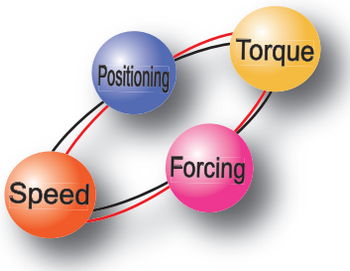
Closed Loop Stepping System
Positioning, Speed, Torque and Forcing Control Driver



ST-Servo

ST-Servo

BSL/NTL

BSL: Pulse string, USB communication, automatic program operation

NTL: Serial communication

Features

High Revolution Speed and High Torque

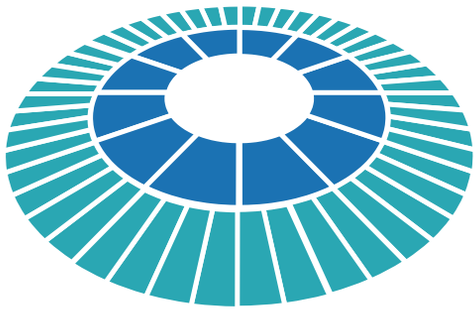
The functionality of the motor has been maximized thanks to the new development of the smart algorithm which achieves high revolution speed and high torque.

Low Heat Generation and Energy Saving

The ST-Servo operates at a high efficiency due to the optimized current controls which change depending on the load.

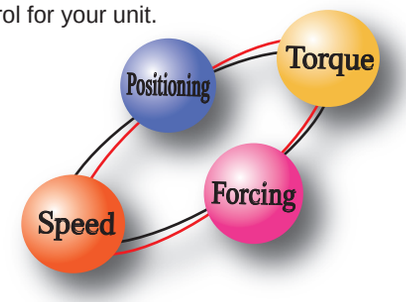
Highly Precise Positioning

The ST-Servo is equipped with a 16,000ppr high resolution encoder for highly precise positioning.



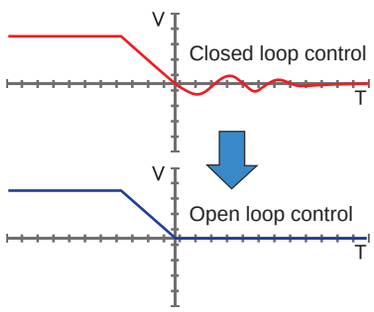
Four Different Control Functions in One Unit

The unit features positioning control, speed control, forcing control and torque control. Control modes can be changed in an instant for the optimal control for your unit.



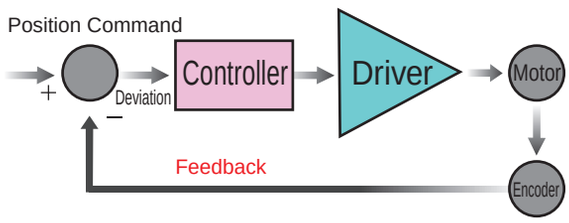
Shortened Takt Time

The user can toggle between closed loop control and open loop control modes. The settling time can be reduced which in turn shortens the takt time.



Highly Reliable System

This is a step-out-less closed loop system equipped with an optical encoder.



Quick Response

The ST-Servo is able to output 150% of its rated torque in an instant which is perfect for nimble starting and stopping.

Assorted Lineup

Selectable command input feature either Pulse string input or RS485 serial communication.

Optimal Control with Three Operation Modes

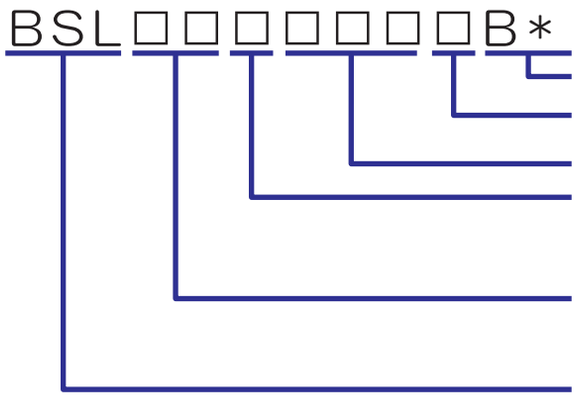
An optimal mode for a specific application can be chosen from three operation modes: full time closed, dual and full time open.

Operation Mode	Control Method	Features
Full time closed	Optimal current control according to the load	Low vibration Step-out-less Low heat generation
Dual	Switch from open to closed or vise versa at a revolution speed for stopping	Step-out-less No hunting Shortening of positioning and settling times Low heat generation
Full time open	Ordinary micro step control	No hunting Quick response time

ST-Servo https://www.hp-vanguard.com/

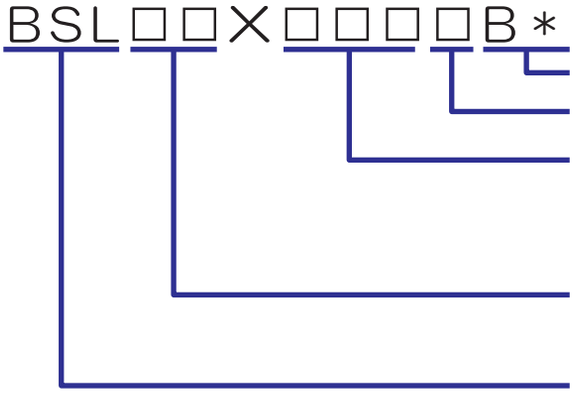
How to Read the Model Number

Set Model Number



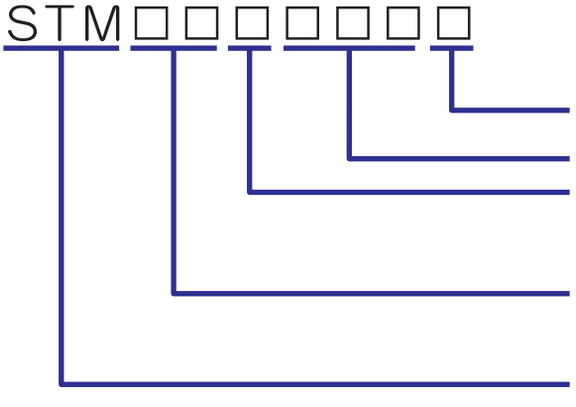
Standard product	
Optional motor:	A: None (Standard)
Motor model	
Motor axis specifications:	S: Single-sided (Standard)
	W: Double-sided
Motor flange size:	25: 25mm square 28: 28mm square
	42: 42mm square 56: 56mm square
Driver type:	BSL, NTL

