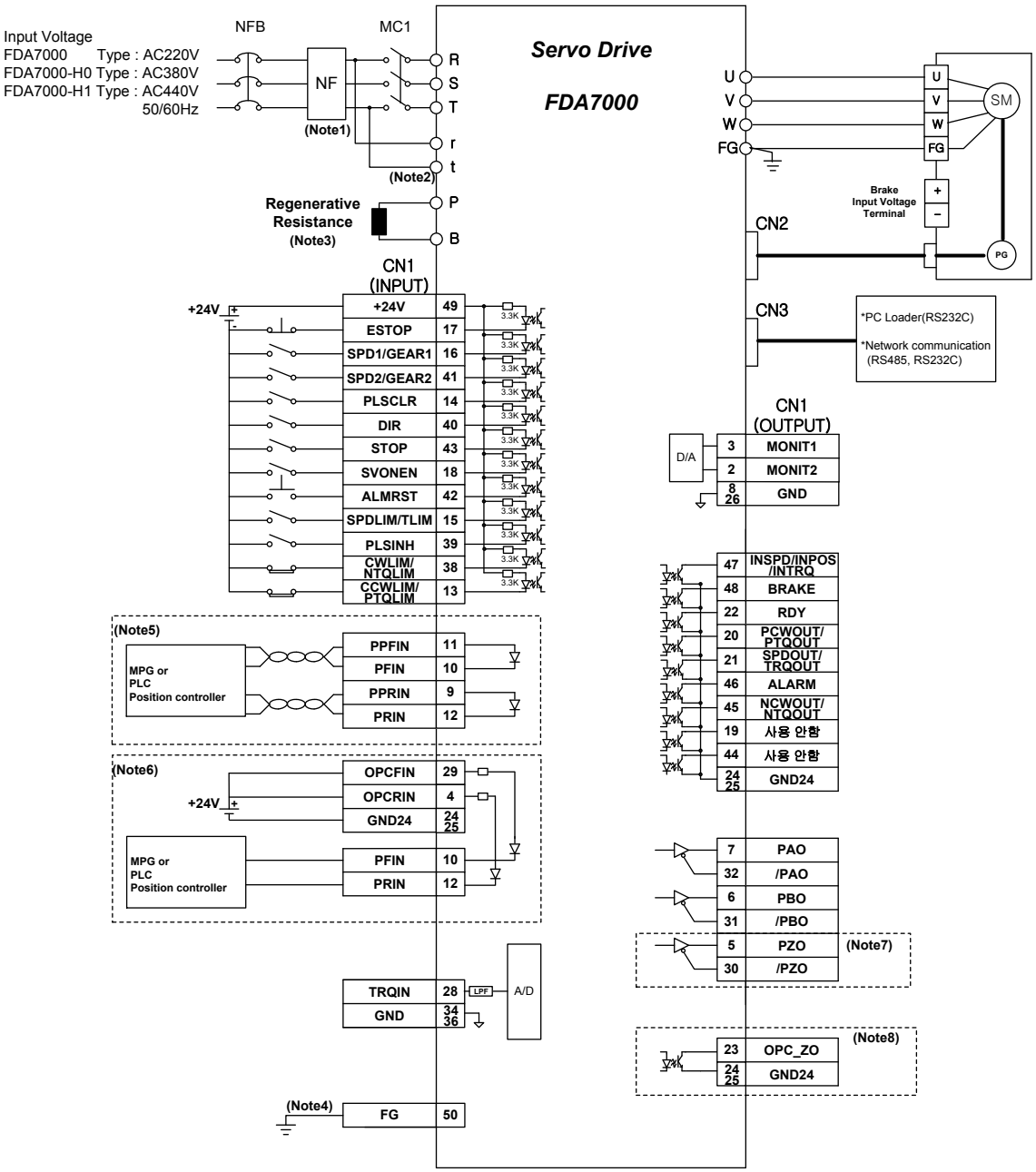
P03-02 = 0 : Applied to IP speed controller

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.



4.2.1. 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).

(Note1) Be sure to use Noise Filter (NF) to prevent noise from entering the outside.

(Note2) Supply power to the r and t terminals as shown below.

FDA7004 ~ FDA7150 : AC 220V

FDA7020-H0 ~ FDA7750-H0 : AC 380V

FDA7020-H1 ~ FDA7750-H1 : AC 440V

FDA7001 ~ 02 type does not have control circuit power r, t terminals.

(Note3) The regenerative resistor of FDA7004 ~ FDA7010 is built-in and is mounted inside the drive. The regenerative resistance of FDA7001, 7002, 7004B and FDA7015 ~ 7750 models is a separate type. Please apply after confirming the capacity. Please contact our sales team for regenerative resistance of models FDA7075 ~ 7750.

(Note4) Be sure to ground the ground wire of CN1 cable to FG (Frame Ground) terminal.

(Note5) Apply position command pulse when outputting by line drive method.

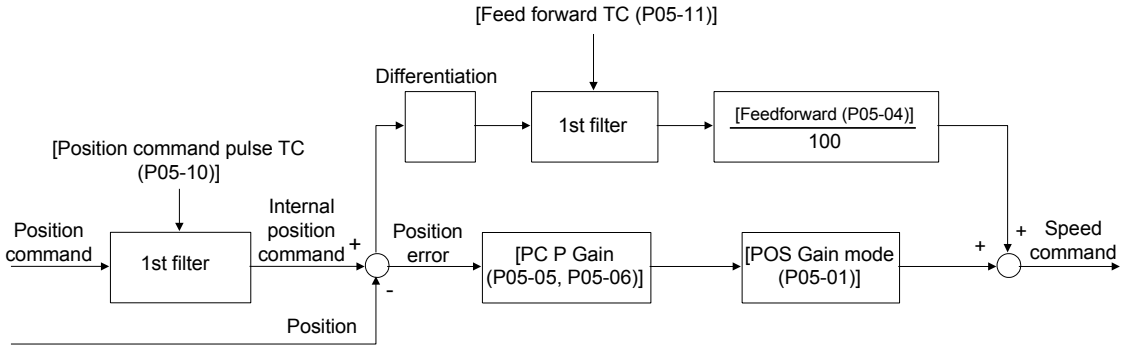
(Note6) Apply position command pulse when outputting by open collector method.

(Note7) Apply the Z phase pulse when outputting by line drive method.

(Note8) Apply the Z phase pulse when outputting by open collector method.

(Note9) Be sure to connect GND24 (CN1-24, 25) and GND (CN1-1, 8, 26, 33, 34, 36) separately.
In case of common connection, malfunction or damage of servo drive may 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.

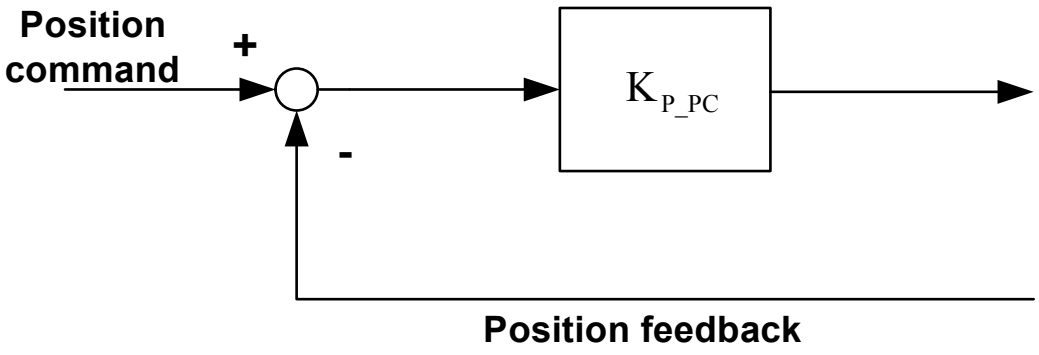
P05-01	POS Gain Mode	Unit -	Setting range 1 ~ 5	Manufactured default 1	Position control

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

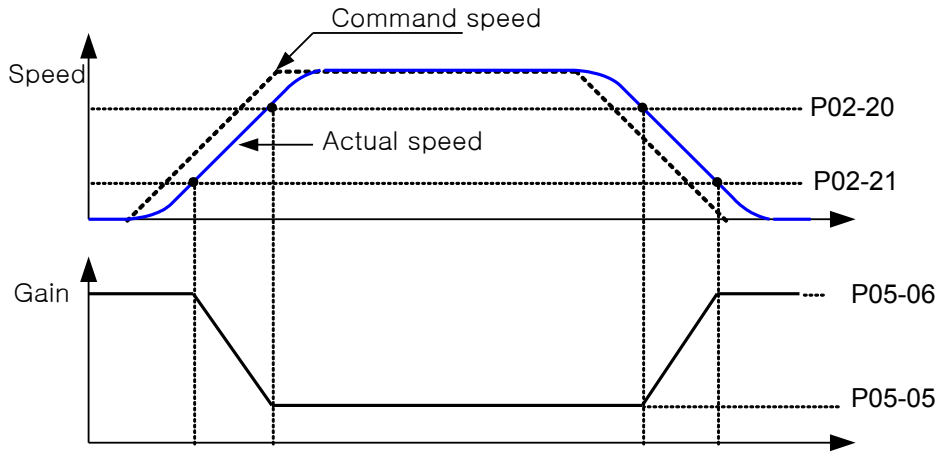
P05-05	PC P Gain1	Unit Hz	Setting range 0.0 ~ 500.0	Manufactured default By capacity	Position control
P05-06	PC P Gain2	Unit Hz	Setting range 0.0 ~ 500.0	Manufactured default By capacity	Position control



K_{P_PC} = **PC P Gain**

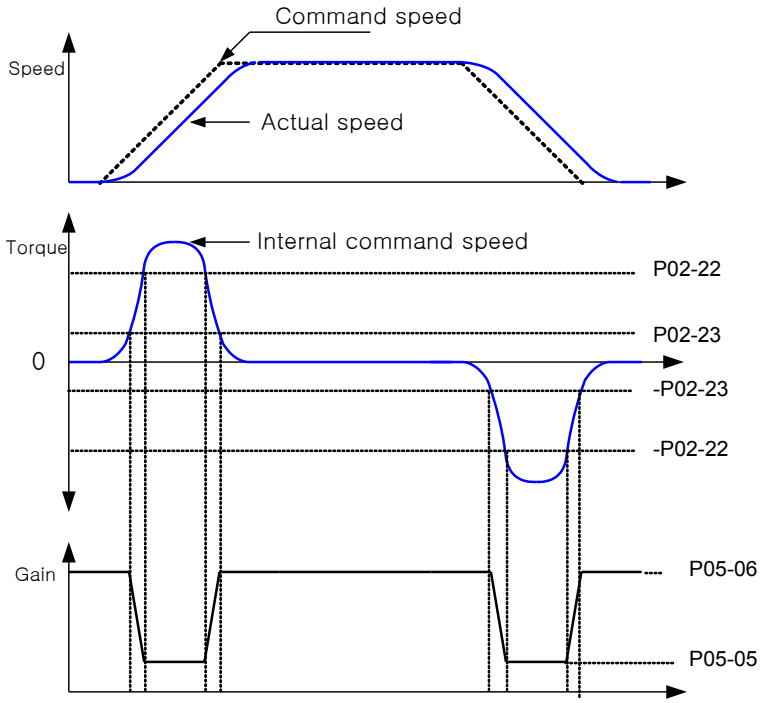
3) When P05-01=”3”, the variable gain is applied based on the following gain adjustment speed 1 and 2.

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

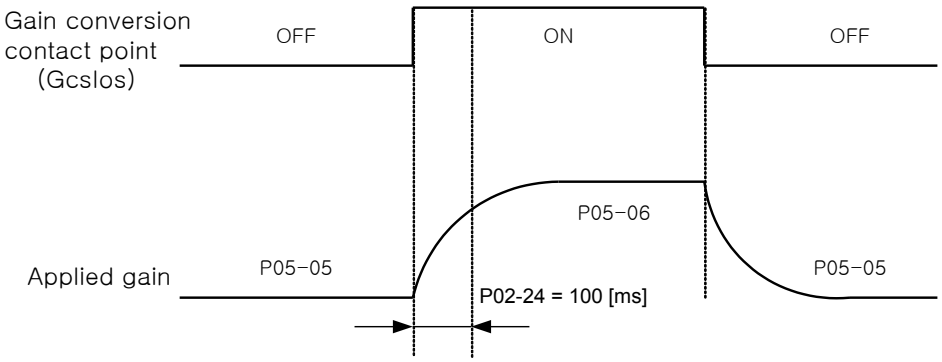
P02-22	Gain ADJ TRQ1	Unit %	Setting range 0.0 ~ 300.0	Manufactured default 150.0	Speed/Torque/ Position control
P02-23	Gain ADJ TRQ2	Unit %	Setting range 0.0 ~ 300.0	Manufactured default 50.0	Speed/Torque/ Position control



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	Setting range 0.0 ~ 10000.0	Manufactured default 100.0	Speed/Torque/ Position control

If you want to execute smooth gain conversion, set the Contact Gain TC to long. Enter the Contact Gain TC in (ms) unit.



6) Feed forward ratio setting

P05-04	Feedforward	Unit %	Setting range 0.0 ~ 100.0	Manufactured default 0.0	Position control

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=[Speed loop gain]/[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

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]

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

7) Position command pulse TC setting

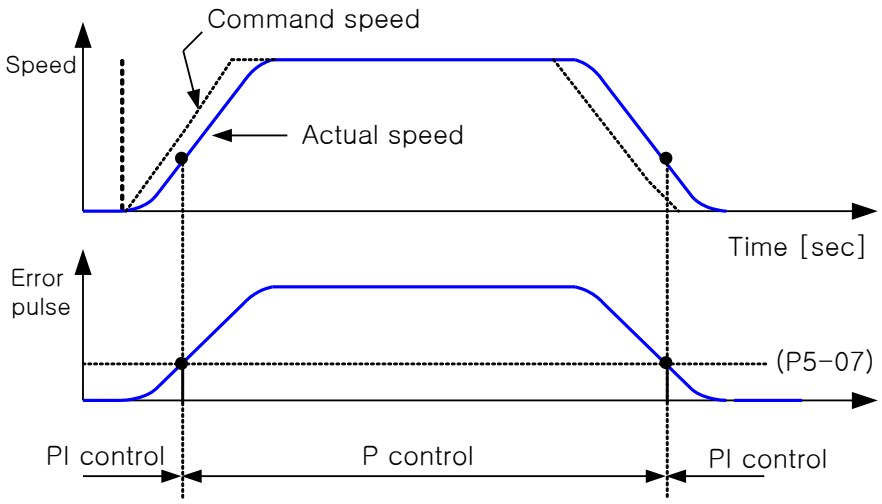
P05-10	POS CMD TC	Unit ms	Setting range 0.0 ~ 2000.0	Manufactured default 0.0	Position control

Set the filter TC on the position command pulse input for smoothing operation in the position 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.

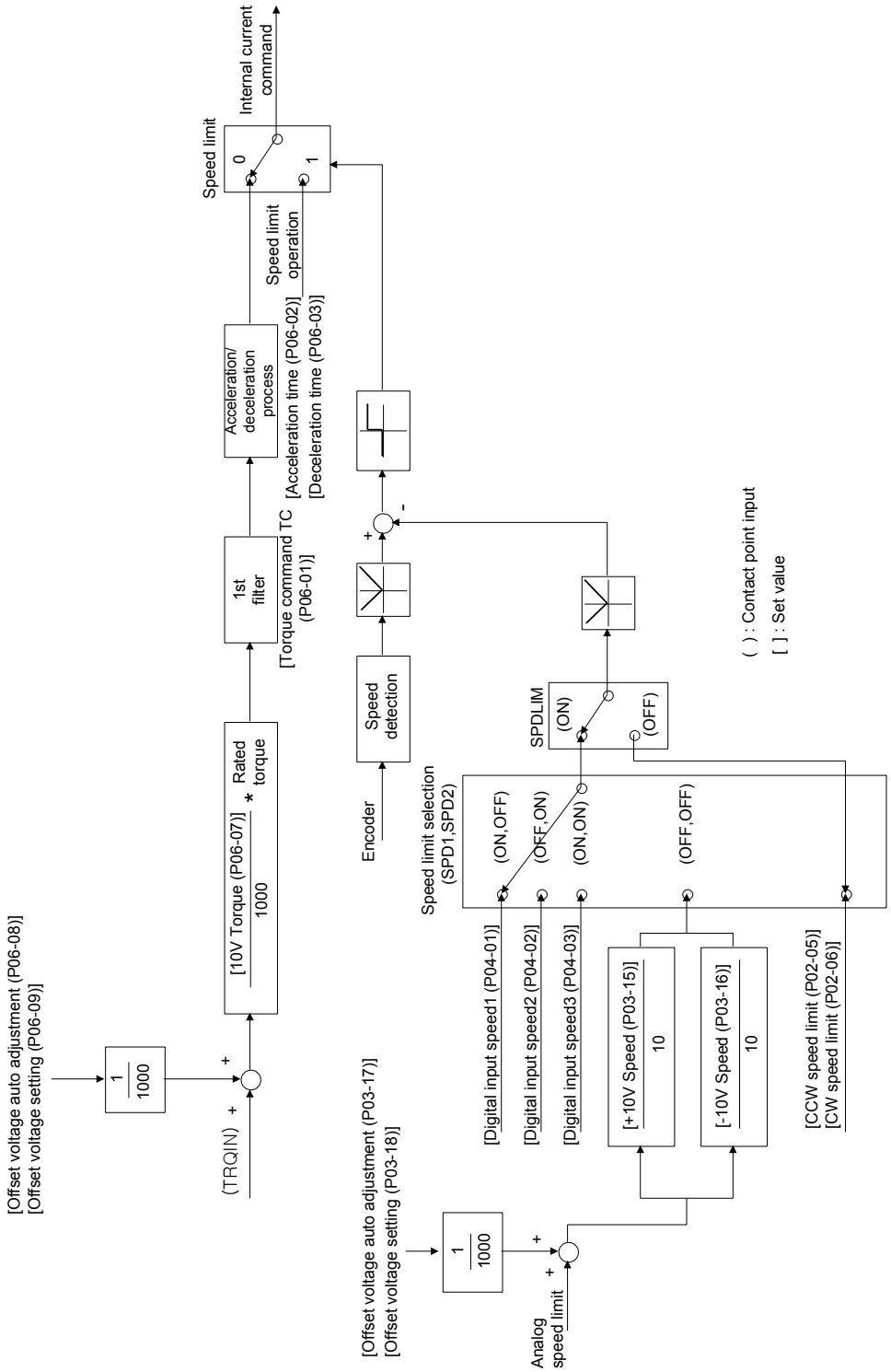
P05-07	PI-P Pulse ERR	Unit pulse	Setting range 0 ~ 99999	Manufactured default 0	Position control

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.

