SS-EC

EtherCAT Step-Servo Drive

- CoE(CiA 402 drive profile)
- PP, PV, TQ, CSP, CSV, HM modes supported
- MOONS' own Q mode supported
- Intelligent built-in controller
- Enhanced motor, optimized design, long life
- Efficient, smooth, accurate, fast
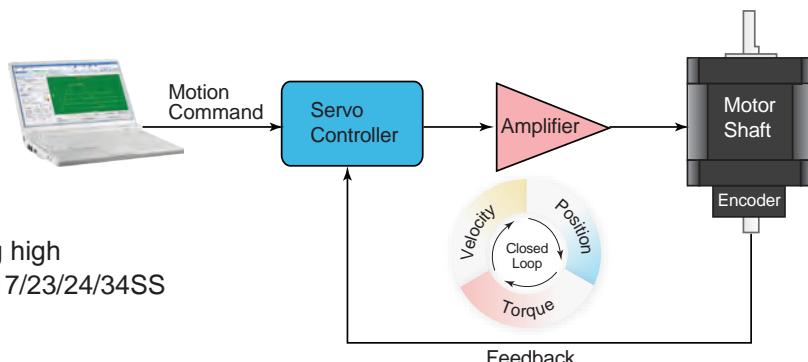- Low vibration, low noise, low heat

EtherCAT®

MOONS'
moving in better ways

The SS-EC is a member of the Step-Servo family equipped with a built-in EtherCAT communication interface. This drive can operate as a standard EtherCAT slave using CANopen over EtherCAT (CoE). It is designed to work with various MOONS' step servo motors.
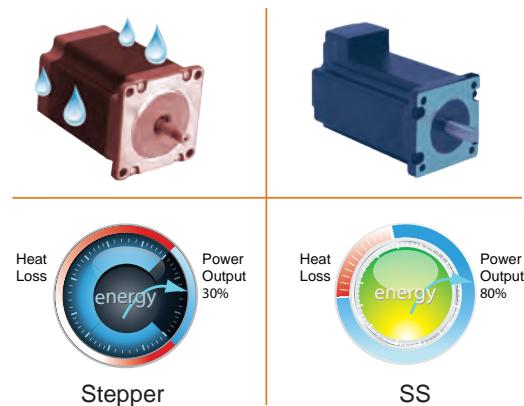
- Programmable, digital step-servo drive and motor package
- Operates from a 24 to 70 volt DC power supply
- CANopen over EtherCAT (CoE) with full support of CiA402. Based on the widely used 100BASE-TX cabling system and with a baud rate of 100Mbps full-duplex, EtherCAT enables high speed and highly reliable communication.
- Supported modes: Profile Position, Profile Velocity, Profile Torque, Cyclic Synchronous Position, Cyclic Synchronous Velocity and Homing; as well as MOONS' own Q mode
- Dual port EtherCAT communication
- USB port for configuration
- Encoder resolution: 20000 counts/rev for AM17/23/24/34SS motor, 4096 counts/rev for AM11SS motor
- SS03-EC output current: continuous 3A, boost 4.5A
- SS05-EC output current: continuous 5A, boost 7.5A
- SS10-EC output current: continuous 10A, boost 15A
- 8 optically isolated digital inputs, 5-24VDC high level voltage
- 4 optically isolated digital outputs, max 30V/100mA sink or source current
- 2 analog inputs, can be configured to 0-5V, 0-10V, ±5V or ±10V signal ranges
- Differential encoder signal output (AOUT+/-, BOUT+/-, ZOUT+/-), 26C31 line driver, 20mA sink or source current
- Auxiliary power supply for keep alive operation
- Front panel with 4 keys and 5 digital LED display for setting parameters
- STO function (Safe Torque Off)

■ Closed Loop

- Very tight position and velocity control for the most demanding applications.
- Robust servo loops that tolerate wide fluctuation in load inertia and frictional loading.
- Precise positioning to within ±1 count using high resolution encoder (20000 counts/rev for AM17/23/24/34SS motor, 4096 counts/rev for AM11SS motor).
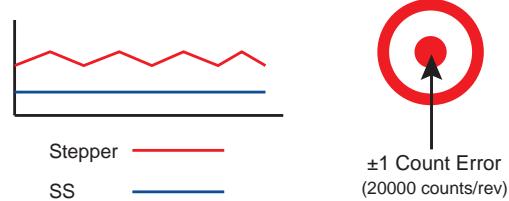
Motion Command → Servo Controller → Amplifier → Motor Shaft

Encoder

Closed Loop: Velocity, Position, Torque

Feedback

■ Low Heating/High Efficiency

Heat Loss — energy — Power Output 30%
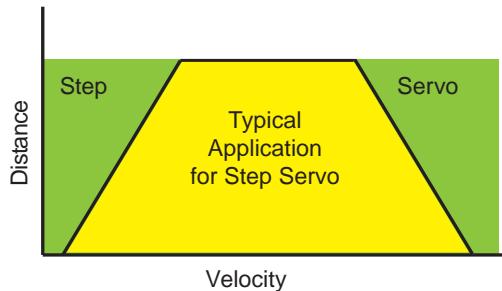
Stepper

Heat Loss — energy — Power Output 80%

SS

- The SS-EC uses only the current required by the application, generating minimum heat output.
- When the motor is not moving, the current can be nearly zero resulting in extremely low heat output.
- Being able to use almost 100% of the available torque allows for more efficient operation and may allow a smaller motor size.

