

# Actuator series Driven by Ezi-SERVO

- Hollow Rotary Index Table
- Accurate Gear Driven
- High Reduction Ratio
- High Precision
- High Torque & High Rigidity
- Easy to Use













Fast, Accurate, Smooth Motion



Actuator series Driven by Ezi-SERVO

High performance of Hollow Rotary Actuator, Ezi-Robo SHG Series, is extremely low backlash gear and super gear ratio of actuator driven directly into the hollow rotary table combines to high speed, high accuracy of closed loop stepping control system, Ezi-SERVO,



### Hollow Rotary Table

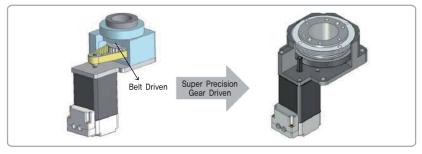
Large Diameter hollow bore to penetrate the output table equipped SHG series ensure flexibility and convenience in the design of equipment when install complex wiring and piping



Model Name	Size of Plinth (Frame Size)	Hollow Bore Diameter
SHG130	130mm	<b> ⊅</b> 56mm
SHG170	170mm	<b></b> ₽85mm

#### Accurate Gear Driven

Extremely low backlash gear direct drive, so that repetitive positioning accuracy from a single direction is +/- 15sec, lost motion by positioning from two directions for less than 2min and the precise positioning can be determined. And Belt and Pulley are not used in this system so it enables cost saving, unnecessary of maintenance and repair service without adjustment of belt-tensioning.



### High Reduction Ratio & High Torque

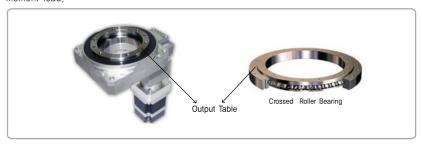


Super HG Series offers high gear ratio as 1:20, 1:36 for model SHG170 and 1:18 for model SHG130 so it enables to drive high inertia of load with very strong output torque from hollow rotary table, Also high gear ratio enables minimization of load inertia moment ratio so it realizes smooth operation at Acceleration/Deceleration and no hunting when it stops suddenly.

Model	Gear Ratio	Gear Level
SHG130	18	2 <sup>nd</sup> Stage Gear
SHG170	20 36	2 <sup>nd</sup> Stage Gear

## High Rigidity

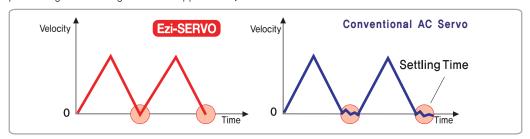
High rigidity of Crossed Roller Bearing and hollow rotary table integrated SHG Series maximizes rigidity of Actuator to support all directions of load as radial load, thrust load and moment load



# **Feature**

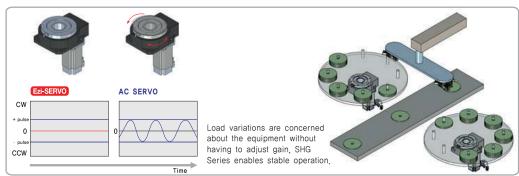
# Fast Response

High rigidity Rotary table fixed to the closed loop stepping control system, Ezi-SERVO can shorten positioning time for big inertia of applications.

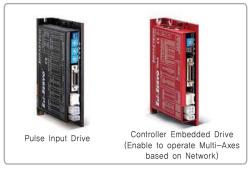


## Supporting Sudden Load Fluctuation and Rapid Acceleration

Adopting a closed loop stepping control system, Ezi-SERVO designed to maintain synchronism and does not have step-out problem, Ezi-Robo SHG series can be driven by rapid acceleration or sudden load fluctuation because the situation in a typical servo system that is prone to fluctuation, hunting does not occur. For sudden load fluctuation with a servo system is essential to improve the control performance does not need to gain adjustment is Gain Tuning Free Actuator.

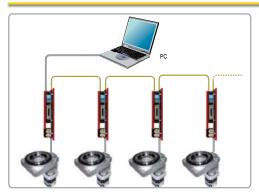


# Variety of Controller with High Performance and Multi−Tasking



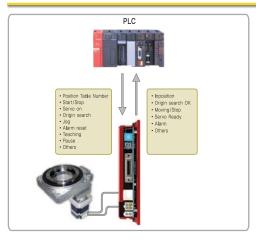
Ezi-SERVO, high performance of closed loop stepping control system by adopting, pulse train input drives and controller integrated drives are possible to use.

#### Network Based Motion Control



A maximum 16 axis can be operated from a PC through RS-485 communications. All of the motion conditions are set through the network and saved in Flash ROM as a parameter. Motion Library (DLL) is provided for programming under Windows 2000/XP.

## Position Table Function

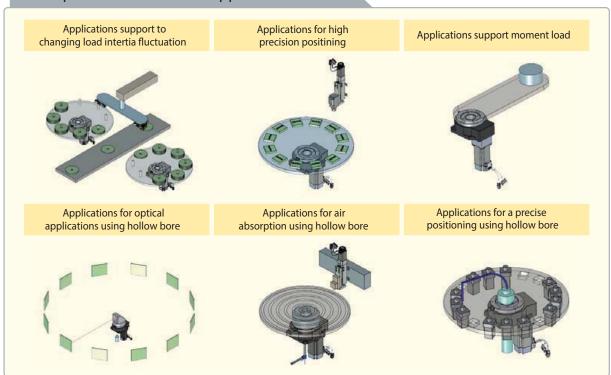


Position Table can be used for motion control by digital input and output signals of host controller. You can operate the motor directly by sending the position table number, start/stop, origin search and other digital input values from a PLC. The PLC can monitor the In-Position, origin search, moving/stop, servo ready and other digital output signals from a drive. A maximum of 256 positioning points can be set from PLC.

# Extensive Input/Output Singals and User-Defined Functions

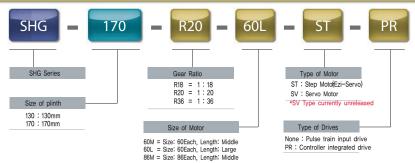
9 Input points / 9 Output points of signals according to the needs of uses can be defined. Therefore, various functions depending on the needs of the user input/output wiring can be used without changing

# Examples of Ezi-Robo SHG Applications



# Part Number / **Specifications and Outline**

# Ezi-Robo Super HG Part Number



## How to read the specification

Part Number		SHG170-R20-60L-ST
Type of Motor		Ezi-Servo 60L Step Motor
① Type of output table supporting bearing		Crossed Roller Bearing
② Permissible Torque	(N· m)	170
③ Inertial Moment	J : (Kg⋅m2)	47520 x 10 <sup>-6</sup>
④ Permissible Speed	(rpm)	150
⑤ Gear Ratio		1:20
Maximum Holding Torque	(N· m)	24
⑦ Resolution	(ppr)	200000 (=10,000 × 20)
® Repetitive Positioning Accuracy	(sec)	±10 (0.0028°)
9 Lost Motion	(min)	2 (0 <u>.</u> 033 °)
1 Angular Transmission Error	(min)	4 (0 <u>.</u> 067 °)
① Permissible Thrust Load	(N)	2000
① Permissible Moment Load	(N· m)	50
③ Runout of output table surface	(mm)	0.07
(1) Runout of output table inner/outer diameter	(mm)	0.04
(§) Runout of output table inner/outer diameter	(mm)	0.07
16 Degree of protection		IP40(Motor, Connector Part IP20)
17 Mass	(Kg)	7.3

	(0)			
Show description of specification items				
① Type of Output Table Supporting Bearing	The type of the bearing used for the output table.			
② Permissible torque	The limit of mechanical strength of the reduction gear mechanism enables to make sure the applied torque including acceleration torque and load fluctuation and it will not exceed the permissible torque.			
③ Inertia moment	Total sum of rotor inertia moment of the motor and the reduction gear of mechanism, converted to a moment on the output table.			
④ Table Permissible Speed	The output table speed can be tolerated by the mechanical strength of the reduction gear mechanism.			
⑤ Gear ratio	Deceleration mechanism to configure the number of teeth of two gears.			
Maximum Holding Torque	Hollow Rotary actuator can exert the maximum holding torque once the actuator is at standstill with power supplied.			
7 Resolution	Needed number of pulse to rotate 1 revolution of output table.			
® Repetitive Positioning Accuracy	A Value indicates the degree of error which is generated when positioning performs repeatedly to the same position in the same direction.			
9 Lost Motion	The difference at the stopped angles achieved when the output table is positioned to the same position during forward and reverse direction of motions. And difference is mainly caused by backlash of gear.			
Angular transmission error	The difference between the theoretical rotation angle of the output table and the actual rotation angle. And this value calculated from the input pulse number.			
11) Permissible thrust load	The permissible value of thrust load applied to the output table in the axial direction.			
<sup>®</sup> Permissible moment load	When a load is applied to a position away from the center of the output table, the output table receives a tilting force and the permissible moment load refers to the permissible value of moment load calculated by multiplying the offset distance from the center by the applied load.			
③ Runout of output table surface	The maximum value of runout of the mounted surface of the output table when the output table rotates without load.			
(4) Runout of output table inner/	The maximum value of runout of the inner diameter or outer diameter of the table when the			

output table rotates without load.

the degree inclines.

16 Degree of Protection IP40 (IP20 for motor connector) Mass

15 Parallelism of Output Torque

outer diameter

IEC 60529, EN60034-5 (= IEC60034-5) classifies the dust resistance and waterproofing into grades. A sum of Actuator configured as the output Table, deceleration mechanism, such as driving motor plus the weight of all components.

