# Ezi-STEP®

## Micro Stepping System

- Micro Stepping with Integrated Drive
- Sensorless Stall Detection
- Software Damping
- Run / Stop Signal Output

**BT**

CE

FASTECH

Fast, Accurate, Smooth Motion

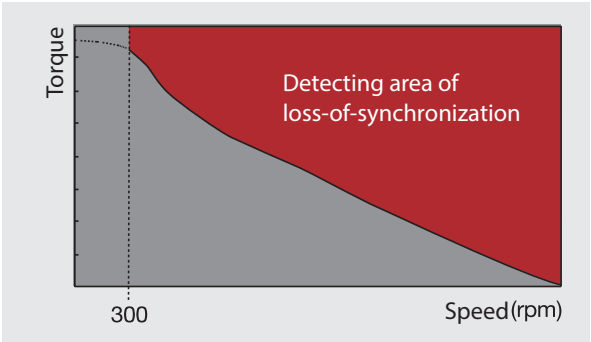
# Features

Ezi-STEP BT is a micro stepping system that incorporates a motor and DSP(Digital Signal Processor) equipped drive that is integrated seamlessly together as a system. This makes it possible to incorporate many functions compared with a conventional stepping motors and drives, such as sensorless detection of loss of synchronization, smooth control over the whole velocity range, higher torque operation and no vibration at the low speed range. Ezi-STEP BT's on-board high-performance digital signal processor and proprietary algorithms allow the Ezi-STEP BT to operate a high speeds with unmatched precision. The unique position estimation algorithm instantaneously detects out-of-synchronization based on the rotor position of the stepping motor, which is not an easy task in a conventional stepping motor and drives(effective only over 300[rpm])
Utilizing a software damping and filtering algorithms, high speed operation is realized by the exciting angle control of a step-angle. The resolutionof Ezi-STEP BT can be selected from basic 1.8° up to 0.0072°(1/250). In addition, Ezi-STEP BT generates various signals including ensorless stall detection, alarm and running signal. Ezi-STEP BT is an economical ideal drive for vision systems, nanotech, packaging, semiconductor, pick and place, automation, laboratory testing, wood working and wherever smooth, quiet, precise, high torque operation is a requirement!

### 1. Sensorless Stall Detection

Detecting the loss-of-synchronization with on-board DSP(Patent pending Ezi-STEP BT can detect the loss-of-synchronization of a stepping motor without the addition of an external sensor.
By monitoring the voltage, current, and back-emf signal, the on-board DSP estimates the current position of a rotor and enables it to detect the loss-of-synchronization(an impossible task for a conventional stepping motor drive), this allows for high-speed operation at 100% torque rating without loss-of-synchronization. *1

*1 : Effective only over 300[rpm]

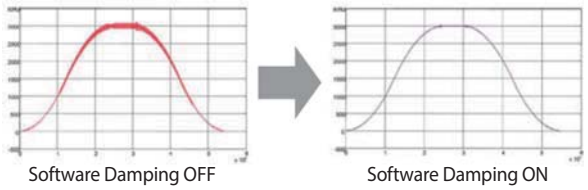



### 2. Microstep and Filtering

High precision Microstep function and Filtering(Patent pending) The high-performance DSP operates at step resolutions of 1.8° up to maximum 0.0072°steps) and Ezi-STEP BT adjusts PWM control signal in every 25μsec, which makes it possible for more precise current control, resulting in high-precision Microstep operation.

### 3. Software Damping

Vibration suppression and High-speed operation(Patent pending) Motor vibration is created by magnetic flux variations of the motor, lower current from the drive due to back-emf from the motor at high speeds and lowering of phase voltages from the drive. Ezi-STEP BT drive detects these problems and the DSP adjusts the phase of the current according to the pole position of the motor, drastically suppressing vibration. This allows the smooth operation of the motor at high speeds.




[This is real measured speed that using 100000[ppr]encoder.]