■ Smooth & Accurate

• Space vector current control with a high resolution encoder gives smooth and quiet operation, especially at low speeds - a feature not found with traditional steppers motors.

• High stiffness due to the nature of the stepper motor combined with the highly responsive servo control results in accurate position control both while running and when standing still.

Stepper ————

SS ————

±1 Count Error
(20000 counts/rev)

■ Fast Response

Distance

Step

Typical Application for Step Servo

Servo

Velocity

• When performing fast point-to-point moves, the high torque output and advanced servo control provides a very responsive system far exceeding what can be done with a conventional stepper system.
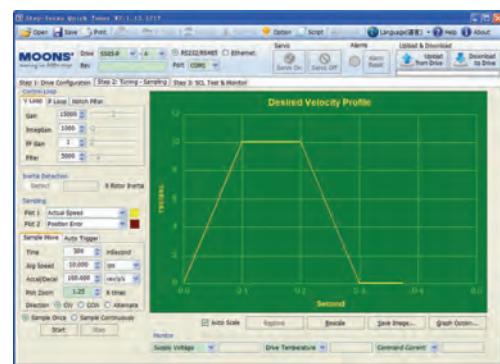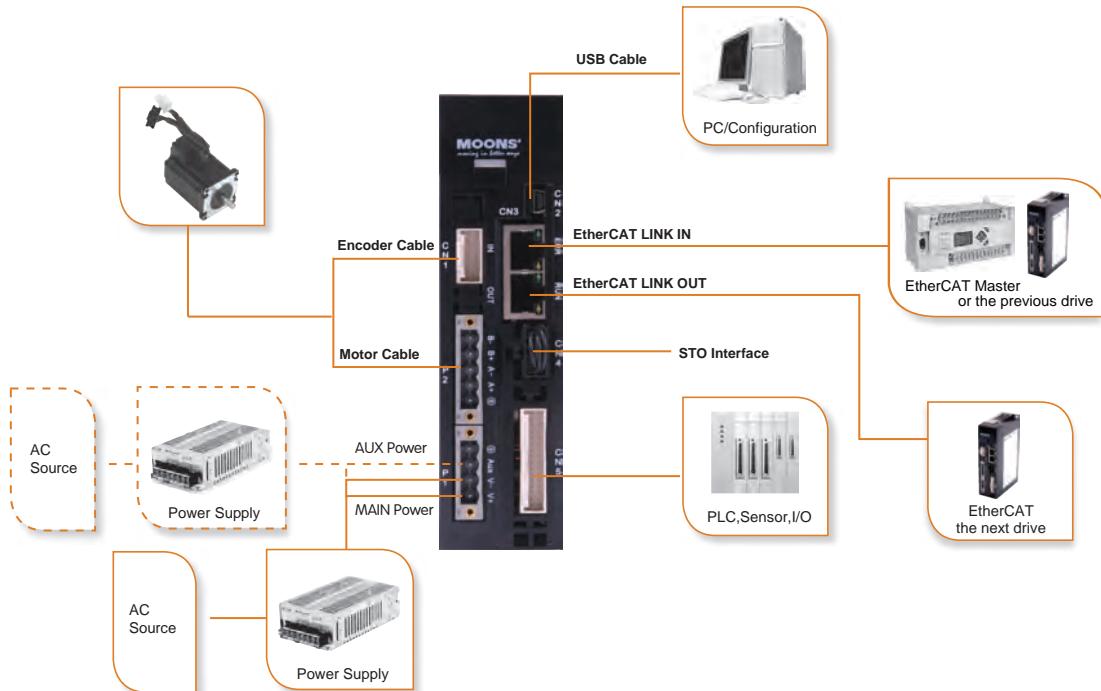
■ High Torque

• Because the *Step-Servo* operates in full servo mode, all the available torque of the motor can be used.

• The motor can provide as much as 50% more torque in many applications. High torque capability often eliminates the need for gear reduction.

• Boost torque capability can provide as much as 50% more torque for short, quick moves.

