Ezi-STEP®

Micro Stepping System

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

BT

CE

FASTECH

Fast, Accurate, Smooth Motion

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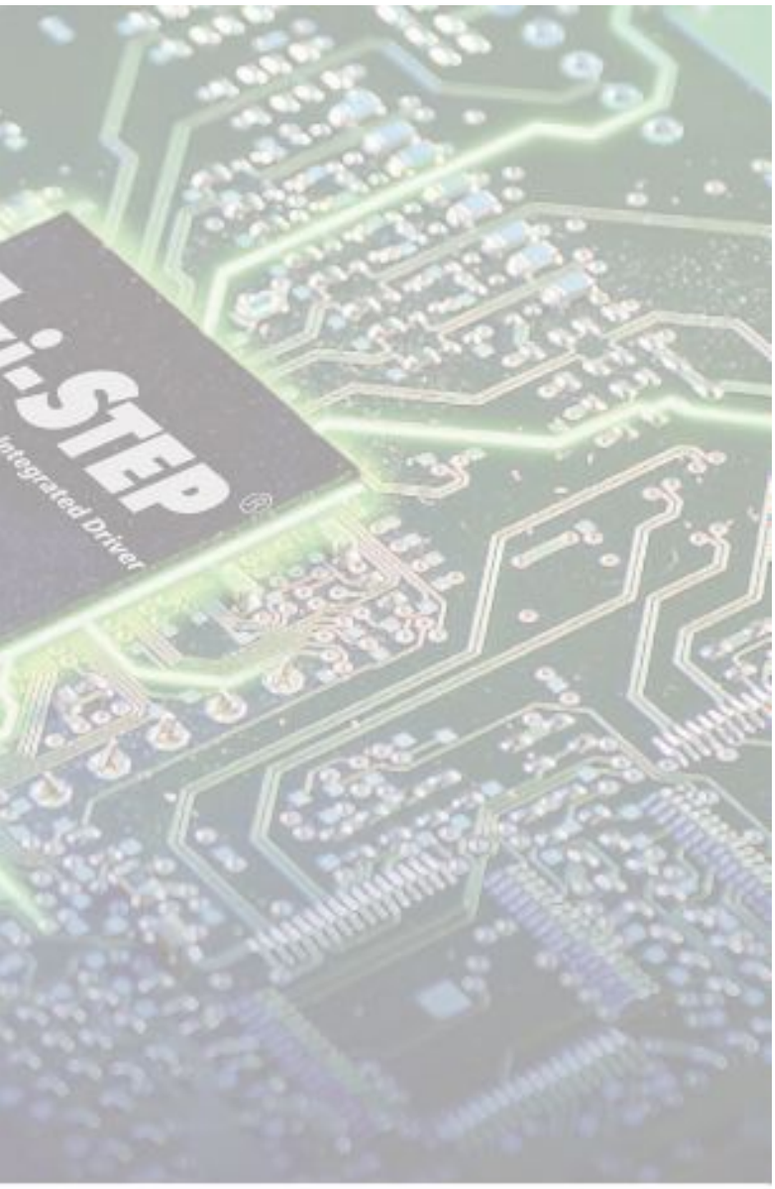
Ezi-STEP® BT

Micro Stepping System

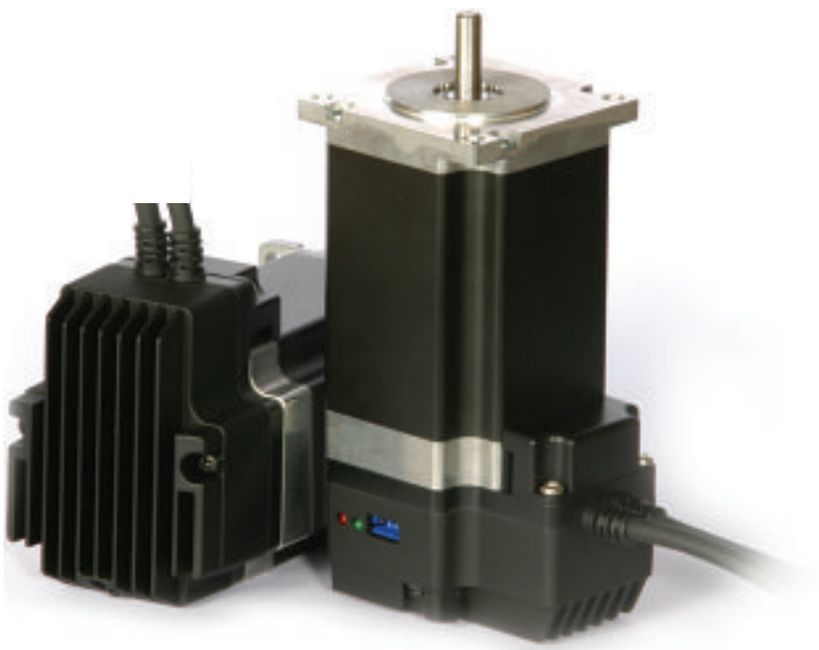


Ezi-STEP BT Characteristics

Ezi-STEP BT is a micro stepping system that incorporates a motor and MCU (Micro Controller Unit) 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.

Utilizing a software damping and filtering algorithms, high speed operation is realized by the exciting angle control of a step-angle. The resolution of 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 sensorless 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 Microstep and Filtering

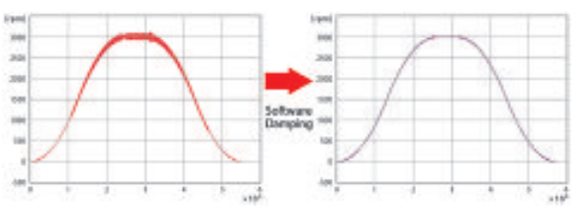
High precision Microstep function and Filtering

The high-performance MCU operates at step resolutions of 1.8° up to maximum 0.0072° (1/250 steps) and Ezi-STEP adjusts PWM control signal in every 25 μsec, which makes it possible for more precise current control, resulting in high-precision Microstep operation.