Driver Model Number



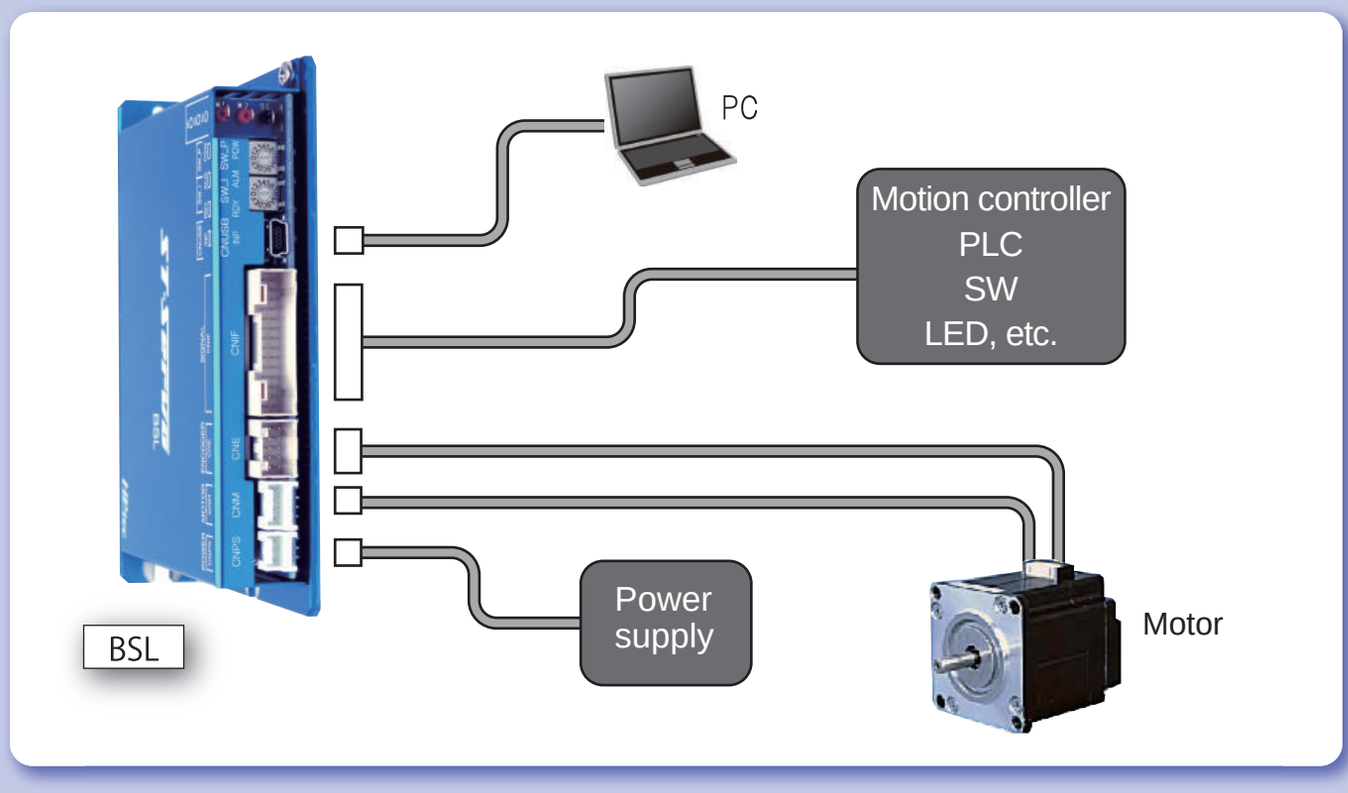
Standard product	
Optional motor:	A: None (Standard)
Motor model	
Motor flange size:	25: 25mm square 28: 28mm square
	42: 42mm square 56: 56mm square
Driver type:	BSL, NTL

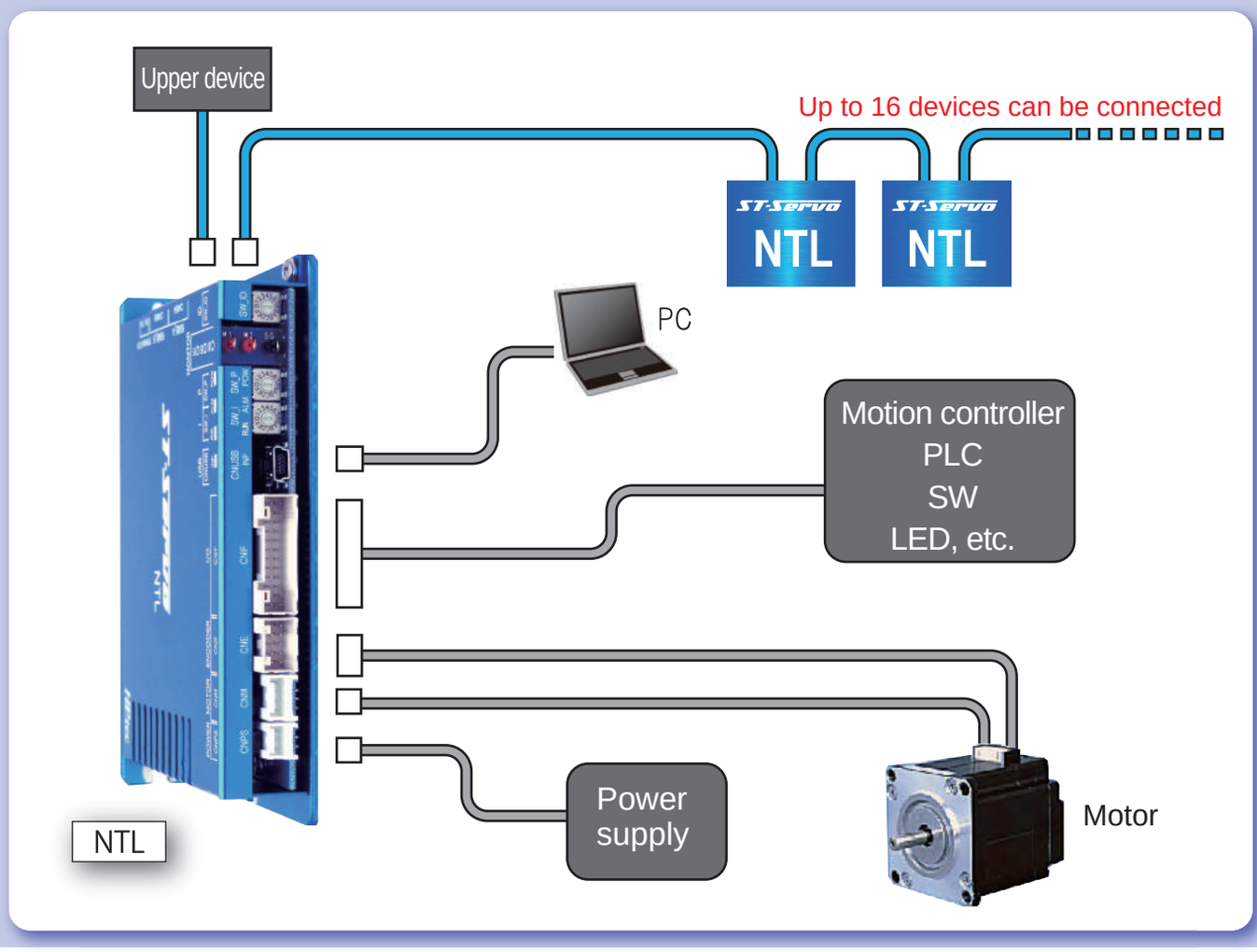
Motor Model Number



Optional motor:	A: None (Standard)
Motor model	
Motor axis specifications:	S: Single-sided (Standard)
	W: Double-sided
Motor flange size:	25: 25mm square 28: 28mm square
	42: 42mm square 56: 56mm square
Indicates a stepping motor	

Diagram


PC
Motion controller
PLC
SW
LED, etc.
Power
supply
Motor
BSL


Upper device
Up to 16 devices can be connected
ST-Servo
NTL
ST-Servo
NTL
PC
Motion controller
PLC
SW
LED, etc.
Power
supply
Motor
NTL

Driver - Rated Specifications

Item		BSL	NTL
Input Power Supply Voltage		DC24V, DC48V	
Control Modes		Positioning, Speed, Torque and Forcing	
Rated Output Current		2.0A peak	
Maximum Output Current		3.0A peak	
Supported Motor Sizes (mm)		25mm square, 28mm square, 42mm square, 56mm square	
Encoder Pulses		6,400ppr, 9,600ppr, 16,000ppr (Depends on the connected motor)	
General Input Signal		6	8
General Output Signal		4	8
Mechanical Input Signal		None	3(+LM,-LM,ORG)
Control Command Method	Pulse String (1/2/AB)	Yes	—
	Parameters	Yes	Yes
	Internal Program	Yes (32 steps)	Yes (64 steps)
	USB	Yes	Yes
	RS485	—	Yes
	Analog Signal	Yes	—
USB Communication		USB 2.0 (Windows Virtual COM Port)	
RS485 Communication		—	Modbus ASCII/RTU
Display		Power LED (Green) Alarm LED (Red) Servo Ready (Green) In Position (Green)	
Alarm Types		Loop Error Full Count Over Speed Gain Adjustment Fault Excess Voltage EEROM Error	
Operating Temperature and Humidity		0 to 50ºC, 85%RH or less (No condensation)	
Storage Temperature and Humidity		-20 to 85ºC, 85% or less (No condensation)	
Dimensions		W117 × D73 × H23 mm	W127 × D78.5 × H23.5 mm
Weight		150g	170g