150% Boost

100% Continuous

70%

Stepper

Rated Torque

SS
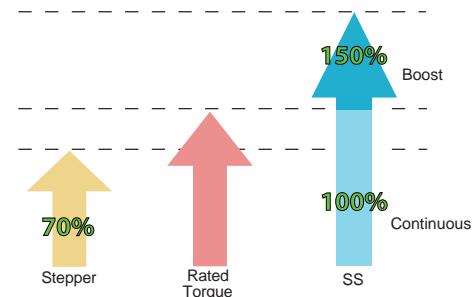
■ Motion Monitoring

• For difficult control situations where performing a precise move is necessary, the *Step-Servo* Quick Tuner software provides an easy to use interface for performing and monitoring the motion profile.

• Many common parameters such as Actual Speed or Position Error can be monitored to evaluate system performance.

• The monitoring is interactive with the servo tuning capability so that optimum performance can be achieved.

USB Cable

PC/Configuration

Encoder Cable

EtherCAT LINK IN

EtherCAT LINK OUT

EtherCAT Master
or the previous drive

Motor Cable

STO Interface

AC Source

AUX Power

Power Supply

MAIN Power

PLC,Sensor,I/O

EtherCAT
the next drive

AC Source

Power Supply

■ Specifications

Power Amplifier	
Amplifier Type	Dual H-Bridge, 4 Quadrant
Current Control	4 state PWM at 20 KHz
Output Current	SS03 Maximum continuous current 3A, boost current 4.5A (for 1.5s) Drive auto-set the current limitation according to the attached motor
	SS05 Maximum continuous current 5A, boost current 7.5A (for 1.5s) Drive auto-set the current limitation according to the attached motor
	SS10 Maximum continuous current 10A, boost current 15A (for 1.5s) Drive auto-set the current limitation according to the attached motor
Power Supply	External 24 - 70 volt DC power supply required Absolute maximum input voltage range 18 - 75 VDC
Auxiliary Power Supply	External 12 - 48 volt DC power supply required
Protection	Over-voltage, under-voltage, over-temp, over-current, short circuit
Controller	
Micro-step Resolution	Software selectable from 200 to 51200 steps/rev in increments of 2 steps/rev
Encoder Resolution	20000 counts/rev for AM17/23/24/34SS motor; 4096 counts/rev for AM11SS motor
Speed Range	Speeds up to 3600 rpm
Filters	Programmable hardware digital noise filter, software noise filter, smoothing filter, PID filter, notch filter
Non-Volatile Storage	Configurations are saved in FLASH memory on-board the DSP
Supported Protocol	CoE (CiA 402 Drive profile)
Supported Modes	Profile Position, Profile Velocity, Profile Torque, Cyclic Synchronous Position, Cyclic Synchronous Velocity, Homing and MOONS' own Q mode
Synchronization	SM Event, DC SYNC Event
Digital Inputs	X1, X2, X3, X4: optically isolated, differential, 5-24VDC, minimum pulse width 250ns, maximum pulse frequency 2MHz X5, X6, X7, X8: optically isolated, single-ended input, 5 - 24 volts
Digital Output	Y1, Y2, Y3, Y4: optically isolated, open collector, 30 volts, 100 mA max, maximum pulse frequency 10 KHz
Analog Input	AIN1, AIN2: individually single-ended or together differential Input resolution 12-bit, software configured as 0-5 volts, 0-10 volts, ±5 volts or ±10 volts (AIN referenced to GND)
+5V Supply Output	+4.8 - 5 volts @ 100mA maximum
Communication	EtherCAT and mini USB for configuration
Environment	
Ambient Temperature	0 - 40°C (32 - 104°F) when mounted to a suitable heatsink
Humidity	90% non-condensing