2 Software Damping

Vibration suppression and high-speed operation

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 drive detects these problems and the MCU 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.



Software Damping OFF Software Damping ON

※ This is real measured speed that using 100,000 [pulse/rev] encoder.

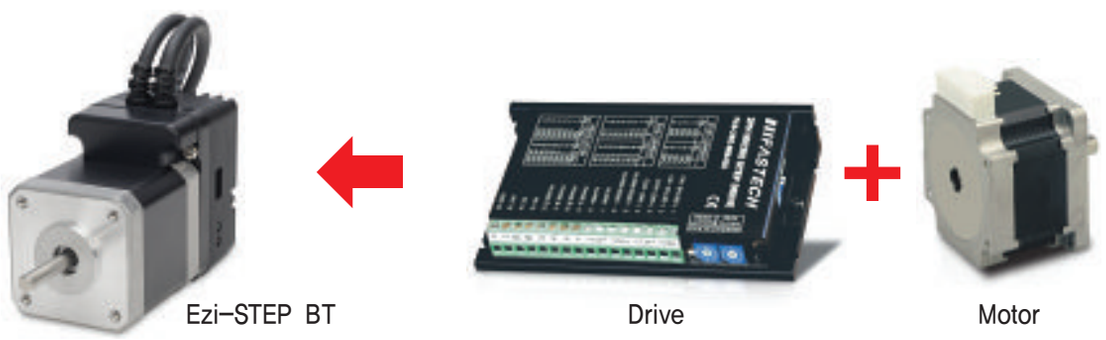
3 Drive Output Signal Monitoring

Ezi-STEP 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.

4 Improvement 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 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.

● Simple and Compact all-in-one Motor integrated with Drive



Ezi-STEP BT Drive Motor

Saving installation space and ease of wiring by integrating drive circuits on the back side of a stepping motor.

● Ezi-STEP BT Part Numbering

Ezi-STEP-BT-42S-BK-□

Product Name

Drive Series Type

BT : Built In

Motor Flange Size

42 : 42mm
56 : 56mm
86 : 86mm

Motor Length

S : Small
M : Medium
L : Large
XL : Extra Large

Brake

Blank : Without Brake
BK : Brake

User Code

● Standard Combination

Unit Part Number	Motor Model Number	Drive Model Number
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		

● Combination with Brake

Unit Part Number	Motor Model Number	Drive Model Number
Ezi-STEP-BT-42S-BK	Motor & Drive Integrated	
Ezi-STEP-BT-42M-BK		
Ezi-STEP-BT-42L-BK		
Ezi-STEP-BT-42XL-BK		
Ezi-STEP-BT-56S-BK		
Ezi-STEP-BT-56M-BK		
Ezi-STEP-BT-56L-BK		
Ezi-STEP-BT-86M-BK		
Ezi-STEP-BT-86L-BK		
Ezi-STEP-BT-86XL-BK		

● Specifications of Drive

Motor Model		BT-42 series	BT-56 series	BT-86 series
Input Voltage		24VDC ±10%		40~70VDC
Control Method		Bipolar PWM drive with 32bit MCU		
Current Consumption		Max 500mA (Except motor current)		
Operating Condition	Ambient Temperature	· In Use: 0~50℃ · In Storage: -20~70℃		
	Humidity	· In Use: 35~85% RH (Non-Condensing) · In Storage: 10~90% RH (Non-Condensing)		
	Vib. Resist.	0.5g		
Function	Rotation Speed	0~3,000 [rpm] *1		
	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 (Selectable by parameter) * Default: 10,000		
	Maximum Frequency	500kHz (Duty 50%)		
	Protection Functions	Over Current Error, Over Speed Error, Step Out Error, Over Temperature Error, Over Regenerated Voltage Error, Motor Connect Error, Motor Voltage Error, System Error, ROM Error		
	LED Display	Power status(Green), Alarm status(Red)		
	STOP Current	20%~100% (Selectable by parameter) Be setted to set value of STOP Current after 0.1 second after motor stop. * Default: 50%		
	Pulse Input Method	1 Pulse / 2 Pulse (Selectable by parameter) 1 Pulse: Pulse/Direction, 2 Pulse: CW/CCW * Default: 2 Pulse		
	Rotational Direction	CW/CCW (Selectable by parameter) Used when changing the direction of motor rotate. * Default: CW		
	Speed/Position Control Command	Pulse Train Input (Photocoupler Input)		
I/O Signal	Input Signals	Motor Free / Alarm Reset (Photocoupler Input)		
	Output Signals	Alarm, Run/Stop (Photocoupler Output)		

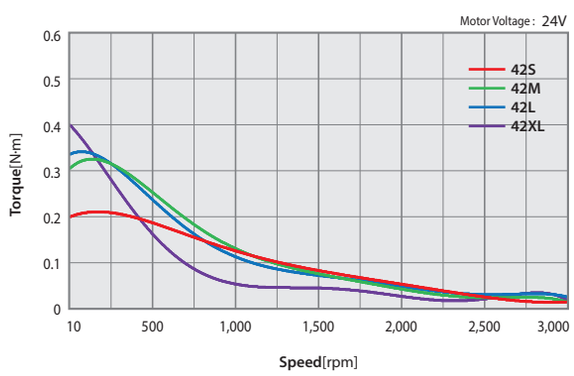
*1 : Up to the resolution of 10,000[ppr], maximum speed can be reached by 3,000[rpm] and with the resolution more than 10,000[ppr], maximum speed shall be reduced accordingly.