### 4. Drive Output Signal Monitoring

Ezi-STEP BT provides loss of step, run / stop, over-current, over-heat, over-voltage, power, and motor connection alarms that can be monitored by the controller and visible by a motor-mounted flashing led indicator.

### 5. Improvement of High-Speed Driving

Depending on the speed of a stepping motor, Ezi-STEP BT automatically increases the supply voltage and prevents the torque lowering due to the low operating voltage to the motor caused by back-emf voltage, this enables high-speed operation. Additionally, the software damping algorithm minimizes the vibration and prevents the loss-of-synchronization at high-speed.

# Part Numbering Method

## Ezi-STEP-BT-56L-BK-□

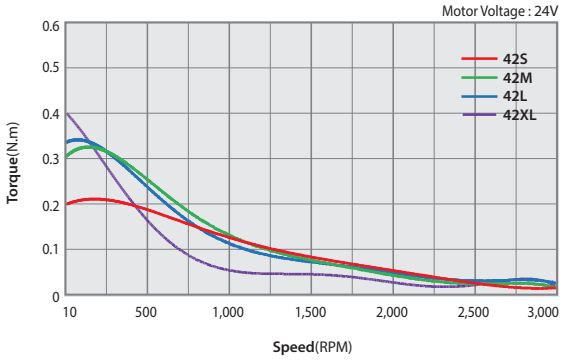
| | |
|---|---|
| Product Name | Ezi-STEP |
| Drive Series Type | **MNB** : Mini<br>**MPB** : Mini Power<br>**HPB** : High Power<br>**MI** : Mini Type<br>**PR** : Plus RS-485<br>**PR-MI** : Plus RS-485 Mini Type<br>**BT** : Built In<br>**ALL** : All Type |
| Motor Flange Size | 42mm<br>56mm<br>86mm |
| Motor Length | **S :** Single<br>**M :** Middle<br>**L :** Large<br>**XL :** Extra Large |
| Brake | No Indication : No<br>BK-Brake |
| User Code | |

| | UNIT No. | MOTOR No. | DRIVE No. |
|---|---|---|---|
| Motor, Drive Combination | Ezi-STEP-BT-42S | Motor & Drive Integrated | |
| | Ezi-STEP-BT-42M | | |
| | Ezi-STEP-BT-42L | | |
| | Ezi-STEP-BT-42XL | | |
| | Ezi-STEP-BT-56S | | |
| | Ezi-STEP-BT-56M | | |
| | Ezi-STEP-BT-56L | | |
| | Ezi-STEP-BT-86M | | |
| | Ezi-STEP-BT-86L | | |
| | Ezi-STEP-BT-86XL | | |

