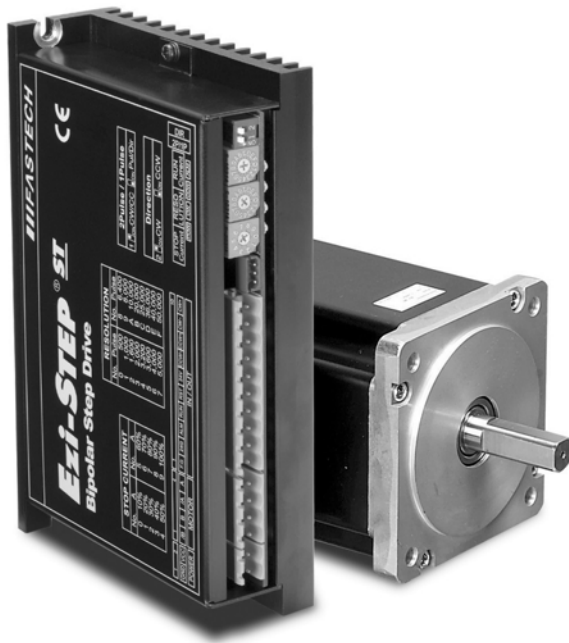


HPB Series

Operating Manual

# Ezi-STEP<sup>®</sup> ST

## Micro Stepping System



CE

**FASTECH**

[www.fastech.co.kr](http://www.fastech.co.kr)

# Table of Contents

<b>1. Precautions</b>	3
<b>2. Main Characteristics</b>	6
<b>3. Ezi - STEP - HPB Part Numbering</b>	7
<b>4. Specifications</b>	8
4.1 Drive Specifications	8
4.1.1 Drive Dimension[mm]	9
4.2 Motor Specifications	10
<b>5. System Configuration(HPB Series)</b>	11
<b>6. Installation and Cabling</b>	12
6.1 Notes on Installation	12
6.2 Connection Diagram(Ezi-STEP-HPB Series)	12
<b>7. Setting and Operating</b>	13
7.1 Status monitor LED	13
7.1.1 Status LED Function and Condition	13
7.1.2 Protection functions and LED flash times	14
7.2 Power Connector(CN1)	14
7.3 Motor Connector(CN2)	14
7.4 Signal Connector(CN3)	14
7.5 Pulse Input Selection(SW1,1)	15
7.6 Rotational Direction Selection(SW1,2)	15
7.7 Resolution Selection(SW3)	15
7.8 STOP Current Selection(SW4)	16
7.9 RUN Current Selection(SW2)	16
<b>8. Control Signal Input/Output Description</b>	16
8.1 Input signals	16
8.2 Output signals	17
<b>Appendix</b>	18
Connector	18
Wiring Diagram	18

## ※ Before operating ※

- Thank you for purchasing Ezi-STEP.
- Ezi-STEP is an all-in-one Unit. For high-speed and high-precision drive of a stepping motor, Ezi-STEP is a unique drive that adopts a new control scheme owing to an on-board high-performance 32bit digital signal processor.
- This manual describes handling, maintenance, repair, diagnosis and troubleshooting of Ezi-STEP.
- Before operating Ezi-STEP, thoroughly read this manual.
- After reading the manual, keep the manual near the Ezi-STEP so that any user can read the manual whenever needed.

## 1. Precautions

### ◆ General Precautions

- Contents of this manual are subject to change without prior notice for functional improvement, change of specifications or user's better understanding.  
Thoroughly read the manual provided with the purchased Ezi-STEP.
- When the manual is damaged or lost, contact agent or our company at the address on the last page of the manual.
- Our company is not responsible for a product breakdown due to user's dismantling the product, and such a breakdown is not covered by the warranty.

### ◆ Put the Safety First

- Before installing, operating and repairing the Ezi-STEP, thoroughly read the manual and fully understand the contents.  
Before operating the Ezi-STEP, understand the mechanical characteristics of the Ezi-STEP and related safety information and precautions.
- This manual divides safety precautions into "Warning" and "Attention".