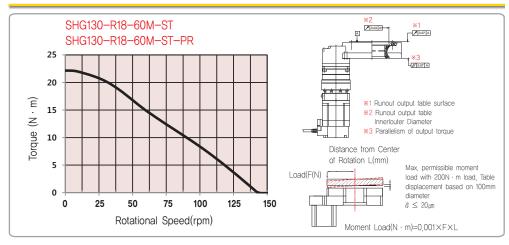
Actuator (plinth base) installed on the output side of the Table and value that indicates whether

# SHG130-R18 Series Specifications

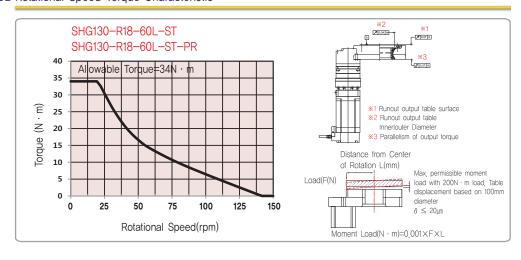


Part Number		SHG130-R18-60M-ST	SHG130-R18-60L-ST
		SHG130-R18-60M-ST-PR	SHG130-R18-60L-ST-PR
Type of Motor	-	Ezi-Servo 60M Step Motor	Ezi-Servo 60L Step Motor
Type of output table supporting bearing		Crossed Roller Bearing	Crossed Roller Bearing
Permissible Torque	(N · m)	34	34
Inertial Moment	J: (Kg·m2)	15718 x 10 <sup>-6</sup>	31270 x 10 <sup>-6</sup>
Permissible Speed	(rpm)	200	200
Gear Ratio		1:18	1 : 18
Maximum Holding Torque	(N · m)	11.0	22.3
Resolution	(ppr)	180,000 (=10,000ppr x 18)	180,000 (=10,000ppr x 18)
Repetitive Positioning Accuracy	(sec)	±10 (0.0028°)	±10 (0.0028°)
Lost Motion	(min)	2 (0.033°)	2 (0 <u>.</u> 033 °)
Angular Transmission Error	(min)	4 (0 <u>.</u> 067°)	4 (0.067°)
Permissible Thrust Load	(N)	2000	2000
Permissible Moment Load	(N · m)	50	50
Runout of output table surface	(mm)	0.07	0.07
Runout of output table inner/outer diameter	(mm)	0.04	0.04
Runout of output table inner/outer diameter	(mm)	0.07	0.07
Degree of protection		IP40(Motor, Connector Part IP20)	IP40(Motor, Connector Part IP20)
Mass	(Kg)	5.6	6.3

# SHG130R18-60M Rotational Speed Torque Characteristic

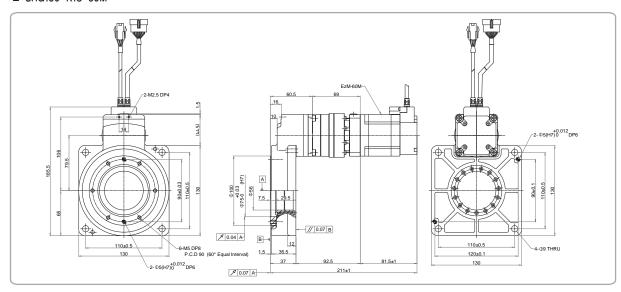


# SHG130R18-60L Rotational Speed Torque Characteristic

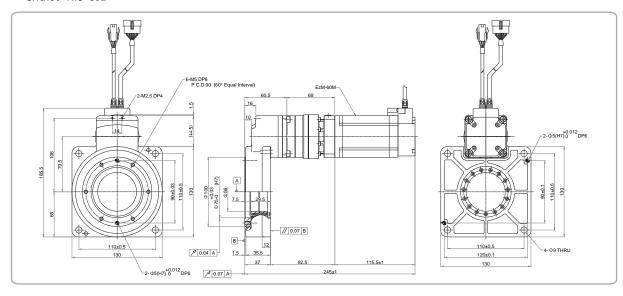


# Dimensions (mm)

### ■ SHG130-R18-60M



### ■ SHG130-R18-60L



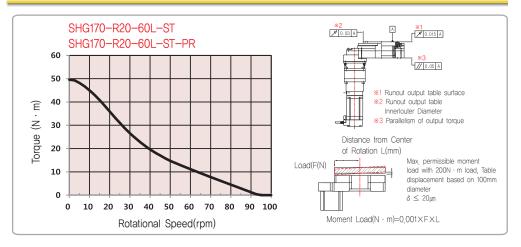
# SHG170-R20 Series Specifications



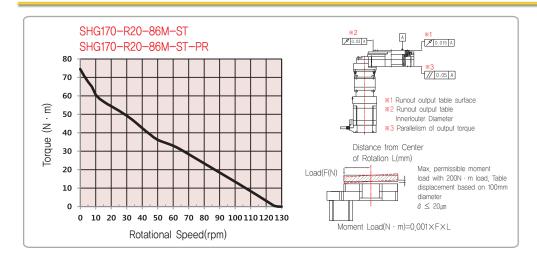


Part Number		SHG170-R20-60L-ST	SHG170-R20-86M-ST
		SHG170-R20-60L-ST-PR	SHG170-R20-86M-ST-PR
Type of motor	-	Ezi-Servo 60L Step Motor	Ezi-Servo 86M Step Motor
Type of output table supporting bearing		Crossed Roller Bearing	Crossed Roller Bearing
Permissible Torque	(N · m)	170	170
Inertia moment	$J: (Kg \cdot m2)$	47520 x 10 <sup>-6</sup>	74840 x 10 <sup>-6</sup>
Permissible speed	(rpm)	150	150
Gear ratio		1:20	1:20
Maximum Holding Torque	(N · m)	24.7	37.2
Resolution	(ppr)	200000 (=10,000ppr x 20)	200000 (=10,000ppr x 20)
Repetitive Positioning Accuracy	(sec)	±10 (0.0028°)	±10 (0.0028°)
Lost Motion	(min)	2 (0.033°)	2 (0.033°)
Angular transmission error	(min)	4 (0 <u>.</u> 067°)	4 (0.067°)
Permissible thrust load	(N)	3900	3900
Permissible moment load	(N · m)	152	152
Runout of output table surface	(mm)	0.07	0.07
Runout of output table inner/outer diameter	(mm)	0.04	0.04
Parallelism of output table	(mm)	0.07	0.07
Degree of protection IP40 (IP20 for motor connector)		IP40 (IP20 for motor connector)	IP40 (IP20 for motor connector)
Mass	(Kg)	7.3	8.0

## SHG170-R-20-60L Rotational Speed Torque Characteristic



# SHG170-R20-86M Rotational Speed Torque Characteristic



# **Specifications and Outline**

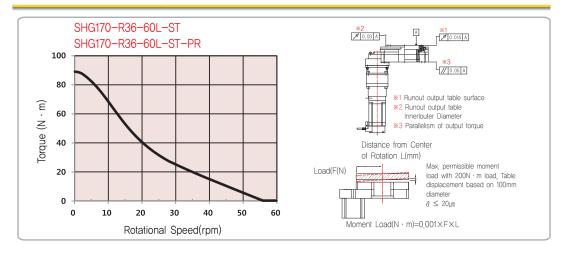
## SHG170-R36 Series Specifications



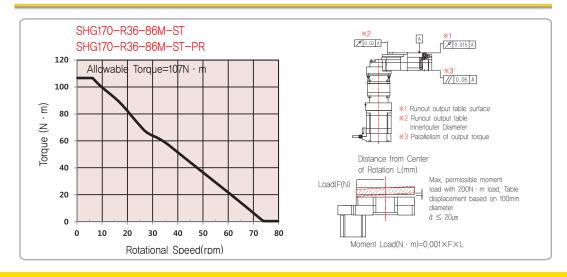


Part Number		SHG170-R36-60L-ST	SHG170-R36-86M-ST
		SHG170-R36-60L-ST-PR	SHG170-R36-86M-ST-PR
Type of motor –		Ezi-Servo 60L Step Motor	Ezi-Servo 86M Step Motor
Type of output table supporting bearing		Crossed Roller Bearing	Crossed Roller Bearing
Permissible Torque	(N · m)	107	107
Inertia moment	J: (Kg·m2)	123510 x 10 <sup>-6</sup>	212030 x 10 <sup>-6</sup>
Permissible speed	(rpm)	150	150
Gear ratio		1:36	1:36
Maximum Holding Torque	(N · m)	44.6	67.0
Resolution	(ppr)	360000 (=10,000ppr x 36)	360000 (=10,000ppr x 36)
Repetitive Positioning Accuracy	(sec)	±10 (0.0028°)	±10 (0.0028°)
Lost Motion	(min)	2 (0.033°)	2 (0.033°)
Angular transmission error	(min)	4 (0.067°)	4 (0.067°)
Permissible thrust load	(N)	4000	4000
Permissible moment load	(N · m)	200	200
Runout of output table surface	(mm)	0.07	0.07
Runout of output table inner/outer diameter	(mm)	0.04	0.04
Parallelism of output table	(mm)	0.07	0.07
Degree of protection IP40 (IP20 for motor connector)		IP40 (IP20 for motor connector)	IP40 (IP20 for motor connector)
Mass	(Kg)	7.3	8.0