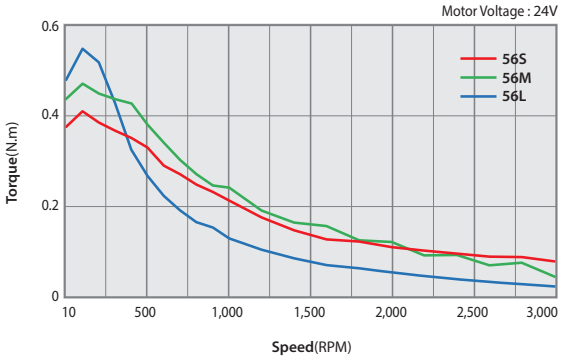
# Motor Specification Table

| Model | | Unit | 42 | | | | 56 | | | 86 | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | 42S | 42M | 42L | 42XL | 56S | 56M | 56L | 86M | 86L | 86XL |
| DRIVE METHOD | | - | | | | | | | | | | |
| Number OF PHASES | | - | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 |
| VOLTAGE | | VDC | 3.36 | 4.32 | 4.56 | 7.2 | 1.35 | 1.62 | 2.58 | 2.22 | 3.48 | 4.68 |
| CURRENT per PHASE | | A | 1.2 | 1.2 | 1.2 | 1.2 | 3.0 | 3.0 | 3.0 | 6.0 | 6.0 | 6.0 |
| RESISTANCE per PHASE | | Ohm | 2.8 | 3.6 | 3.8 | 6.0 | 0.45 | 0.54 | 0.86 | 0.37 | 0.58 | 0.78 |
| INDUCTANCE per PHASE | | mH | 5.4 | 7.2 | 8.0 | 15.6 | 1.2 | 2.0 | 4.0 | 3.0 | 6.5 | 8.68 |
| HOLDING TORQUE | | N·m | 0.32 | 0.44 | 0.5 | 0.8 | 0.64 | 1.0 | 2.0 | 4.5 | 8.5 | 12.0 |
| ROTOR INERTIA | | g·cm² | 35 | 54 | 77 | 114 | 180 | 280 | 520 | 1800 | 3600 | 5400 |
| WEIGHTS | | g | 250 | 280 | 350 | 500 | 500 | 720 | 1150 | 2300 | 3800 | 5300 |
| LENGTH(L) | | mm | 34 | 40 | 48 | 60 | 46 | 55 | 80 | 78 | 117 | 155 |
| ALLOWABLE OVERHUNG LOAD (DISTANCE FROM END OF SHAFT) | 3mm | N | 22 | 22 | 22 | 22 | 52 | 52 | 52 | 270 | 270 | 270 |
| | 8mm | | 26 | 26 | 26 | 26 | 65 | 65 | 65 | 300 | 300 | 300 |
| | 13mm | | 33 | 33 | 33 | 33 | 85 | 85 | 85 | 350 | 350 | 350 |
| | 18mm | | 46 | 46 | 46 | 46 | 123 | 123 | 123 | 400 | 400 | 400 |
| ALLOWABLE THRUST LOAD | | N | Lower than motor weight | | | | | | | | | |
| INSULATION RESISTANCE | | Mohm | 100 MΩ MIN.(at 500VDC) | | | | | | | | | |
| INSULATION CLASS | | - | CLASS B(130℃) | | | | | | | | | |
| OPERATING TEMPERATURE | | ℃ | 0 to 55 | | | | | | | | | |