■ Dimensions

👆 Visit www.moonsindustries.com for 3D drawings

• Motor   unit: mm

AM11SS
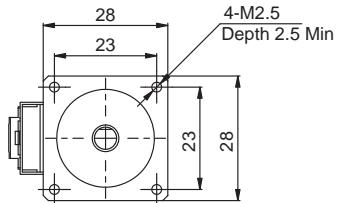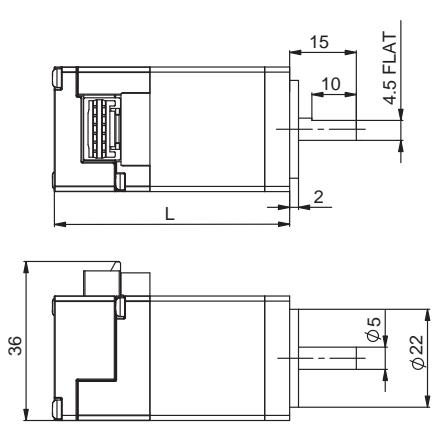
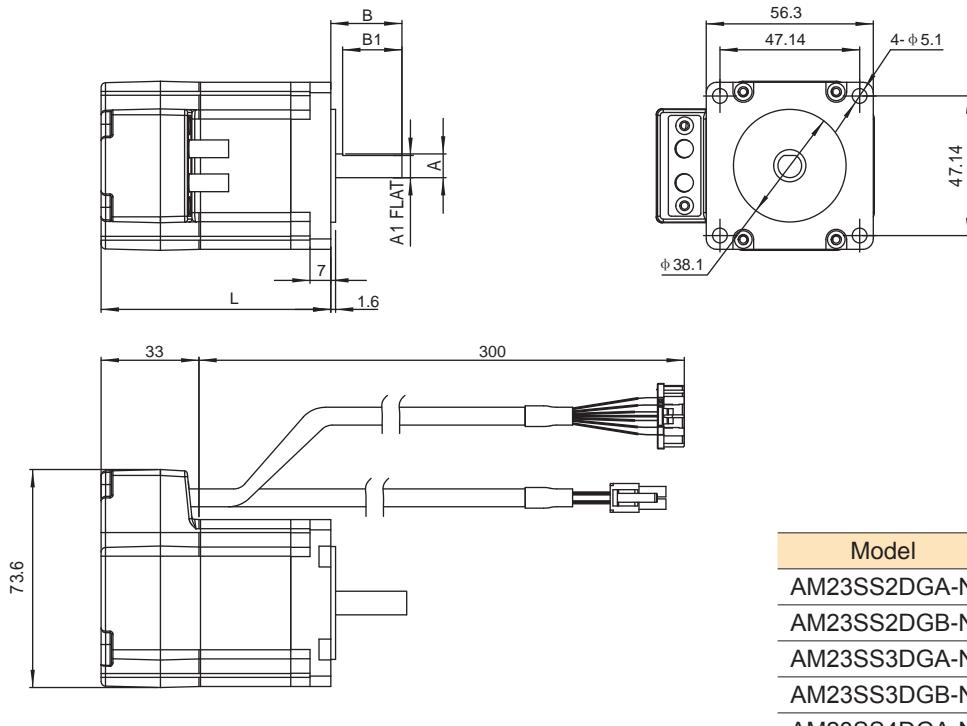| Model	L
AM11SS1DMA	43.8
AM11SS2DMA	52.9
AM11SS3DMA	64.1

AM17SS-N
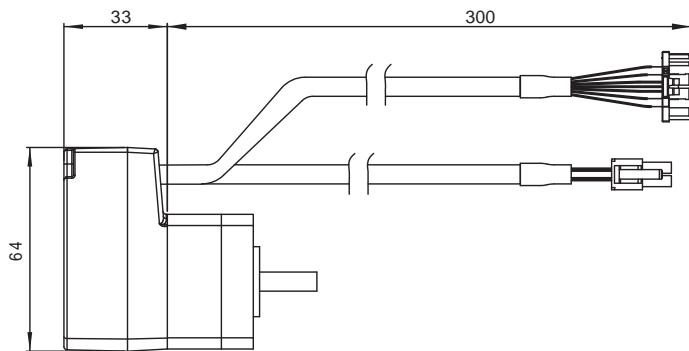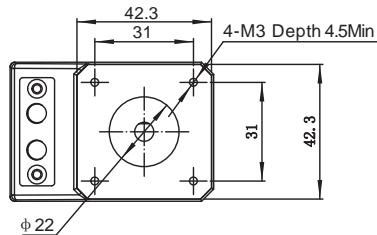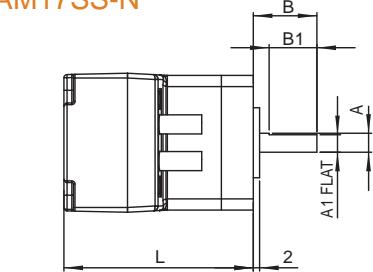
Model	A	A1	B	B1	L
AM17SS1DGA-N	φ6	5.5	20	15	59.5
AM17SS1DGB-N	φ5	4.5	24	15	59.5
AM17SS2DGA-N	φ6	5.5	20	15	65
AM17SS2DGB-N	φ5	4.5	24	15	65
AM17SS3DGA-N	φ6	5.5	20	15	73.5
AM17SS3DGB-N	φ5	4.5	24	15	73.5
AM17SS4DGA-N	φ6	5.5	20	15	89
AM17SS4DGB-N	φ5	4.5	24	15	89

AM23SS-N

Model	A	A1	B	B1	L
AM23SS2DGA-N	φ8	7.5	24	20	77.5
AM23SS2DGB-N	φ6.35	5.85	20	15	77.5
AM23SS3DGA-N	φ8	7.5	24	20	99.5
AM23SS3DGB-N	φ6.35	5.85	20	15	99.5
AM23SS4DGA-N	φ8	7.5	24	20	102.5