**Attention** : If the user does not properly handle the product, the user may seriously or slightly injured and damages may occur only in the machine.



**Warning** : If the user does not properly handle the product, a dangerous situation (such as an electric shock) may occur resulting in deaths or serious injuries.

- Although precaution is only a **Attention**, a serious result could be caused depending on the situation. Follow safety precautions.

## ◆ Check the Product



### Attention

**Check if the Product is damaged or missing part.**  
Otherwise, the machine may get damaged or the user may get injured.

## ◆ Install



### Attention

**Carefully move the Ezi-STEP.**  
Otherwise the Product may get damaged or by dropping the Product the user's foot may cause an injury.

**Use non-flammable materials such as metal in the place where the Ezi-STEP is to be installed.**  
Otherwise, a fire may occur.

**When installing several Ezi-STEP in a sealed place, install a cooling pan to keep the ambient temperature of the Ezi-STEP 50°C or lower.**  
Otherwise, a fire or other kinds of accidents may occur due to overheating.



### Warning

**The process of Installation, Connection, Operation, Checking and Repairing should be done with qualified person.**  
Otherwise, a fire or other kinds of accidents may occur.

## ◆ Connect Cables



### Attention

**Keep the rated range of Input Voltage for Ezi-STEP.**  
Otherwise, a fire or other kinds of accidents may occur.

**Cable connection should follow the wiring diagram.**  
Otherwise, a fire or other kinds of accidents may occur.



### Warning

**Before connecting cables, check if input power is off.**  
Otherwise, an electric shock or a fire may occur.

**The case of the Ezi-STEP is insulated from the ground of the internal circuit by the condenser. Ground the Ezi-STEP.**  
Otherwise, an electric shock or a fire may occur.

## ◆ Operation

---



### Attention

**If a protection function(alarm) occurs, firstly remove its cause and then release(alarm reset) the protection function.**

If you are operating continuously without removing its cause, the machine may get damaged or the user may get injured.

**Do not make Motor Free input signal to ON during operation.**

Motor will stop and stop current will become zero. The machine may get damaged or the user may get injured.

**Make all input signals to OFF before supply input voltage to Ezi-STEP.**

The machine may get damaged or the user may get injured by motor operation.

**All parameter values are set by default factory setting value. Change this value after reading this manual throughly.**

Otherwise, the machine may get damaged or other kinds of accidents may occur.

---

## ◆ Check and Repair

---



### Warning

**Stop supplying power to the main circuit and wait for a while before checking or repairing the Ezi-STEP.**

Electricity remaining in the capacitor may cause danger.

**Do not change cabling while power is being supplied.**

Otherwise, the user may get injured or the step drive may get damaged.

**Do not reconstruct the Ezi-STEP.**

Otherwise, an electric shock may occur or the reconstructed product can not get After-Service.

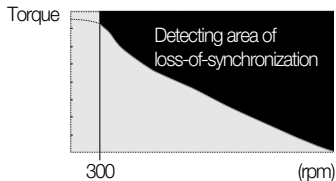
---

## 2. Main Characteristics

### 1 Step-Out Detection(patent pending)

Ezi-STEP can detect the loss-of-synchronization of a stepping motor without the addition of an external sensor. By monitoring the voltage, the current, and the back-emf signal, the on-board DSP estimates the current position of a rotor and enables to detect the loss-of-synchronization (so far seemingly impossible task in a conventional stepping motor drive), in turn realizing operation in high-speed region without worrying about loss-of-synchronization\*.

\* effective only over 300 rpm



### 2 Microstep and Filtering(patent pending)

High Precision microstep function and Filtering (Patent pending)

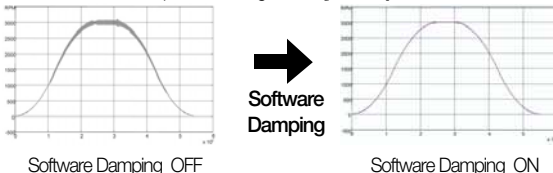
The high-performance DSP resolves the basic resolution of  $1.8^\circ$  up to maximum  $0.0072^\circ$  (1/250 steps). Contrary to a conventional drive, Ezi-STEP adjusts PWM control signal in every  $25\mu\text{sec}$ , which makes it possible to more precise current control and realizes a high-precision microstep operation.