Specifications of Motor

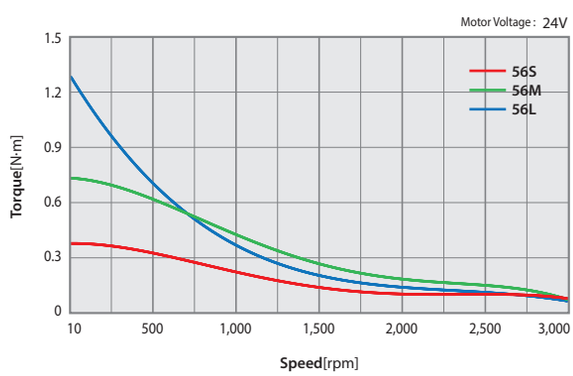
MODEL			Ezi-STEP-BT-42 series				Ezi-STEP-BT-56 series			Ezi-STEP-BT-86 series		
		UNIT	42S	42M	42L	42XL	56S	56M	56L	86M	86L	86XL
DRIVE METHOD		–	BI-POLAR									
NUMBER OF PHASES		–	2	2	2	2	2	2	2	2	2	2
CURRENT per PHASE		A	1.2	1.2	1.2	1.2	3.0	3.0	3.0	6.0	6.0	6.0
HOLDING TORQUE		N·m	0.32	0.44	0.5	0.65	0.64	1.0	1.5	4.5	8.5	12
ROTOR INERTIA		$g \cdot cm^2$	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
PERMISSIBLE 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
PERMISSIBLE THRUST LOAD		N	Lower than motor weight									
INSULATION RESISTANCE		Mohm	100 MIN.(at 500VDC)									
INSULATION CLASS		–	CLASS B(130℃)									
OPERATING TEMPERATURE		℃	0 to 55									

Torque Characteristics of Motor

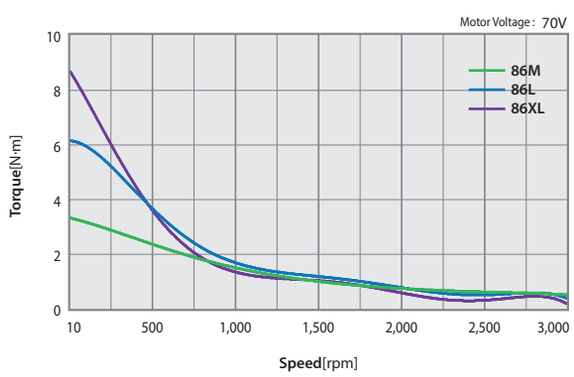
Ezi-STEP-BT-42 series



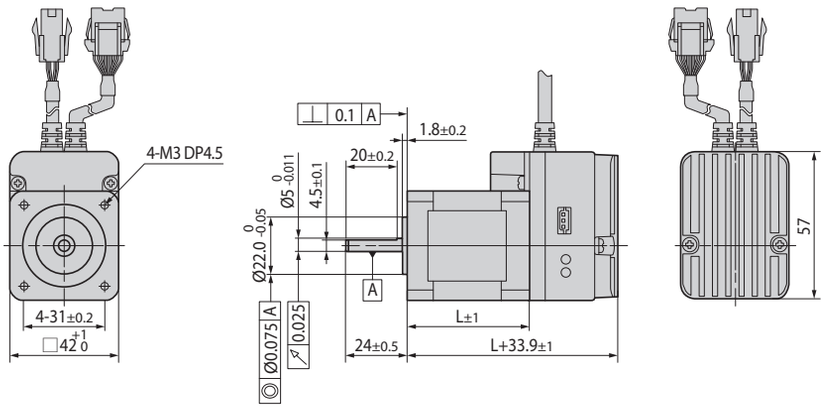
Ezi-STEP-BT-56 series



Ezi-STEP-BT-86 series

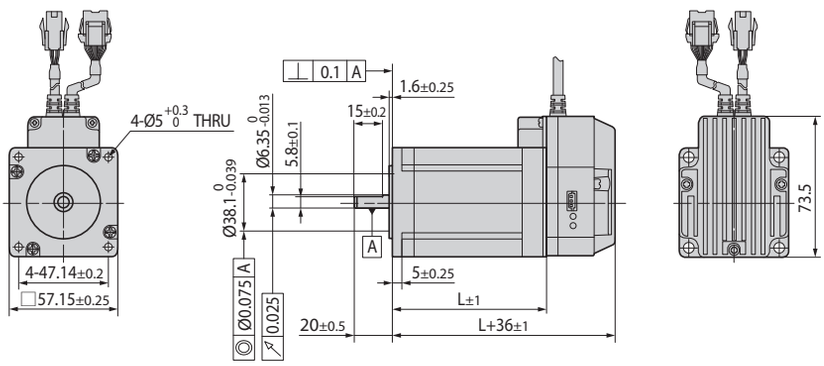


● Dimensions of Motor [mm]