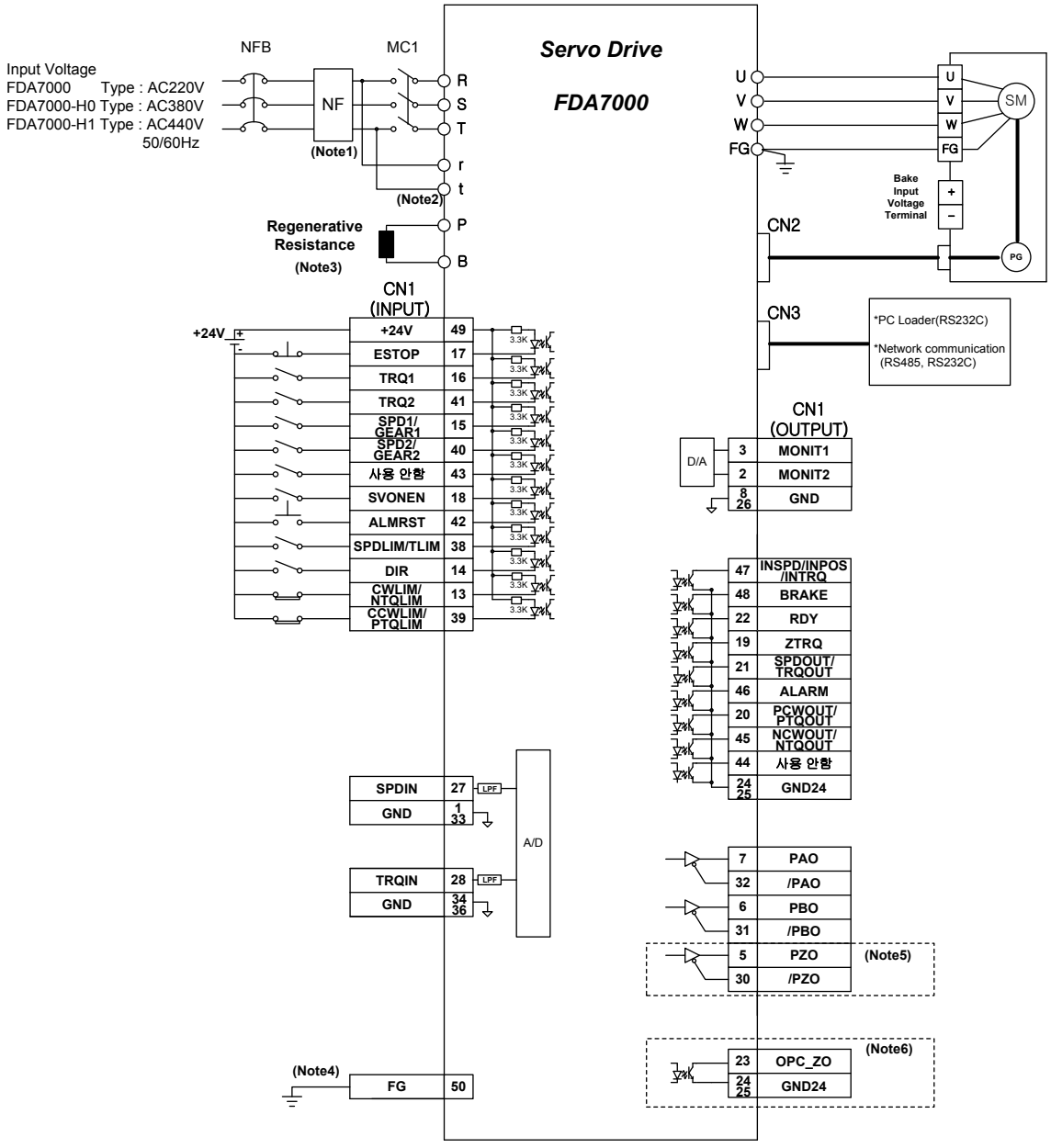


4.3. Gain adjustment method for torque control mode

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.



4.3.1. 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).

(Note1) Be sure to use Noise Filter (NF) to prevent noise from entering the outside.㈜2 :

(Note2) Supply power to the r and t terminals as shown below.

FDA7004 ~ FDA7150 : AC 220V

FDA7020-H0 ~ FDA7750-H0 : AC 380V

FDA7020-H1 ~ FDA7750-H1 : AC 440V

FDA7001 ~ 02 type does not have control circuit power r, t terminals.

(Note3) The regenerative resistor of FDA7004 ~ FDA7010 is built-in and is mounted inside the drive. The regenerative resistance of FDA7001, 7002, 7004B and FDA7015 ~ 7750 models is a separate type. Please apply after confirming the capacity. Please contact our sales team for regenerative resistance of models FDA7075 ~ 7750.

(Note4) Be sure to ground the ground wire of CN1 cable to FG (Frame Ground) terminal.

(Note5) Apply the Z phase pulse when outputting by line drive method.

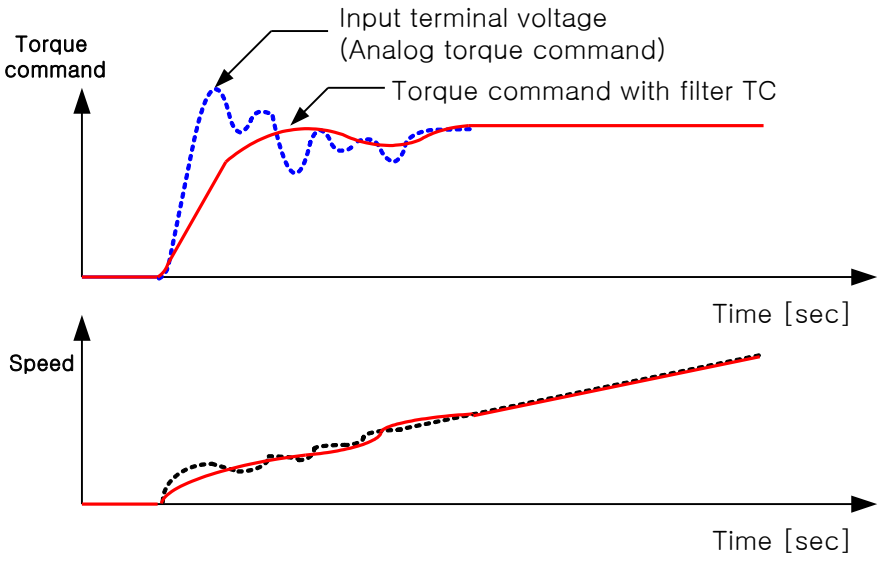
(Note6) Apply the Z phase pulse when outputting by open collector method.

(Note7) Be sure to connect GND24 (CN1-24, 25) and GND (CN1-1, 8, 26, 33, 34, 36) separately.
In case of common connection, malfunction or damage of servo drive may occur.

4.3.2. Gain adjustment of torque servo

P06-01*	Analog TRQ TC	Unit ms	Setting range 0.0 ~ 2000.0	Manufactured default 0.0	Torque control

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. Auto-tuning

For the Auto-tuning 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.

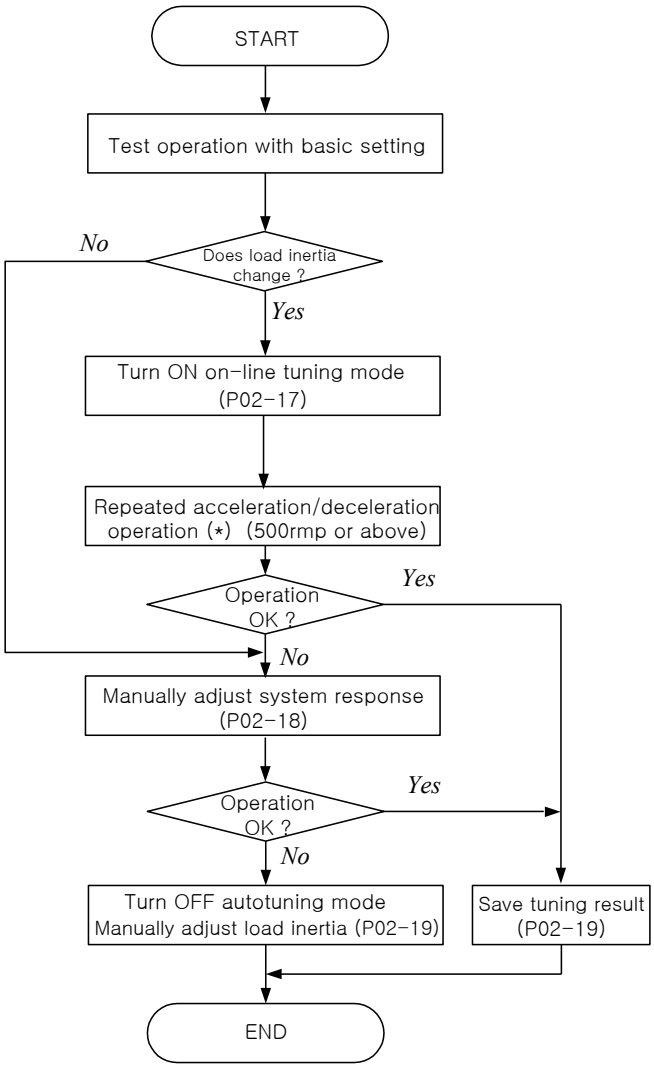
4.4.1. System response setting

The system response is set (P02-18) manually before using Auto-tuning. The following P05-05, P05-06, P03-05, P03-06, P03-07, P03-08 and P02-16 automatically changes and when the Auto-tuning 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. Auto-tuning setting sequence



♥ Auto-tuning 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 Auto-tuning mode (P02-17).

4.4.3. Precaution during Auto-tuning

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 Auto-tuning when operating weak belt with lower mechanical strength.

4) Avoid using Auto-tuning 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. Important Points of Gain Adjustment

From the drive's command, the motor needs to run as soon as possible with no time delay. Please familiarize yourself with the following important points for this operation.

1) Important points when in speed control mode

- Speed control proportional gain(P03-05) gradually increases the motor (machine) to a value that does not generate strange sounds and vibrations. Also, since the speed control proportional gain value and inertia ratio are proportional to each other, if the noise or vibration occurs in the motor (machine), reducing the inertia ratio or speed control proportional gain reduces the strange sound and vibration in the motor (machine).

- Like the speed control proportional gain, the inertia ratio(P02-19) gradually increases to the value where strange sounds and vibrations do not occur in the motor (machine). In addition, since the inertia ratio and the speed control proportional gain are proportional, if the noise or vibration occurs in the motor (machine), reducing the speed control proportional gain or inertia ratio reduces the strange sound and vibration in the motor (machine).

- Velocity integral time constant(P03-06) is gradually decreased in order to reduce velocity ripple and reduce over / under shoot in most applications. However, if the value of speed integral time constant is set too small, strange sounds and vibrations may occur in the motor (machine). In addition, if the load is very large (more than 8 times), set the speed integral time constant to a large value and reduce the speed control proportional gain value.

2) Important points when using Gain 1 and Gain 2 in speed control mode

- Gain switching method by contact
  : When sound is generated when the motor is stopped, the contact can be selected to apply high gain during normal operation and the contact can be selected to apply low gain after motor stop. In this case, using P03-22 (Stop speed vibration suppression) produces a similar effect.

- Gain switching method by speed
  : The gain switching method by contact is aimed at setting low gain in the motor stop area, while the speed gain switching method requires high-precision machining which requires high gain at low speed and low gain at high speed. This can be used for machines.

- Gain switching method by torque
  : If the gain is set high when the servo motor is operated with high torque, it may cause vibration. In addition, when the servo motor is operated at low torque, the low gain causes poor speed ripple and control performance. In this case, by using the gain switching method for torque, stable and excellent control performance can be realized in the whole operating area.

3) Important points when in position control mode

- Position control proportional gain gradually increases to the value that undershoot does not occur when abnormal sound, vibration and target position are reached in the motor (machine). In addition, increase the speed control proportional gain value and inertia ratio to a value where noise does not occur from the motor (machine).

- Responsiveness is improved by decreasing the value of the speed integral time constant. However, if it is made too small, it can cause vibration in the motor (machine), and if it is too

large, the deviation pulse can be maintained without convergence.

4) Important points when using Gain 1 and Gain 2 in the position control mode

- Gain switching method by contact
  : When sound is generated when the motor stops, select the contact to apply high gain in normal operation and select the contact to apply low gain after motor stop.

- Gain switching method by speed
  : The gain switching method by contact is aimed at setting low gain in the motor stop area, while the speed gain switching method requires high-precision machining which requires high gain at low speed and low gain at high speed. This can be used for machines.

- Gain switching method by torque
  : If the gain is set high when the servo motor is operated with high torque, it may cause vibration. In addition, when the servo motor is operated at low torque, the low gain causes the speed ripple and control performance to deteriorate. In this case, by using the gain switching method for torque, stable and excellent control performance can be realized in the whole operating area.

4.6. 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.

4.6.1. 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.

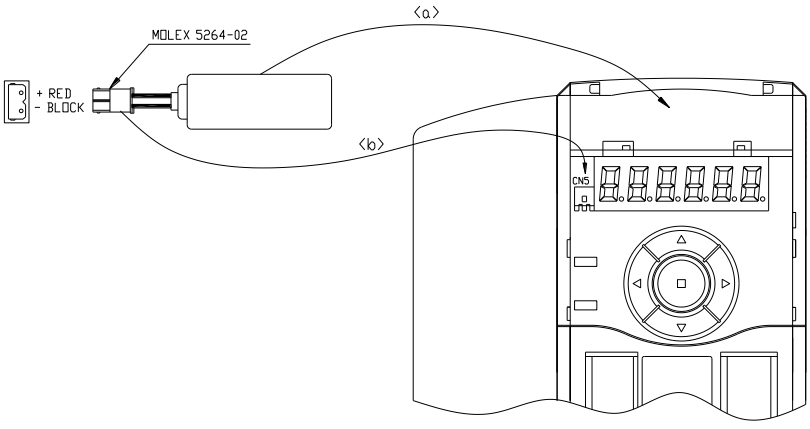
1) Recommended battery specification

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

- FDA7001~7045, FDA7004B~7030B, FDA7002EX~7045EX

  : Attached to the inside of the servo drive

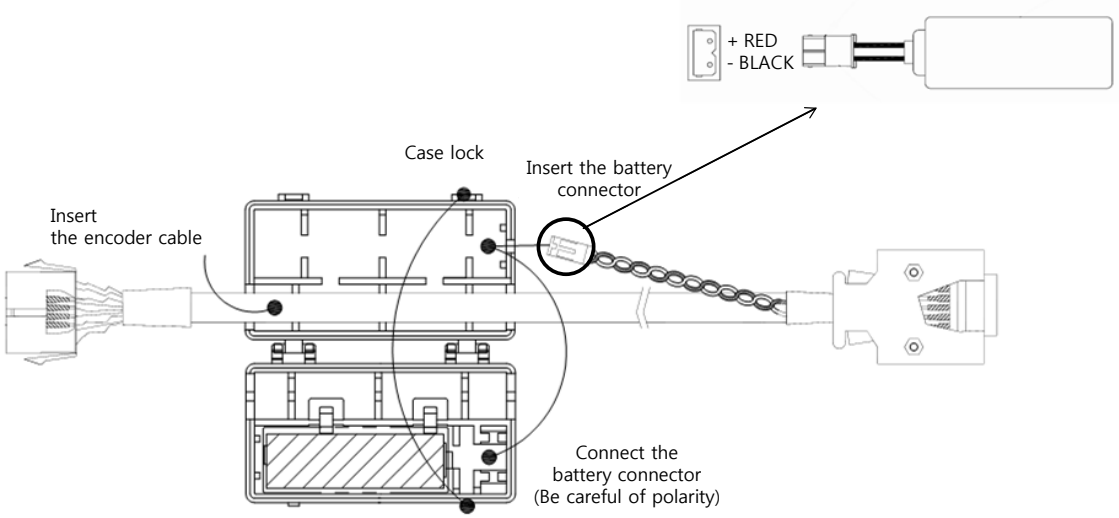


<a> : Open the cover and insert the battery unit in the arrow direction.