General Motor Specifications

Size (mm)	25mm square x 50.5	28mm square x 50.5	42mm square x 48.0
Motor Model	STM25S100A (Single-sided) STM25W100A (Double-sided)	STM28S100A (Single-sided) STM28W100A (Double-sided)	STM42S100A (Single-sided) STM42W100A (Double-sided)
Set Model	BSL25S100AB* (Single-sided) BSL25W100AB* (Double-sided)	BSL28S100AB* (Single-sided) BSL28W100AB* (Double-sided)	BSL42S100AB* (Single-sided) BSL42W100AB* (Double-sided)
Driver Model	BSL25X100AB*	BSL28X100AB*	BSL42X100AB*
Input Power Supply Voltage	DC24V/DC48V ±10%		
Continuous Rating Torque (mN•m)	106	106	300
Rotor Inertia (g·cm^2)	4	4	50
Encoder Resolution	9,600	9,600	16,000
Weight (g)	120	120	270

Size (mm)	42mm square x 58.0	56mm square x 60.0
Motor Model	STM42S101A (Single-sided) STM42W101A (Double-sided)	STM56S100A (Single-sided) STM56W100A (Double-sided)
Set Model	BSL42S101AB* (Single-sided) BSL42W101AB* (Double-sided)	BSL56S100AB* (Single-sided) BSL56W100AB* (Double-sided)
Driver Model	BSL42X101AB*	BSL56X100AB*
Input Power Supply Voltage	DC24V/DC48V ±10%	
Continuous Rating Torque (mN•m)	434	706
Rotor Inertia (g·cm^2)	75	180
Encoder Resolution	16,000	16,000
Weight (g)	370	620

Note: As for the NTL set model and driver model, “BSL” in the table above is replaced with “NTL”.

List of Cables

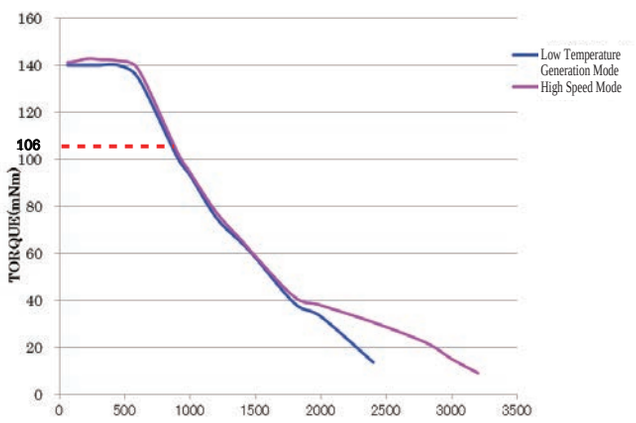
Product Name	Model	Cable Length (meters)
25mm or 28mm square Motor - Motor Cable	C004039-□.0	Standard: 1 Optional: 3, 5, 10, 20
42mm square Motor - Motor Cable	C004035-□.0	Standard: 1 Optional: 3, 5, 10, 20
56mm square Motor - Motor Cable	C004036-□.0	Standard: 1 Optional: 3, 5, 10, 20
25mm or 28mm square Motor - Encoder Cable	C008025-□.0	Standard: 1 Optional: 3, 5, 10, 20
42mm or 56mm square Motor - Encoder Cable	C008024-□.0	Standard: 1 Optional: 3, 5, 10, 20
Power supply Cable	C003036-□	Optional: 1, 2, 3
I/F Cable	C028001-□	Optional: 1, 2, 3

Revolution Speed - Torque Curve

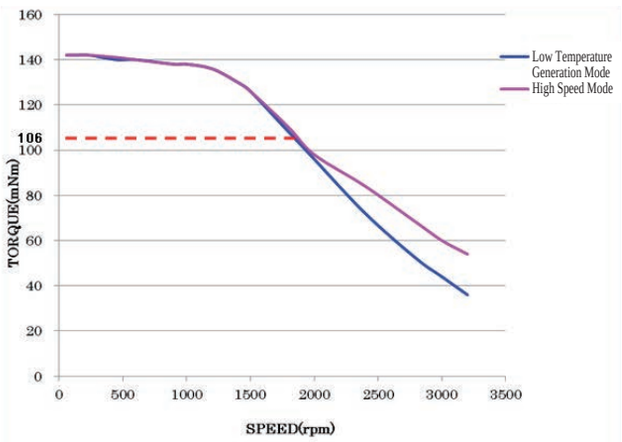
25mm square, 28mm square

Low Temperature Generation Mode: Blue Line
High Speed Mode: Red Line

25mm square, 28mm square×50.5L 24V



25mm square, 28mm square×50.5L 48V

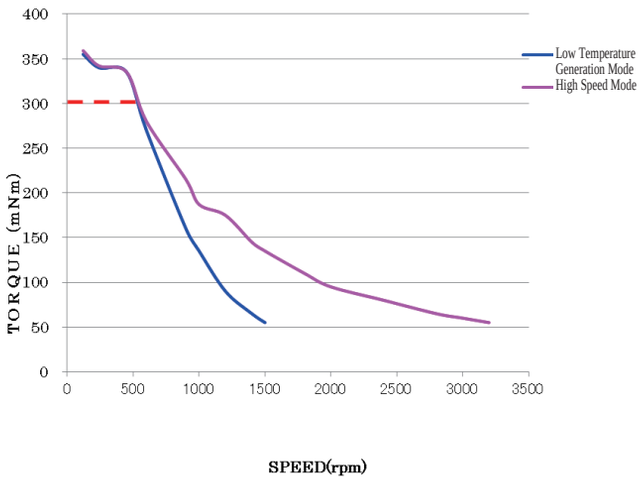


42mm square

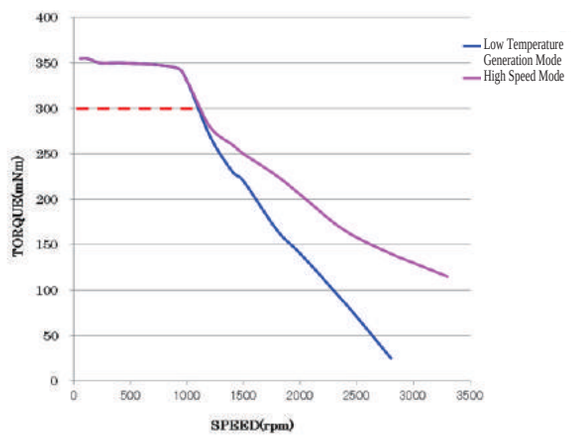
Note) The instantaneous torque is the amount of torque which exceeds the continuous rating torque. The maximum torque during the torque control and forcing control is the continuous rating torque.