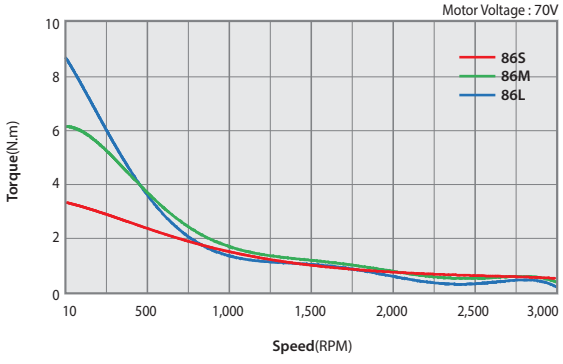
### Ezi-STEP BT_ 42 Series




### Ezi-STEP BT_ 56 Series

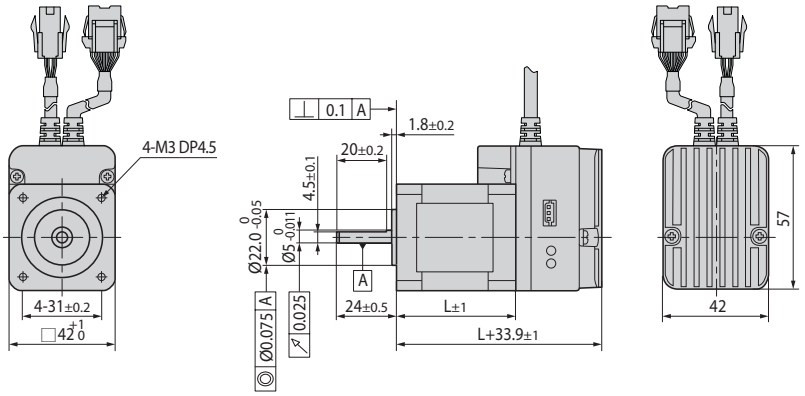



### Ezi-STEP BT_ 86 Series



# Motor Drawing

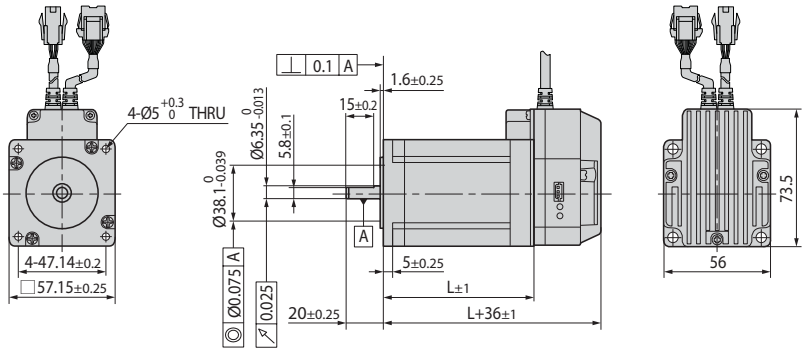
### Ezi-STEP BT_ 20mm




**42mm**

| Model Name | Length(L) |
|---|---|
| 42S | 34 |
| 42M | 40 |
| 42L | 48 |
| 42XL | 60 |