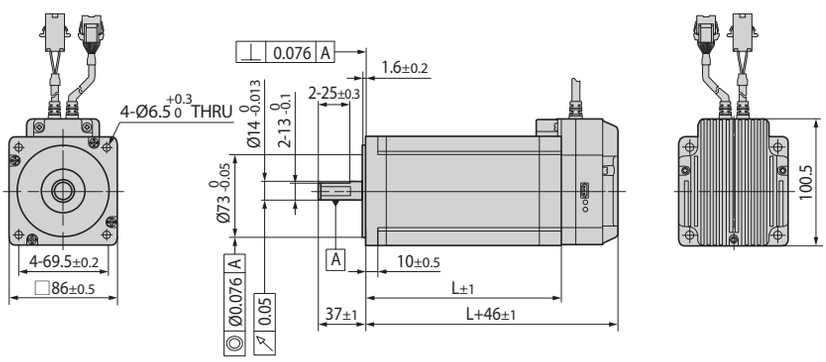
42mm

Model name	Length(L)
42S	34
42M	40
42L	48
42XL	60



56mm

Model name	Length(L)
56S	46
56M	55
56L	80



86mm

Model name	Length(L)
86M	78
86L	117
86XL	155

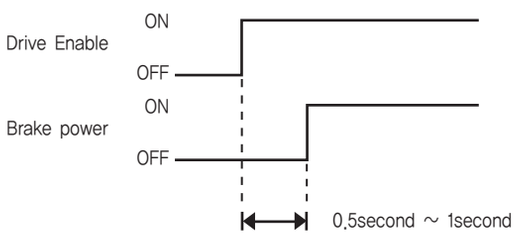
● Specifications of Motor with Brake

Unit Part Number	Motor Model Number	Electronic Brake					Motor Unit Weight [g]	Permitted Overhung Load [N]				Permitted Thrust Load [N]
		Type	Voltage Input [V]	Rated Current [A]	Power Consumption [W]	Statical Friction Torque [N·m]		Length from Motor Point [mm]				
								3	8	13	18	
Ezi-STEP-BT-42S-BK	Motor & Drive Integrated	Non-excitation run Type	24VDC ±10%	0.2	5	0.2	560	22	26	33	46	Must be Lower than Unit's Weight
Ezi-STEP-BT-42M-BK							630					
Ezi-STEP-BT-42L-BK							700					
Ezi-STEP-BT-42XL-BK							820					
Ezi-STEP-BT-56S-BK				0.27	6.6	0.7	1110	52	65	85	123	
Ezi-STEP-BT-56M-BK							1270					
Ezi-STEP-BT-56L-BK							1700					
Ezi-STEP-BT-86M-BK				0.54	13	4	3750	270	300	350	400	
Ezi-STEP-BT-86L-BK							5250					
Ezi-STEP-BT-86XL-BK							6750					

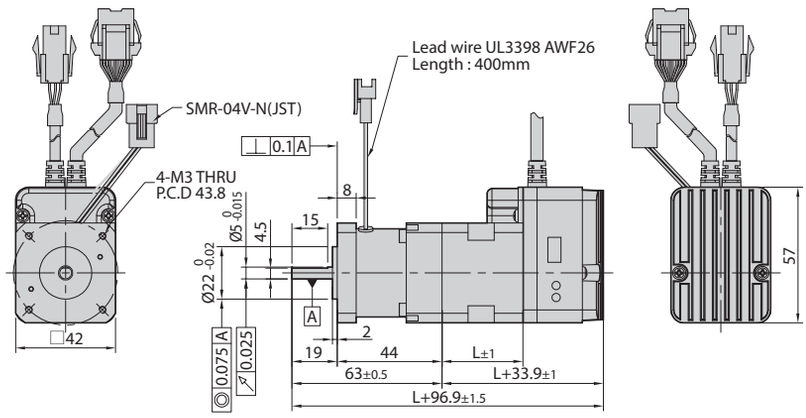
* Electronic Brake cannot be used for braking. Position hold purpose only when power OFF.
* The weight means Motor Unit Weight including Motor and Electronic Brake.
* Motor specification and torque characteristic are same as Standard Motor.

* Brake Operation Timing Chart

Ezi-STEP BT has no function to control the brake.
Brake must be controlled by the host controller. Please refer to below Timing Chart when control Brake from upper controller.
Otherwise, drive malfunctioning and loads can be fall down.
Also, please do not operate the brake while motor operation to prevent damage of drive and equipment.

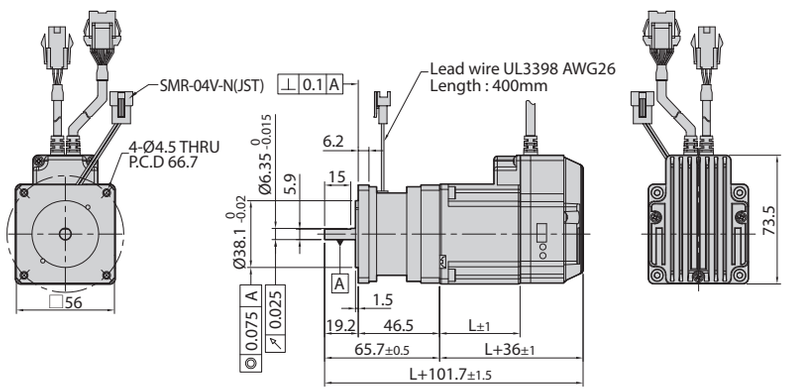


● Dimensions of Motor with Brake [mm]