### 3 Software Damping(patent pending)

Vibration suppression and High-speed operation (Patent pending)

Ideally the applied currents to a stepping motor are a precise sinusoidal waves, But in practice the magnetic flux nonlinearity of the motor, the lowering of current due to the increase of back emf at high-speed and the lowering of the phase voltage are the sources of motor vibration. For these practice Ezi-STEP detects these nonlinearity with DSP and adjusts the phase of the current according to the pole position of the motor, drastically suppressing vibration. As reducing the vibration of the motor, it is possible to operate in high-speed regime.

\* This is real measured speed that using 100000[pulse/rev] encoder.



### 4 Drive Output Signal Monitoring

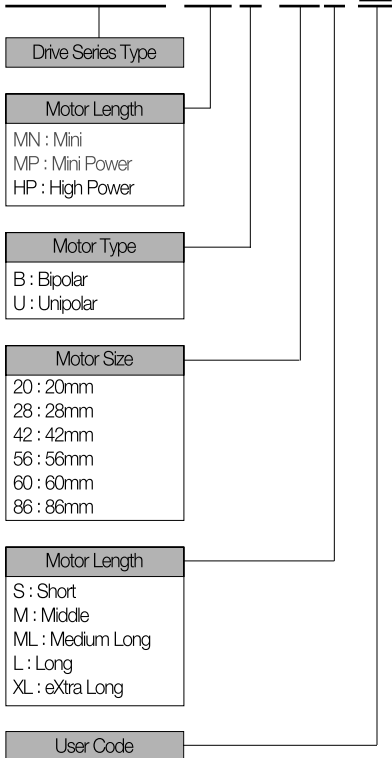
Besides alarming loss-of-synchronization, there are various warning signals depending on the alarm issued. Also, Ezi-STEP provides an easy interface to communicate with an upper controller by issuing RUN/STOP signal. (The type of alarm issued can be identified by LED indicator)

## 5 Improve of High-Speed Driving

Depending on the speed of a stepping motor, Ezi-STEP automatically increases the supply voltage and prevents the torque lowering due to the low effective operating voltage on a motor from the back emf voltage, in turn enabling a high-speed operation. Also, the software damping algorithm minimizes the vibration and prevents the loss-of-synchronization at high-speed.

### 3. Ezi - STEP - HPB Part Numbering

#### Ezi-STEP-HPB-42S-□



Unit	Motor	Drive
Ezi-STEP-MNB-20M-□	BM-20M	EzStep-MNB-20M
Ezi-STEP-MNB-20L-□	BM-20L	EzStep-MNB-20L
Ezi-STEP-MNB-28M-□	BM-28M	EzStep-MNB-28M
Ezi-STEP-MNB-28L-□	BM-28L	EzStep-MNB-28L
Ezi-STEP-MNB-42S-□	BM-42S	EzStep-MNB-42S
Ezi-STEP-MNB-42M-□	BM-42M	EzStep-MNB-42M
Ezi-STEP-MNB-42L-□	BM-42L	EzStep-MNB-42L
Ezi-STEP-MNB-42XL-□	BM-42XL	EzStep-MNB-42XL

Unit	Motor	Drive
Ezi-STEP-MPB-42S-□	BM-42S	EzStep-MPB-42S
Ezi-STEP-MPB-42M-□	BM-42M	EzStep-MPB-42M
Ezi-STEP-MPB-42L-□	BM-42L	EzStep-MPB-42L
Ezi-STEP-MPB-42XL-□	BM-42XL	EzStep-MPB-42XL
Ezi-STEP-MPB-56S-□	BM-56S	EzStep-MPB-56S
Ezi-STEP-MPB-56M-□	BM-56M	EzStep-MPB-56M
Ezi-STEP-MPB-56ML-□	BM-56ML	EzStep-MPB-56ML
Ezi-STEP-MPB-56L-□	BM-56L	EzStep-MPB-56L
Ezi-STEP-MPB-56XL-□	BM-56XL	EzStep-MPB-56XL
Ezi-STEP-MPB-60M-□	BM-60M	EzStep-MPB-60M
Ezi-STEP-MPB-60L-□	BM-60L	EzStep-MPB-60L
Ezi-STEP-MPB-60XL-□	BM-60XL	EzStep-MPB-60XL