# SHG170R36-60L Rotational Speed Torque Characteristic

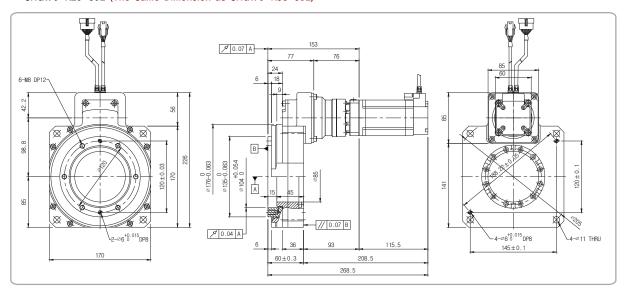


### SHG170-R36-86M Rotational Speed Torque Characteristic

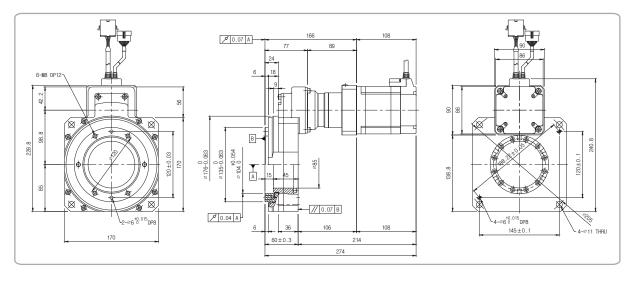


# Dimensions (mm)

# ■ SHG170-R20-60L (The Same Dimension as SHG170-R36-60L)



### ■ SHG170-R20-86M (The Same Dimension as SHG170-R36-86M)



# **Mechanism Options**

# Origin Sensor Set

The Origin Sensor Set has been provided as an optional package including Photo Micro Sensor, Cable with connector, shielding plate, the mounting screws so that user can easily do homing operation which is frequently required with a rotary table. The necessary components for origin detection are provided to be used when user need to install origin sensor so reduces the effort to design, production and sourcing the components and also easy to install and can be used immediately.

#### ■ Type

Model	Sensor Output	Products
OSHB-A	NPN	SHG170
OSHB-AY	PNP	SHG130

# ■ The Components of the Sensor Set

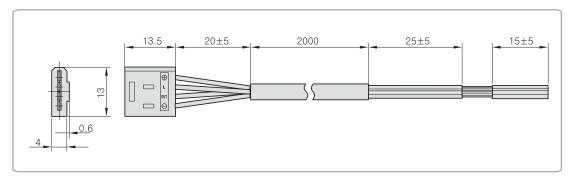


#### ■ Specification

Туре	NPN Type	PNP Type	
Sensor Model	EE-SX672A (OMRON Product) SHG170, SHG130	EE-SX672A (OMRON Product) SHG170, SHG130	
Supply Voltage	DC5~24V±10%, Ripple (P-P) below 10%	DC5~24V±10%, Ripple (P-P) below 10%	
Current Consumption	Below 35mA	Below 35mA	
Control Output	NPN Open Collector Output DC5~24V below 100mA Residual voltage below 0.8V (When load current is 100mA)	PNP Open Collector Output DC5~24V below 50mA Residual voltage below 1,3V (When load current is 50mA)	
Indicator LED	Detection signal (RED)	Detection signal (RED)	
Sensor Logic	Normally Open/Normally Closed (It can be switched depending on connection)	Normally Open/Normally Closed (It can be switched depending on connection)	

#### ■ Connector attached cable (OMRON Robot code attached connector EE1010-R)

Terminal Layout		
1	0	Brown
2	L	Pink
3	OUT	Black
4	Θ	Blue



#### ■ Installation Precaution of Origin Sensor Set

When install the optional Origin Sensor Set, please be aware of the following.

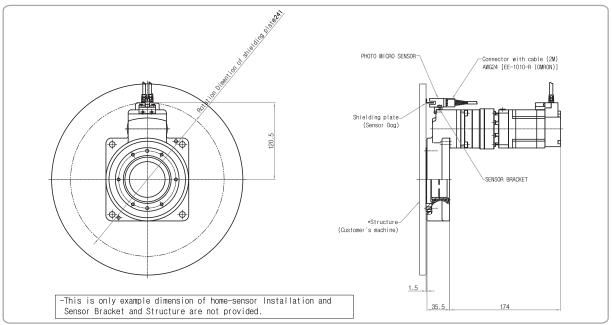
- •Please set the operating conditions to be below 40 °C for operating temperature and to be below 90 °C for the surface temperature of the motor part.
- •When using the half output shaft of the motor part for home positioning, please provide separate Sensor and Bracket at user side.

# ■ Precaution of Sensor Cable Extension

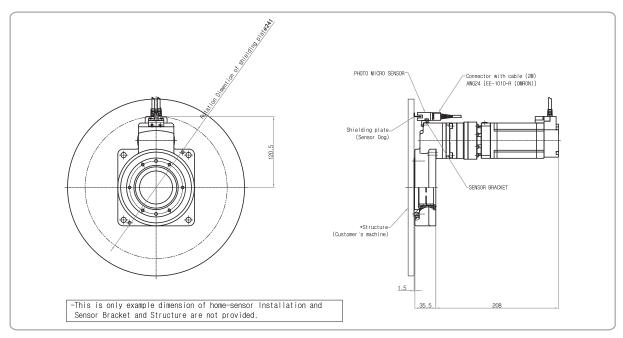
In case of extending the Sensor line more than 2m, please connect to the ground after wiring by Shield Cable,

# imensions of Home-Sensor Installation

### ■ SHG130-R18-60M

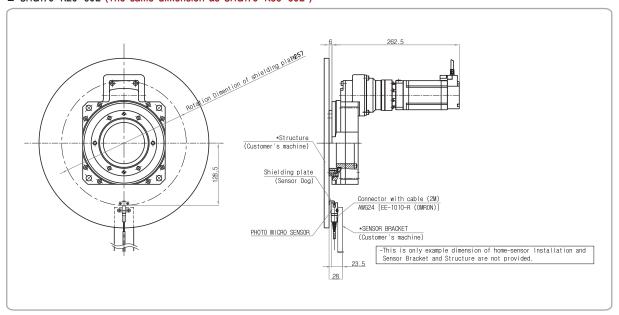


#### ■ SHG130-R18-60L

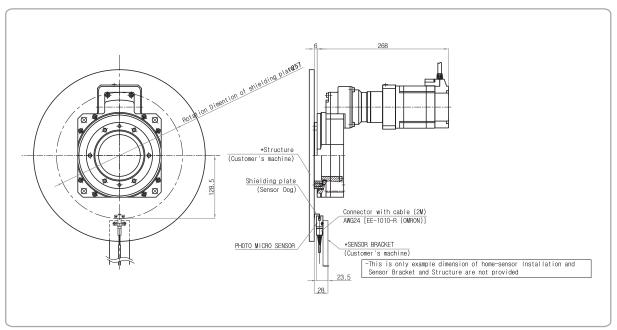


# in Dimensions of Home-Sensor Installation

#### ■ SHG170-R20-60L (The same dimension as SHG170-R36-60L)



#### ■ SHG170-R20-86M (The same dimension as SHG170-R36-86M)

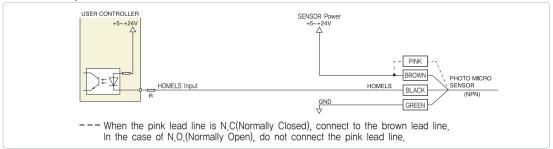


#### Dimensions of Home-Sensor Installation

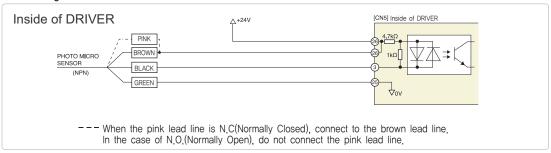
#### ■ NPN Type

Please supply the power of DC5V or more and the power of 24V or less. Also, please set the current value at below 100mA, In the case of exceed 100mA of current value, please connect an external resistor R. Please use common GND for the power of the sensor and the power of user controller.

#### ■ Pulse Train Input Unit



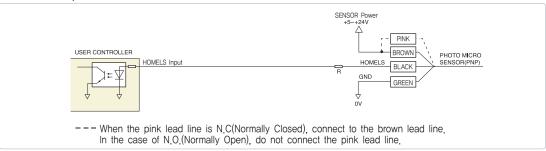
#### Positioning Function Embedded Unit



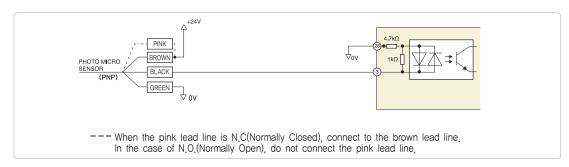
#### ■ PNP Type

Please supply the power of DC5V or more and the power of 24V or less, Also, please set the current value at below 50mA, In the case of exceed 50mA of current value, please connect an external resistor R. Please use common GND for the power of the sensor and the power of user controller.

#### ■ Pulse Train Input Unit



#### • Positioning Function Embedded Unit



# How to Install

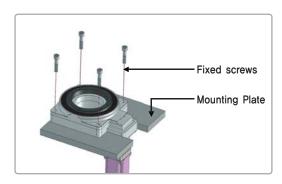
# How to Install the Ezi-Robo SHG

Please refer to the installation method as shown in the picture when attach the actuator to mounting plate in the case of applying SHG series.

■ How to Install to the Mounting Plate (If the TAP Hole is exist on the mounting plate)

### • The bolt specifications

Products	Dimension	
SHG170	M10 X 45L	
SHG130	M8 X 20L	



 $\ensuremath{\mathbb{X}}$  Please refer to the table to find the bolt dimension, If non-standard bolt is used, it may cause damage to the product, therefore the standard bolt must be used.