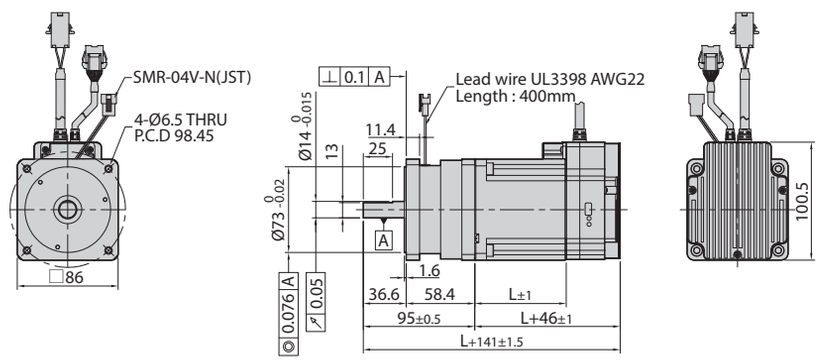
42mm

Model Name	Length(L)	Weight(kg)
42S	34	0.56
42M	40	0.63
42L	48	0.70
42XL	60	0.82



56mm

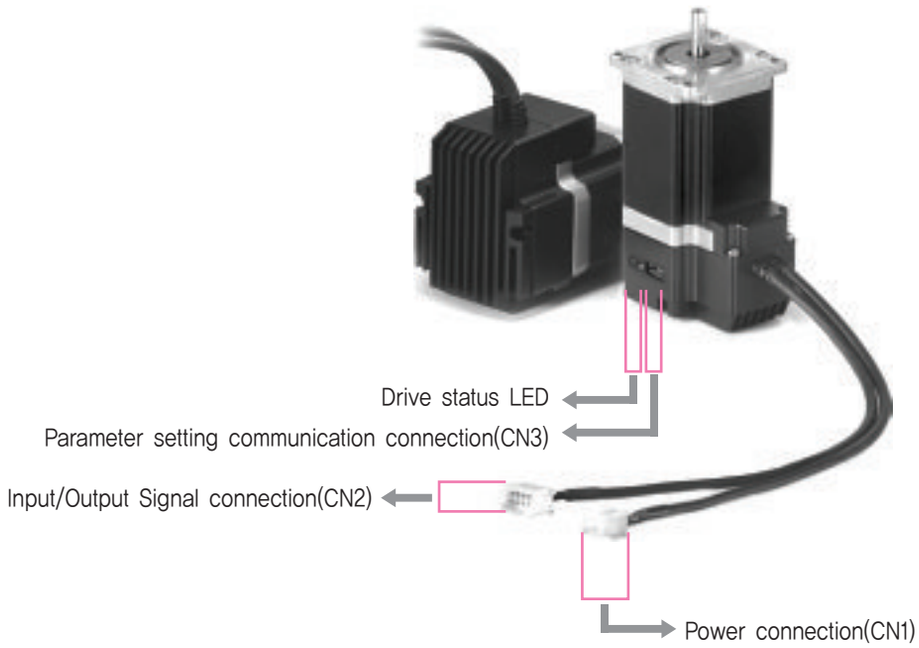
Model Name	Length(L)	Weight(kg)
56S	46	1.11
56M	55	1.27
56L	80	1.70



86mm

Model Name	Length(L)	Weight(kg)
86M	78	3.75
86L	117	5.25
86XL	155	6.75

● Settings and Operation



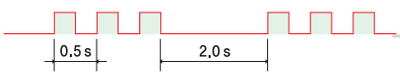
1. Drive Status LED

Indication	Color	Function	ON/OFF Condition
PWR	Green	Power input indication	Lights when power is ON Flashs when motor is Free status.
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 Error	The current through power devices in drive exceeds the limit value *1
2	Over Speed Error	Motor speed exceed 3,000 [rpm]
3	Step Out Error	Abnormally motor do not followed pulsed input
5	Over Temperature Error	Inside temperature of drive exceeds 85℃
6	Over Regenerativted Voltage Error	Back-EMF more high limit value BT-42/56 series: 50V, BT-86 series: 90V
7	Motor Connect Error	The power is ON without connection of the motor cable to drive
9	Motor Voltage Erroe	Motor voltage is out of limited value BT-42/56 series: 20V, BT-86 series: 36V
11	System Error	Error occurs in drive system
12	ROM Error	Error occurs in parameter storage device(ROM)

*1 : Limit value depends on motor model (Refer to the Manual)

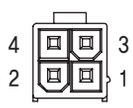


Alarm LED flash (Ex, Step Out Error)

2. Power Connector(CN1)

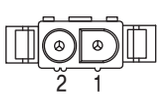
NO.	Function	I/O
1	24VDC	Input
2	GND	Input
3	F.GND	Input
4	NC	-----

※ BT-42, BT-56 series.



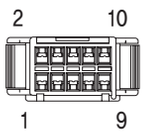
NO.	Function	I/O
1	40~70VDC	Input
2	GND	Input

※ BT-86 series.



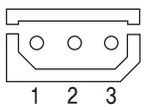
3. Input/Output Signal Connector(CN2)

NO.	Function	I/O
1	CW+(Pulse+)	Input
2	CW-(Pulse-)	Input
3	CCW+(Dir+)	Input
4	CCW-(Dir-)	Input
5	Alarm	Output
6	EXT_GND	Input
7	EXT_24VDC	Input
8	Alarm Reset	Input
9	Run/Stop	Output
10	F.GND	-----