<b> : Connect the connector to CN5.

- FDA7075 ~ 7150, FDA7020-H ~ FDA7750-H type should be attached to encoder cable using battery case.

♥ **Battery Order Code: KBAT70 (Integrated Case)**



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.

4.6.2. 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

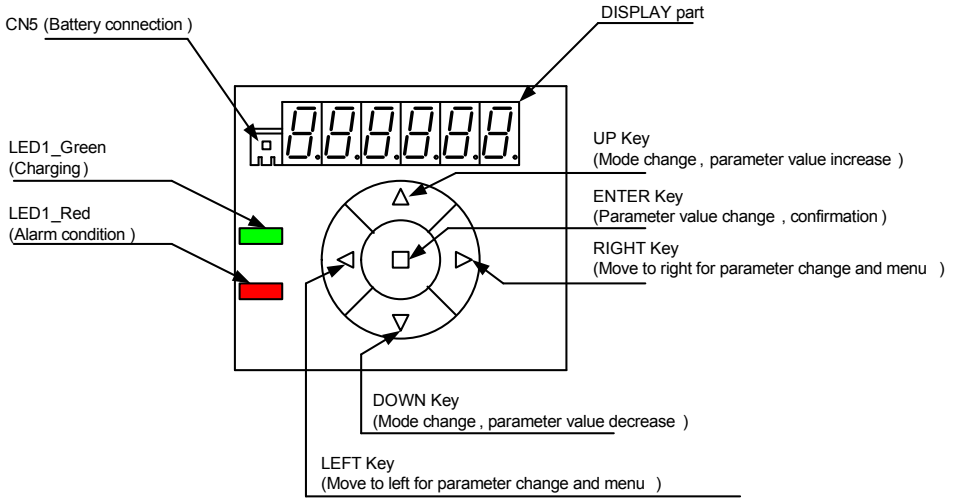
Servo operating

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

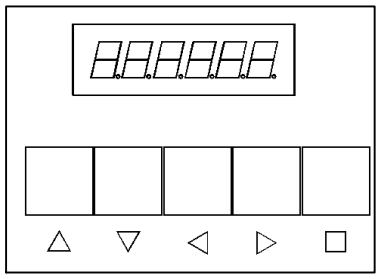
Chapter 5. Servo operating

5.1. Basics of loader

When the servo drive is first installed on the control panel, it is essential to check the motor parameters (P01--) before applying the main circuit power and activating SVONEN. It is information about the motor connected to the servo and the correct value must be set for the servo system to operate normally. Next, monitor the group that displays the motor status (StE--) and make sure that various commands and limits are set correctly. And if it is the first time operation, verify the stability to some extent through autotuning, test operation (Jog, Auto Jog). Auto tuning operation is available online, but it is not necessary to use it when the gain of stable control system is secured off line.



[Overview diagram of FDA7001~FDA7010 internal mount loader]



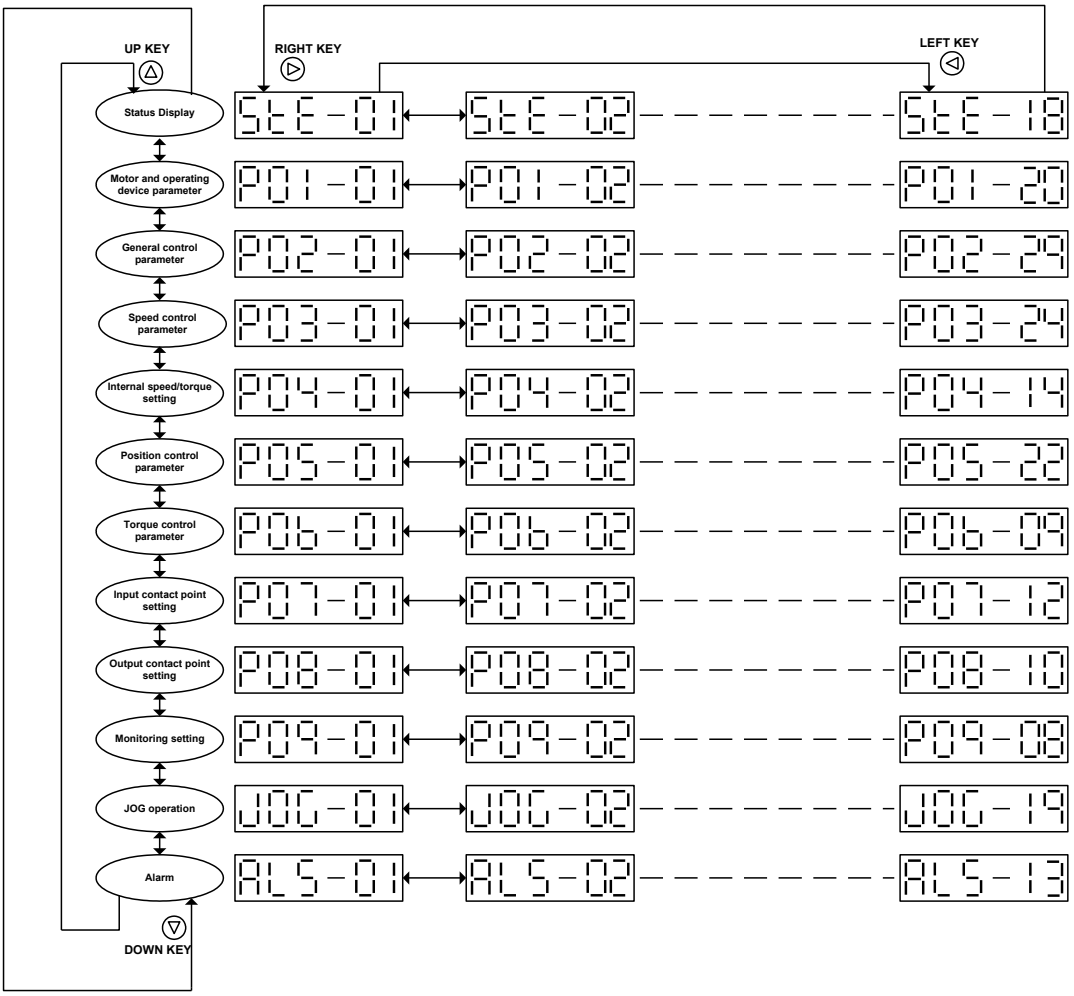
UP DOWN LEFT RIGHT ENTER

[Overview diagram of FDA7075~7150, FDA7020-H~7750-H internal mount 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
1st and 2nd 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

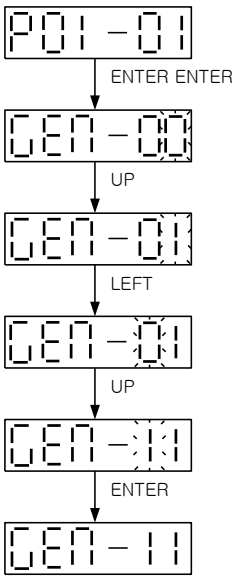
DOWN : Negative direction mode change, decrease in blinking value

LEFT : Move blinking value to left

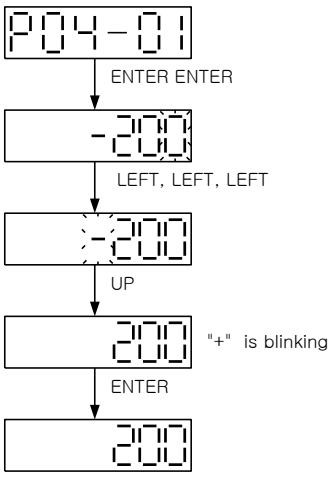
RIGHT : Move blinking value to right

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

※ Enter motor ID (00 → 11)



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

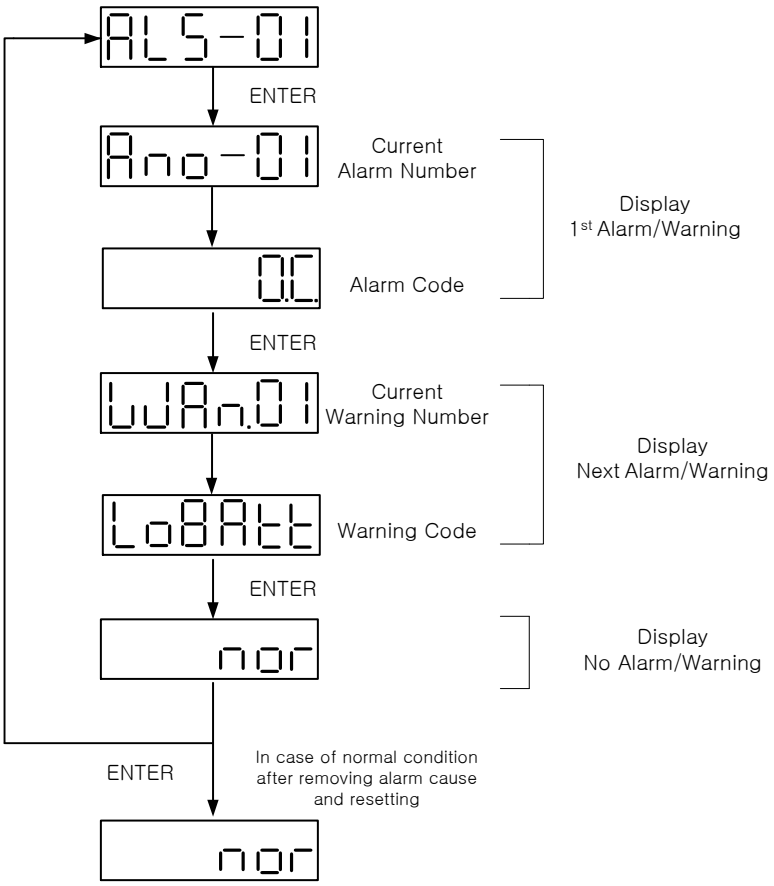


◆ When changing the parameter “-“ sign indicates the blinking value but “+” sign does not indicate anything.

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

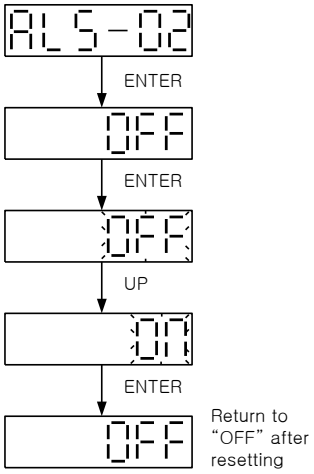
UP : ON/OFF change

DOWN : ON/OFF change

LEFT : Move menu

RIGHT : Move menu

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

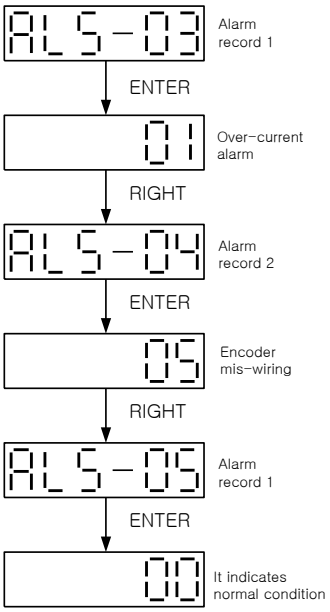


As the function to reset the alarm generated in the current system, the alarm reset menu is the same function as external input reset.

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)

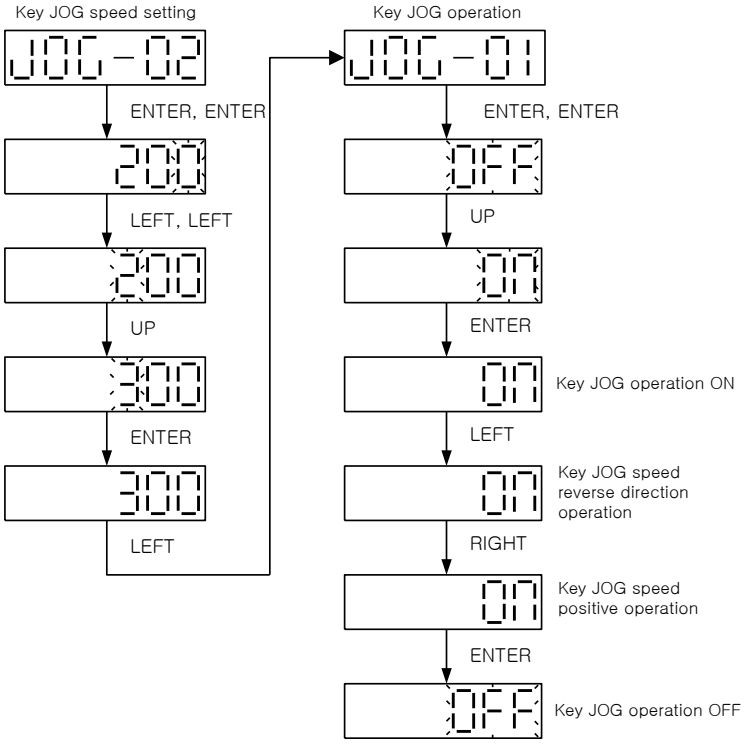
UP : Positive direction mode change, increase blinking value

DOWN : Negative direction mode change, decrease in blinking value

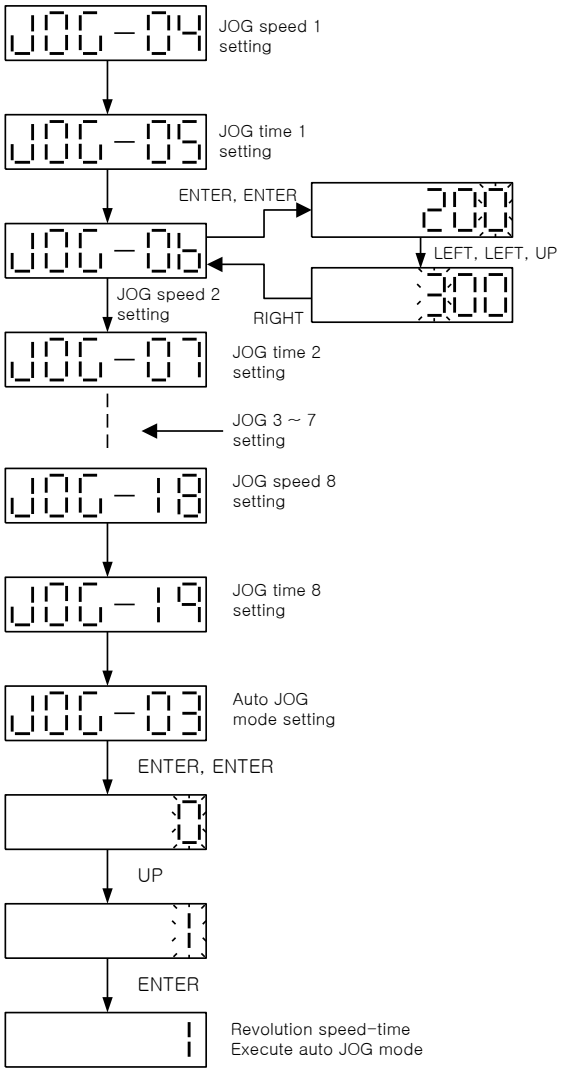
LEFT : Command reverse direction revolution, move blink to left when entering key jog speed (JOG-02)

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

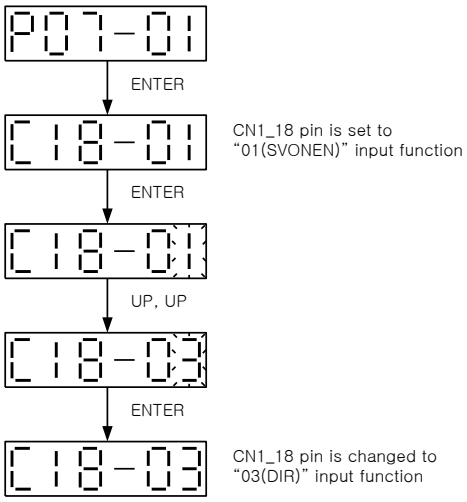


Auto jog mode supports 8-steps repeated pattern operations, and the 1st auto jog mode that sets the revolution speed [rpm] and revolution time [sec] and 2nd auto jog mode that sets the revolution time [rpm] and revolutions [rev] are supported.