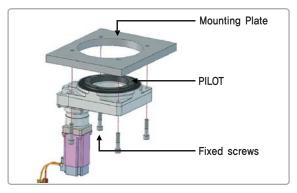
#### ■ How to Install to the Actuator Pilot

#### ■ The bolt specifications

Products	Products
SHG170	M10 X45L

#### ■ PILOT Dimension

Products	Products
SHG170	0 Ф176-0.063



# Drive and Motor Combination

# Pulse Input Drive and Motor Combination

Unit Model Number	Motor Model Number	Drive Model Number	Remarks
SHG130-R18-60M-ST	EzM-60M-A	EzS-PD-60M-A	Released
SHG130-R18-60L-ST	EzM-60L-A	EzS-PD-60L-A	Released
SHG170-R20-60L-ST	EzM-60L-A	EzS-PD-60L-A	Released
SHG170-R36-60L-ST	EzM-60L-A	EzS-PD-60L-A	Released
SHG170-R20-86M-ST	EzM-86M-A	EzS-PD-86M-A	Released
SHG170-R36-86M-ST	EzM-86M-A	EzS-PD-86M-A	Released



# Ontroller Emvedded Drive and Motor Combination

Unit Model Number	Motor Model Number	Drive Model Number	Remarks
SHG130-R18-60M-ST-PR	EzM-60M-A	EzS-NDR-60M-A	Released
SHG130-R18-60L-ST-PR	EzM-60L-A	EzS-NDR-60L-A	Released
SHG170-R20-60L-ST-PR	EzM-60L-A	EzS-NDR-60L-A	Released
SHG170-R36-60L-ST-PR	EzM-60L-A	EzS-NDR-60L-A	Released
SHG170-R20-86M-ST-PR	EzM-86M-A	EzS-NDR-86M-A	Released
SHG170-R36-86M-ST-PR	EzM-86M-A	EzS-NDR-86M-A	Released

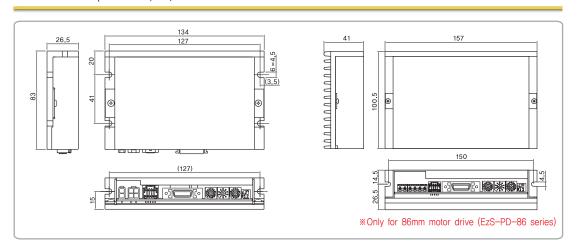


# **Pulse Input Drive**

# Specification of Pulse Input Drive

	Motor Model EzM-60 series		EzM-86 series		
	Driver Model EzS-PD-60 series		EzS-PD-86 series		
	Input Voltage 24VDC±10%				
С	Control Method Closed loop control with 32bit DSP				
Curr	ent Consumption	Max 500mA (Except motor current)			
ng on	Ambient Temperature	In Use : 0~50°C In Storage : -20~70°C			
Operating Condition	Humidity	In Use: 35~85% (Non-Condensing) In Storage: 10~90% (Non-Condensing)			
	Vib. Resist.	0.5G			
	Rotation Speed	0~3,000rpm			
	Resolution(P/R)	10,000/Rev. Encoder model: 500 1,000 1,600 2,000 3,	600 5,000 6,400 7,200 10,000		
	Max. Input Pulse Frequency				
ion	Protection Functions  Over current, Over speed, Position tracking error, Over load, Over temperature, Over regenerated voltage, Motor connect error, Encoder connect error, Motor voltage error, In–Posit System error, ROM error, Position overflow error				
Function	LED Display	Power status, In-Position status, Servo On status, Alarr	m status		
II.	In-Position Selection	0∼F (Selectable with DIP switch)			
	Position Gain Selection	0∼F (Selectable with DIP switch)			
	Pulse Input Method	1-Pulse / 2-Pulse (Selectable with DIP switch)			
	Rotational Direction	CW / CCW (Selectable with DIP switch)			
nal	Input Signals	Position command pulse, Servo On/Off, Alarm reset (Pl	notocoupler input)		
I/O Signal	Output Signals	Signals In-Position, Alarm (Photocoupler output) Encoder signal (A+, A-, B+, B-, Z+, Z-, 26C31 of Equivalent) (Line Driver output)			

# Dimensions of Pulse Input Drive (mm)

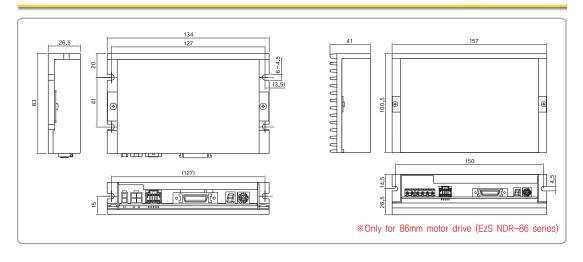


# **Controller Embedded Drive**

# Specification of Controller Emvedded Drive

	Motor Model	EzM-60 series	EzM-86 series		
I	Driver Model	EzS-NDR-60 series	EzS-NDR-86 series		
I	nput Voltage	24VDC ±10%			
С	ontrol Method	Closed loop control with 32bit DSP			
М	ulti Axes Drive	Maximum 16 axes through Daisy-Chain			
F	Position Table	256 motion command steps (Continuous, Wait, Loop,	Jump and External start etc.)		
Curre	ent Consumption	Max 500mA (Except motor current)			
ng	Ambient Temperature	In Use : 0~50°C In Storage : −20~70°C			
Operating Condition	Humidity	In Use: 35~85% (Non-condensing) In Storage: 10~90% (Non-condensing)			
	Vib. Resist.	0,5G			
	Rotation Speed	0~3,000rpm			
	Resolution(P/R)	10,000/Rev. Encoder model : 500 1,000 1,600 2,000	0 3,600 5,000 6,400 7,200 10,000		
Protection Functions  Over current, Over speed, Position tracking error, Over load, Over temperature, Over regenerated voltage, Motor connect error, Encoder connect error, Motor voltage e In-Position error, System error, ROM error, Input voltage error, Position overflow error  I ED Display  Over current, Over speed, Position tracking error, Over load, Over temperature, Over regenerated voltage, Motor connect error, Encoder connect error, Motor voltage error, Position error, System error, ROM error, Input voltage error, Position overflow error		oder connect error, Motor voltage error,			
Ţ	LED Display	Power status, In-Position status, Servo On status, Al	arm status		
	In-Position Selection	0~15 (Selectable by parameter)			
	Position Gain Selection	0~15 (Selectable by parameter)			
	Rotational Direction	CW / CCW (Selectable by parameter)			
I/0 ignal	Input Signal	3 dedicated input (LIMIT+, LIMIT-, ORIGIN), 9 progra	ammable input (Photocoupler)		
Sig	Output Signal	1 dedicated output (Compare Out), 9 programmable	output (Photocoupler), Brake signal		
Communication The RS-485 serial communication with PC Transmission speed: 9,600~921,600bps					
Po	osition Control	Incremental mode / Absolute mode  Data Range: -134,217,727 to +134,217,727pulse, Operating speed: Max. 3,000rpm			
Re	eturn to Origin	Origin Sensor, Z phase, ±Limit sensor, Torque			
	GUI	User Interface Program within Windows			
Software		Motion Library (DLL) for windows 2000/XP			

# Dimensions of Controller Emvedded Drive (mm)

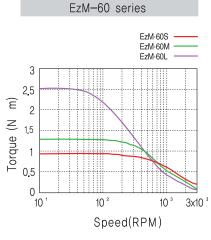


# Motor Specifications and Torque Characteristics

# Specification of Motor (Same Pulse Input and Controller Embedded Drive)

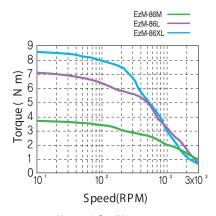
Model	Unit	EzM-60M-A	EzM-60L-A	EzM-86M-A	
Drive Method	_	BI-POLAR	BI-POLAR	BI-POLAR	
Number of Phase	_	2	2	2	
Voltage	VDC	1,56	2.6	2,4	
Current per Phase	A	4.0	4.0	6.0	
Resistance per Phase	Ohm	0,39	0,65	0.4	
Inductance per Phase	mH	1,2	2.4	3.5	
Holding Torque	N·m	1,28	2.4	4.0	
Rotor Inertia	g · cm	320	800	1400	
Weight	g	900	1600	2,3	
Length	mm	56	90	79	
Allowable Thrust Load	N	Lower than motor weight			
Insulation Resistance	Mohm	100min, (at 500VDC)			
Insulation Class	_	CLASS B			
Operating Temperature	° C		0 to 55		

# Torque Characteristics (Same Pulse Input and Controller Embedded Drive)

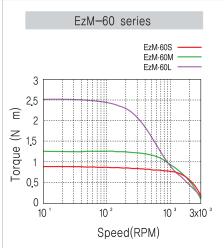


\*\* Measured Condition Motor Voltage = 24VDC Motor Current = Rated Current (Refer to Motor Specification) Drive = Ezi-SERVO-Plus R