Continuous Rating Torque

42mm square×48.0L 24V



42mm square×48.0L 48V

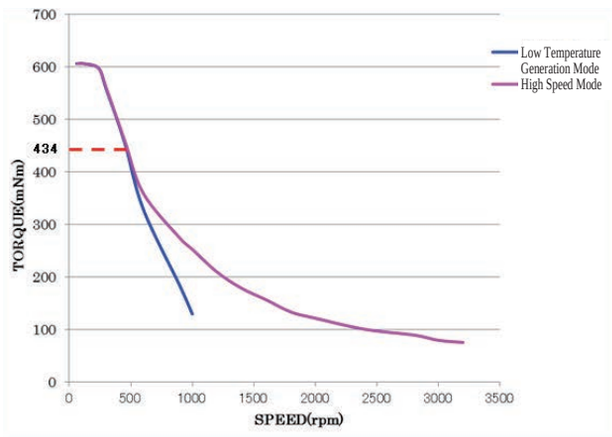


Revolution Speed - Torque Curve

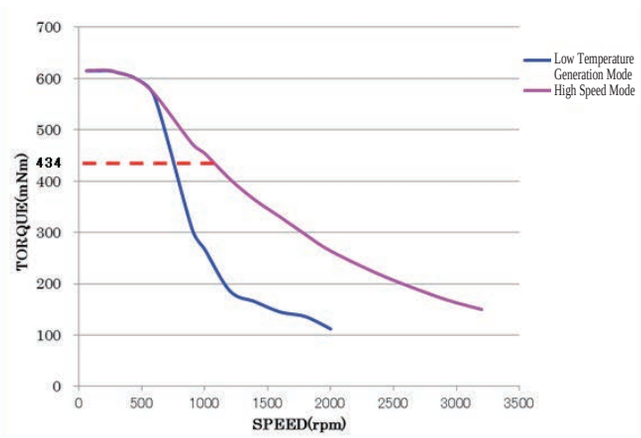
42mm square

Low Temperature Generation Mode: Blue Line
High Speed Mode: Red Line

42mm square×58.0L 24V



42mm square×58.0L 48V

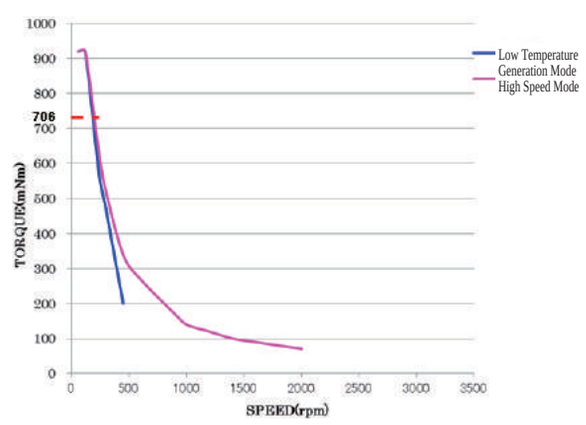


56mm square

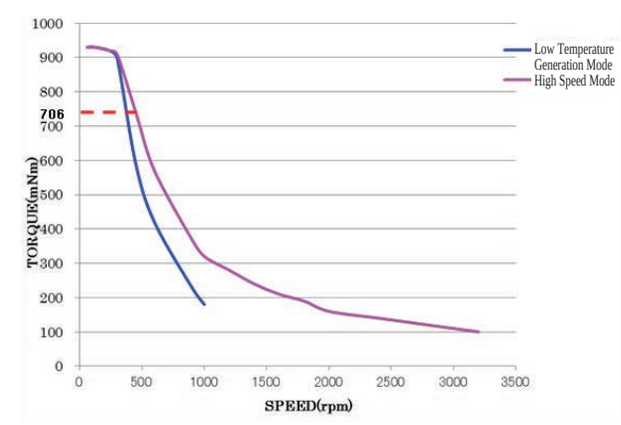
Note) The instantaneous torque is the amount of torque which exceeds the continuous rating torque. The maximum torque during the torque control and forcing control is the continuous rating torque.