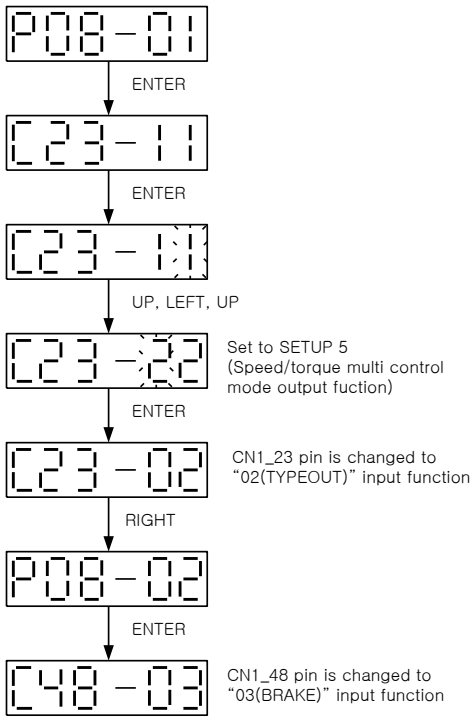
JOG-03 Set value	Operation explanation
0	Do not use auto jog mode
1	Use auto jog mode for revolution speed – revolution time
2	Use auto jog mode for revolution speed – revolutions

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)



Chapter 6

Troubleshooting and check

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

Chapter 6. Troubleshooting and check

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.

6.1.2. 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.

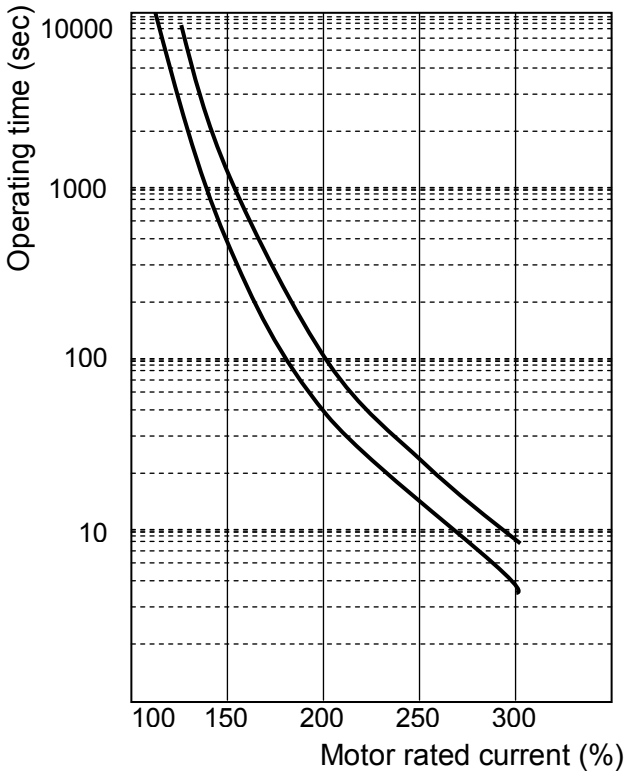
Display	Content	Cause	Corrective Actions
nor	Normal condition		
Ano-00 EMER STOP	Emergency stop	Turn external ESTOP contact point input OFF.	Check external DC 24V power. Check ESTOP contact point ON status
Ano-01 OVER CURNT	Over-current	Servo drive output terminal (U, V, W) short circuit, output over-current	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-wring, 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.
Ano-13 Output EC	Output U,V,W Mis-wiring	Output U, V, W mis-wiring (Error Connection)	Check motor wiring, replace servo drive
Ano-14 ABS LOW BATT	Battery LOW Voltage Alarm	Battery voltage is lowered below 3.1V (When P02-35 = 1)	Battery (3.6V) replacement
Ano-15 FLASH ERR	Parameter Erase Error	Flash-ROM erase fail	After checking power system noise, reset. Replace drive if it still occurs
Ano-16 FLASH ERR	Parameter Write Error	Flash-ROM write fail	After checking power system noise, reset. Replace drive if it still occurs
Ano-17 FLASH ERR	Parameter Init. Error	Parameter initialization fail	
Ano-18 OVER TEMP.	Over Temperature	High load long time driving, Temperature rise in the cabinet, Temperature sensor failure and cable removal	Check motor proper load, check cooling in electric cabinet, replace temperature sensor and cable, check machine

Ano-19 STALL OVER LOAD	Stall status Over-load	Servo motor restrained state, High load operation at stop	Servo motor restraint, stall status, proper load inspection through machine inspection
Ano-20 STALL OVER CURNT.	Stall status Over-current	Servo motor restrained state, Servo drive output terminal (U, V, W) short circuit, DB fault, output over-current	Servo motor is constrained by machine check, stall load proper load check, output terminal wiring check, restart after alarm reset, Over-Current continue drive replacement
Ano-21 STALL OVER TEMP.	Stall status Over-load	Servo motor restrained state Servo motor fan failure Temperature sensor failure and cable removal	Servo motor restraint, stall status proper load check, servo motor fan check, temperature sensor and cable check through machine check
Ano-27 ENC CNT ERR	17bit serial encoder count error	Poor encoder cable signal connection, bad FG wiring, Encoder failure	Encoder cable signal line and FG wiring check, encoder cable replacement, encoder replacement
Wan.01 ABS LOW BATT	Battery LOW Voltage Warning	Battery voltage is lowered below 3.1V (When P02-35 = 0)	Battery (3.6V) replacement
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.

[When using the FDA7000EX Series]

Ano-22 OVER HEAT	Explosion proof motor Overheat alarm	Explosion-proof motor overheating state, Motor temperature detection signal wiring	After cooling the explosion-proof motor, check the PTC connection. Explosion-proof motor if alarm occurs continuously at room temperature
Ano-23 ID FAIL	Servo motor parameter Reading failure	Encoder cable error, Incremental Type Servo motor, encoder failure	Encoder Cable Check Servo motor encoder type check Encoder exchange



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]

(note1) If Ano-03 (OVER LOAD) happens often, refer servo drive overload characteristic-curve and re-establish suitable load of servo motor.

(note2) The overload alarm occurs 25% faster when the motor is in the Stall state.

6.2. Precautions

- When measuring motor voltage: The voltage output from the servo amplifier to the motor is PWM controlled, so the waveform of pulse phase is output. Since the indicated value can vary greatly depending on the type of instrument, be sure to use a rectified voltmeter for accurate measurements.

- When measuring the motor current: The pulse waveform is smoothed to a certain sine wave by the reactance of the motor, so connect the moving iron type ammeter directly.

- When measuring electric power: Measure the electric current type by the three-wattmeter method.

- Other instruments: When using an oscilloscope or digital bolt meta, please use it without touching the ground. Use a meter input current of 1 mA or less.

6.3. 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.

6.4. Part replacement

The following parts are subject to deterioration and failure of equipment due to mechanical friction or aging. Therefore, periodical inspection and regular replacement are necessary for preventive preservation.

1) Smoothing Capacitor: Aging characteristics due to ripple current. The life of a capacitor is highly dependent on the ambient temperature and the operating conditions, but 10 years is the standard for continuous operation under normal air-conditioning conditions. Aging of capacitors proceeds rapidly over a period of time, so the inspection period should be checked at least once a year (less than half a year when it is close to life).

As an external judgment standard of inspection matter

a. Condition of the case: side, bottom extension of the case

b. Condition of the lid: prominent expansion, extreme cracking, cracking

c. Explosion-proof condition: Significant extension of the sides, working

d. In addition, the service life is judged when the rated capacity of the capacitor regularly falls below 85%, such as appearance, sheathing, cracking, discoloration, and leaking water.

2) Relays: Poor contact occurs due to contact wear caused by switching current. As it depends on the power supply capacity, the life cycle is based on 100,000 cumulative switching times (switching life).

3) Motor bearing: Replace the motor at rated speed and rated load based on 20,000 to 30,000 hours. Since the bearing of the motor depends on the operating conditions, replace it even if you find abnormal noise or abnormal vibration during inspection.

[Standard replacement years of parts]

Part Name	Standard replacement years	replacement method, others
Smoothing condenser	7 ~ 8 years	Replacement with new boards (decision after inspection)
Relays	-	decision after inspection
Fuse	10 years	Replacement with new boards
Motor bearing	-	decision after inspection
Aluminum Electrolytic Capacitors on Printed Boards	5 years	Replacement with new boards (decision after inspection)

6.5. Preservation

6.5.1. Servo Motor

If you do not use it right away, please keep the following things in mind.

1) Keep in a clean and dry place.

Storage temperature	Storage humidity
-15 ℃ ~ +70℃	90 % RH or below

(Caution!) No condensation or freezing

2) When storing outdoors or in a humid place, prevent rain and dust from entering.

3) If the product is to be stored for a long time after use, apply anti-rust agent to the machine's moving surfaces such as shafts to prevent rust.

6.5.2. Servo Drive

It is not recommended to store it for a long time without using it.

1) Keep in a clean and dry place.

Storage temperature	Storage humidity
-15 ℃ ~ +65℃	90 % RH or below

(Caution!) No condensation or freezing

The storage temperature is for a short time, such as in transportation.

2) It is an open structure, so be careful not to catch dust.

Chapter 7

Connection with host controller

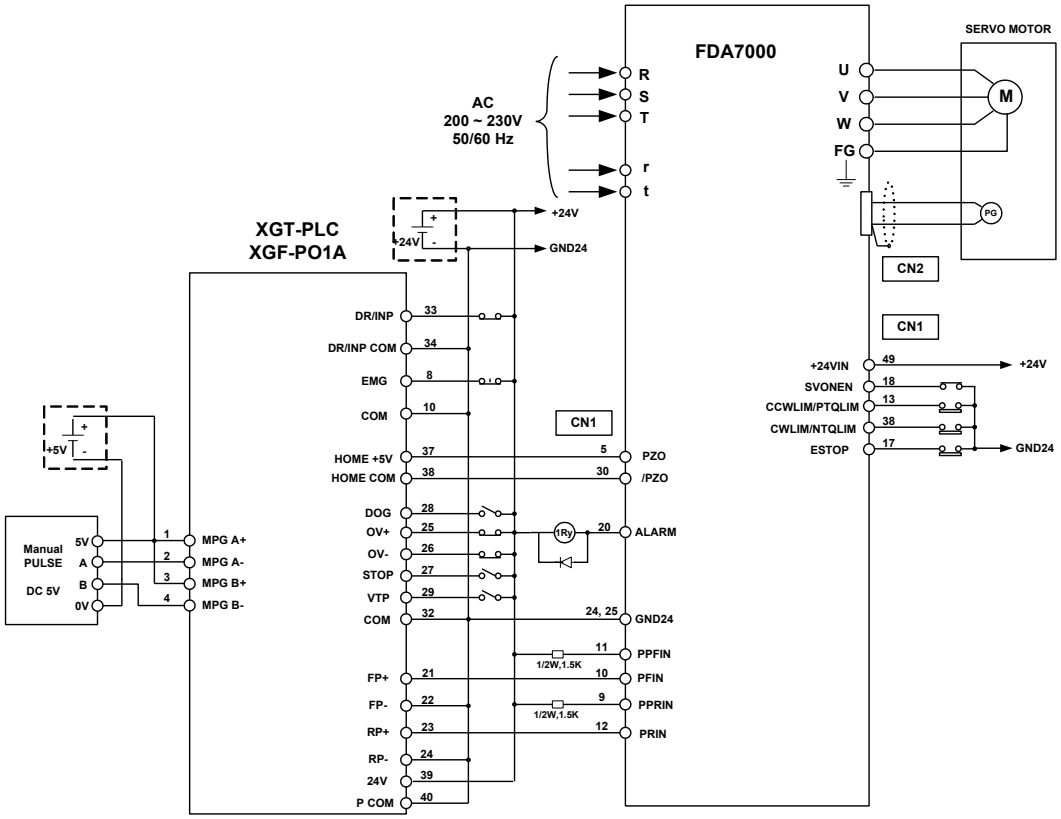
Chapter 7 shows the example of connection with representative host controller.

Chapter 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.



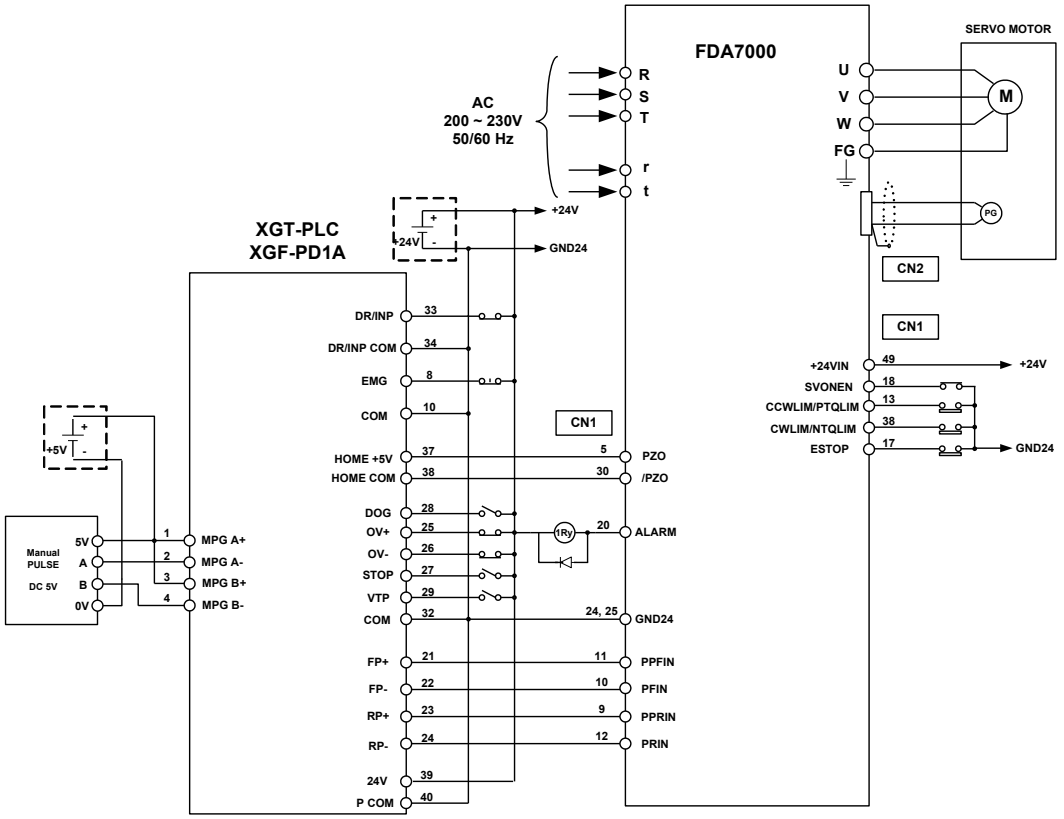
(Note) After connecting the power, it takes about 1-2 seconds until the alarm signal leads to normal operation. Consider this when designing the power connection sequence. Also the alarm signal operates alarm detection relay 1Ry to turn on the main circuit power of servo drive.

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)

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

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



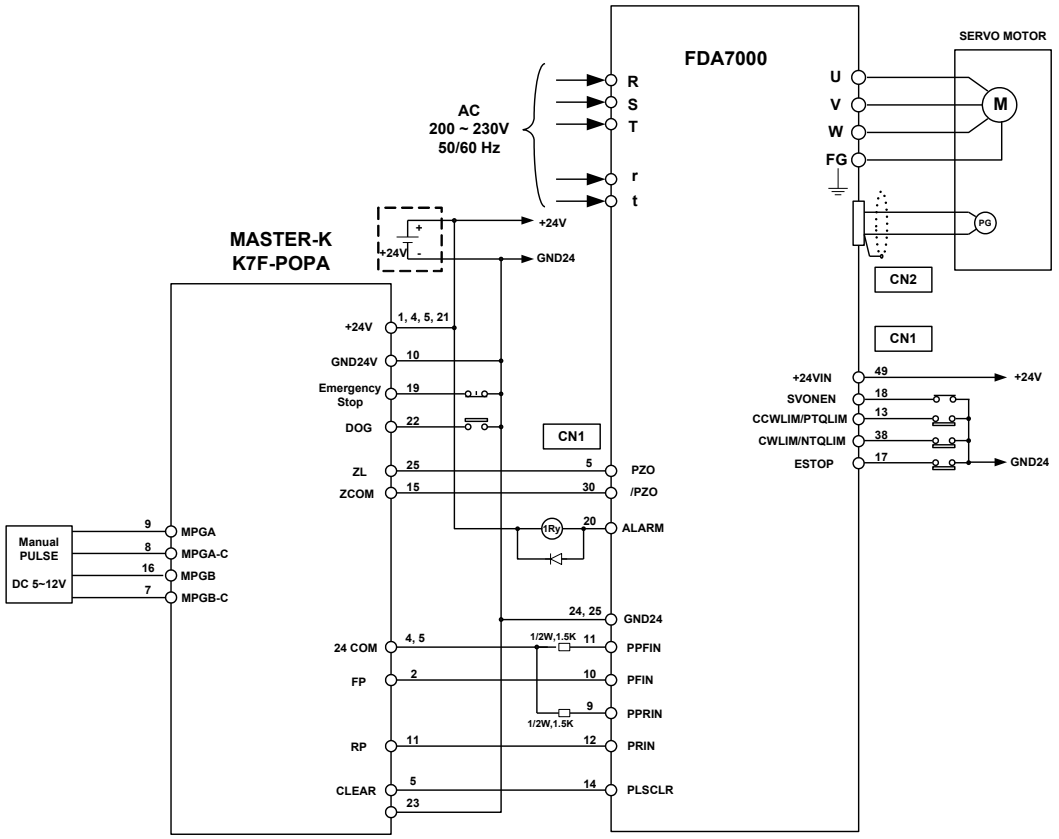
(Note) After connecting the power, it takes about 1-2 seconds until the alarm signal leads to normal operation. Consider this when designing the power connection sequence. Also the alarm signal operates alarm detection relay 1Ry to turn on the main circuit power of servo drive.