AM24SS-N
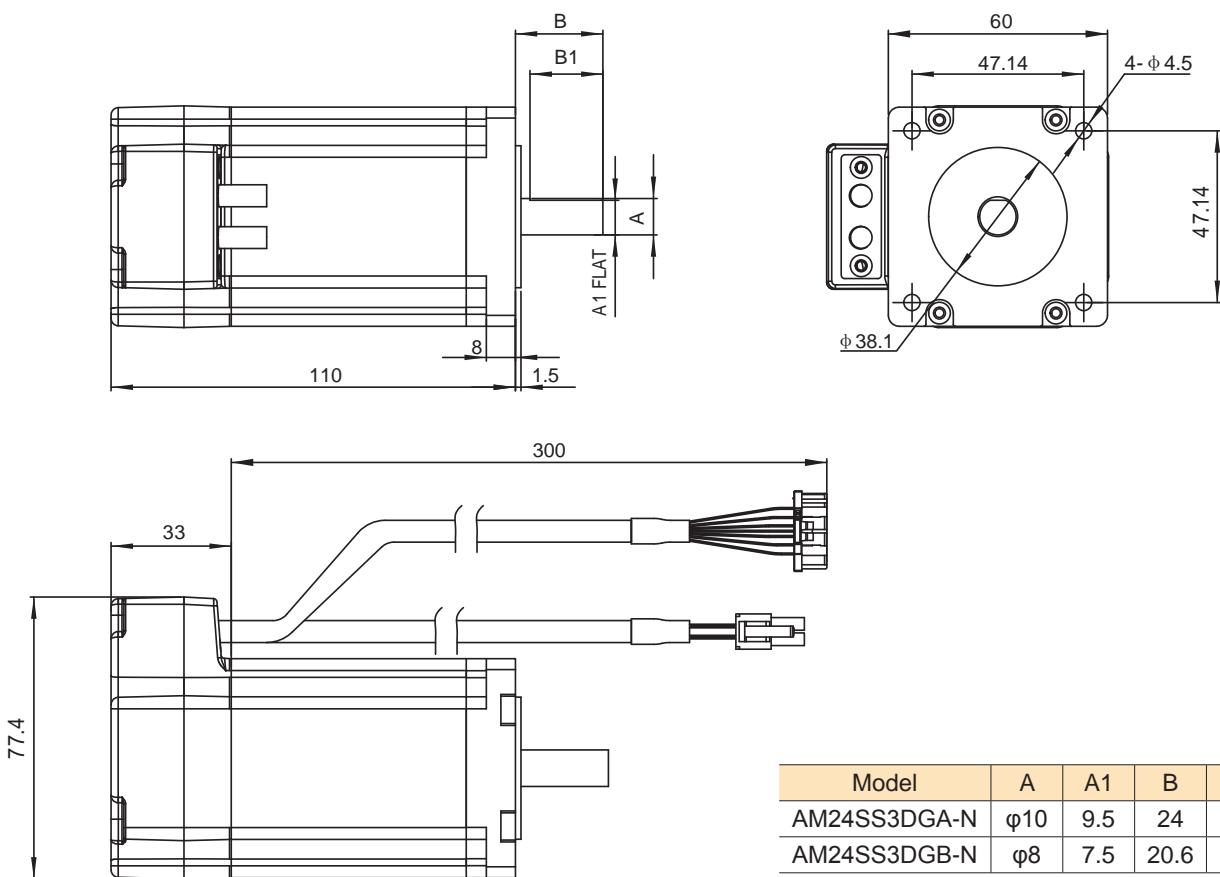
Model	A	A1	B	B1
AM24SS3DGA-N	φ10	9.5	24	20
AM24SS3DGB-N	φ8	7.5	20.6	15