Continuous Rating Torque

56mm square×60.0L 24V

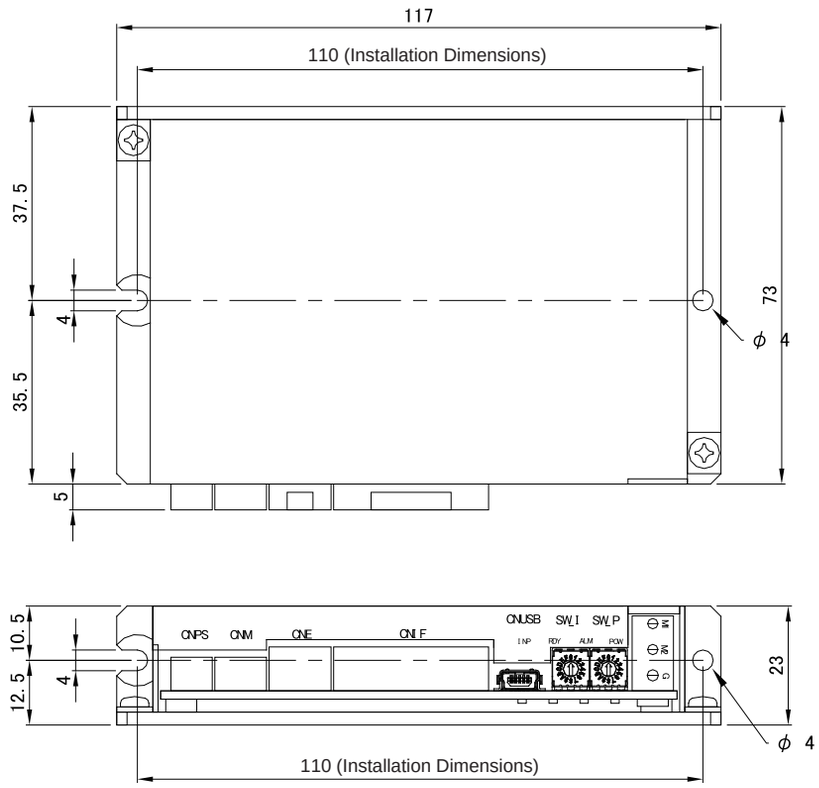


56mm square×60.0L 48V

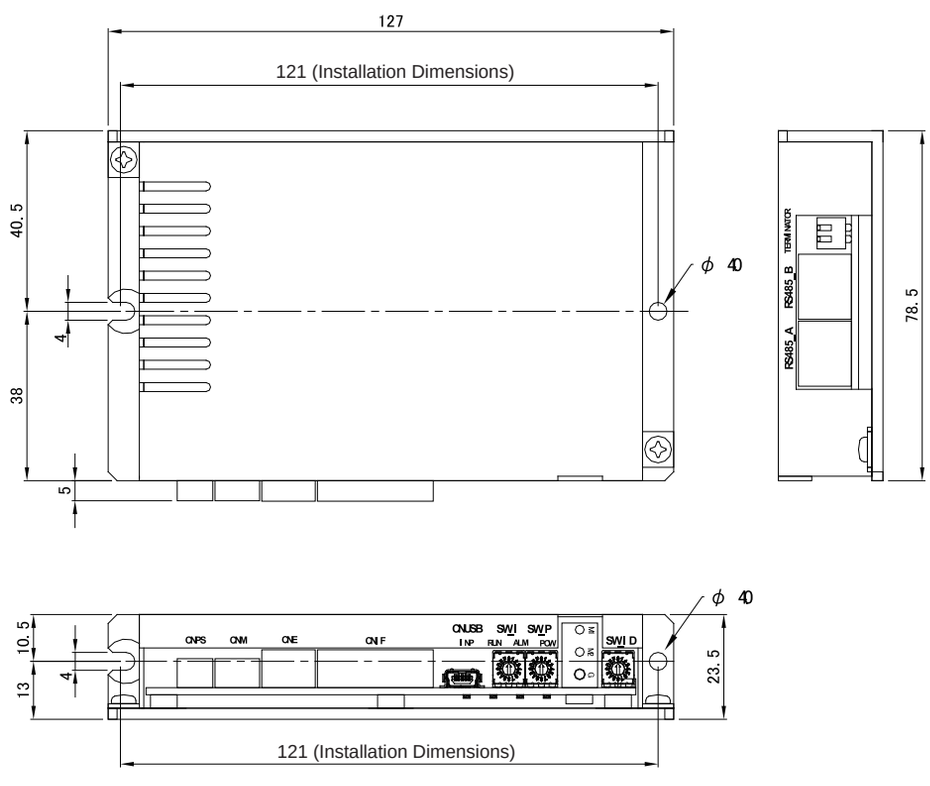


Outline Drawing

BSL V2



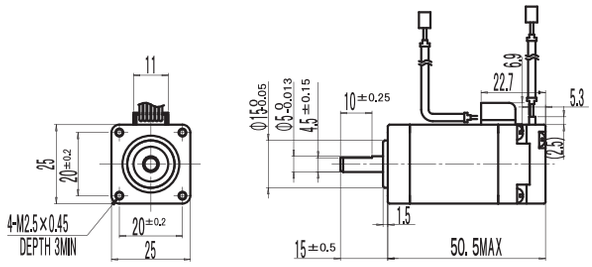
NTL



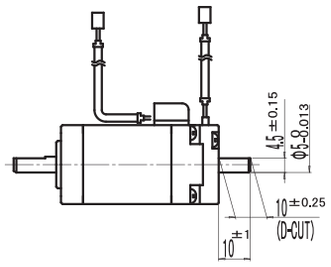
Outline Drawing - Motor

25

Single-Sided (S) Type

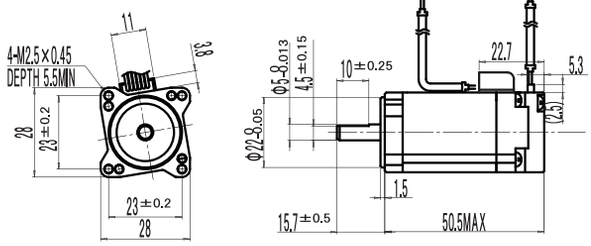


Double-Sided (W) Type

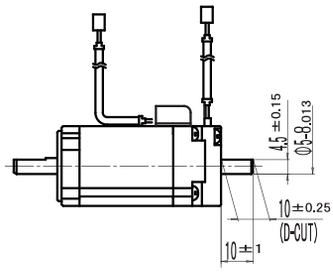


28

Single-Sided (S) Type

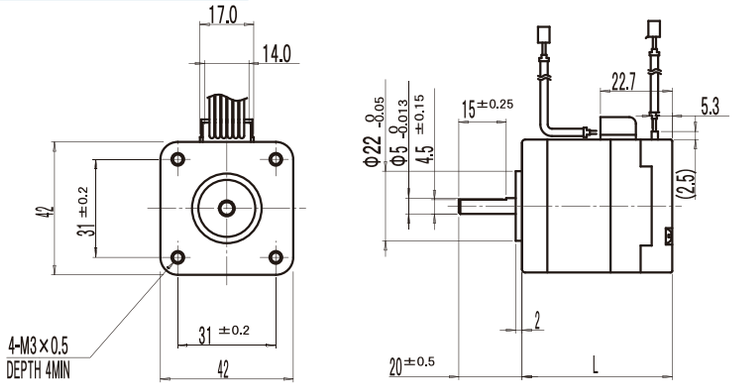


Double-Sided (W) Type

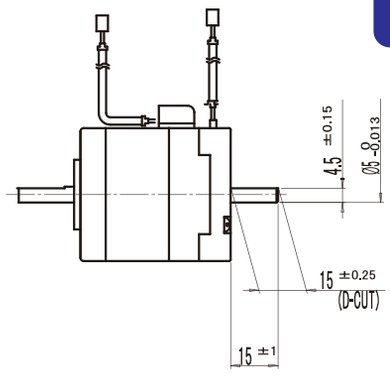


42

Single-Sided (S) Type

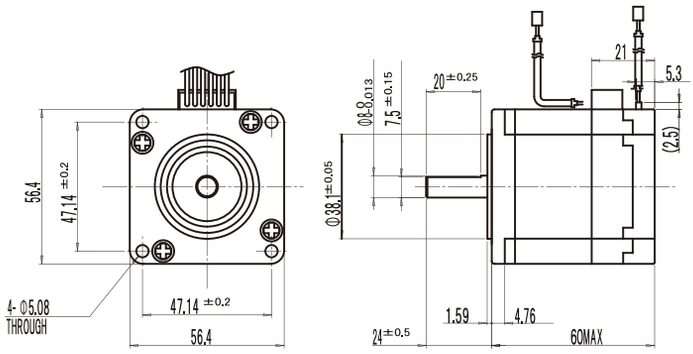


Double-Sided (W) Type

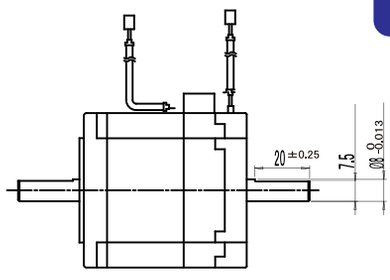


56

Single-Sided (S) Type

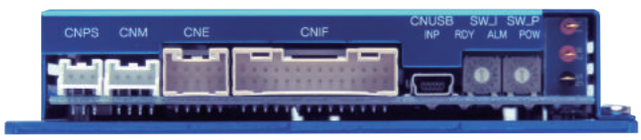


Double-Sided (W) Type



BSL, NTL

BSL



NTL

●General Components

Monitor terminal (5V Standard)

Terminal	Details (Select according to the parameters)
M1	Command speed, motor speed, command torque
M2	Motor speed, torque, position deviation, in position
G	GND

CNPS (For Power Supply)

No.	Signal Name	Details	Remarks
1	+24V or +48V	Main power supply plus	+24V ±10% +48V ±10%
2	0V	0V main power supply	
3	FG	Frame ground	Be sure to wire the frame ground

CNM (For Motor)

No.	Signal Name	Details
1	A	Motor A phase
2	/A	Motor / A phase
3	B	Motor B phase
4	/B	Motor / B phase

CNE (For Encoder)

No.	Signal Name	IN/OUT	Details
1	+5V	OUT	+5V power supply for encoder
2	GND	OUT	Power supply GND for encoder
3	A+	IN	A phase +
4	A-	IN	A phase -
5	B+	IN	B phase +
6	B-	IN	B phase -
7	Z+	IN	Z phase +
8	Z-	IN	Z phase -
9	NC		
10	FG		Shield (Note)

Note) The cable included with the driver is not shielded. If using a cable that is longer than 1 meter, be sure to use a shielded cable.

CNUSB (For USB)

No.	Signal Name	IN/OUT	Details
1	+5V	IN	Bus power from PC
2	D-	IN/OUT	Data line -
3	D+	IN/OUT	Data line +
4			
5	GND	IN	Signal ground

Gain Switch

SW	Details	Remarks
SW_P	Proportional gain of speed loop	Match the load inertia with 0-F.
SW_I	Integral time constant of speed loop	Match the load rigidity with 0-F.