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)

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

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



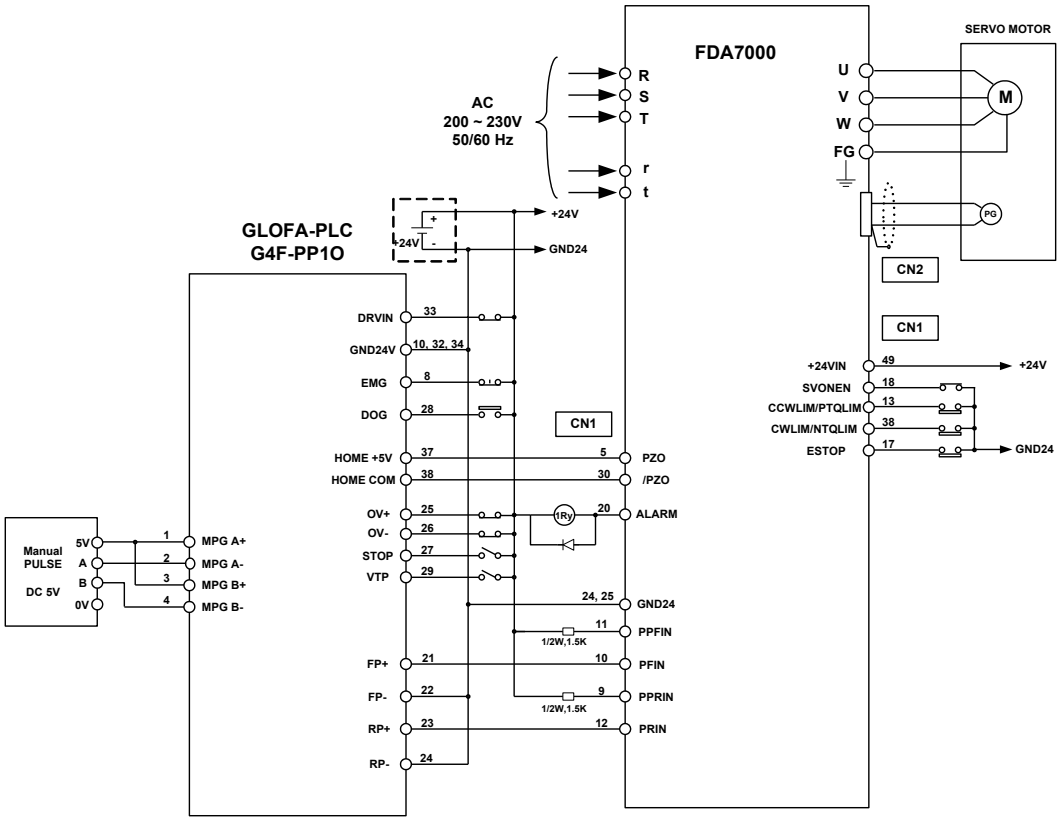
(Note) After connecting the power, it takes about 1-2 seconds until the alarm signal leads to normal operation. Consider this when designing the power connection sequence. Also the alarm signal operates alarm detection relay 1Ry to turn on the main circuit power of servo drive.

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)

Connection with LS Industrial Systems GLOFA-PLC position decision unit G4F-PP1O

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



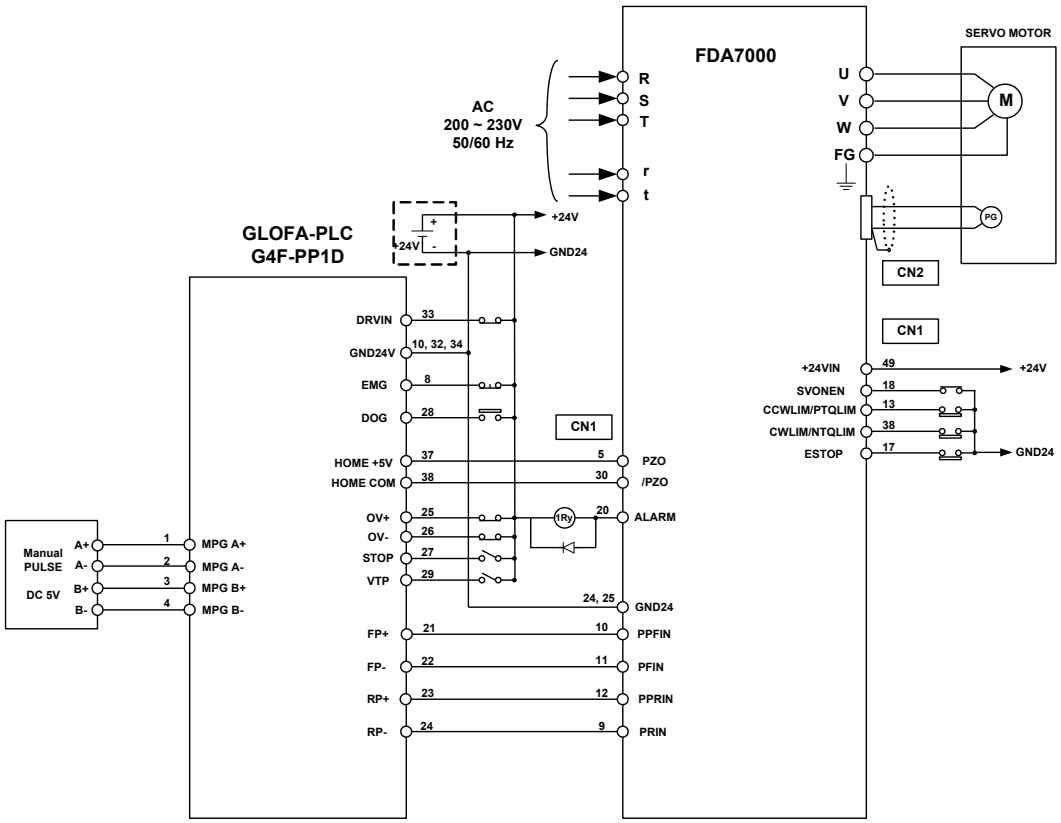
(Note) After connecting the power, it takes about 1-2 seconds until the alarm signal leads to normal operation. Consider this when designing the power connection sequence. Also the alarm signal operates alarm detection relay 1Ry to turn on the main circuit power of servo drive.

It only has the signals related to LS Industrial Systems G4F-PP1O and FDA7000 Series

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

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

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



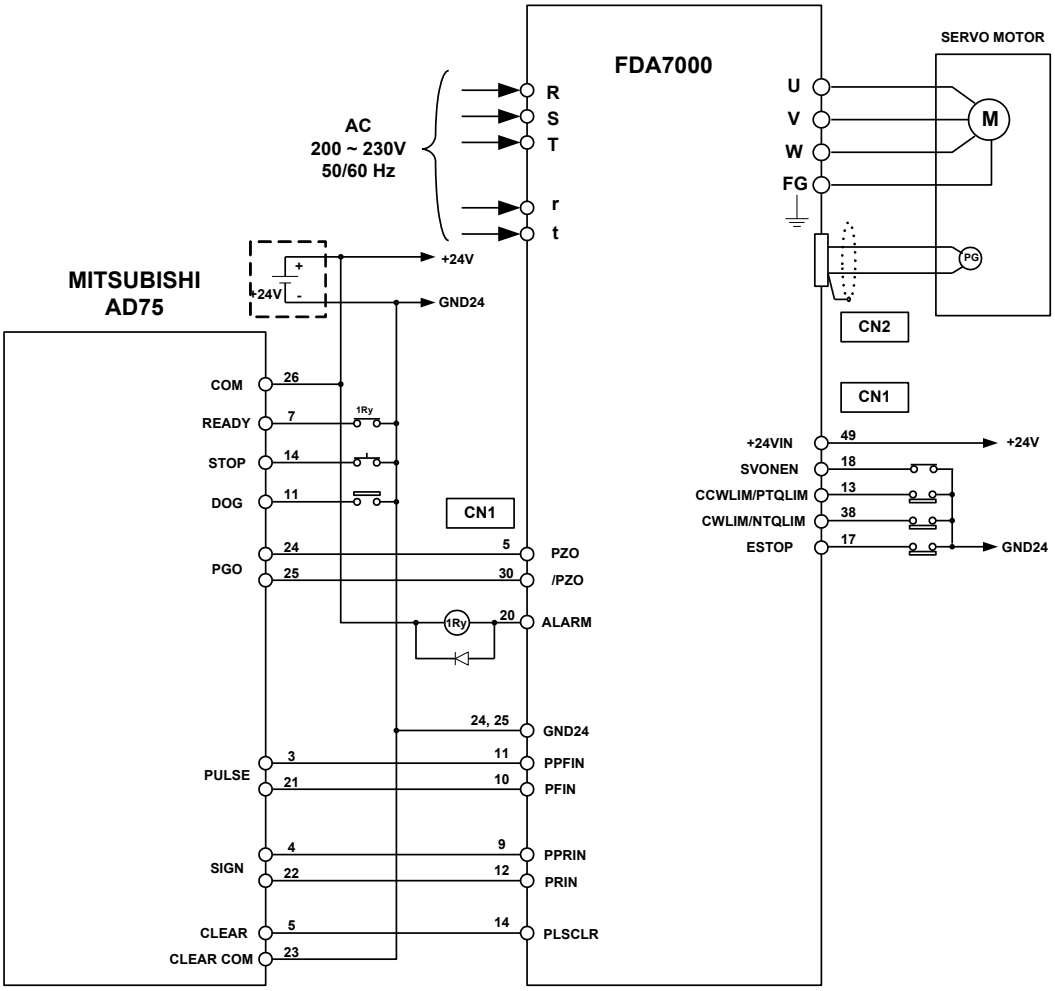
(Note) After connecting the power, it takes about 1-2 seconds until the alarm signal leads to normal operation. Consider this when designing the power connection sequence. Also the alarm signal operates alarm detection relay 1Ry to turn on the main circuit power of servo drive.

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).

Connection with Mitsubishi Electric position decision unit AD75

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



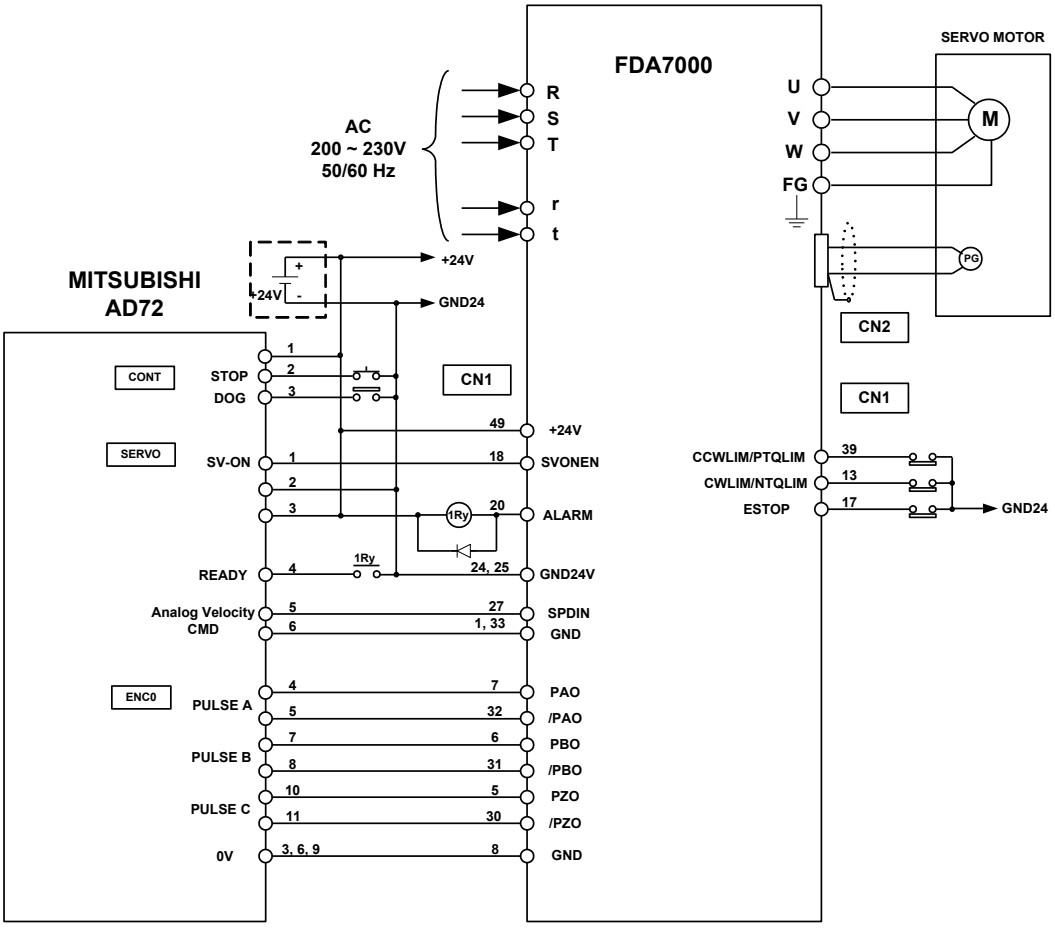
(Note) After connecting the power, it takes about 1-2 seconds until the alarm signal leads to normal operation. Consider this when designing the power connection sequence. Also the alarm signal operates alarm detection relay 1Ry to turn on the main circuit power of servo drive.

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).

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.

Explosion-proof servo drives have the same external dimensions as the FDA7000 and FDA7000-H series.

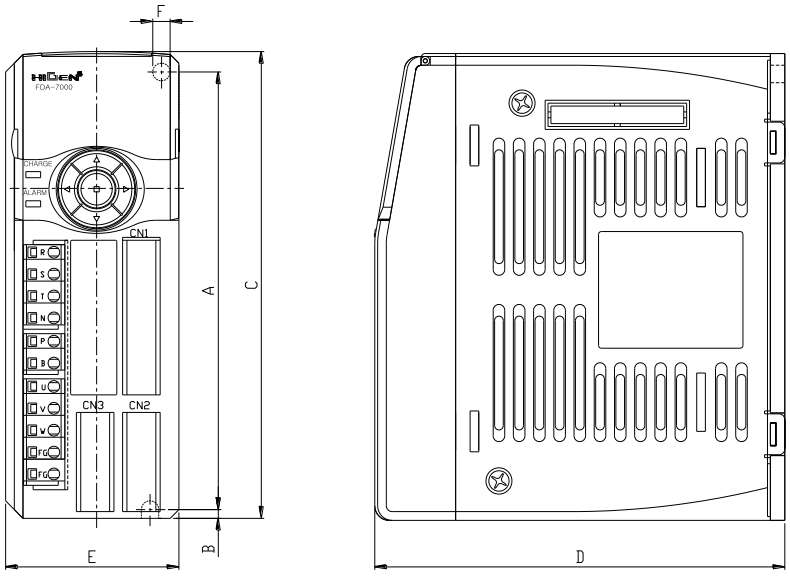
Chapter 8. External View

8.1. External view of AC220V model servo drive

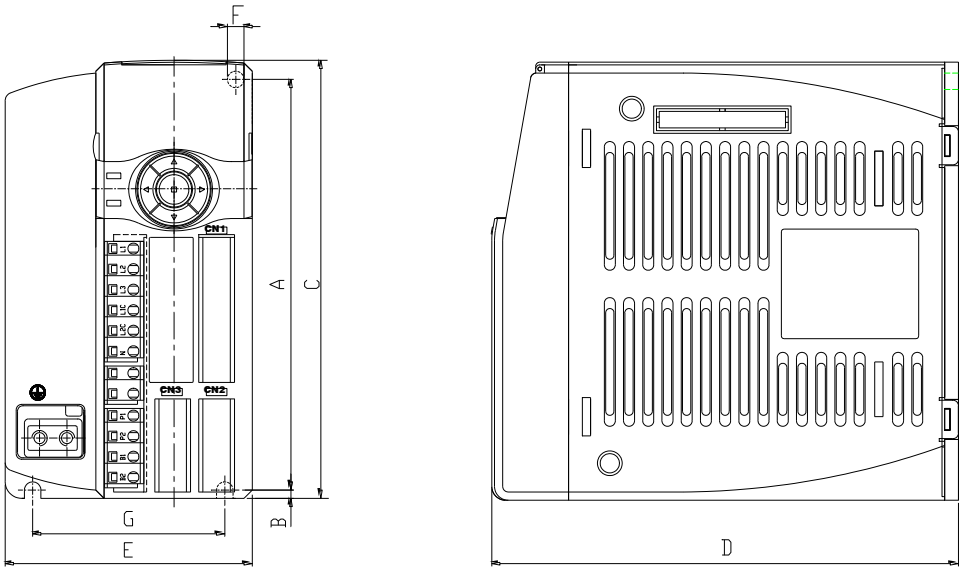
Model	A	B	C	D	E	F	G	Weight [Kg]	Cooling method	Remarks
FDA7001	149	4.5	160	140	60	5.0	-	1.0	Self cooling	view A
FDA7002	149	4.5	160	140	60	5.0	-	1.0		
FDA7004	150	3.0	160	170	90	6.0	70	1.5		view B
FDA7005	150	3.0	160	170	90	6.0	70	1.9		
FDA7010	150	3.0	160	170	90	6.0	70	1.9		
FDA7015	239	5.5	251	225	132	5.2	119	4.3		view C
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		
FDA7075	334	8.0	350	236	240	7.0	180	15		view F
FDA7110	434	12.5	450	280.5	260	7.0	200	23		view G
FDA7150	434	12.5	450	280.5	260	7.0	200	24		