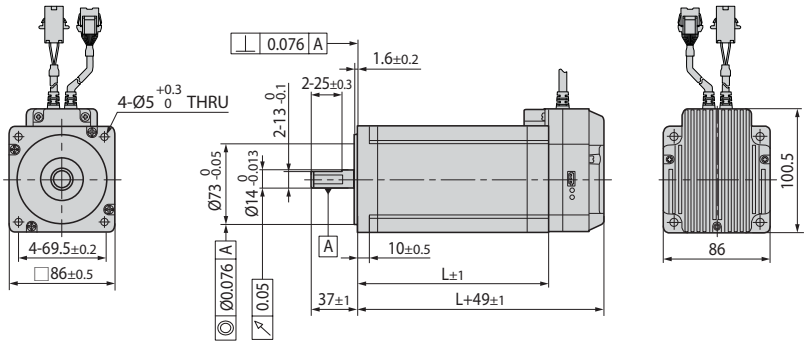
### Ezi-STEP BT_ 28mm




**56mm**

| Model Name | Length(L) |
|---|---|
| 56S | 46 |
| 56M | 55 |
| 56L | 80 |

### Ezi-STEP BT_ 42mm




**86mm**

| Model Name | Length(L) |
|---|---|
| 86M | 78 |
| 86L | 117 |
| 86XL | 155 |

# Drive Specification

## Specifications

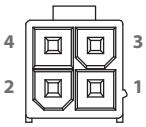
| Motor Model | | BT-42 Series | BT-56 Series | BT-86 Series |
|---|---|---|---|---|
| Input Voltage | | 24VDC ±10% | | 40 ~ 70VDC |
| Control Method | | Bipolar PWM drive with 32bit DSP | | |
| Current Consumption | | Max. 500mA(Except Motor Current) | | |
| Operating Condition | Temperature | · In Use : 0 ~ 50˚C · In Storage : -20 ~ 70˚C | | |
| | Humidity | · In Use : 35 ~ 85%RH(Non-condensing) · In Storage : 10 ~ 90%RH(Non-condensing) | | |
| | Vib. Resist. | 0.5G | | |
| Function | Resolution[ppr] | 500 / 1,000 / 1,600 / 2,000 / 3,200 / 3,600 / 4,000 / 5,000 / 6,400 / 8,000 / 10,000 / 20,000 / 25,000 / 36,000 / 40,000 / 50,000(Set by RS-232C Communication) ※ Default : 10,000 | | |
| | Max. Input Pulse Frequency | 500KHz(Duty 50%) | | |
| | Protection | Over Current Error, Over Speed Error, Step Out Error, Over Temperature Error, Over Regenerated Voltage Error, Motor Connection Error, Motor Voltage Error, System Error, ROM Error (Identifiable which alarm is activated by counting the blinking times of status monitor LED) | | |
| | LED Display | · Power Status(Green) · Alarm(Red) | | |
| | Stop Current | 10% ~ 100%(Set by RS-232C Communication) 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 RS-232C Communication) · 1-Pulse : Pulse / Direction · 2-Pulse : CW / CCW ※ Default : 2-Pulse | | |
| | Rotational Direction | CW / CCW(Set by RS-232C Communication) Used when changing the direction of motor rotate. ※ Default : CW | | |
| | Speed / Position Command | Pulse Train Input(Photocoupler Input) | | |
| I/O Signal | Input Signal | Motor Free / Alarm Reset(Photocoupler Input) | | |
| | Output Signal | Alarm, Run / Stop(Photocoupler Output) | | |

## Connector

### 1. Power Connection(CN 1)

· Only for BT-42, BT-56 Series.

| No. | Function |
|---|---|
| 1 | 24VDC |
| 2 | GND |
| 3 | F. GND |
| 4 | NC |

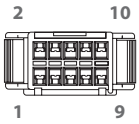



· Only for BT-86 Series.

| No. | Function |
|---|---|
| 1 | 40 ~ 70VDC |
| 2 | GND |

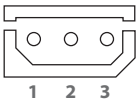

### 2. Signal Connector(CN 2)

| No. | Function | I/O |
|---|---|---|
| 1 | CW+(Pulse+) | Input |
| 2 | CW-(Pulse-) | Input |
| 3 | CCW+(Dir+) | Input |
| 4 | CCW-(Dir-) | Input |
| 5 | Alarm | Output |
| 6 | GND | Input |
| 7 | 24VDC | Input |
| 8 | Alarm Reset | Input |
| 9 | Run / Stop | Output |
| 10 | F. GND | ---- |