Unit	Motor	Drive
Ezi-STEP-HPB-86M-□	BM-86M	EzStep-HPB-86M
Ezi-STEP-HPB-86L-□	BM-86L	EzStep-HPB-86L
Ezi-STEP-HPB-86XL-□	BM-86XL	EzStep-HPB-86XL

## 4. Specifications

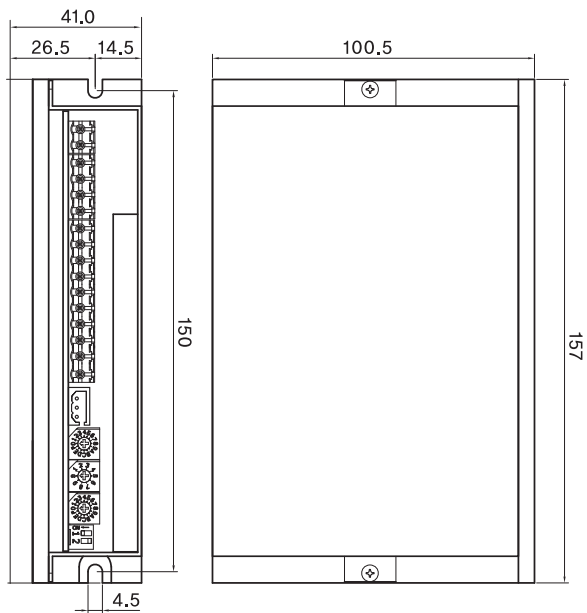
### 4.1 Drive Specifications

Drive		Ezi-Step-HPB Series
Input Voltage		40~70VDC
Drive Method		Bipolar PWM drive with 32bit DSP
Current		Max. 500mA(Except motor current)
Operating Condition	Temperature	In Use : 0 ~ 50C In Storage : -20 ~ 70C
	Humidity	In Use : 35~85%RH (Non-Condensing) In Storage : 10~90%RH (Non-Condensing)
	Vib. Resist.	0.5G
Function	Resolution(P/R)	500, 1000, 1600, 2000, 3200, 3600, 4000, 5000, 6400, 8000, 10000, 20000, 25000, 36000, 40000, 50000 (Set by Rotary Switch) ※ Default = 10000
	Maximum Frequency	500 KHz (Duty 50%)
	Alarm Function	Step-Out, Over-Current, Over-Heat, Over-Voltage, Power, Motor Connection(Identifiable which alarm is activated by counting the flash times of status monitor LED)
	LED Display	Power Status(Green), Alarm Status(Red), CW Rotation(Yellow), CCW Rotation(Orange)
	STOP Current	10% ~ 100% (Set by Rotary Switch) Be setted to set value of STOP current after 0.1 second after motor stop. ※ Default = 50%
	Pulse Input Method	1 Pulse / 2 Pulse (Set by DIP Switch) 1 Pulse : Pulse / Direction, 2 Pulse : CW / CCW ※ Default = 2 Pulse
	Rotational Direction	CW / CCW (Set by DIP Switch) Used when changing the direction of motor rotate. ※ Default = CW
	Speed/Position Command	Pulse train input (Photocoupler Input)
I/O	Input Signals	Motor Free / Alarm Reset (Photocoupler Input)
	Output Signals	Alarm, Run/Stop (Photocoupler Output)