*** The FDA7000EX / EXD series is the same size as the FDA7000 series.**

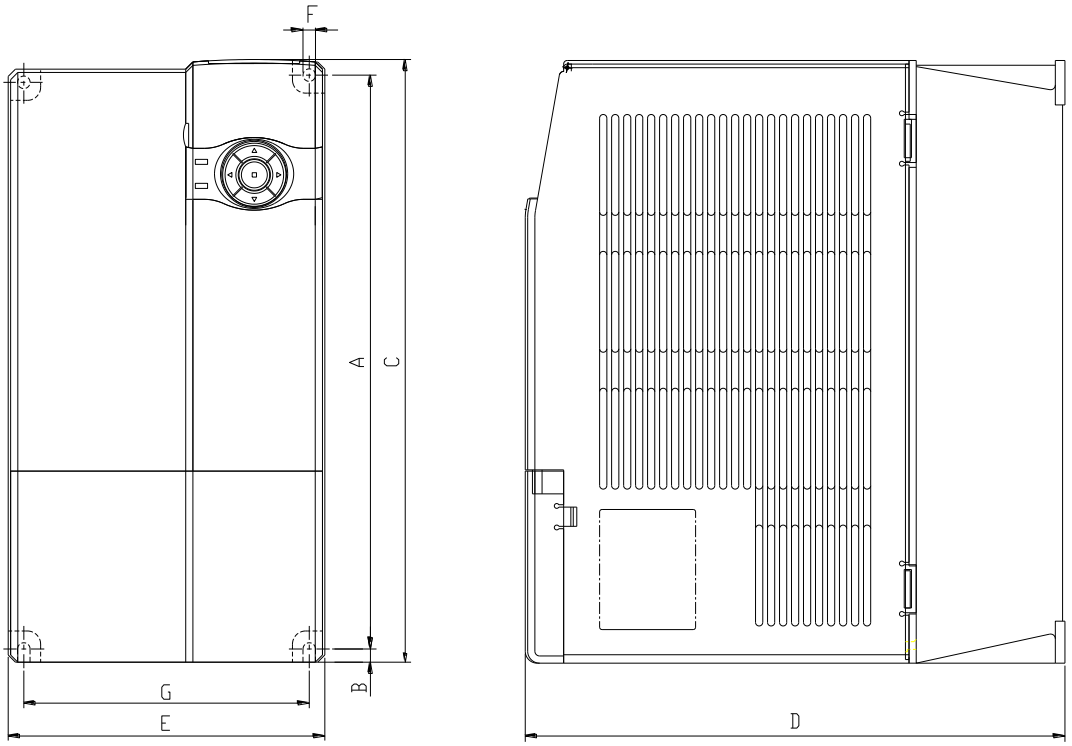
[External view A]



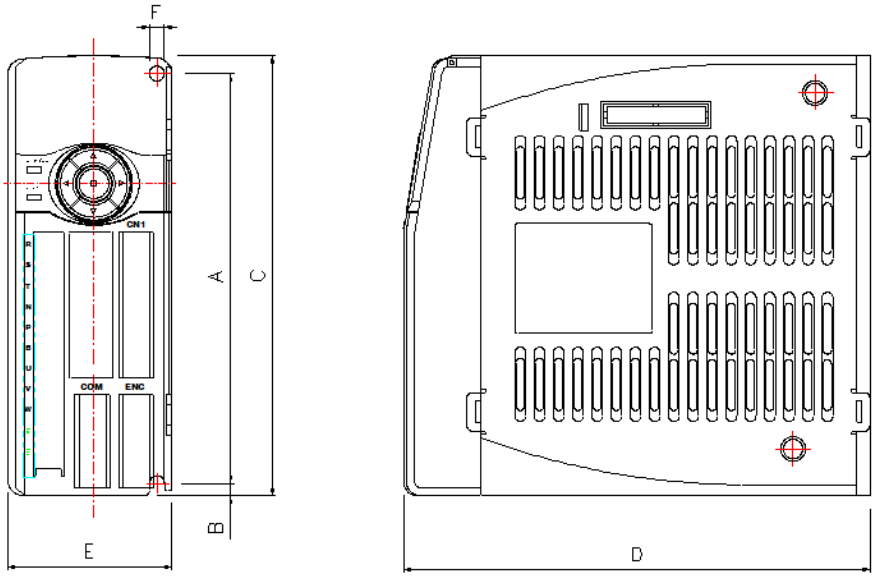
[External view B]



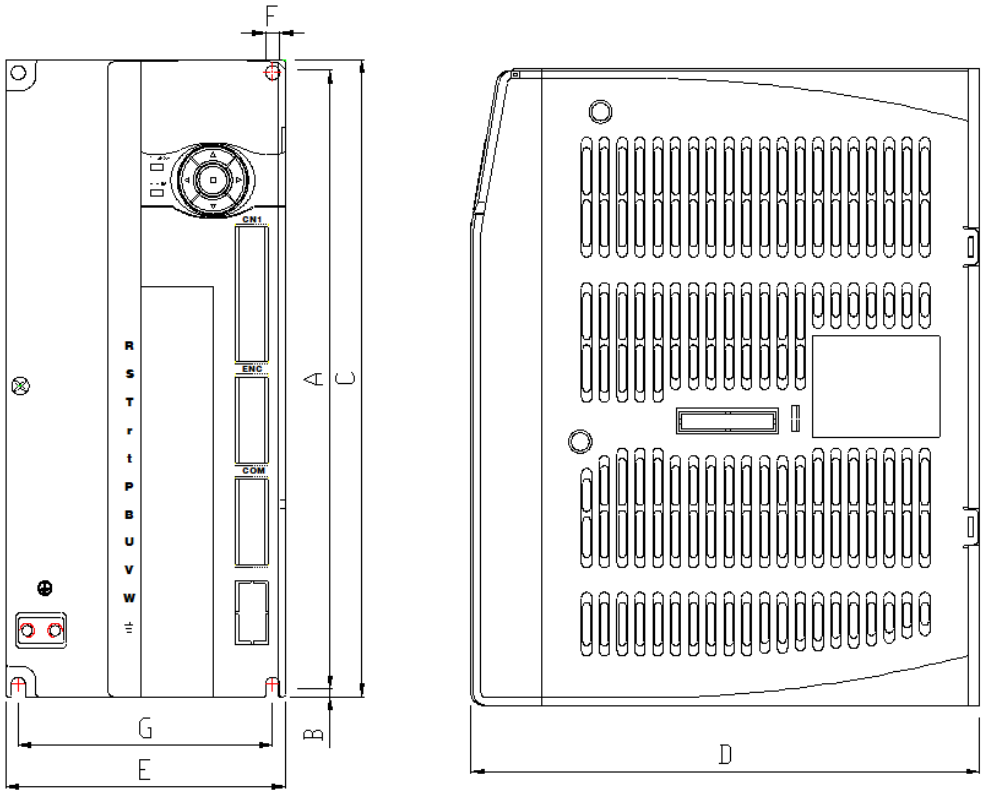
[External view C]



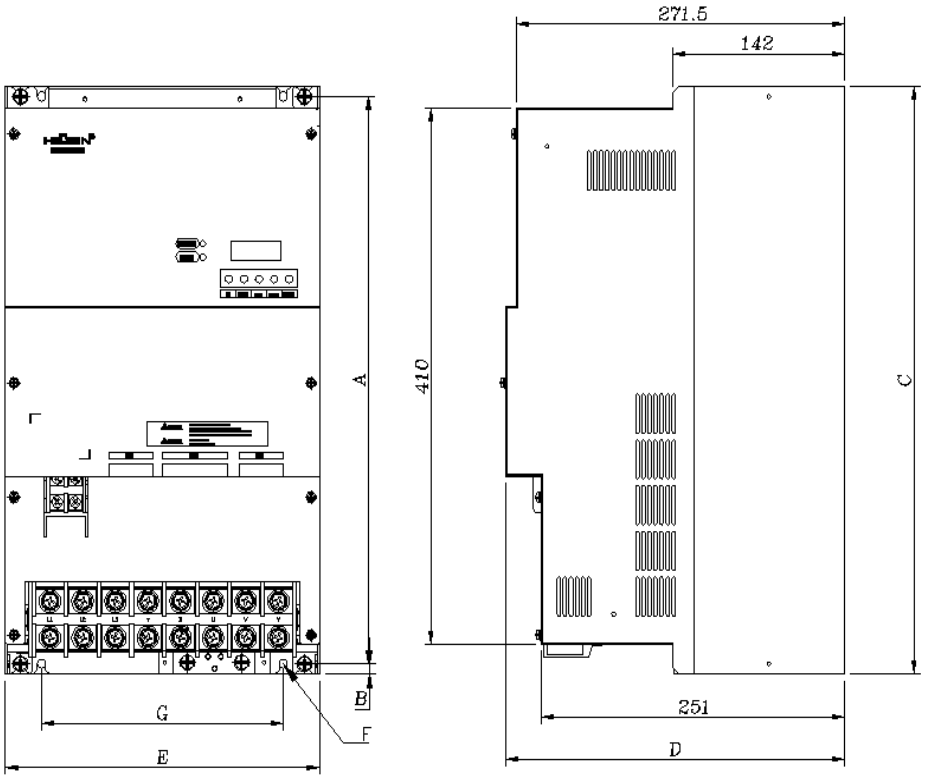
[External view D]



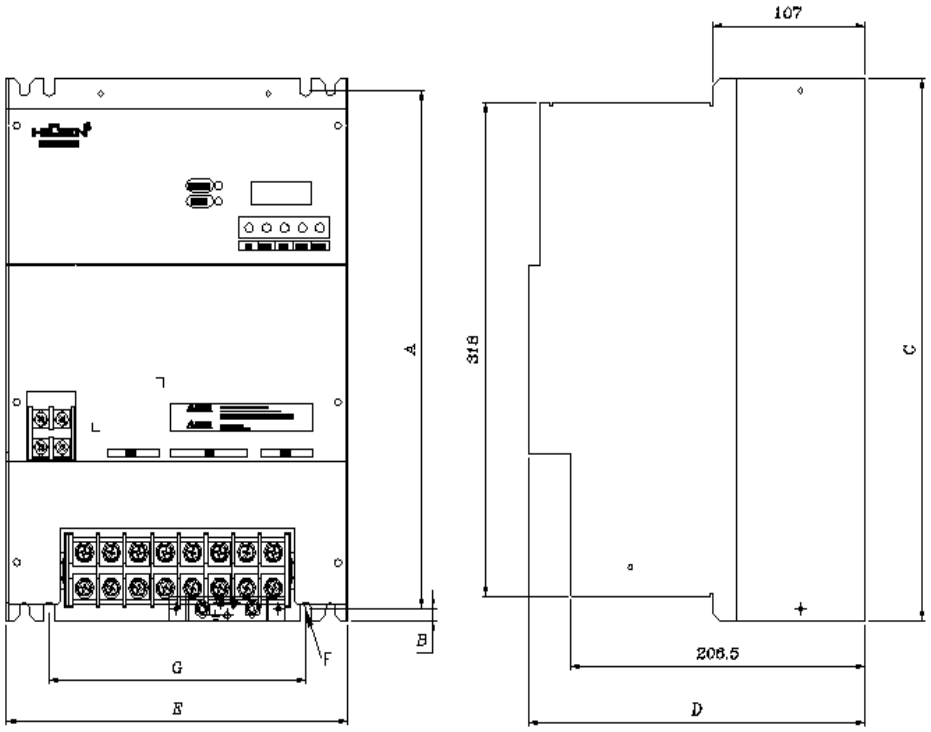
[External view E]



[External view F]



[External view G]

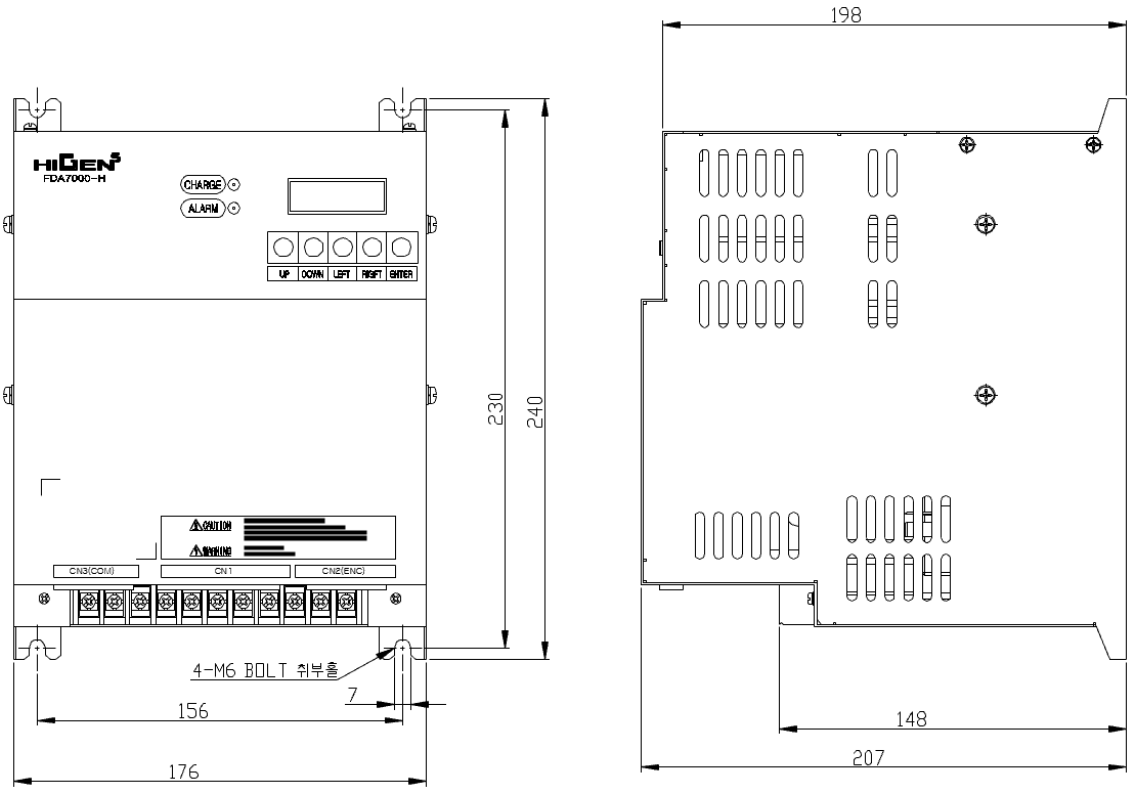


8.2. External view of AC380V model servo drive

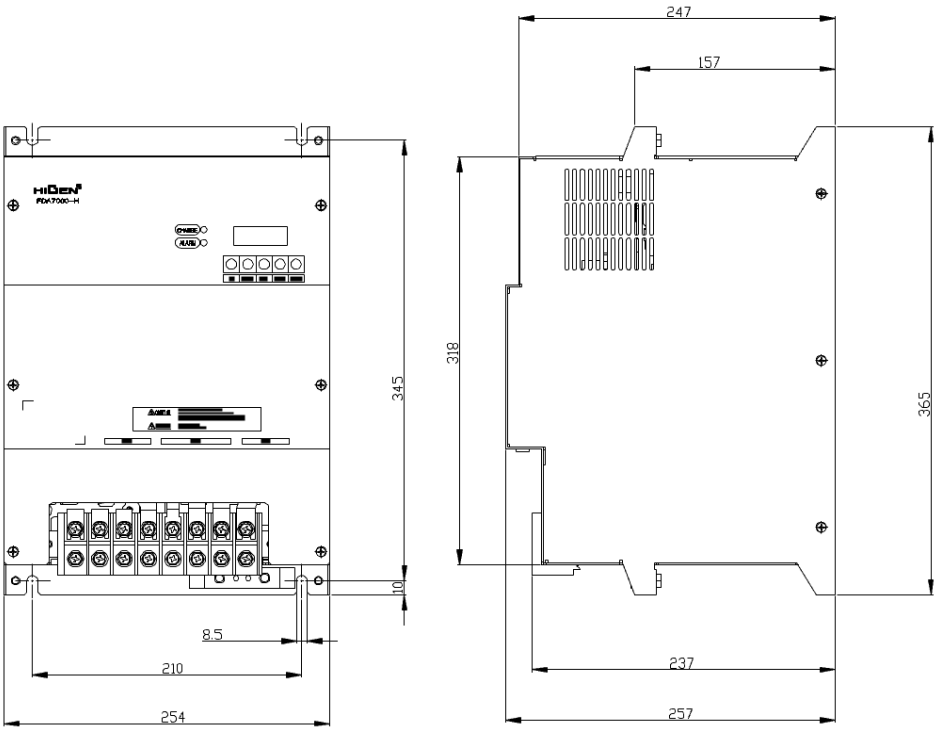
Servo Drive	Weight [Kg]	Cooling	External view
FDA7020-H□	6.0	Forced cooling (FAN)	External view H
FDA7030-H□	6.2		
FDA7045-H□	6.4		
FDA7075-H□	15		External view I
FDA7110-H□	23		External view J
FDA7150-H□	24		
FDA7220-H□	35.4		External view K
FDA7300-H□	51.7		External view L
FDA7370-H□	52.3		
FDA7450-H□	52.3		
FDA7550-H□	55.0		External view M
FDA7550-H□	55.0		