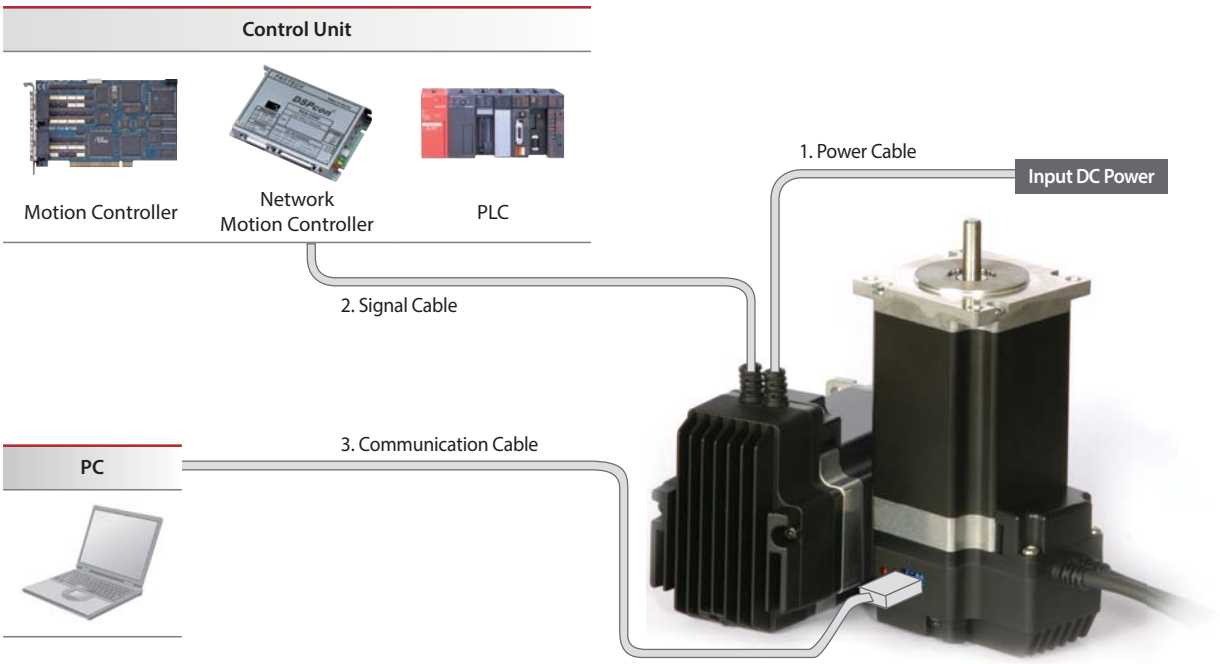



### 3. Communication Connector(CN 3)

| No. | Function | I/O |
|---|---|---|
| 1 | Tx | Output |
| 2 | Rx | Input |
| 3 | GND | ---- |



# System Configuration




| Type | Power Cable | Control Cable |
|---|---|---|
| Standard Length | - | - |
| Max. Length | 2m | 20m |

## Option Cable

### 1. Power Cable

Available to connect power of Ezi-STEP BT.

| Model Name | Length[m] | Remark |
|---|---|---|
| CBTS-P-□□□F | □□□ | Normal Cable |
| CBTS-P-□□□M | □□□ | Robot Cable |
| CBTL-P-□□□F | □□□ | only for BT-86 Series Normal Cable |