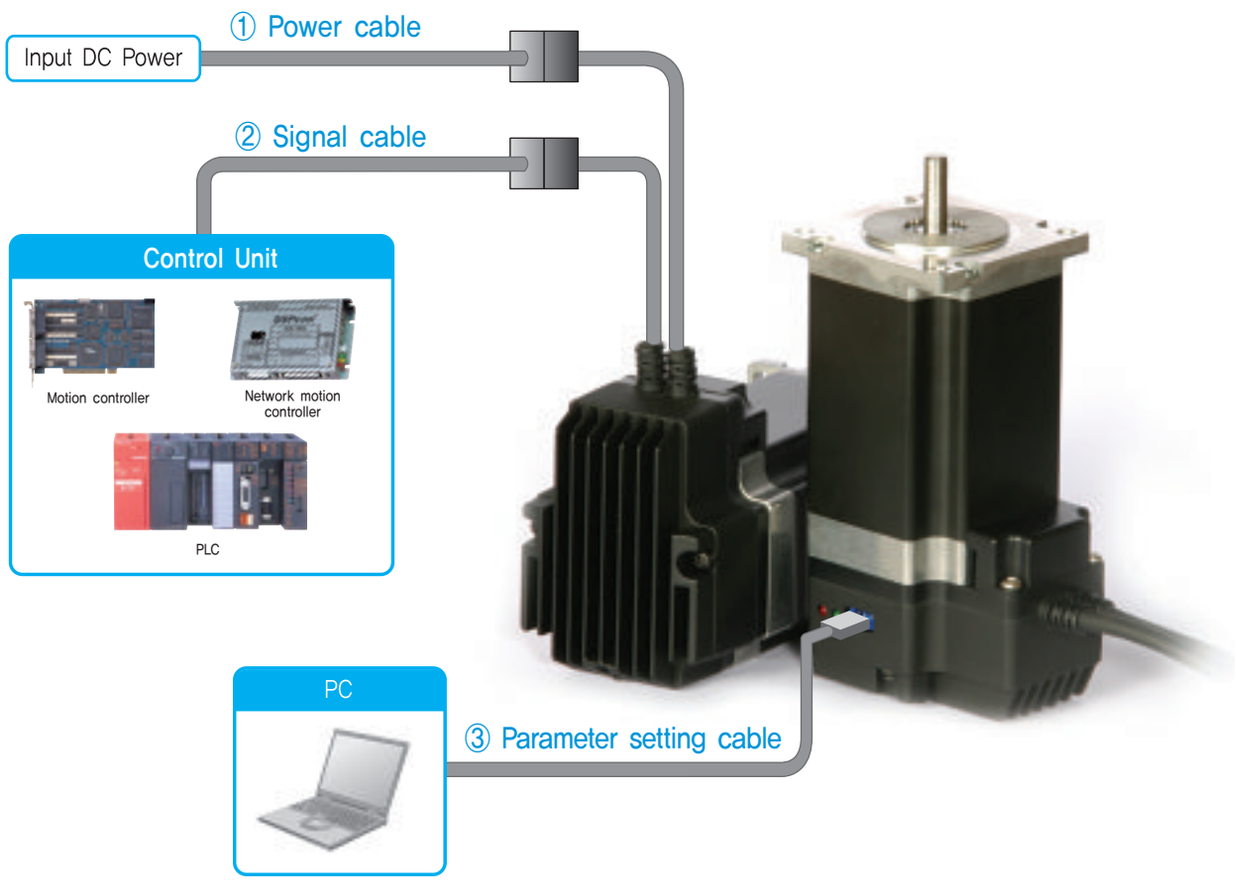


4. Parameter Setting Connector(CN3)

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



● System Configuration



Type	Power Cable	Signal Cable	Parameter Setting Cable
Length supplied	30m	30cm	–
Max. Length	2m	20m	3m

1. Options

① Power Cable

Available to connect between Power and Ezi-STEP BT.

Item	Length [m]	Remark
CBTS-P-□□□F *1	□□□	Normal Cable
CBTS-P-□□□M *1	□□□	Robot Cable
CBTL-P-□□□F *2	□□□	Normal Cable
CBTL-P-□□□M *2	□□□	Robot Cable

*1 : Ezi-STEP-BT-42/56 series

*2 : Ezi-STEP-BT-86 series

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

② Signal Cable

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

Item	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 Parameter Setting Cable

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

Item	Length [m]	Remark
CBTS-C-□□□F	□□□	Normal Cable

□ is for Cable Length. The unit is 1m and Max. 3m length.