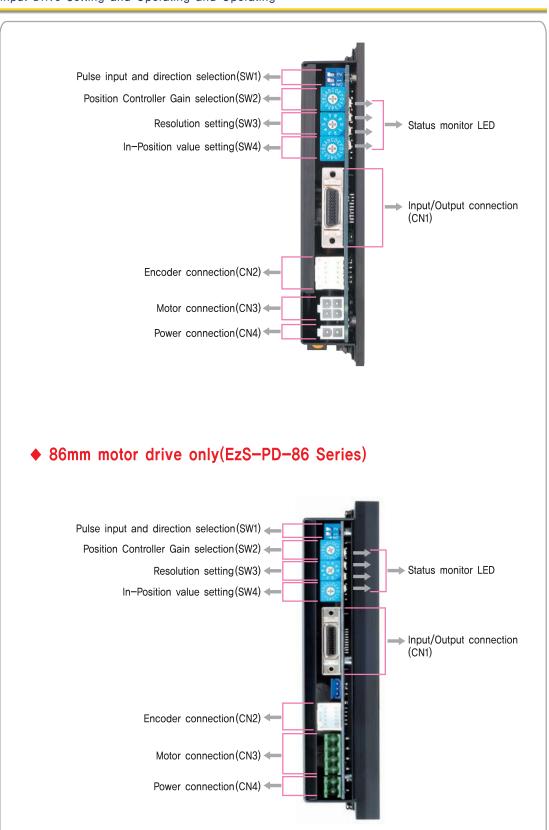
\*\* Measured Condition Motor Voltage = 70VDC Motor Current = Rated Current (Refer to Motor Specification) Drive = Ezi-SERVO-Plus R



\*\* Measured Condition Motor Voltage = 40VDC Motor Current = Rated Current (Refer to Motor Specification) Drive = Ezi-SERVO-Plus R

# Pulse Input Drive Setting and Operating

Pulse Input Drive Setting and Operating and Operating



# **Pulse Input Drive Setting** and Operating

## Setting and Operating

### 1. Status Monitor LED

Indication	Color	Function	ON/OFF Condition
PWR	Green	Power Input Indication LED is turned ON when power is applied	
INP	Yellow	Complete Positioning Motion	Lights On when Positioning error reaches within the preset pulse selected by rotary switch
SON	Orange	Servo On / Off Indication	Servo On: Lights On, Servo Off: Lights Off
ALM	Red	Alarm Indication	Flash when protection function is activated (Identifiable which protection mode is activated by counting the blinking times)

### ◆ Protection functions and LED flash times

Times	Protection	Conditions
1	Over current	The current through power devices in inverter exceeds the limit value
2	Over speed	Motor speed exceed 3,000rpm
3	Position tracking error	Position error value is higher than 90° in motor run state
4	Over load	The motor is continuously operated more than 5 second under a load exceeding the $\max_{\cdot}$ torque
5	Over temperature	Inside temperature of drive exceeds 55℃
6	Over regeneratived voltage	Back-EMF more high limit value*1
7	Motor connect error	The power is ON without connection of the motor cable to drive
8	Encoder connect error	Cable connection error with Encoder connector in drive
9	Motor voltage error	Motor voltage is out of limited value*2
10	In-Position error	After operation is finished, a position error occurs
11	System error	Error occurs in drive system
12	ROM error	Error occurs in parameter storage device(ROM)
14	Input voltage error	Power source voltage is out of limited value*3
15	Position overflow error	Position error value is higher than 90° in motor stop state

0,5s 2.0 s Alarm LED flash (ex: Position tracking error)

- \*1: Voltage limit of Back-EMF depends on motor model (Refer to the Manual)
- \*2 : Motor limit voltage value depends on motor model (Refer to the Manual)
- \*3: Limit value provided to drives depends on driver model (Refer to the Manual)

# 2. Pulse Input Selection Switch(SW1.1)

Indication	cation Switch Name		Functions		
2P/1P		Selecting pulse input mode		Selectable 1-Pulse input mode or 2-Pulse input mode as Pulse input signal, ON: 1-Pulse mode OFF: 2-Pulse mode **Default: 2-Pulse mode	
		2-Pu	lse Mode	1-Puls	e Mode
	CW(Pulse) Pin CCW(Dir) Pin				
	Rotational Direction	CW	CCW	CW	CCW

# 3. Rotational Direction Selection Switch(SW1.2)

Indication	Switch Name	Functions
DIR	Switching Rotational Direction	Based on CW(+Dir signal) input to driver, ON: CCW(-Direction) OFF: CW(+Direction) **Default: CW mode





Direction selection switch: OFF CW Dir.

# **4. Resolution Selection Switch(SW3)** The Number of pulse per revolution.

Position	Pulse/Rotation	Position	Pulse/Rotation
0	500* <sup>1</sup>	5	3,600
1	500	6	5,000
2	1,000	7	6,400
3	1,600	8	7,200
4	2,000	9	10,000*2



<sup>\*1 :</sup> Resolution value depend on encoder type.

<sup>\*2</sup>: Default = 10,000

#### 5. Position Controller Gain Selection Switch(SW2)

The Position Controller Gain Switch allows for the correction of the motor position deviation after stopping caused by load and friction. Depending on the motor load, the user may have to select a different gain position to stabilize and to correct positional error quickly.

#### To tune the controller

- 1. Set the switch to "0" position.
- 2. Start to rotate the switch until system becomes stable.
- 3. Rotate the switch +/-  $1\sim2$  position to reach better performance.

Position	Time Constant of the Integral part	Proportional Gain*1
0	1	1
1	1	2
2	1	3
*23	1	4
4	1	5
5	1	6
6	2	1
7	2	2
8	2	3
9	2	4
А	2	5
В	3	1
С	3	2
D	3	3
Е	3	4
F	3	5

<sup>\*1 :</sup> Value in the columns are in relative units, They only show the parameter changes depending on the switch's position.





#### 6. In-Position Value Setting Switch(SW4)

To select the output condition of In-Position signal, In-Position output signal is generated when the pulse number of positional error is lower than selected In-Position value set by this switch after positioning command is executed,

Position	In-Position Value[Pulse] Fast Response	Position	In-Position Value[Pulse] Accurate Response
0*1	0	8	0
1	1	9	1
2	2	Α	2
3	3	В	3
4	4	С	4
5	5	D	5
6	6	Е	6
7	7	F	7

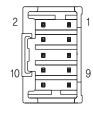
<sup>\*1 :</sup> Default = 0

\*\*Please refer to User Manual for setup.



# 7. Encoder Connector(CN2)

No.	Function	1/0
1	A+	Input
2	A-	Input
3	B+	Input
4	B-	Input
5	Z+	Input
6	Z-	Input
7	5VDC	Output
8	5VDC GND	Output
9	F. GND	
10	F. GND	

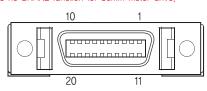


# 8. Input/Output Connector(CN1)

No.	Function	1/0
1	CW+(Pulse+)	Input
2	CW-(Pulse-)	Input
3	CCW+(Dir+)	Input
4	CCW-(Dir-)	Input
5	A+	Output
6	A-	Output
7	B+	Output
8	B-	Output
9	Z+	Output
10	Z-	Output
11	Alarm	Output
12	In-Position	Output
13	Servo On/Off	Input
14	Alarm Reset	Input
15	NC	
16	BRAKE+	Output
17	BRAKE-	Output
18	S-GND	Output
19	24VDC GND	Input
20	24VDC	Input

**<sup>\*\*</sup>BRAKE** function is optional

<sup>\*</sup>There is no BRAKE function for 86mm motor drive.



### 9. Motor Connector(CN2)

No.	Function	
1	A Phase	
2	B Phase	
3	/A Phase	
4	/B Phase	

3	1
40	
4	2

No.	Function	
1	/B Phase	
2	B Phase	
3	/A Phase	
4	A Phase	





No.	Function	
1	24VDC ±10%	
2	GND	

No. Function	
1	GND
2	40~70VDC

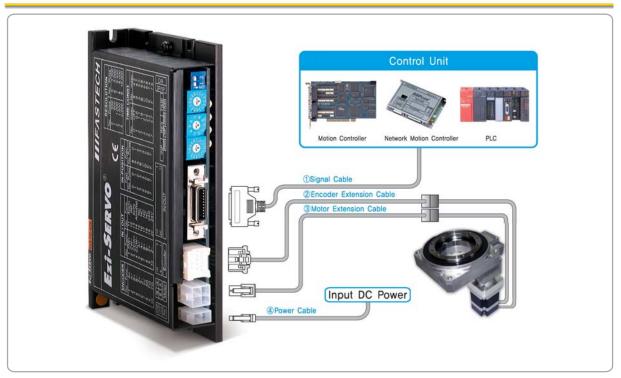






# Pulse Input Drive Setting and Operating

System Configuration of Pulse Input Drive



Type	Signal Cable	Encoder Cable	Motor Cable	Power Cable
Standard Length	_	30cm	30cm	_
Max, Length	20m	20m	20m	2m

# 1. Cable Option

#### 1)Signal Cable

Available to connect between Control System and Ezi-SERVO.

Item	Length[m]	Remark
CSVO-S-□□□F		Normal Cable
CSVO-S-□□□M		Robot Cable

 $\hfill\square$  is for Cable Length. The unit is 1m and Max. 20m length.

#### 3 Motor Extension Cable

Available to extended connection between motor and Ezi-SERVO.

ltem	Length[m]	Remark
CSVO-M-□□□F		Normal Cable
CSVO-M-		Robot Cable

 $\hfill\square$  is for Cable Length. The unit is 1m and Max, 20m length,

## ②Encoder Extension Cable

Available to extended connection between Encoder and Ezi-SERVO.