## 4.1.1 Drive Dimension[mm]

© Ezi-Step-HPB Series

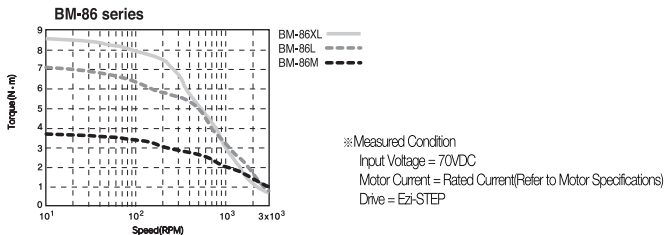
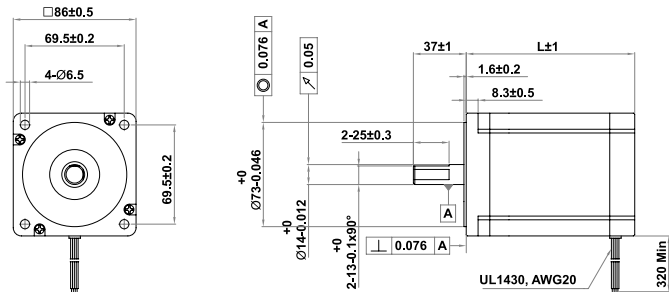


## 4.2 Motor Specifications

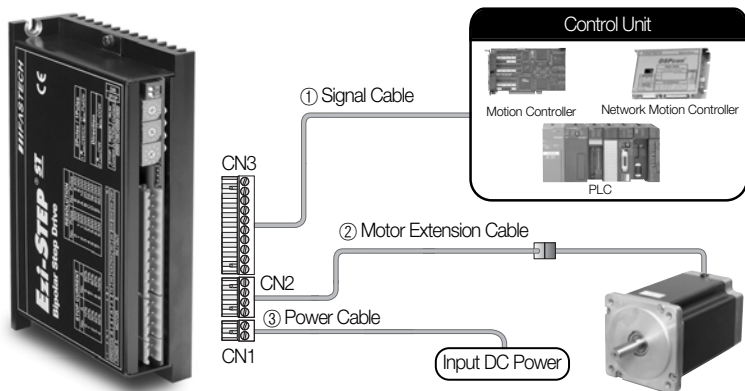
### 4.2.1 BM-86 Series

MODEL	Unit	BM-86M	BM-86L	BM-86XL
Drive method	-	Bi-polar	Bi-polar	Bi-polar
Number of phase	-	2	2	2
Current per phase	A	6,0	6,0	6,0
Holding torque	N · m	4,5	8,5	12
Rotor inertia	g · cm <sup>2</sup>	1400	2700	4000
Weights	kg	2,3	3,8	5,3
Length(L)	mm	79	117	155

### ◎ Motor Dimension[mm] and Torque Characteristics



## 5. System Configuration[HPB Series]



※ Standard Cable length of Power and Signal is 30cm, Extension Cable is needed to extend this limitation.

### ● Option

#### ① Signal Cable

Available to connect between Control Unit and Ezi-STEP-HPB.

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

□ is for Cable Length, The Unit is 1m and Max 20m Length.

#### ③ Power Cable

Available to connect between Power and Ezi-STEP-HPB.

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

□ is for Cable Length, The Unit is 1m and Max 2m Length.

#### ② Motor Extension Cable

Available to connect between motor and Ezi-STEP-HPB.

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

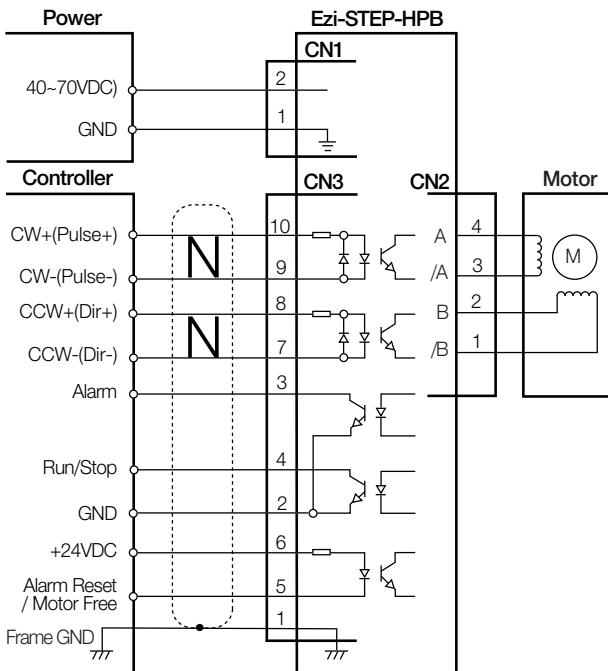
□ is for Cable Length, The Unit is 1m and Max 20m Length.