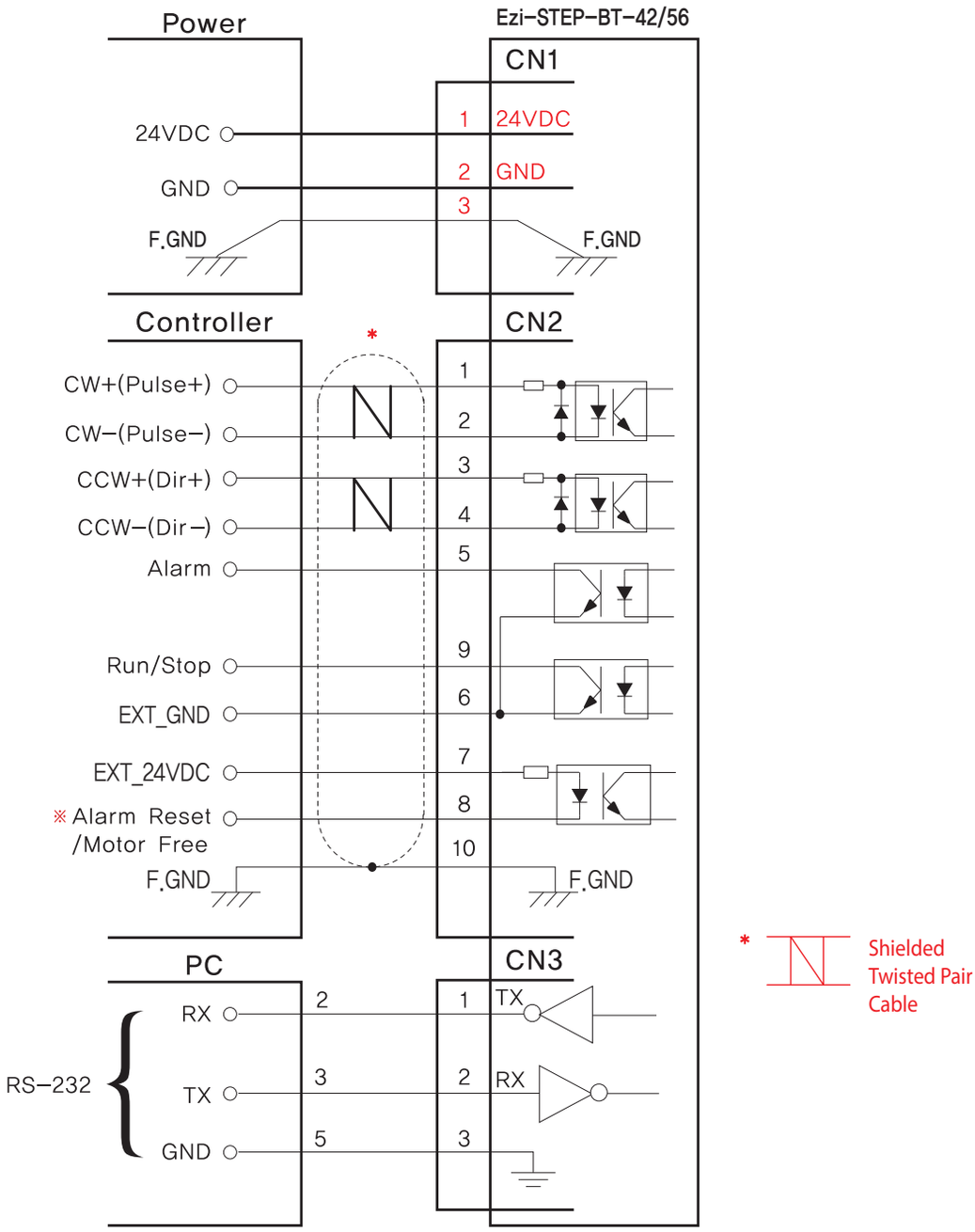
2. Connector Specifications

Connector specifications for cabling to drive.

Purpose		Item	Part Number	Manufacturer
Power (CN1)	BT-42/56 series	Housing Terminal	5557-04R 5556T	MOLEX
	BT-86 series	Housing Terminal	3191-2R 1381T	MOLEX
Signal (CN2)		Housing Terminal	XADRP-10V SXA-001T-P0.6	JST
Parameter Setting	Drive Side (CN3)	Housing Terminal	5264-03 5263	MOLEX
	PC Side	D-SUB Connector Terminal	717SD-ESD9S 7E-1675-09	AMPHENOL

※ Above connector is the most suitable product for the drive applied. Another equivalent connector can be used.

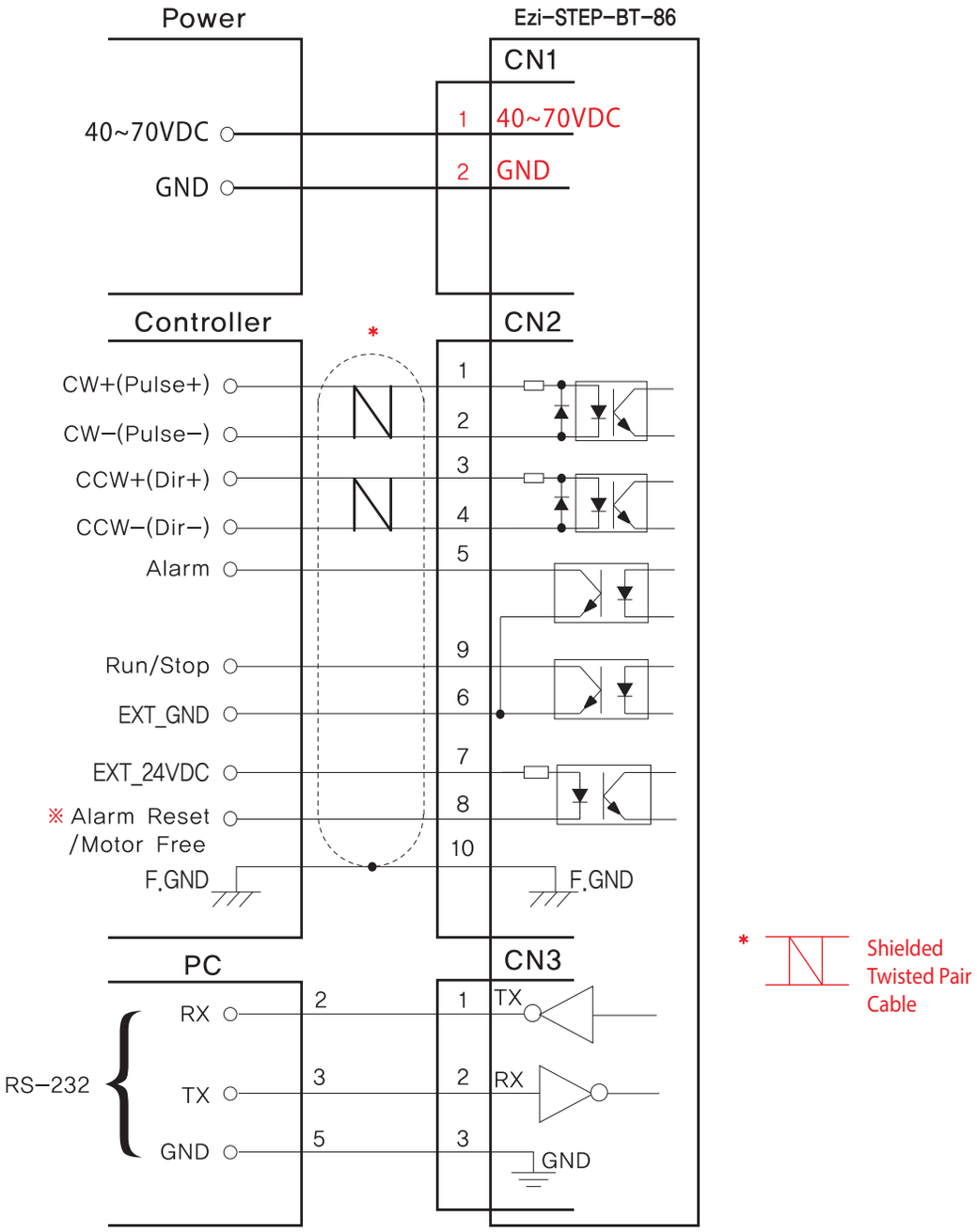
● External Wiring Diagram [Ezi-STEP-BT-42/56 series]



※ Alarm Reset signal line is also used for Motor Free signal.
(For details, please refer to Control Signal Input/Output Description)

※ When connects I/O cable between controller and drive, please turn off the power of both controller and drive, in order to protect the drive from any damage.