Item	Length[m]	Remark
CSVO-E-DDDF		Normal Cable
CSVO-E-DDDM		Robot Cable

 $\hfill\square$  is for Cable Length. The unit is 1m and Max. 20m length,

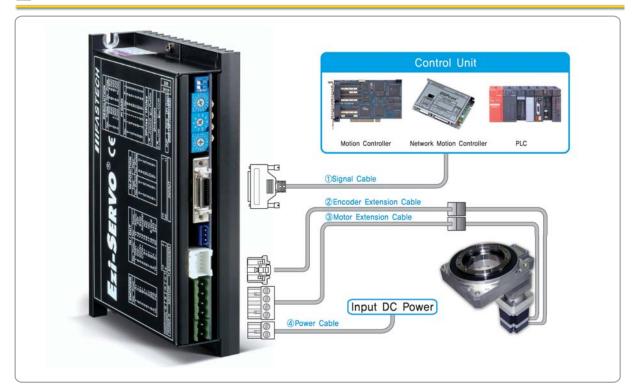
### 4 Power Cable

Available to connect between Power and Ezi-SERVO.

Item	Length[m]	Remark
CSVO-P-□□□F		Normal Cable
CSVO-P-□□□M		Robot Cable

☐ is for Cable Length. The unit is 1m and Max. 2m length.

# System Configuration of Pulse Input Drive(86mm)



Туре	Signal Cable	Encoder Cable	Motor Cable	Power Cable
Standard Length	_	30cm	30cm	_
Max. Length	20m	20m	20m	2m

# 1. Cable Option

### 1)Signal Cable

Available to connect between Control System and Ezi-SERVO.

Item	Length[m]	Remark
CSVO-S-□□□F		Normal Cable
CSVO-S-□□□M		Robot Cable

 $\hfill\Box$  is for Cable Length. The unit is 1m and Max. 20m length.

# 3 Motor Extension Cable

Available to extended connection between motor and Ezi-SERVO.

Item		Length[m]	Remark
	CSVP-M-□□□F		Normal Cable
	CSVP-M-□□□M		Robot Cable

 $\square$  is for Cable Length. The unit is 1m and Max. 20m length.

### **2** Encoder Extension Cable

Available to extended connection between Encoder and Ezi-SERVO.

Item	Length[m]	Remark
CSVO-E-DDDF		Normal Cable
CSVO-E-		Robot Cable

 $\hfill\Box$  is for Cable Length. The unit is 1m and Max. 20m length.

## 4 Power Cable

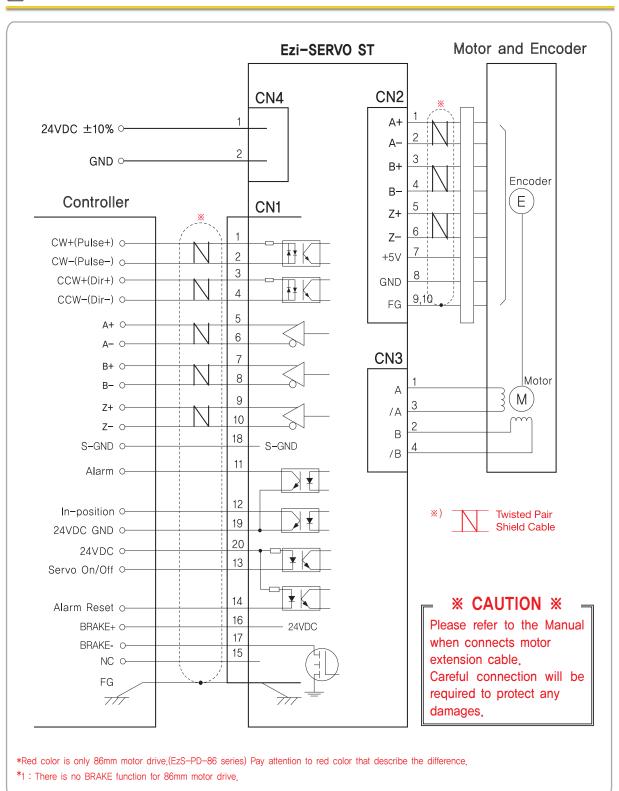
Available to connect between Power and Ezi-SERVO,

Item	Length[m]	Remark
CSVP-P-00F		Normal Cable
CSVP-P-		Robot Cable

 $\hfill\Box$  is for Cable Length. The unit is 1m and Max, 2m length,

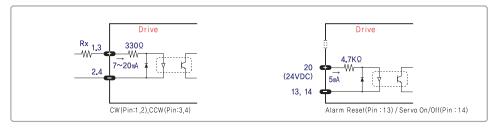
# Pulse Input Drive Setting and Operating Control I/O Signals

Pulse Input Drive External Wiring Diagram



# Input Signal

Input signals of the drive are all hotocoupler protected, the signal shows the status of internal hotocouplers [ON: onduction], OFF: on-cconduction], ot isplaying the voltage levels f the signal.



#### CW, CCW Input

This signal can be used to receive a positioning pulse command from a user host motion controller.

The user can select 1-pulse input mode or 2-pulse input mode (refer to witch No.11, W1). The input schematic of CW, CCW is designed for 5V TTL level. When using 5V level as an input signal, the resistor Rx is not used and connect to he river directly. When the level of input signal is more than 5V, Rx resistor is re-quired, of the resistor is absent, the drive will be amaged! If the input signal level is 12V, Rx value is 680 ohm and 24V, Rx value is 1,8 kohm.

#### ■ Servo On/Off Input

This input can be used only to djust the position by manually moving the motor shaft from the load—side. By setting the signal [ON], the driver cuts off the power supply to the motor. Then, one can manually adjust output position. When setting the signal back to [OFF], the driver resumes the power to the motor and recovers the holding torque, When driving a motor, one needs to set the signal [OFF].

#### ■ Alarm Reset Input

When a protection mode has been activated, a signal to this alarm reset input cancels the Alarm output.

# ON OFF \_\_\_\_\_\_\_more than 0.1s

\*\* By setting thea larm eset nput signal [ON], ancel the Alarm output, Before ancel the Alarm output, have to remove the source of alarm.

Output Signal

Output signals from the driver are hotocoupler protected: alarm, in-Position and the line Driver utputs (encoder signal). In the case of hotocoupler outputs, the signal indicates the status of internal hotocouplers ON: onduction], OFF: non-conduction], not isplaying the voltage levels of the signal.



#### ■ Alarm Output

The Alarm output indicates [ON] when the driver is in a normal operation. If a protection mode has been activated, it goes [OFF], A host controller needs to detect this signal and stop sending a motor driving command. When the driver detects an abnormal operation such as overload or over current of the motor, it sets the Alarm output to [OFF], flashes the Alarm LED, disconnect the power to a motor and stops the motor simultaneously. [Caution] Only at the Alarm output port, the photocoupler isolation is reverse. When the driver is in normal operation the Alarm output is [ON].

On the contrary when the driver is in abnormal operation that start protection mode, the alarm output is OFF].

# Motor Speed rot. Stop rot. Stop In-Position signal ON OFF

#### ■ In-Position Output

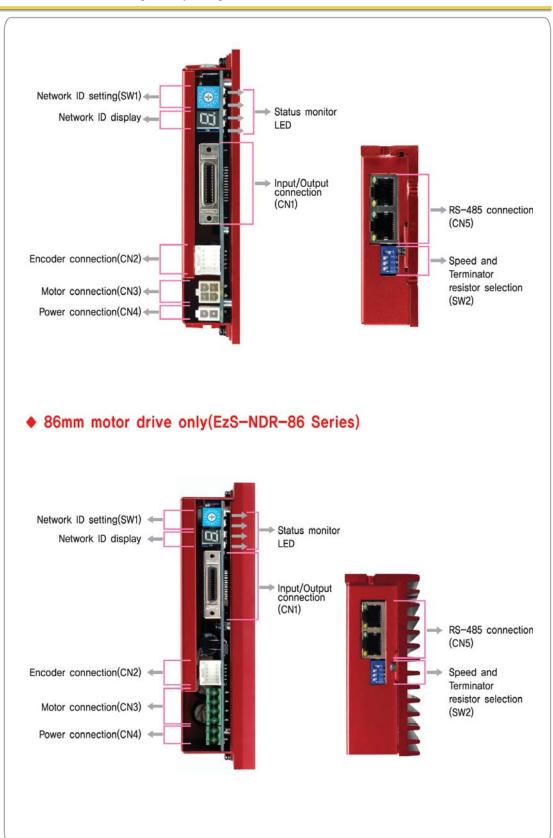
In-Position signal is [ON] when positioning is completed. This signal is [ON] when the motor position error is within the value set by he witch SW4.