*** The FDA7000EX / EXD series is the same size as the FDA7000 series.**

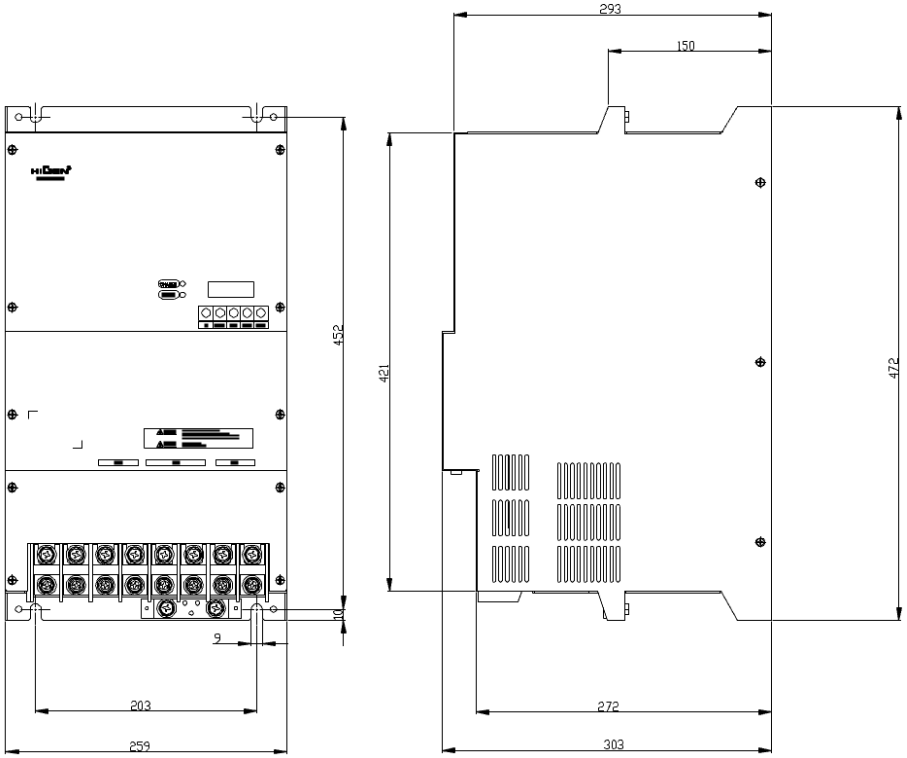
[External view H]



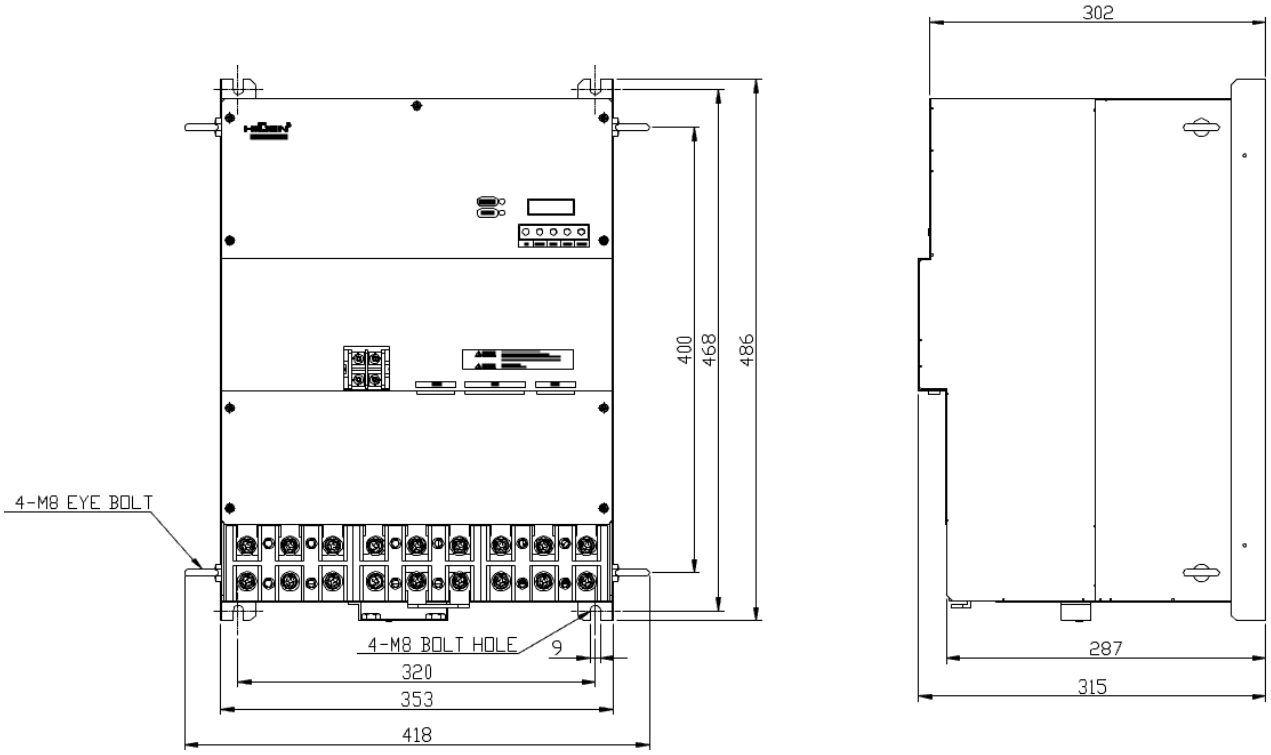
[External view I]



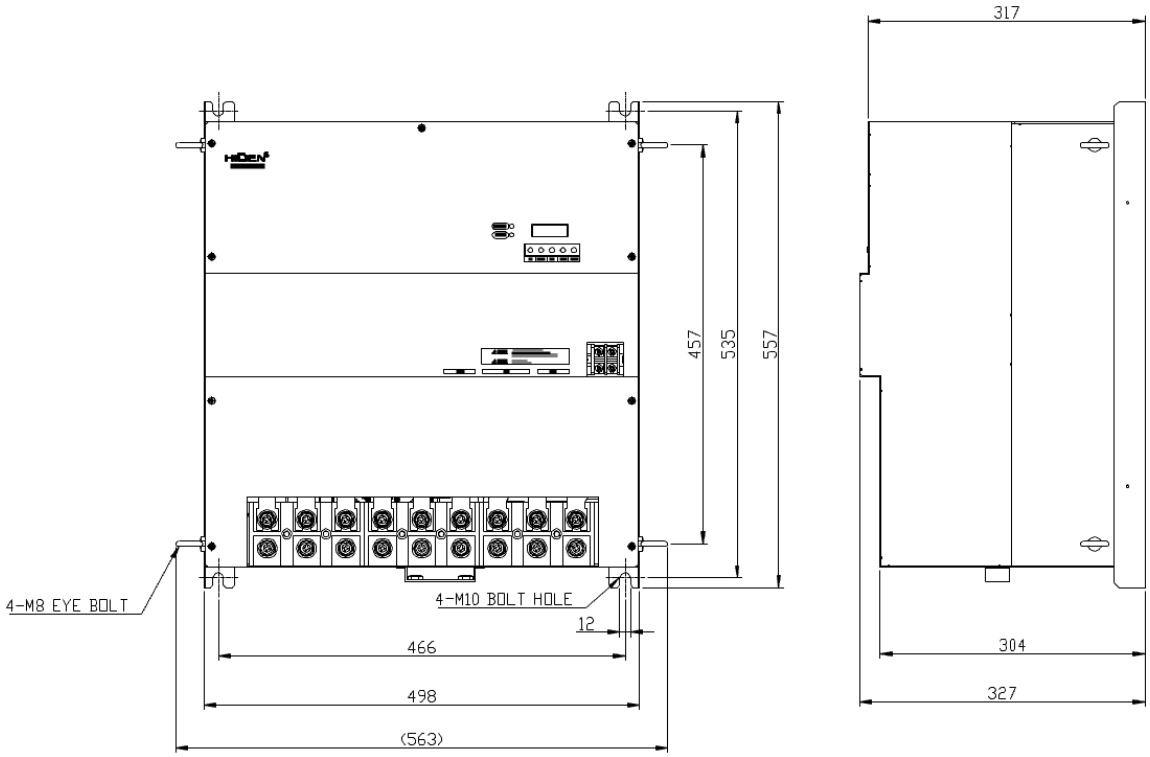
[External view J]



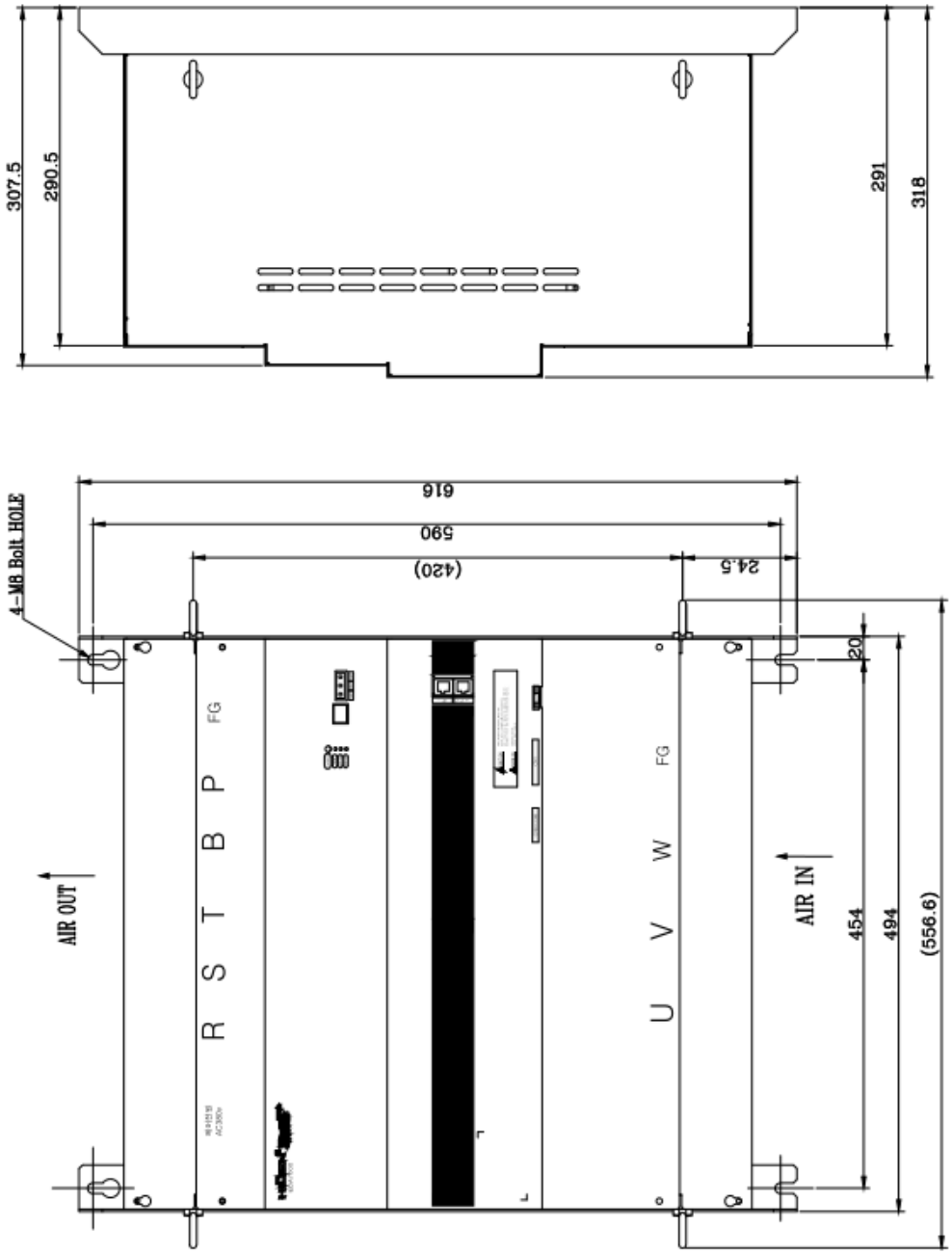
[External view K]



[External view L]



[External view M]



Appendix Ⅰ

Servo system application

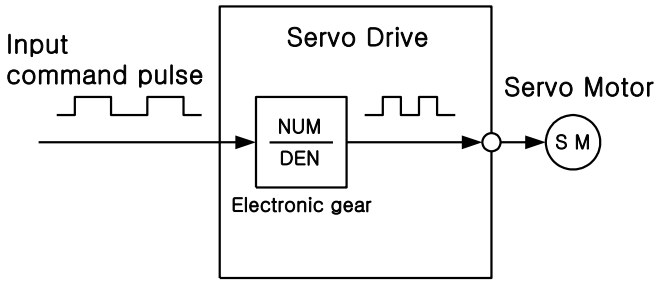
Appendix Ⅰ explains the application cases that can be utilized when applying the servo system.

Appendix I. Servo system application

Ⅰ.1. Position control application

The electronic gear enable the work-piece movement distance per input reference command pulse from the host controller to be set to any value. One reference command pulse form 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

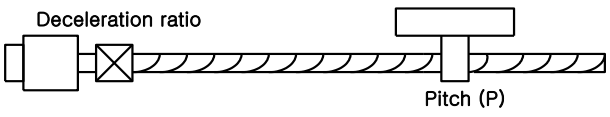
♥ The command unit shows the minimum command unit of the position data to move the load.

♥ 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

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



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].

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]

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

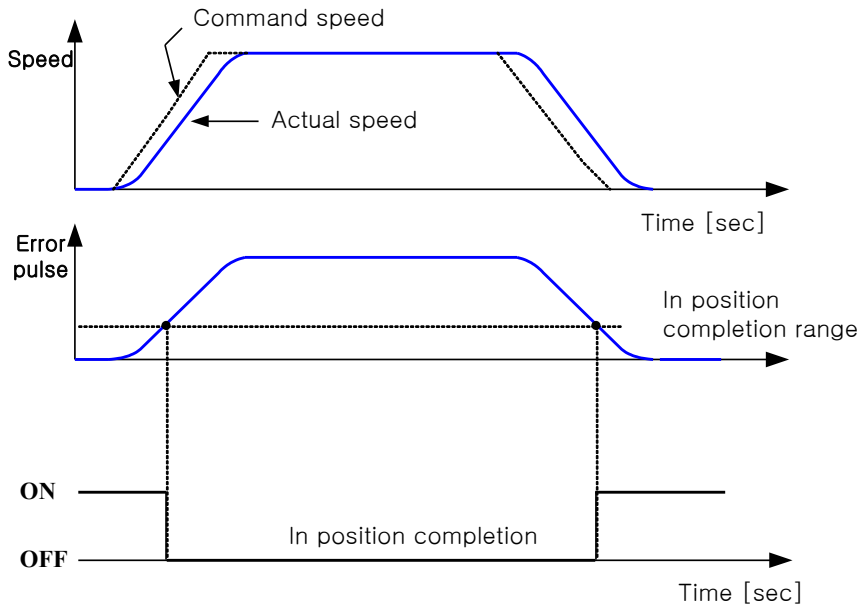
$$\text{Electronic gear ratio}\left(\frac{\text{NUM}}{\text{DEN}}\right)=\frac{\text{Number of motor encoder pulse}\times 4}{\text{Command unit}}\times\text{Reduction ratio}$$

The result of calculating the electronic gear ratio must be between 0.05~20.

Set the applicable parameter.

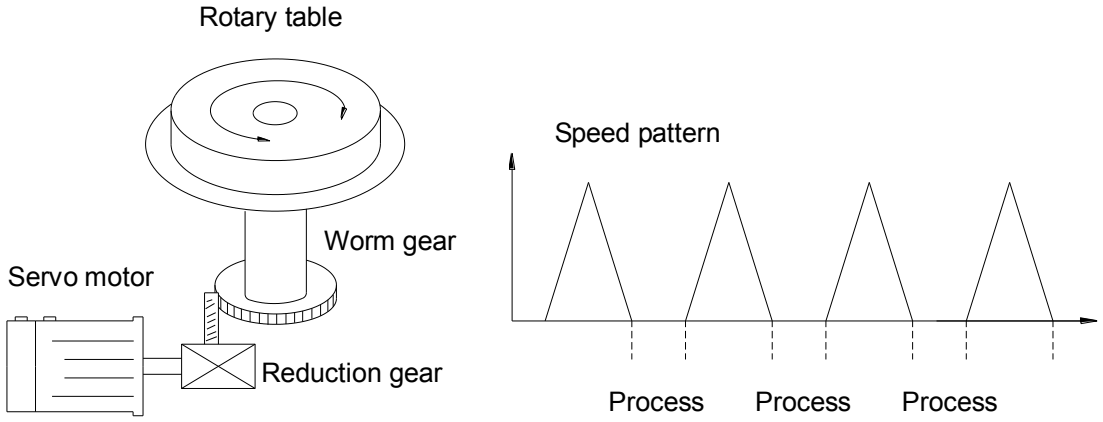
[Position completion range setting]

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.