| CBTL-P-□□□M | □□□ | Only for BT-86 Series Robot Cable |

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

### 2. Signal Cable

Available to connect between Control System and Ezi-STEP BT.

| Model Name | Length[m] | Remark |
|---|---|---|
| CBTS-S-□□□F | □□□ | Normal Cable |
| CBTS-S-□□□M | □□□ | Robot Cable |

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

### 3. Communication Cable

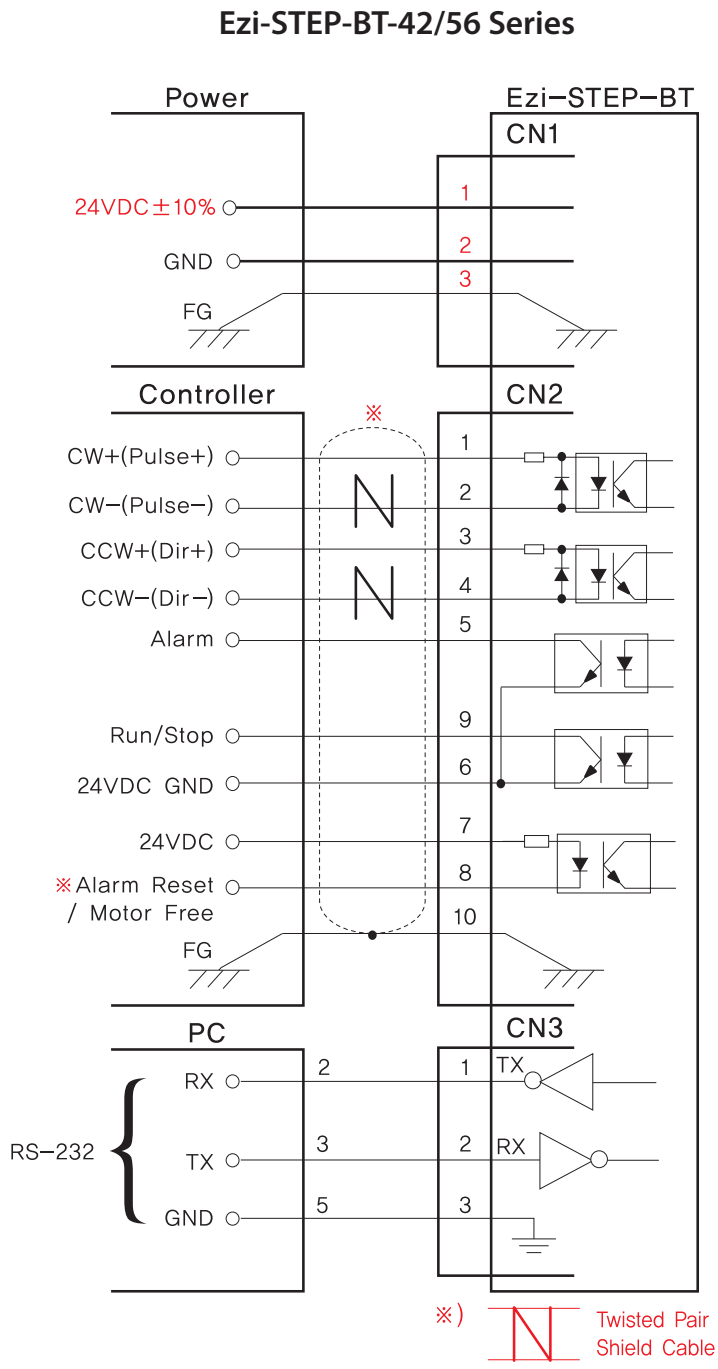
Available to connect between PC and Ezi-STEP BT.
This is used for change setting value of Resolution and Stop Current etc.