LED Name	Features	LED
POW	• Indicates that the power is ON. • Blinks when a parameter which requires the power to be turned ON again has been overwritten.	Green
ALM	• Indicates that the driver is faulty. The type of alarm can be identified by the number of times it blinks. Refer to the alarm details for the alarm features. • Lights up when a parameter which requires the power to be turned ON again has been overwritten.	Red
RDY	• Indicates that the initialization process for the driver is complete after turning on the power. • Blinks when the operation for the power factor detection has been set using the command input.	Green
INP	• Indicates that it is in the in-position zone during position control. • Indicates that the target speed has been reached during speed control. • Indicates that the torque limit has been reached during forcing control.	Green

●BSL
CNIF (For I/F)

No.	Signal Name	Details	IN/OUT	Remarks
1	P1+	Command CW pulse or command pulse or B phase	IN	Can be selected from two pulse, one pulse and two phase pulse Set to two pulse when shipped (CW / CCW pulse)
2	P1-			
3	P2+	Command CCW pulse or command direction or A phase		
4	P2-			
5	COM+	+24V power supply for I/O	IN	Power plus for insulation (+24V ± 10%)
6	COM-	0V power supply for I/O	IN	Power supply 0V for insulation
7	IN1	Digital input 1	IN	Servo on when shipped
8	IN2	Digital input 2	IN	The alarm is reset when shipped
9	IN3	Digital input 3	IN	Start/Stop for Speed or Torque control when shipped
10	IN4	Digital input 4	IN	P operation when shipped
11	IN5	Digital input 5	IN	Mode(Mode0/Mode1) for Control mode switch when shipped
12	IN6	Digital input 6	IN	Rotation direction (CW/CCW) for Speed or Torque control when shipped
13	+10Vout	Power supply for speed command	OUT	Used when setting the speed command with the volume
14	Vref+	Speed and torque command Torque limit value plus	IN	0 to ±5V or 0 to ±10V
15	Vref-	Minus for above command	IN	Same voltage as internal GND
16	OUT1	Digital output 1	OUT	In position for Position control or Zero speed for Speed control when shipped
17	OUT2	Digital output 2	OUT	Alarm when shipped
18	OUT3	Digital output 3	OUT	Torque limit for the forcing control when shipped
19	OUT4	Digital output 4	OUT	Speed reached for Speed control when shipped
20	BRAKE+	Brake release output +	OUT	+24V (Same voltage level as 5th pin)
21	BRAKE-	Brake release output -	OUT	500mA max
22	ECA+	Encoder A phase	OUT	Differential output
23	ECA-		OUT	
24	ECB+	Encoder B phase	OUT	Differential output
25	ECB-		OUT	
26	ECZ+	Encoder Z phase	OUT	Differential output
27	ECZ-		OUT	
28	SG	Signal ground		Same voltage as internal Signal ground

●NTL
CNIF (For I/F)

No.	Signal Name	Details	IN/OUT	Remarks
1	COM+	+24V power supply for I/O	IN	+24V ±10% power supply input for insulation
2	COM-	0V power supply for I/O	IN	Power supply input for insulation
3	IN1	Digital input 1	IN	Servo on when shipped
4	IN2	Digital input 2	IN	The alarm is reset when shipped
5	IN3	Digital input 3	IN	Start/Stop for Speed or Torque control when shipped
6	IN4	Digital input 4	IN	P operation when shipped
7	IN5	Digital input 5	IN	Control mode switch when shipped (Mode 0 / Mode 1)
8	IN6	Digital input 6	IN	Revolution direction (CW/CCW) for Speed or Torque control when shipped
9	IN7	Digital input 7	IN	General input when shipped
10	IN8	Digital input 8	IN	General input when shipped
11	+LM	+ limit sensor	IN	Mechanical sensor
12	-LM	- limit sensor	IN	
13	ORG	Origin sensor	IN	
14	OUT1	Digital output 1	OUT	In position for Position control or Zero speed for Speed control when shipped
15	OUT2	Digital output 2	OUT	Alarm when shipped
16	OUT3	Digital output 3	OUT	Torque limit for the forcing control when shipped
17	OUT4	Digital output 4	OUT	Speed reached for Speed control when shipped
18	OUT5	Digital output 5	OUT	General output when shipped
19	OUT6	Digital output 6	OUT	General output when shipped
20	OUT7	Digital output 7	OUT	General output when shipped
21	OUT8	Digital output 8	OUT	General output when shipped
22	BRAKE+	Brake release output +	OUT	+24V (Same voltage level as 5th pin)
23	BRAKE-	Brake release output -	OUT	500mA max
24	FG	Shield		

●NTL
CN485A, CN485B (For RS485 communication)

No.	Signal Name	IN/OUT	Details
1			
2	SG		Signal ground
3	Sig-A	IN/OUT	Signal line A
4			
5	SG		Signal ground
6	Sig-B	IN/OUT	Signal line B
7			
8	SG		Signal ground

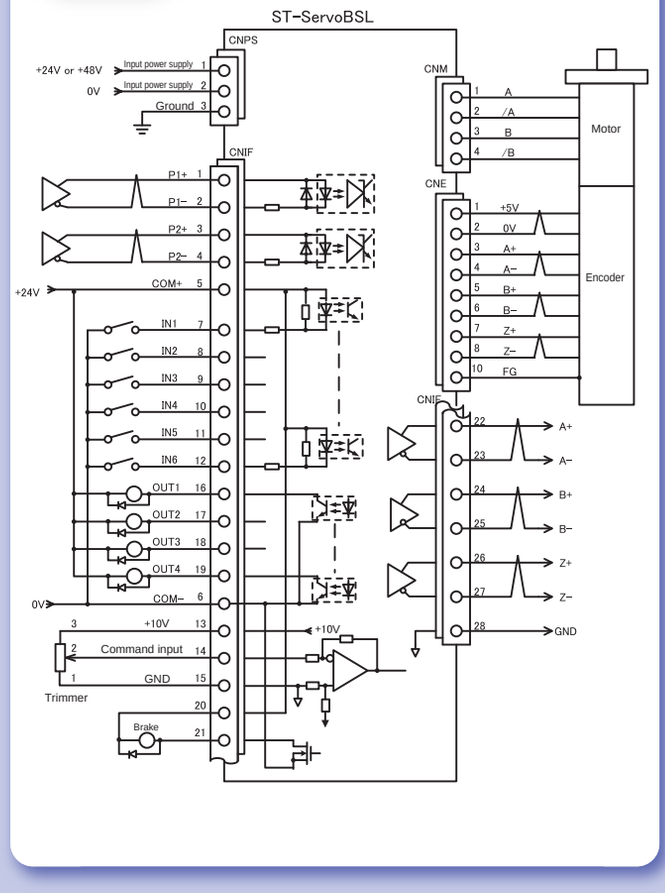
●NTL
Communication switch

SW	Details	Remarks
SW_ID	Communication ID	Set the ID for the machine with 0-F.
SW_TM	Communication line terminating resistor setting	The termination will be OFF when both 1 and 2 are OFF. The termination will be ON when both 1 and 2 are ON.