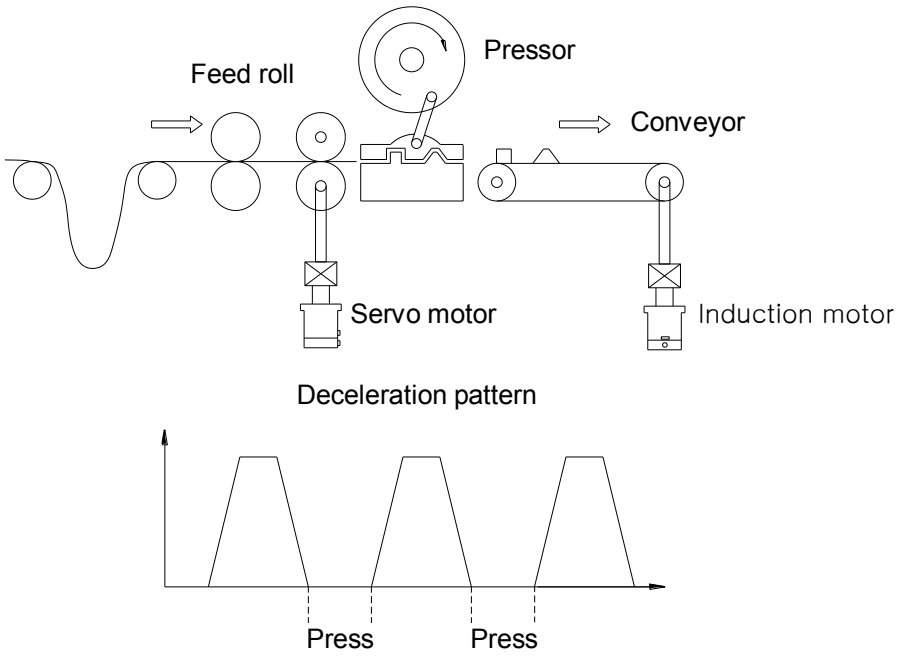
Ⅰ.2. Example of other application

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

Appendix II. Noise control

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.

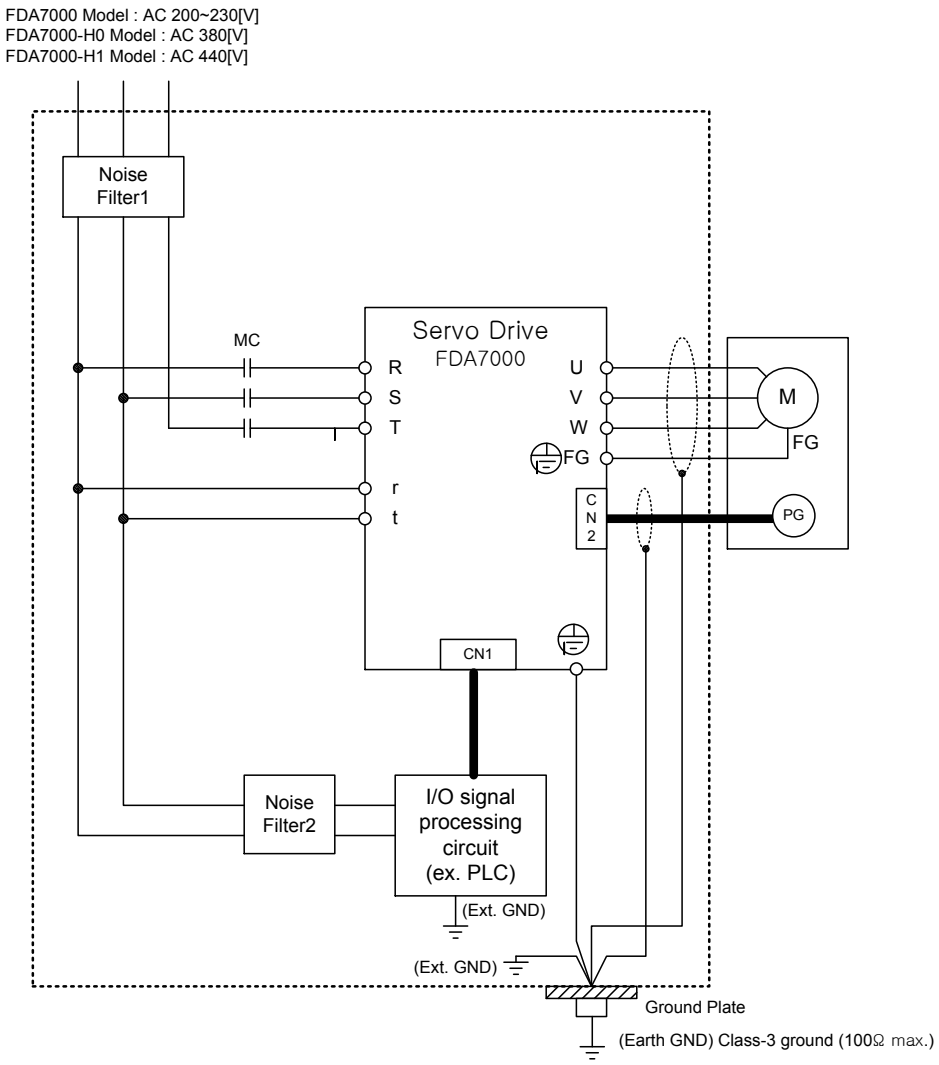
④ Use a noise filter to prevent noise interference. FDA7000 is designed as an industrial device, it provides no mechanism to prevent noise interference.

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 s surge protector in the relay, solenoid and electromagnetic contactor coils.
- The distance between a power line and s signal line must be at least 30 cm.
- Do not put the power line and signal line in the same duct or bundle then together.
- Do not share the power supply with an electric welding machine or electrical discharge machine. When the servo drive in 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 in required to prevent the adverse effects of the switching noise.

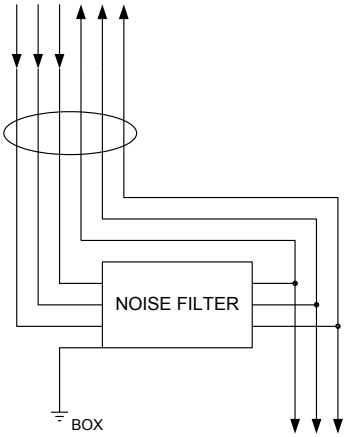
※ Example of wiring connected with ground connection



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

- Remove noise by attaching Spark Killer to MC (Magnetic Contactor).

※ Example of noise filter wiring



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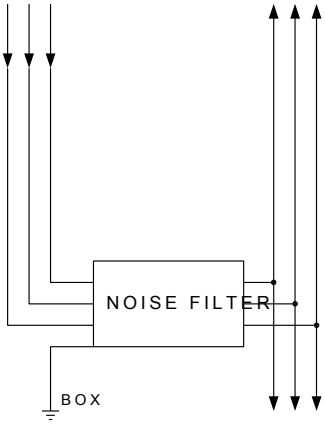

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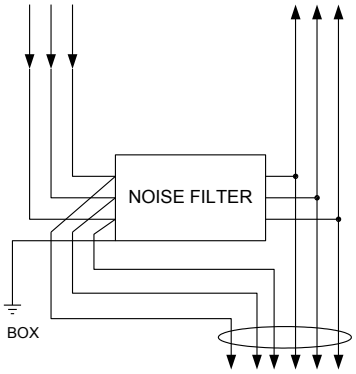

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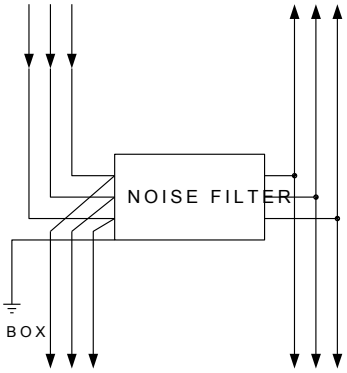

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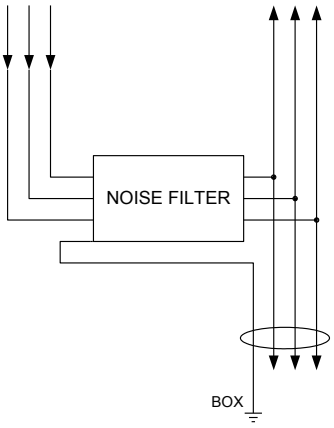
[Do not put the input and output line in the same duct or bundle them together.]



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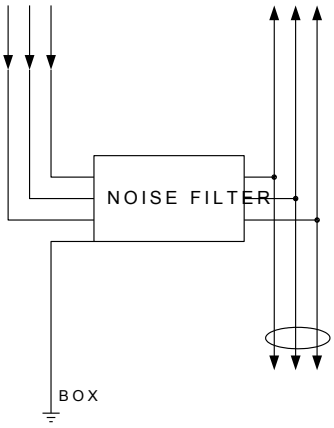
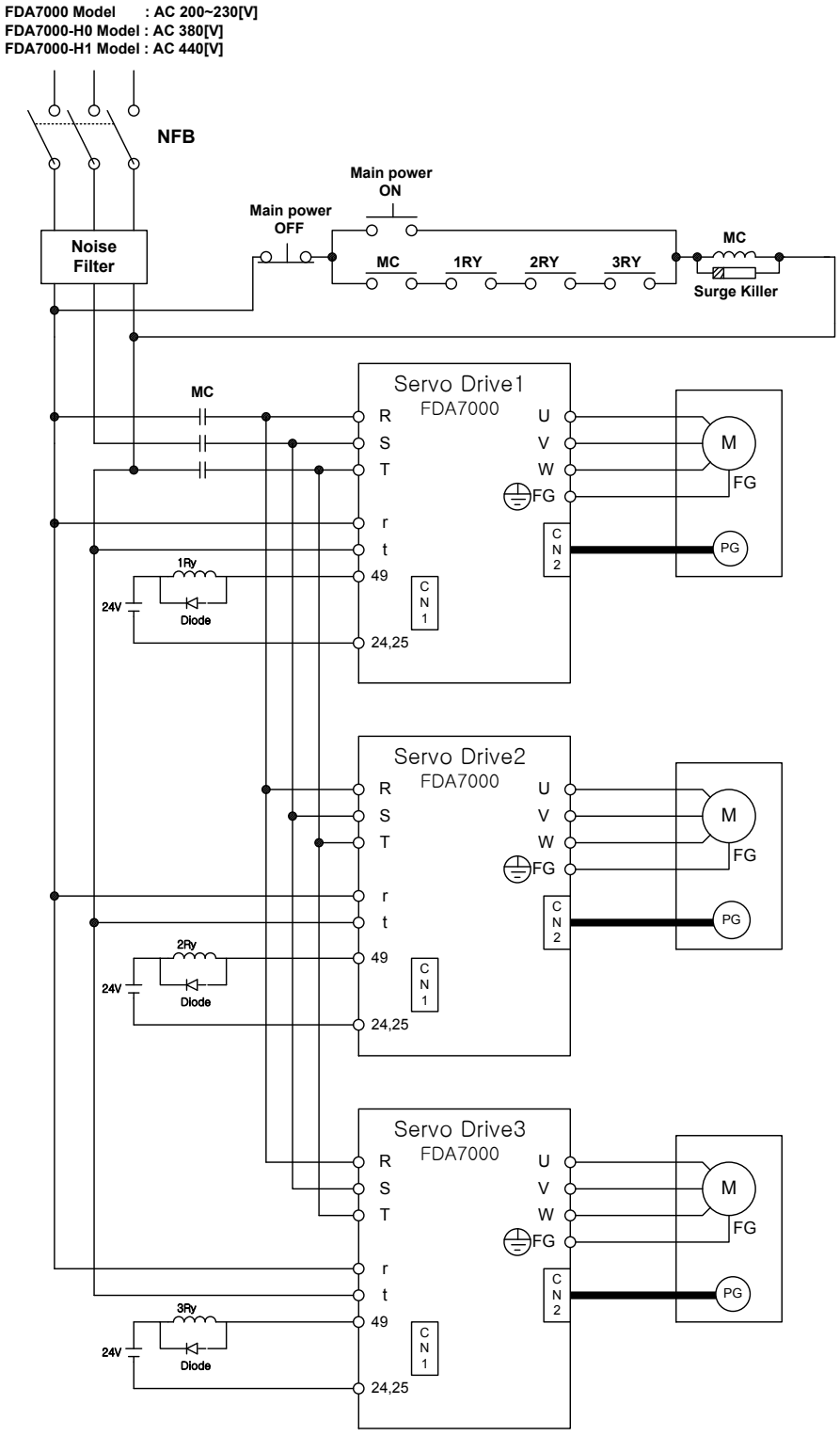


< O >

[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

AC SERVO Drive	FDA7004B	FDA7004	FDA7005	FDA7010
NOISE FILTER	P3B4010-DA(10A)			NFZ-4030SG(30A)

AC SERVO Drive	FDA7015/ FDA7015B	FDA7020/ FDA7020B	FDA7030/ FDA7030B	FDA7045	FDA7075	FDA7110	FDA7150
NOISE FILTER	NFZ-4030SG(30A)			NFZ4040 SG(40A)	FT3RE-4060 (60A)		FT3RE-4080 (80A)

AC Servo Drive	FDA7020-H	FDA7030-H	FDA7045-H	FDA7075-H	FDA7110-H	FDA7150-H
Noise Filter	ET3RE-4030 (30A)			ET3RB-4040		ET3RB-4060

AC Servo Drive	FDA7220-H	FDA7300-H	FDA7370-H	FDA7450-H	FDA7550-H	FDA7750-H
Noise Filter	FT3RB-4060	FT3RB-4080	FT3RB-4100	FT3RB-4120	FB3RE-4150	FB3RE-4200

◆ Noise Filter : OKY (http://www.oky.co.kr), ORIENT (http://www.suntronix.com)

Appendix III

All parameters table

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

Appendix III. All parameters table

Ⅲ.1. Parameters table

Ⅲ.1.1. StE- parameters

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
StE-19	Degree per 1 rotation	deg	0.000 ~ 359.999	-	Speed/Torque/Position
StE-20	Current warning	-	0 ~ 1023	-	Speed/Torque/Position
StE-21	Average load rate time	ms	0.0 ~ 99999.9	0.0	Speed/Torque/Position
StE-22	Average load rate	%	-999.9 ~ 999.9	-	Speed/Torque/Position
StE-23	DC LINK voltage	V	0.0 ~ 999.9	-	Speed/Torque/Position

Ⅲ.1.2. P01- parameters

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	Kgfcm/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
P01-21 *	ABS Protocol	-	1~3	3	Speed/Torque/Position
P01-22 *	Modbus Protocol	-	0~1	0	Speed/Torque/Position

P01-23 *	Single-turn Data Offset	-	0 ~ 131072	0	Position
P01-24	Memory Type	-	0 ~ 3	0	Speed/Torque/Position

Ⅲ.1.3. P02- parameters

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
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
P02-34	Multi-turn Limit	rev	0~65535	65535	Speed/Torque/Position
P02-35	Battery Alarm/Warning Set	-	0~1	0	Speed/Torque/Position
P02-36	Battery Alarm Filter	ms	0~10000	100	Speed/Torque/Position
P02-37	Power Fail Mode	-	0~1	0	Speed/Torque/Position
P02-38	Reverse Rotation Mode	-	ON/OFF	OFF	Speed/Torque/Position
P02-39	External DB Control	-	0 ~ 2	0	Speed/Torque/Position

[When using the FDA7000-EX series]

P02-40	Motor OVER TEMP set	-	ON/OFF	OFF	Speed/Torque/Position

Ⅲ.1.4. P03- parameters

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
P03-25	Alarm Reset Delay Time	Ms	0 ~ 99999	0	Speed/Torque/Position

III.1.5. P04- parameters

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

III.1.6. P05- parameters

P05-01*	POS Gain Mode	-	1 ~ 5	1	Position
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
P05-23	Position Error Clear	-	ON/OFF	OFF	Position

III.1.7. P06- parameters

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

III.1.8. P07- parameters

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
P07-13	Digital Input time	ms	1 ~ 500	1	Speed/Torque/Position
P07-14	Safe Input time	ms	1 ~ 500	1	Speed/Torque/Position

III.1.9. P08- parameters

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

Ⅲ.1.10. P09- parameters

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

Ⅲ.1.11. JOG- parameters

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

Ⅲ.1.12. ALS- parameters

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 III

All parameters table

Appendix IV. Revision history

Issue date	Revised content	Version
2007.07	Issued initial version.	1.3
2008.01	1st correction (Function correction and contents modification)	1.4
2020.03.02	2nd correction(add models and function)	1.5

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