AM34SS-N

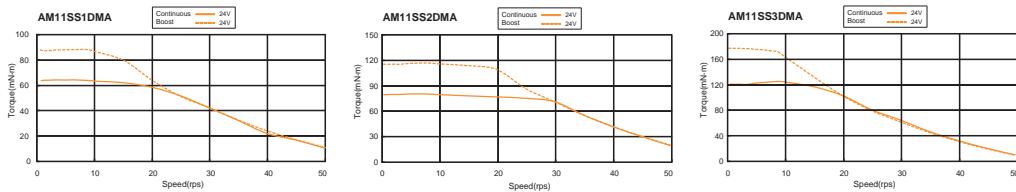| Model	L
AM34SS1DGA-N	88
AM34SS3DGA-N	117.5
AM34SS5DGA-N	147
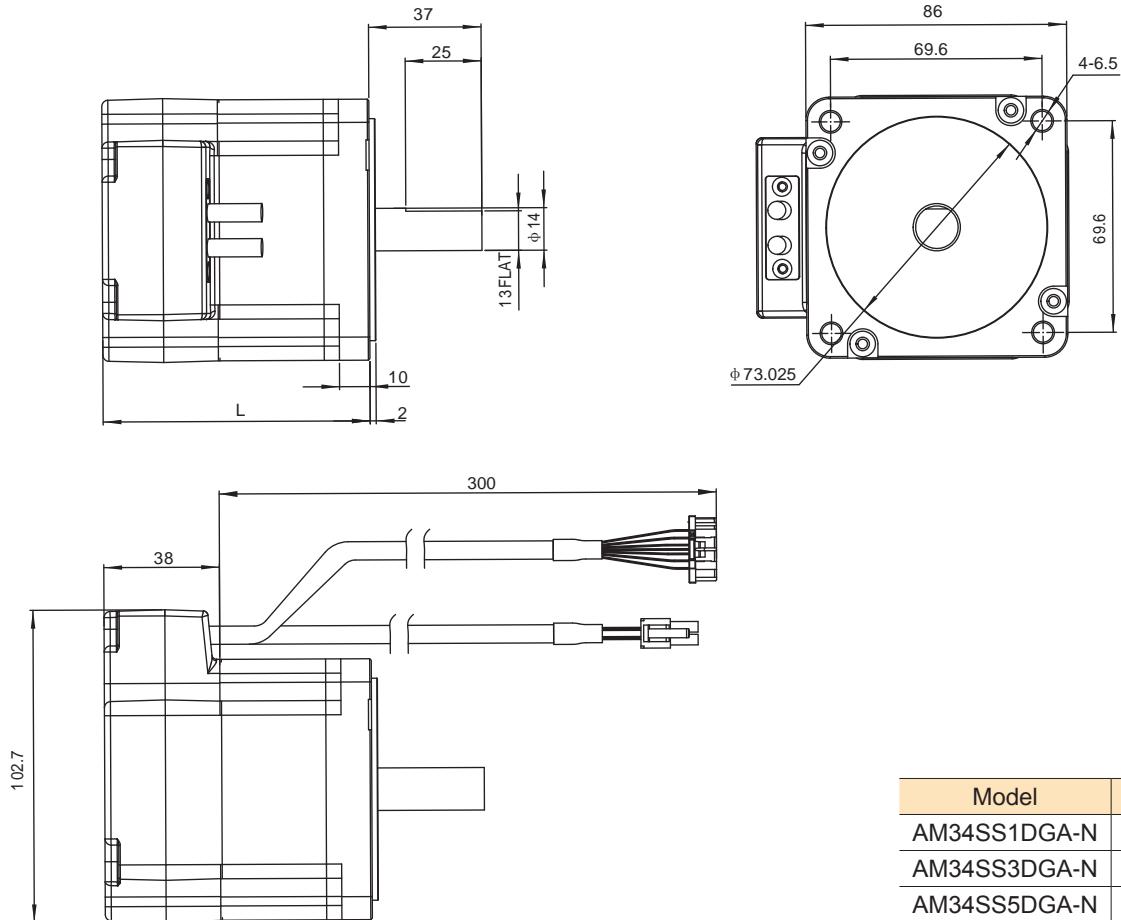
• Drive   unit: mm
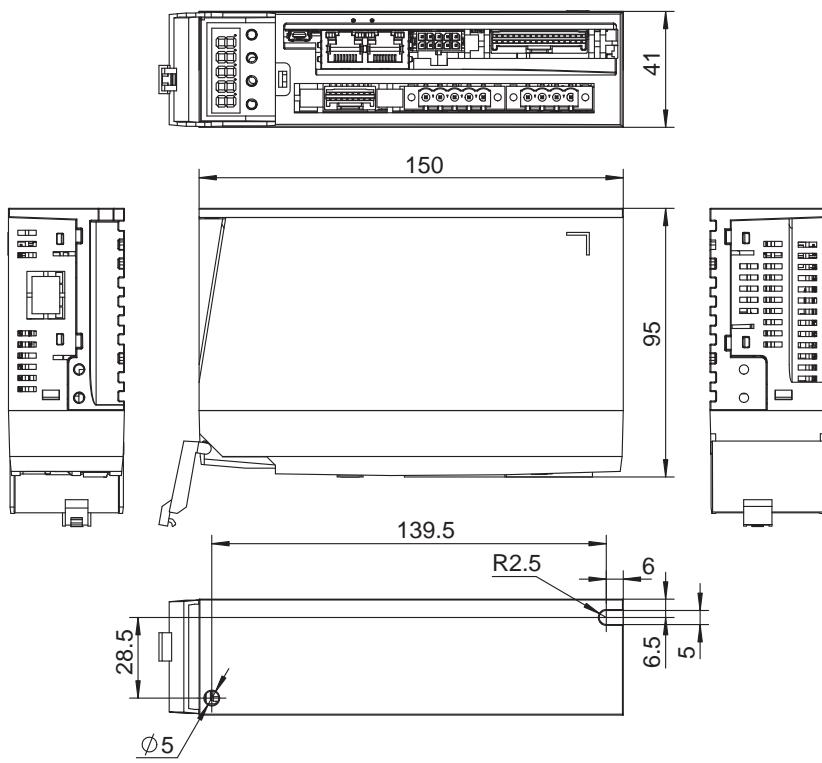
■ Motor Specifications