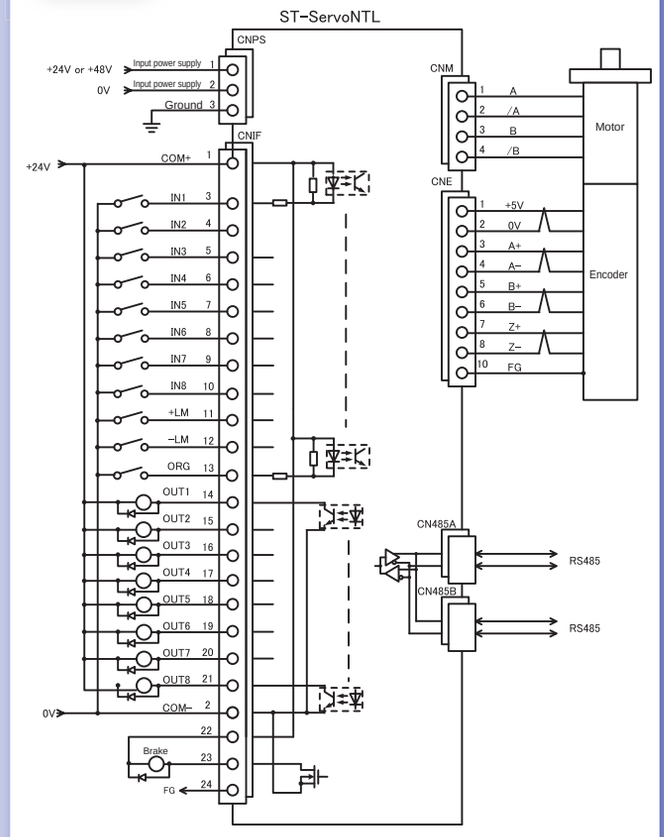
Electrical Schematic and List of Combinations

Electrical Schematic

BSL



NTL



List of Combinations

Size (mm)	25mm squarex50.5	28mm squarex50.5	42mm squarex48.0
Motor Model	STM25S100A (Single-Sided) STM25W100A (Double-Sided)	STM28S100A (Single-Sided) STM28W100A (Double-Sided)	STM42S100A (Single-Sided) STM42W100A (Double-Sided)
Set Model	BSL25S100AB* (Single-Sided) BSL25W100AB* (Double-Sided)	BSL28S100AB* (Single-Sided) BSL28W100AB* (Double-Sided)	BSL42S100AB* (Single-Sided) BSL42W100AB* (Double-Sided)
Driver Model	BSL25X100AB*	BSL28X100AB*	BSL42X100AB*

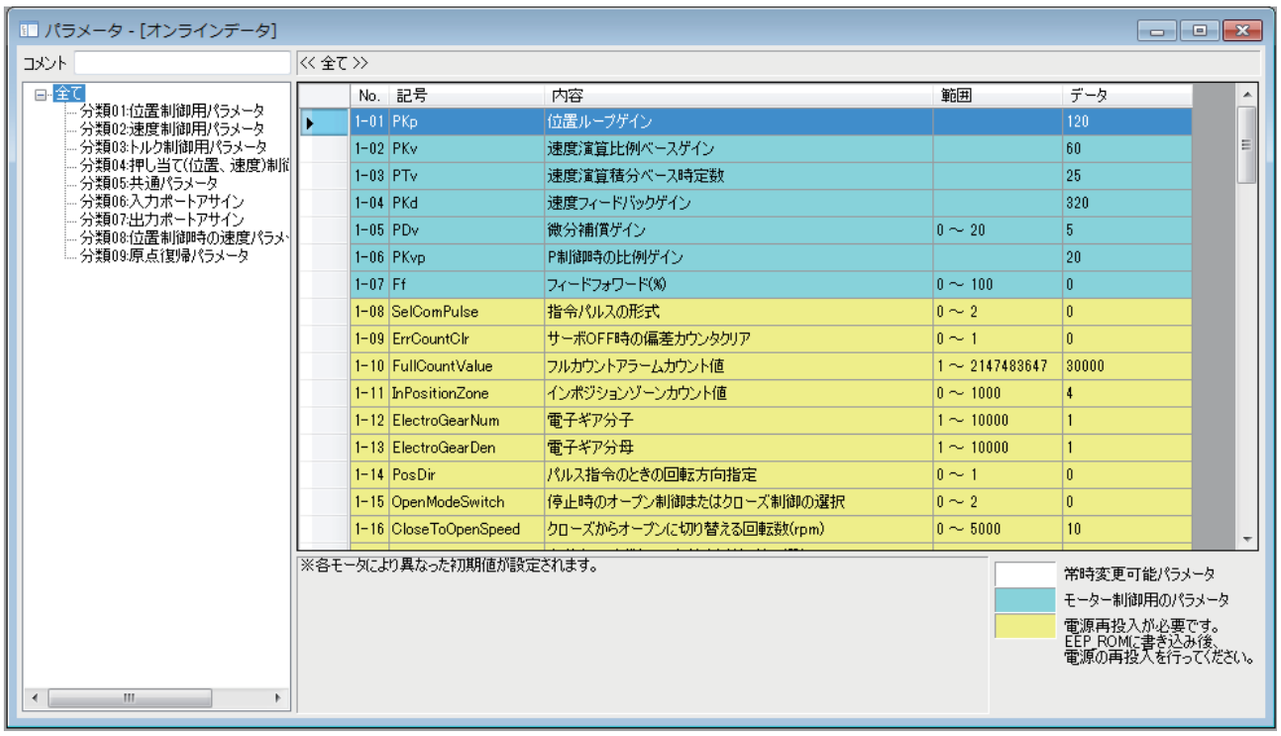
Size (mm)	42mm squarex58.0	56mm squarex60.0
Motor Model	STM42S101A (Single-Sided) STM42W101A (Double-Sided)	STM56S100A (Single-Sided) STM56W100A (Double-Sided)
Set Model	BSL42S101AB* (Single-Sided) BSL42W101AB* (Double-Sided)	BSL56S100AB* (Single-Sided) BSL56W100AB* (Double-Sided)
Driver Model	BSL42X101AB*	BSL56X100AB*

The ST-Servo comes with application software running on Windows.
The application software allows you to do the following:
• Set and edit ST-Servo parameters
• Set and edit program data
• Manual operation
and more.

Operating Environment

[OS]	Windows 7 Windows 8 / 8.1 * The application software can be run on both 64 bit (x64) and 32 bit (x86) Japanese operating systems.
[Processor]	Intel Pentium 4 3GHz or faster (Recommended: Intel Core2 Duo 2GHz or faster) Or another processor with compatible capability.
[Memory]	1GB or more (Recommended: 2GB or more)

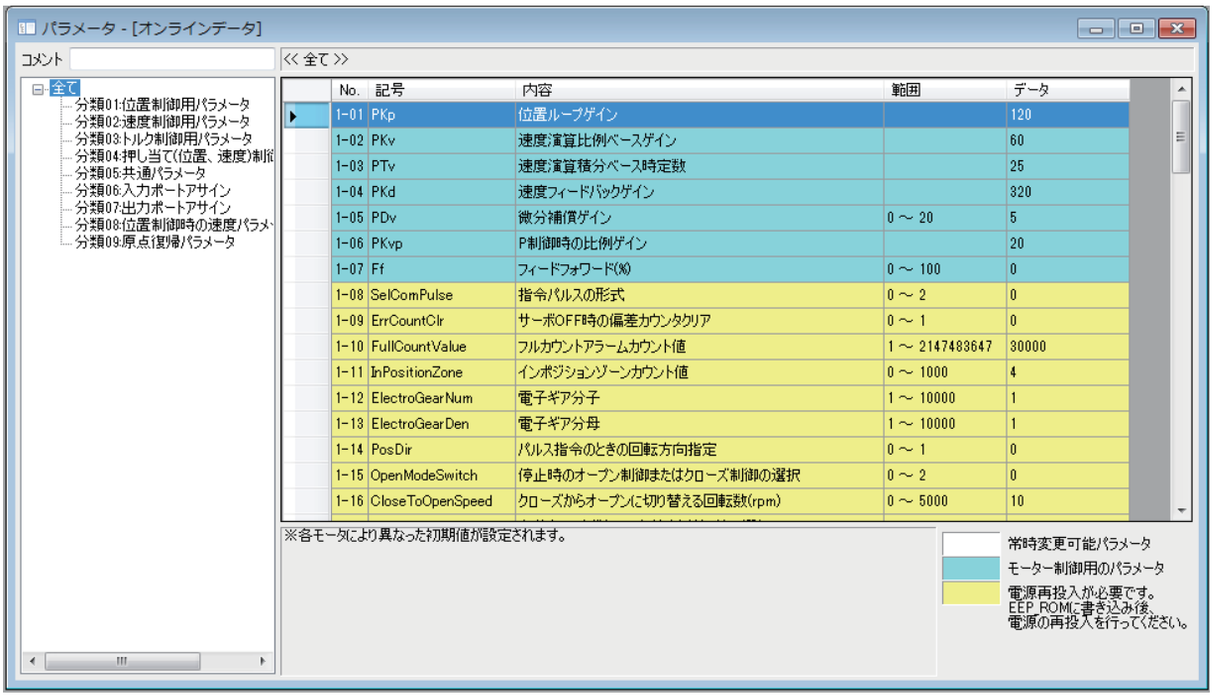
The ST-Servo communication specifications have also been made public for users to control it using their own programming.