## 6. Installation and Cabling

### 6.1 Notes on Installation

- 1) Ezi-STEP has been designed for indoor uses.
- 2) The ambient temperature of the room should be 0C~50C.
- 3) If the temperature of the case is higher than 50C, radiate heat of the outside to cool down the case.
- 4) Do not install Ezi-STEP under direct rays, near magnetic or radioactive objects.

### 6.2 Connection Diagram(Ezi-STEP-HPB Series)

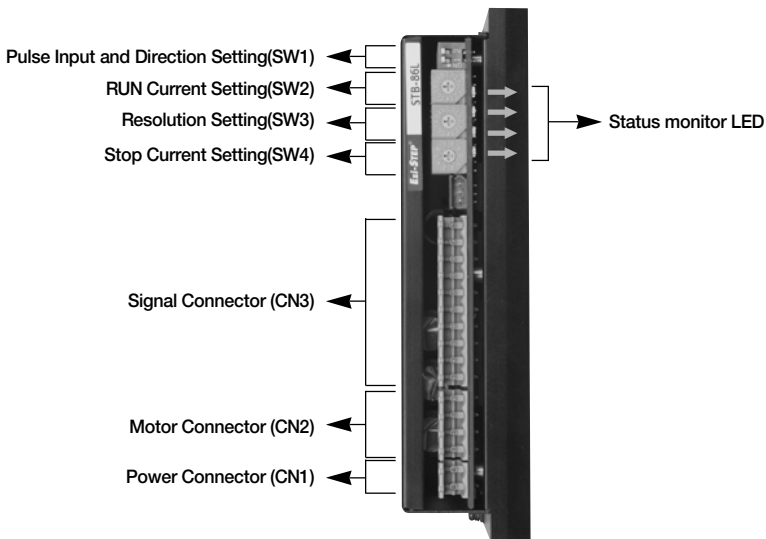


※ Alarm Reset signal line is also used for Motor FREE signal. (For details, please refer to the section for Control Input/Output signal)

※ **N** Twisted Pair Shield Cable

## 7. Setting and Operating

### ◎ HPB Series



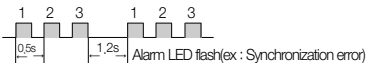
### 7.1 Status monitor LED

#### 7.1.1 Status LED Function and Condition

Status	Color	Function	Flash Condition
PWR	Green	Power input indication	Lights when power is ON Flashes when motor is Free status
ALM	Red	Alarm indication	Flash when protection function is activated (Identifiable which protection mode is activated by counting the flash times)
CW	Yellow	Motor Rotation Direction	Lights when motor rotate CW direction
CCW	Orange	Motor Rotation Direction	Lights when motor rotate CCW direction

## 7.1.2 Protection functions and LED flash times

Flash Times	Protection	Conditions
1	Overcurrent	Excessive current flowed into a motor
2	Overspeed	Motor speed exceeded 3000 rpm
3	Out of Synchronization	Abnormally, motor did not followed pulsed inputs
5	Overheat	Internal temperature of a motor drive exceeded 55°C
6	Over regenerative Voltage	Back EMF more than 90V
7	Motor Connection	Power is ON without connection of motor cable to drive
9	Low Input Voltage	Power source voltage is below 40 volts
11	System error	Error occurs in drive system
12	ROM error	Error occurs in Parameter storage Device(ROM)
14	High Input Voltage	Power source voltage is higher than 70 volts.