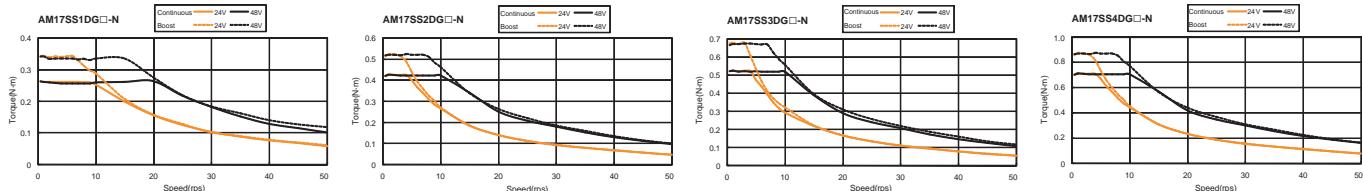| Motor Part Number	Matching Drive	Holding Torque	Rotor Inertia	Encoder Resolution	Maximum Speed	Mass	Frame Size	Permissible Shaft Load (N)					Permissible Thrust Load
								Distance (L) from Shaft End (mm)					
		N•m	g•cm^2	counts/rev	RPM	g		0	5	10	15	20	
AM11SS1DMA		0.065	9			118		20	25	34	52	-	
AM11SS2DMA	SS03-EC-D	0.08	12	4096		168	28mm						
AM11SS3DMA		0.125	18			218							
AM17SS1DG□-N		0.3	38			390		35	44	58	85	-	
AM17SS2DG□-N	SS03-EC-D or SS05-EC-D	0.5	57			440	42mm						
AM17SS3DG□-N		0.6	82			520							Less than the motor mass
AM17SS4DG□-N		0.75	123		3600	760							
AM23SS2DG□-N		0.9	260	20000		850		63	75	95	130	190	
AM23SS3DG□-N	SS05-EC-D	1.5	460			1250	56mm						
AM23SS4DGA-N		2.5	365			840							
AM24SS3DG□-N		2.5	900			1650	60mm	90	100	130	180	270	
AM34SS1DGA-N	SS10-EC-D	3.5	915			2000		260	290	340	390	480	
AM34SS3DGA-N		6.0	1480			3100	86mm						
AM34SS5DGA-N		8.0	2200			4200							

□□A or B, refer to motor part numbering system

• Torque Curves

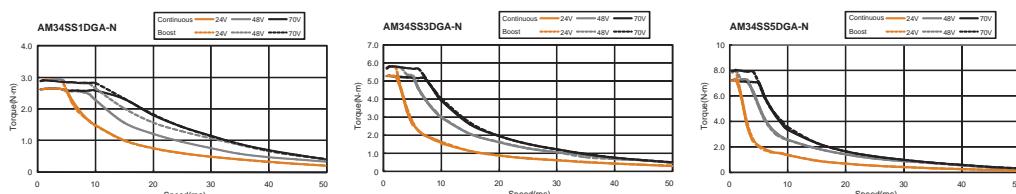**AM11SS Series**

AM17SS Series

AM23SS Series
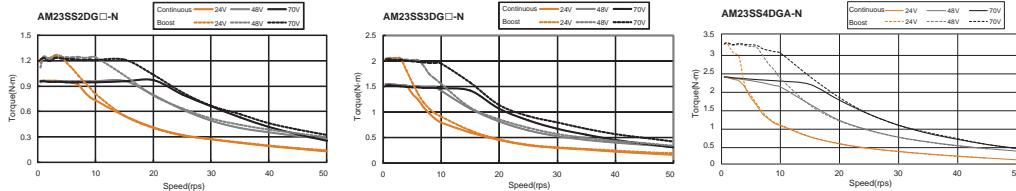
AM24SS Series
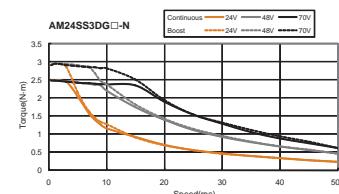
AM34SS Series

■ Numbering System

AM17 SS 1 D G A-N

Frame Size
11,17,23,24,34

Step Servo

Motor Size
1 = 1Stack
2 = 2Stack
3 = 3Stack
4 = 4Stack
5 = 5Stack

D=DC Input

Encoder
G=5000-Line
M=1024-Line

Mechanical Option
A=Output shaft size
11: φ5
17: φ6
23: φ8
24: φ10
34: φ14
B=Output shaft size
17: φ5
23: φ6.35
24: φ8