#### ■ Encoder signal Output

The encoder signal is a line driver output, this can be used to confirm the stop position,

# Controller Embedded Drive System Configurations

Ontroller Embedded Drive Setting and Operating



### Setting and Operating

# 1. Status Monitor LED

Indication	Color	Function	ON/OFF Condition
PWR	Green	Power Input Indication	LED is turned ON when power is applied
INP	Yellow	Complete Positioning Motion	Lights On when Positioning error reaches within the preset pulse selected by rotary switch
SON	Orange	Servo On / Off Indication	Servo On: Lights On, Servo Off: Lights Off
ALM	Red	Alarm Indication	Flash when protection function is activated (Identifiable which protection mode is activated by counting the blinking times)

### Protection functions and LED flash times

Times	Protection	Conditions
1	Over current	The current through power devices in inverter exceeds the limit value
2	Over speed	Motor speed exceed 3,000rpm
3	Position tracking error	Position error value is higher than 90° in motor run state*1
4	Over load	The motor is continuously operated more than 5 second under a load exceeding the max, torque
5	Over temperature	Inside temperature of drive exceeds 55°C
6	Over regeneratived voltage	Back-EMF more high limit value*2
7	Motor connect error	The power is ON without connection of the motor cable to drive
8	Encoder connect error	Cable connection error with Encoder connector in drive
9	Motor voltage error	Motor voltage is out of limited value*3
10	In-Position error	After operation is finished, a position error occurs
11	System error	Error occurs in drive system
12	ROM error	Error occurs in parameter storage device(ROM)
14	Input voltage error	Power source voltage is out of limited value*4
15	Position overflow error	Position error value is higher than 90° in motor stop state*1

0.5 s Alarm LED flash (ex: Position tracking error)

- \*1: 주어진 값은 파라미터에 의해 변경 가능 합니다. (메뉴얼 참조)
- \*2 : Voltage limit of Back-EMF depends on motor model (Refer to the Manual)
- \*3: Motor limit voltage value depends on motor model (Refer to the Manual)
- \*4: Limit value provided to drives depends on driver model (Refer to the Manual)

# 2. Network ID Selection Switch(SW1)

Position	ID number	Position	ID number
0	0	8	8
1	1	9	9
2	2	Α	10
3	3	В	11
4	4	С	12
5	5	D	13
6	6	Е	14
7	7	F	15



\*Maximum 16 axis can be connected in one network.

# 3. Speed and Terminator Resistor Selection Switch(SW2)

The purpose of this is to setting the communication speed and connect a terminator resistor if drive is installed at the end of network.

SW 2.1 used for connecting the terminator resistor. SW 2.2~SW 2.4 used for setting speed as follows.

SW 2.1	SW 2.2	SW 2.3	SW 2.4	Baud rate[bps]
_	OFF	OFF	OFF	9,600
_	ON	OFF	OFF	19,200
_	OFF	ON	OFF	38,400
_	ON	ON	OFF	57,600
_	OFF	OFF	ON	115,200*1
_	ON	OFF	ON	230,400
_	OFF	ON	ON	460,800
_	ON	ON	ON	921,600

<sup>\*1 :</sup> Default setting value

If SW2.1 is OFF, terminator resistor is disconnected.

If SW2.2 is ON, terminator resistor is connected.



# **Controller Embedded Drive System Configurations**

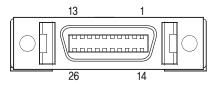
Setting and Operating

# 4. Input/Output Signal(CN1)

NO.	Function	1/0
1	LIMIT+	Input
2	LIMIT-	Input
3	ORIGIN	Input
4	Digital In1	Input
5	Digital In6	Input
6	Digital In7	Input
7	Compare Out1	Output
8	Digital Out1	Output
9	Digital Out2	Output
10	Digital Out3	Output
11	Digital Out4	Output
12	Digital Out5	Output
13	Digital Out6	Output
14	Digital In2	Input
15	Digital In3	Input
16	Digital In4	Input
17	Digital In5	Input
18	Digital In8	Input
19	Digital In9	Input
20	Digital Out7	Output
21	Digital Out8	Output
22	Digital Out9	Output
23	BRAKE+	Output
24	BRAKE-	Output
25	24VDC GND	Input
26	24VDC	Input

**<sup>\*</sup>BRAKE** function is optional.

<sup>\*</sup>There is no BRAKE function for 86mm motor drive.



# 5. Encoder Connector(CN2)

NO.	Function	I/O
1	A+	Input
2	A-	Input
3	B+	Input
4	B-	Input
5	Z+	Input
6	Z-	Input
7	5VDC	Output
8	5VDC GND	Output
9	Frame GND	
10	Frame GND	



# 6. Motor Connector(CN3)

NO.	Function	
1	A Phase	
2	B Phase	
3	/A Phase	
4	/B Phase	



NO.	Function	
1	/B Phase	
2	B Phase	
3	/A Phase	
4	A Phase	



\*Only for 86mm motor drive.

# 7. Power Connector(CN4)

NO.	Function	
1	24VDC ±10%	
2	GND	



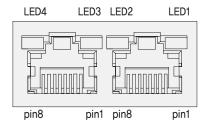
NO.	Function	
1	GND	
2	40∼70VDC	



\*Only for 86mm motor drive.

# 8. RS-485 Communication Connector(CN5)

NO.	Function	NO.	Function
1	GND	6	Data-
2	GND	7	GND
3	Data+	8	GND
4	GND	LED 1, 3	Drive status
5	GND	LED 2, 4	Communication status



# **♦** Connector for Cabling

These connectors are serviced together with Ezi-SERVO Plus-R except when purchasing option cables.

# CN1: Input/Output Connector

Item	Specification	Maker
Connector	10126-3000PE	3M
Shell	10326-52FO-008	3M

Item	Specification	Maker	
Housing	51353-1000	MOLEX	
Terminal	56134-9000	MOLEX	

# **CN3**: Motor Connector

Item	Specification	Maker
Housing	5557-04R	MOLEX
Terminal	5556T	MOLEX

# **CN4**: Power Connector

**CN2**: Encoder Connector

Item	Specification	Maker
Housing	5557-02R	MOLEX
Terminal	5556T	MOLEX

# **CN3**: Motor Connector (86mm motor drive only)

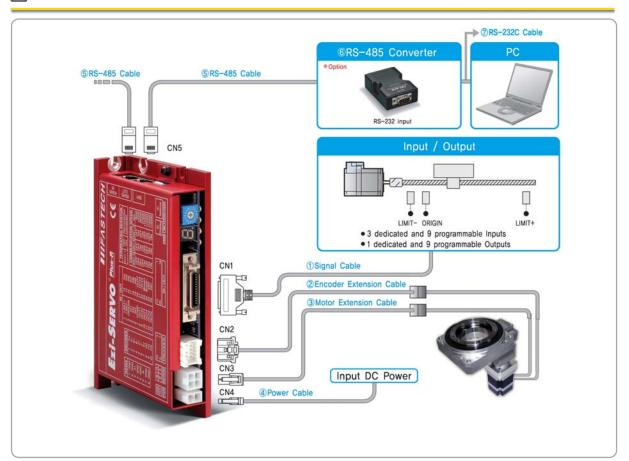
Item	Specification	Maker
Terminal Block	AK950-4	PTR
Housing	3191-4RI	MOLEX
Terminal	138IT	MOLEX

# **CN4**: Power Connector (86mm motor drive only)

Item	Specification	Maker
Terminal Block	AK950-2	PTR

# Controller Embedded Drive System Configurations

Ontroller Embedded Drive System Configurations



Туре	Signal Cable	Encoder Cable	Motor Cable	Power Cable	RS-485 Cable
Standard Length	_	30cm	30cm	_	_
Max. Length	20m	20m	20m	2m	30m

# 1. Cable Option

### **1**Signal Cable

Available to connect between Control System and Ezi-SERVO Plus-R.

Item	Length[m]	Remark
CSVR-S-□□□F		Normal Cable
CSVR-S-□□□M		Robot Cable

 $\hfill\square$  is for Cable Length. The unit is 1m and Max, 20m length,

### **2**Encoder Extension Cable

Available to extended connection between Encoder and Ezi-SERVO Plus-R.

Item	Length[m]	Remark
CSVO-E-DDDF		Normal Cable
CSVO-E-DDDM		Robot Cable

 $\hfill\square$  is for Cable Length. The unit is 1m and Max. 20m length.

#### **3Motor Extension Cable**

Available to extended connection between motor and Ezi-SERVO Plus-R.

Item	Length[m]	Remark
CSVO-M-□□□F		Normal Cable
CSVO-M-□□□M		Robot Cable

 $\hfill\Box$  is for Cable Length. The unit is 1m and Max. 20m length.

#### 4 Power Cable

Available to connect between Power and Ezi-SERVO Plus-R.

Item	Length[m]	Remark
CSVO-P-□□□F		Normal Cable
CSVO-P-□□□M		Robot Cable

 $\hfill\square$  is for Cable Length. The unit is 1m and Max. 2m length.

#### ⑤RS-485 Cable

Item	Length[m]	Remark
CGNR-R-0R6F	0.5	
CGNR-R-001F	1	
CGNR-R-1R5F	1.5	Normal Cable
CGNR-R-002F	2	Normal Cable
CGNR-R-003F	3	
CGNR-R-005F	5	

# 2. Option

# 6FAS-RCR(RS-232C to RS-485 Converter)

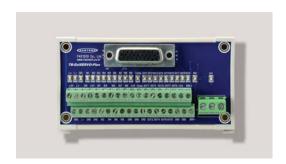
Item	Specification	
Comm. Speed	Max. 115.2Kbps	
Comm. Distance	RS-232C : Max. 15m	
Comm. Distance	RS-485 : Max. 1.2km	
Connector Type	RS-232C: DB9 Female	
Connector Type	RS-485: RJ-45	
Dimension	50X75X23mm	
Weight	38g	
Dower	Powered from PC	
Power	(Usable for external DC5~24V)	

### 7RS-232C Cable

Item	Length[m]	Remark
CGNR-C-002F	2	
CGNR-C-003F	3	Normal Cable
CGNR-C-005F	5	

### **®TB-Plus(Interface Board)**

Available to connect more conveniently between Input/Output signal and Ezi-SERVO Plus-R.