## 7.2 Power Connector (CN1)

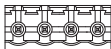
Number	Function
1	GND
2	40~70 VDC



1 2

## 7.3 Motor Connector (CN2)

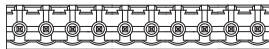
Number	Function
1	/B
2	B
3	/A
4	A



1 4

## 7.4 Signal Connector (CN3)

Number	Function	Input/Output
1	Frame Ground	
2	GND	Input
3	ALARM	Output
4	RUN / STOP	Output
5	ALARM RESET	Input
6	+24VDC	Input
7	CCW-(DIR-)	Input
8	CCW+(DIR+)	Input
9	CW-(PULSE-)	Input
10	CW+(PULSE+)	Input

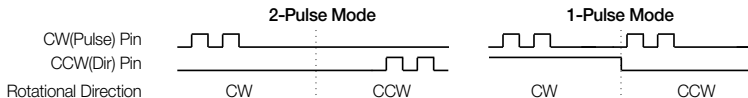


1

10

## 7.5 Pulse Input Selection(SW1.1)

Indication	Switch Name	Functions
1P/2P	Pulse input mode Select Switch	Selectable 1-Pulse input mode or 2-Pulse input mode as pulse input signal. 1 : 1-Pulse mode 0 : 2-Pulse mode ※ The default factory setting is 2-Pulse mode



## 7.6 Rotational Direction Selection(SW1.2)

Indication	Switch Name	Functions
DIR	Rotational Direction Select Switch	Based on CW(+Dir signal) input to drive. 1 : CCW(-Direction) 0 : CW(+Direction) ※ The default factory setting is CW(Clockwise).



**Direction Selection : 1**

**CCW Dir.**



**Direction Selection : 0**

**CW Dir.**



## 7.7 Resolution Selection(SW3)

The number of pulse per revolution.

Position	Pulse/Revolution	Position	Pulse/Revolution
0	500	8	6,400
1	1,000	9	8,000
2	1,600	A	10,000
3	2,000	B	20,000
4	3,200	C	25,000
5	3,600	D	36,000
6	4,000	E	40,000
7	5,000	F	50,000



※ The default factory setting is 10,000.

## 7.8 Stop Current Selection(SW4)

Stop Current means the motor current value automatically set in 0.1 sec aftrre motor stops. This is to prevent the overheat of a motor when the motor is under long time idling. The unit of the selection value is a percentage.

Position	STOP Current (%)	Position	STOP Current (%)
0	10	5	60
1	20	6	70
2	30	7	80
3	40	8	90
4	50	9	100



※ The default factory setting is 50%

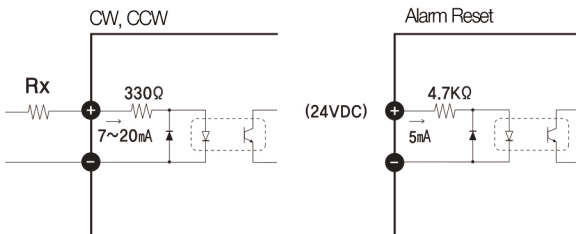
## 7.9 RUN Current Selection(SW2)

SW2 do not used in Ezi-STEP-HPB.

# 8. Control signal Input/Output Description

## 8.1 Input Signals

Input signals of the drive are all photocoupler inputs. The signal shows the status of internal photocouplers [ON: conduction], [OFF: Non-conduction], not displaying the voltage levels of the signal.



### ◆ CW, CCW Input

This signal can be used to receive a positioning pulse command from a user-side host motion controller. A user can select 1-pulse input mode or 2-pulse input mode.

The input schematic of CW, CCW is designed for 5V TTL level. When using 5V level as an input signal, the resistor Rx is used and connect to the drive directly. When the level of input signal is more than 5V, have to add Rx. If this resistor is absent, the inner schematic can be broken. In input signal level is 12V case, Rx value is 680ohm and in 24V case, 1.8Kohm is suitable for Rx value.