| Model Name | Length[m] | Remark |
|---|---|---|
| CBTS-C-□□□F | □□□ | Normal Cable |

※ □□□ is for Cable Length. The unit is 1m and Max. 15m length.

# External Wiring Diagram

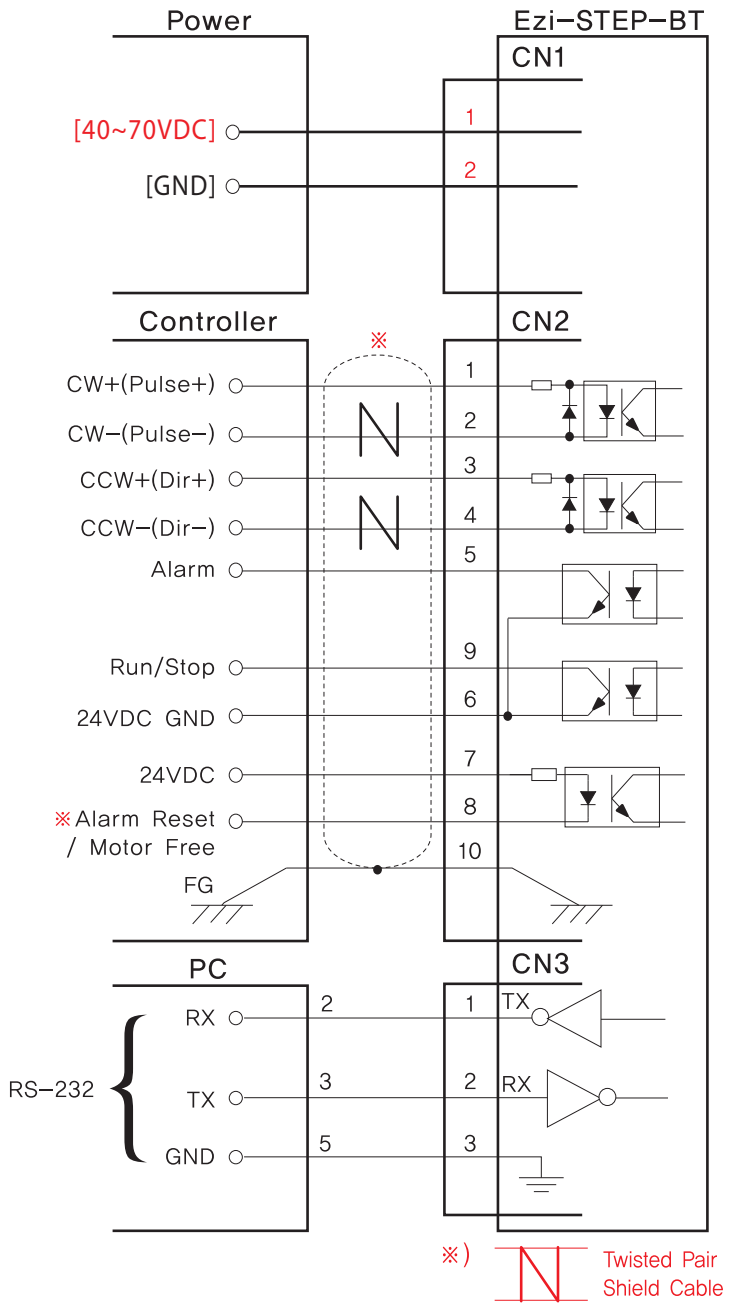
## Ezi-STEP BT_ 42 Series / 56 Series




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

## Ezi-STEP BT_ 86 Series

### Ezi-STEP-BT-86 Series

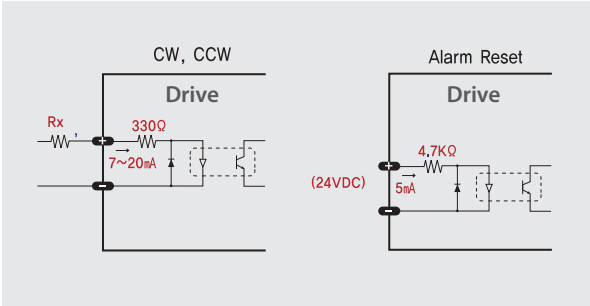



※ Alarm Rest signal line is also used for Motor FREE signal.(For details, please refer to the section for Control Input / Output signal)

# Control Signal Input / Output Description

## Input Signal

Input signal 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.




### 1. CW, CCW Input

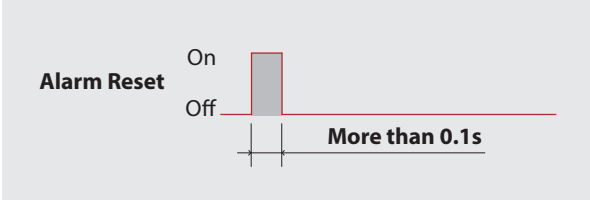
This signal can be used to receive a positioning pulse command from a user-side host motion controller. A user can select 1-Pulse Input mode of 2-Pulse Input mode. The input schematic of CW, CCW is designed for 5V TTL level. When using 5V level as an input signal, the resistor Rx is used and connect 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.

### 2. 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.

### 3. Alarm Reset Input

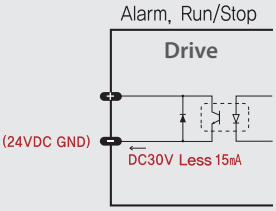
When a protection mode has been activated, a signal to this Alarm Reset input cancels the Alarm output. By setting the alarm reset input signal [ON], cancel Alarm output. Before cancel the Alarm output, have to remove the source of alarm.




**[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.

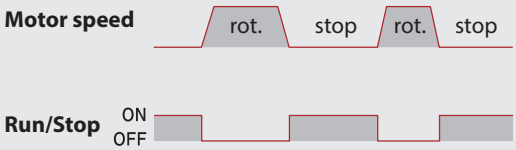
## Output Signal

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.




### 1. 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 mode.




### 2. 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 meeds to detect this signal and stop sending a motor driving command. When the drive detects an abnormal operation such as overload of over-current 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.

FASTECH

*Fast, Accurate, Smooth Motion*

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