● External Wiring Diagram [Ezi-STEP-BT-86 series]



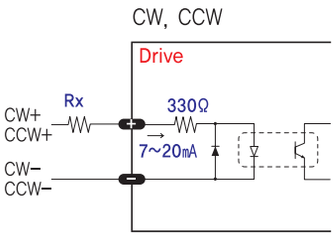
※ Alarm Reset signal line is also used for Motor Free signal.
(For details, please refer to Control Signal Input/Output Description)

※ When connects I/O cable between controller and drive, please turn off the power of both controller and drive, in order to protect the drive from any damage.

●Control Signal Input/Output Description

1 Input Signal

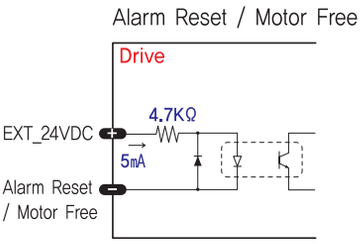
Input signals of the drive are all photocoupler protected. The signal shows the status of internal photocouplers [ON: conduction], [OFF: Non-conduction], not displaying the voltage levels of the signal.



Pin No.	Function
1	CW+
2	CW-
3	CCW+
4	CCW-

◆ 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 switch No.1, SW1). 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 the driver directly. When the level of input signal is more than 5V, Rx resistor is required. If the resistor is absent, the drive will be damaged. If the input signal level is 12V, Rx value is 680ohm and 24V, Rx value is 1.8Kohm.



Pin No.	Function
8	Alarm Reset
7	EXT_24VDC

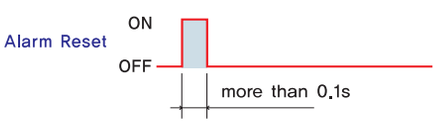
Alarm Reset signal line is also used for Motor Free signal.

◆ 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.

◆ Alarm Reset Input

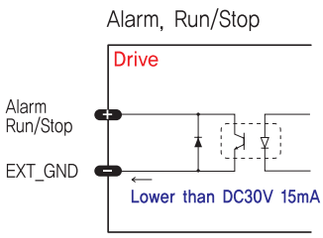
When a protection mode has been activated, a signal to this Alarm Reset input cancels the Alarm output. By setting the alarm reset input signal [ON], cancel Alarm output. Before cancel the Alarm output, have to remove the source of alarm.



[Caution] If Alarm Reset input signal still remains [ON], motor will be Free state. Keep in mind to change [ON]→[OFF] state.

2 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.



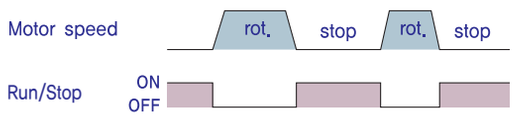
Pin No.	Function
5	Alarm
9	Run/Stop
6	EXT_GND

◆ 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 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.

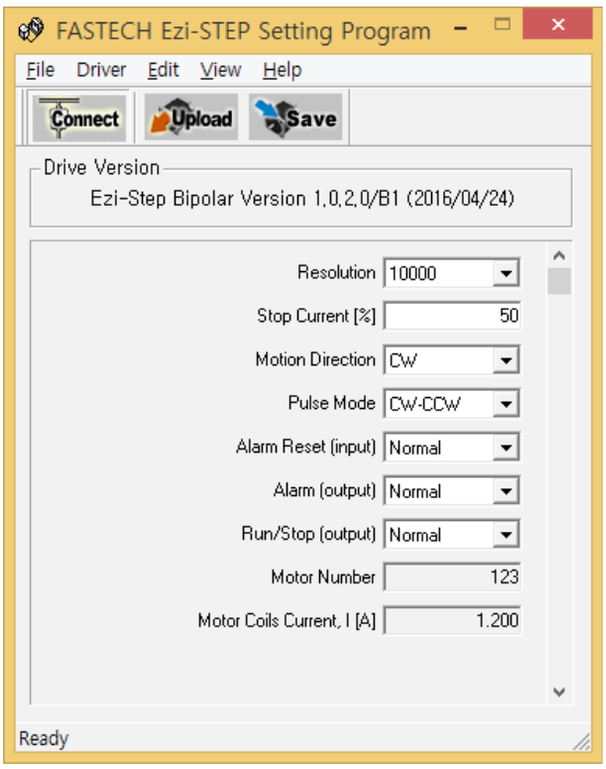
◆ Run/Stop Output

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



● Parameter Settings GUI [User Interface]

Ezi-STEP BT drive utilizes various parameters for operation and some parameters can be changed upon the needs of the user. Ezi-STEP BT provides Drive Setting Program for more convenient use. The screen shot in right side is the sample of Drive Setting Program which is used for drive setting and parameter change. User can change and set the parameter such as Resolution, Stop Current, level of Alarm Reset, Alarm, Motion Direction and so on. By using this drive setting program, user can find the optimal condition to Ezi-STEP BT to fit with the user's own system. Please be noticed that connection for drive setting program shall be done when the Ezi-STEP BT is disable staus for safety reason.



※ Parameter setting program can be downloaded from website. (www.fastech.co.kr)
※ Parameter setting program can support Window 7/8/10.
※ Parameter setting program(GUI) can be updated without notice to improve the performance and convenience of user.

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Fast, Accurate, Smooth Motion

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