### ◆ Alarm Reset Input

When a protection mode has been activated, a signal to this Alarm Reset input cancels the Alarm output. By setting the alarm reset input signal [ON], cancel Alarm output. Before cancel the Alarm output, have to remove the source of alarm.



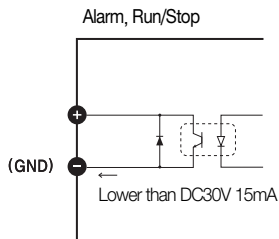
[Caution] If Alarm Reset input signal still remains [ON], motor will be Free state. Keep in mind to change [ON]→ [OFF] state. It operates reversely compare to Normal mode, when you set Inverse mode.

### ◆ Motor Free Input

This input can be used only to adjust the position by manually moving the motor shaft from the load-side. By setting the signal[ON], the drive cuts off the power supply to the motor. Then, one can manually adjust output position. When setting the signal back to[OFF], the drive resumes the power supply to the motor and recovers the holding torque. When driving a motor, one needs to set the signal[OFF]. In normal operations set the signal [OFF] or disconnect a wire to the signal. It operates reversely compare to Normal mode, when you set Inverse mode.

## 8.2 Output Signals

As the output signal from the drive, there are the photocoupler outputs(Alarm,Run/Stop). The signal status operate as [ON : conduction], [OFF : Non-conduction] of photocoupler not as the voltage level of signal.

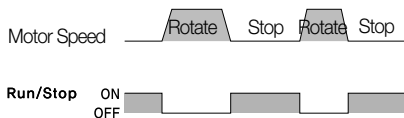


### ◆ Alarm Output

The Alarm output indicates [OFF] when the drive is in a normal operation. If a protection mode has been activated, it goes [ON]. A host controller needs to detect this signal and stop sending a motor driving command. When the drive detects an abnormal operation such as overload or overcurrent of a motor, it sets the Alarm output to [ON], flash the Alarm LED, disconnects the power to a motor, and stops the motor, simultaneously. It operates reversely compare to Normal mode, when you set Inverse mode.

### ◆ Run/Stop Output

Run/Stop Output state is[ON] when motor positioning is completed. It operates reversely compare to Normal mode, when you set Inverse



It operates reversely compare to Normal mode, when you set Inverse mode.

## Appendix

### ■ Connector

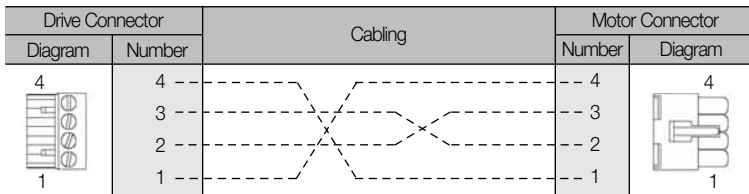
Connector specifications for cabling to Ezi-STEP

ITEM	ITEM	Part Number	Maker
Power Connector (CN1)	Terminal Block	AK950-2	PTR
Motor Connector (CN2)	Terminal Block	AK950-4	PTR
	Housing	3191-4PI	MOLEX
	Terminal	1381T	MOLEX
Signal Connector (CN3)	Terminal Block	AK950-10	PTR

※ These connectors are serviced to gether with Ezi-STEP except when purchasing option cables.

※ Above connector is the most suitable product for Ezi-STEP, Another equivalent connector can be used.

### ■ Wiring Diagram





[www.fastech.co.kr](http://www.fastech.co.kr)



**FASTECH Co., Ltd.**

Rm #1202, Bucheon Technopark 401 Dong, Yakde-a-dong,  
Wonmi-Gu, Bucheon-si, Gyeonggi-do, Rep. Of Korea (Zip)420-734  
TEL : 82-32-234-6300,6301    FAX : 82-32-234-6302  
E-mail : [daniel@fastech.co.kr](mailto:daniel@fastech.co.kr)    Homepage : [www.fastech.co.kr](http://www.fastech.co.kr)

©Copyright FASTECH CO.,LTD,2011 rev:04