#### Interface Cable

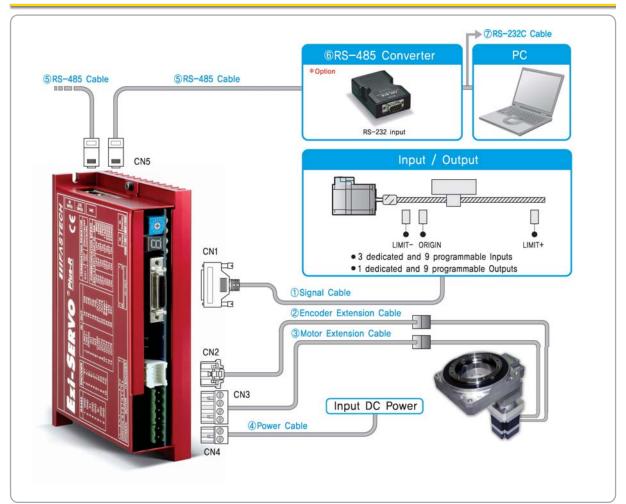
Available to Connect between TB-Plus Interface Board and Ezi-SERVO Plus-R,

Item	Length[m]	Remark
CIFD-S-00F		Normal Cable
CIFD-S-□□□M		Robot Cable

 $\hfill\square$  is for Cable Length. The unit is 1m and Max. 20m length.

# Controller Embedded Drive System Configurations

Ontroller Embedded Drive System Configurations (86mm)



Туре	Signal Cable	Encoder Cable	Motor Cable	Power Cable	RS-485 Cable
Standard Length	_	30cm	30cm	-	_
Max. Length	20m	20m	20m	2m	30m

# 1. Cable Option

### **1**Signal Cable

Available to connect between Control System and Ezi-SERVO Plus-R.

Item	Length[m]	Remark
CSVR-S-□□□F		Normal Cable
CSVR-S-□□□M		Robot Cable

 $\hfill\square$  is for Cable Length. The unit is 1m and Max. 20m length.

#### 2)Encoder Extension Cable

Available to extended connection between Encoder and Ezi-SERVO Plus-R.

Item	Length[m]	Remark
CSVO-E-DDDF		Normal Cable
CSVO-E-□□□M		Robot Cable

☐ is for Cable Length. The unit is 1m and Max. 20m length.

#### **3Motor Extension Cable**

Available to Extended connection between motor and Ezi-SERVO Plus-R.

Item	Length[m]	Remark
CSVP-M-□□□F		Normal Cable
CSVP-M-□□□M		Robot Cable

 $<sup>\</sup>hfill\square$  is for Cable Length. The unit is 1m and Max. 20m length.

### **4**Power Cable

Available to connect between Power and Ezi-SERVO Plus-R.

Item	Length[m]	Remark
CSVP-P-00F		Normal Cable
CSVP-P-		Robot Cable

 $<sup>\</sup>square$  is for Cable Length. The unit is 1m and Max. 2m length.

### ⑤RS-485 Cable

Item	Length[m]	Remark
CGNR-R-0R6F	0.6	
CGNR-R-001F	1	
CGNR-R-1R5F	1.5	Normal Cable
CGNR-R-002F	2	Normal Cable
CGNR-R-003F	3	
CGNR-R-005F	5	

# 2. Option

### @FAS-RCR(RS-232C to RS-485 Converter)

Item	Specification	
Comm. Speed	Max. 115.2Kbps	
Comm. Distance	RS-232C : Max. 15m	
Comm. Distance	RS-485 : Max. 1.2km	
Connector Type	RS-232C: DB9 Female	
Connector Type	RS-485: RJ-45	
Dimension	50X75X23mm	
Weight	38g	
Power	Powered from PC	
Power	(Usable for external DC5~24V)	

### 7)RS-232C Cable

Item	Length[m]	Remark
CGNR-C-002F	2	
CGNR-C-003F	3	Normal Cable
CGNR-C-005F	5	

### **®TB-Plus(Interface Board)**

Available to connect more conveniently between Input/Output signal and Ezi-SERVO Plus-R.



#### Interface Cable

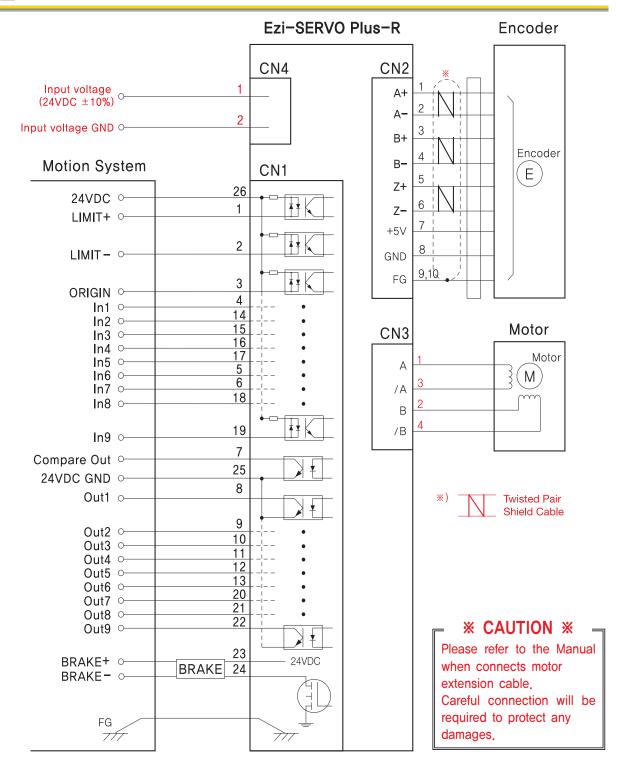
Available to Connect between TB-Plus Interface Board and Ezi-SERVO Plus-R,

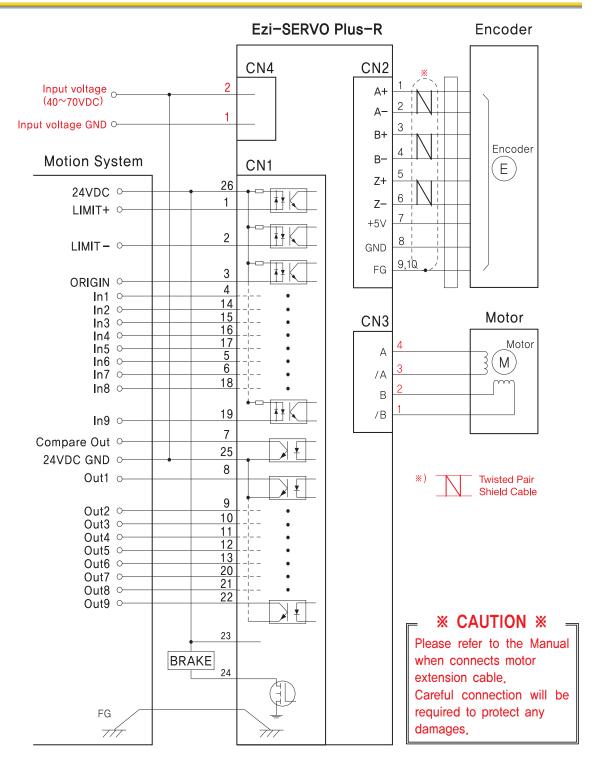
Item	Length[m]	Remark
CIFD-S-00F		Normal Cable
CIFD-S-		Robot Cable

 $\hfill\square$  is for Cable Length. The unit is 1m and Max. 20m length.

# **External Wiring Diagram**

O Controller Embedded Drive External Wiring Diagram

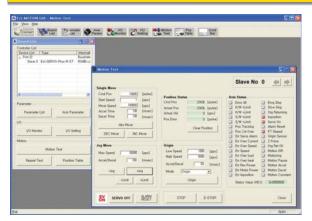




- \* This Wiring Diagram is only for 86mm motor drive(EzS-NDR-86 series),
- \* Pay attention to red color that describe the difference.

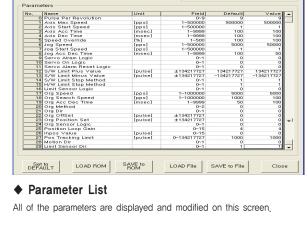
# GUI (Graphic User Interface) Screen Shot

# Ontroller Embedded Drive User GUI

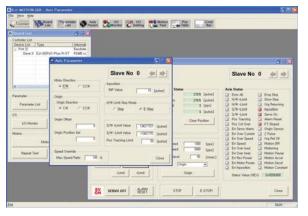


#### ♦ Controller Lists and Motion Test

This screen display the controller list that connected to system, You can make a single move, jog and origin command and also the motor status is displayed,

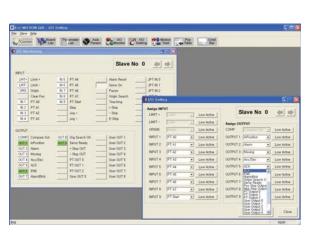


Slave No 0



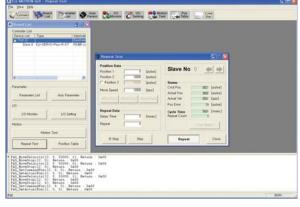
#### ◆ Axis Parameter Setup

You can select various parameters that frequently used, (ex : sensor input logic)



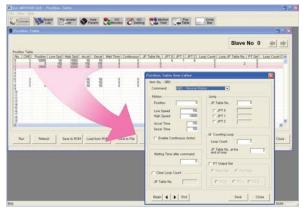
#### ♦ I/O Monitoring and Setting

You can select various digital input and output signals of controller.



### **♦** Motion Repeat and Monitor Status

Target position, speed, delay time and repeat count are selected for repeat motion test. Motion library(DLL) is also displayed on screen.



#### ◆ Position Table

You can edit the position table and execute it, The position table data can be saved and loaded from Flash ROM and Windows file,

MEMO	



Fast, Accurate, Smooth Motion

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