Software

• Setting and Editing Parameters
There are parameters for each function. BSL has 9 classifications while NTL has 11 classifications.

Classification 01: Position Control Parameters
Classification 02: Speed Control Parameters
Classification 03: Torque Control Parameters
Classification 04: Forcing (Position / Speed) Parameters
Classification 05: Common Parameters
Classification 06: Assign Input Ports
Classification 07: Assign Output Ports
Classification 08: Speed Parameters During Position Control
Classification 09: Zero Return Parameters
Classification 10: Communication Settings Parameters (*NTL only)
Classification 15: Expansion Parameters (*NTL only)



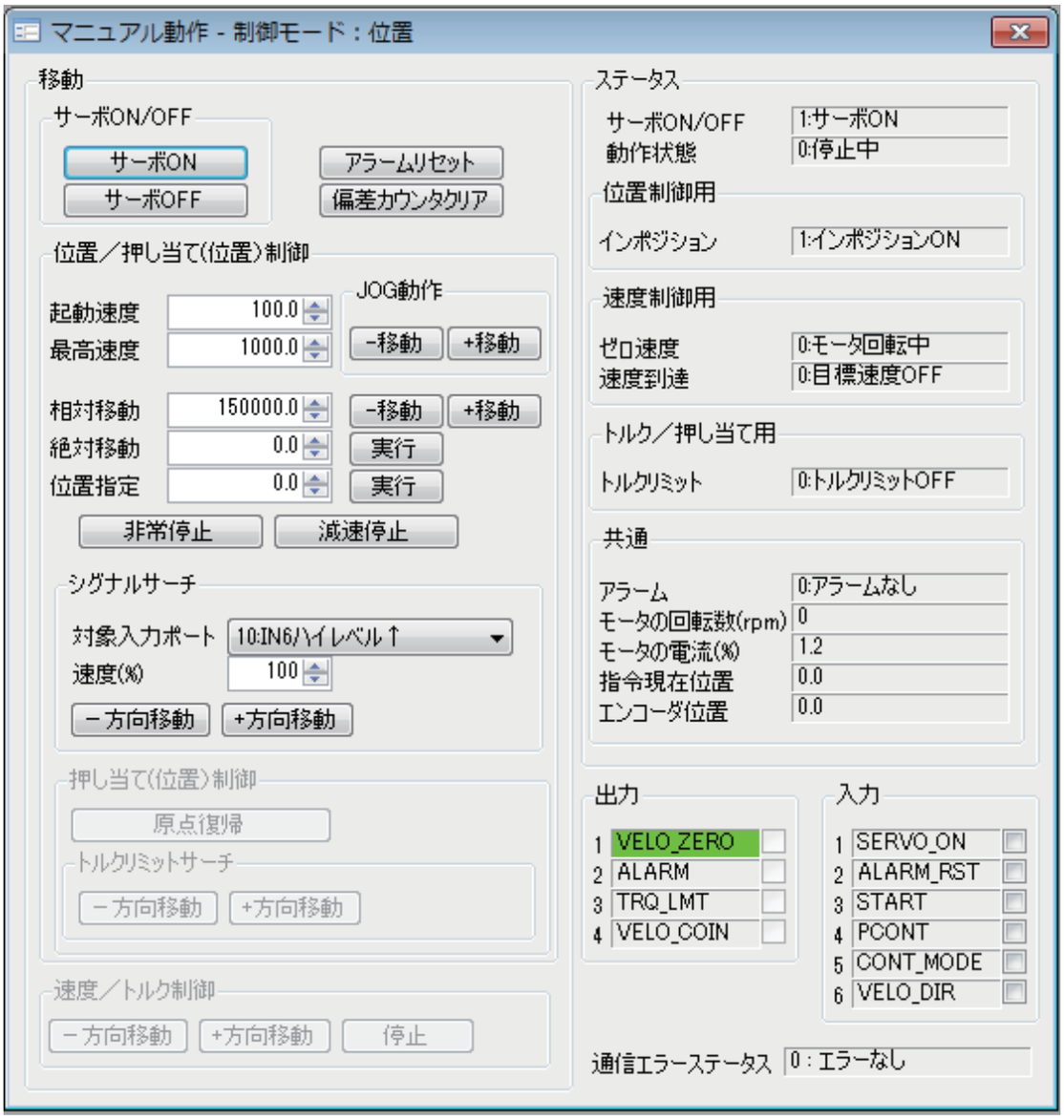
• Programming
A maximum of 32 steps (64 steps for the NTL) can be programmed.
The step no. executed can be selected from the input port for the program selection no. When setting the steps, you can either set one step or multiple steps.
The function for each step is selected using the mode.
• Mode types

0: INC Relative Positioning
1: ABS Absolute Positioning
2: ORG Zero Return
3: +TLS Search for + Directional Torque Limit
4: -TLS Search for - Directional Torque Limit
5: +SIG + Direction Signal Detection
6: -SIG - Direction Signal Detection
7: SET Set the Current Position
8: CLR Clear the Deviation Counter
9: OUTI General Output - Instant
10: OUTB General Output - Coordinate Comparison (Large)
11: OUTS General Output - Coordinate Comparison (Small)

No.	モード	移動量	速度(%)	トルク(×0.1%)	対象ポート	レンジL	レンジH	ウェイト(msec)	次
0	00:INC	0.0	100	500	0	0.0	0.0	0	-1
1	00:INC	0.0	100	500	0	0.0	0.0	0	-1
2	00:INC	0.0	100	500	0	0.0	0.0	0	-1
3	00:INC	0.0	100	500	0	0.0	0.0	0	-1
4	00:INC	0.0	100	500	0	0.0	0.0	0	-1
5	00:INC	0.0	100	500	0	0.0	0.0	0	-1
6	00:INC	0.0	100	500	0	0.0	0.0	0	-1
7	00:INC	0.0	100	500	0	0.0	0.0	0	-1
8	00:INC	0.0	100	500	0	0.0	0.0	0	-1
9	00:INC	0.0	100	500	0	0.0	0.0	0	-1
10	00:INC	0.0	100	500	0	0.0	0.0	0	-1
11	00:INC	0.0	100	500	0	0.0	0.0	0	-1
12	00:INC	0.0	100	500	0	0.0	0.0	0	-1
13	00:INC	0.0	100	500	0	0.0	0.0	0	-1
14	00:INC	0.0	100	500	0	0.0	0.0	0	-1

Software

•Manual Operation
Perform various manual operations and monitor the current operational status.



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Fax: +81-4-2951-5383

□ Quotation □ Order Desired Delivery Date: Month ____ Day ____ Year ____

Please enter necessary information in the bold boxes.

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Department		Position	
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Address	〒		
Contact Information	TEL	FAX	
	E-MAIL		

Model	Quantity	Remarks	Unit Price (Yen)	Total (Yen)
Grand Total				

The total price does not include sales tax.

Contact for inquiries and requests: Vanguard Systems Inc. ME Division

Phone: +81-4-2951-5381

Email: sales-div1@hp-vanguard.com

Dealers

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