SS 05 - EC - D

Step Servo

Output Current
03 - 3A
05 - 5A
10 - 10A

EC=EtherCAT

D=Dual-port Ethernet
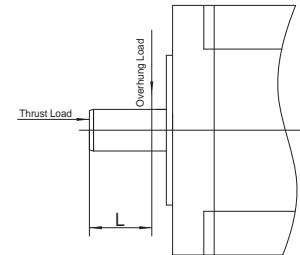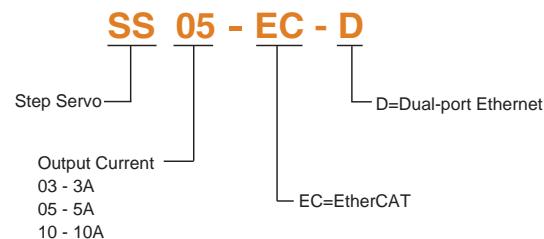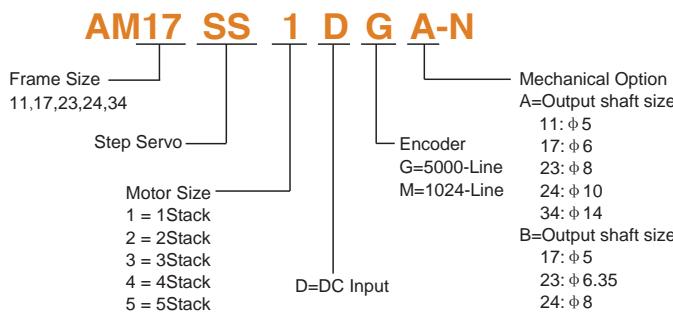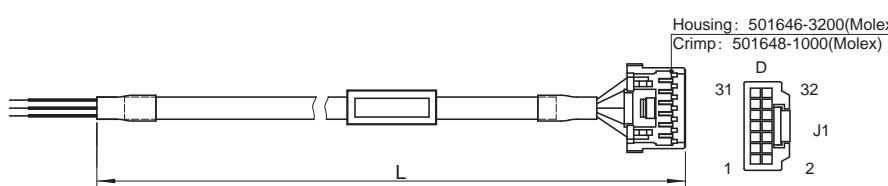
Note: AM17/23/24/34SS motors matching with SS-EC drive have -N suffix
AM11SS motors matching with SS-EC drive DO NOT have -N suffix

## ■ Optional Accessories (Sold separately)

• I/O Cable

Housing： 501646-3200(Molex)
Crimp： 501648-1000(Molex)

P/N	Length (L)
1117-200	2M

Wiring Diagram			
PIN (J1)	Color (Signal)	PIN (J1)	Color (Signal)
1	Blue/White (X1+)	17	NC
2	Blue/Black (X1-)	18	NC
3	Green/White (X2+)	19	Brown/White (Y1+)
4	Green/Black (X2-)	20	Brown/Black (Y1-)
5	Red (X3+)	21	Gray/White (Y2+)
6	Orange (X3-)	22	Gray/Black (Y2-)
7	Blue (X4+)	23	Purple/White (Y3+)
8	Purple (X4-)	24	Purple/Black (Y3-)
9	Yellow (X5)	25	Pink (Y4+)
10	Green (X6)	26	Yellow/Green (Y4-)
11	Brown (X7)	27	Red/White (AOUT+)
12	Gray (X8)	28	Red/Black (AOUT-)
13	Shield	29	Orange/White (BOUT+)
14	White (XCOM)	30	Orange/Black (BOUT-)
15	Black (GND)	31	Yellow/White (ZOUT+)
16	NC	32	Yellow/Black (ZOUT-)

• Motor Extension Cable between SS-EC drive and AM11SS motor

Housing: 51065-0600(Molex)
Crimp: 50212-8000(Molex)
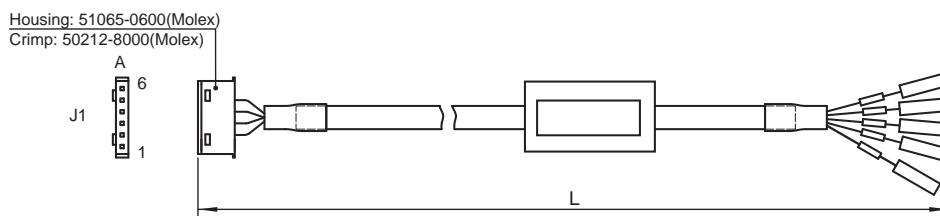
P/N	Length (L)
1127-100	1M
1127-300	3M
1127-500	5M
1127-1000	10M

Wiring Diagram	
PIN (J1)	Color (Signal)
1	Blue (B-)
3	Red (B+)
4	Green (A-)
6	Black (A+)

• Motor Extension Cable between SS-EC drive and AM17/23/24/34SS-N motor

Housing: 39-01-3049(Molex)
Crimp: 39-00-0040(Molex)
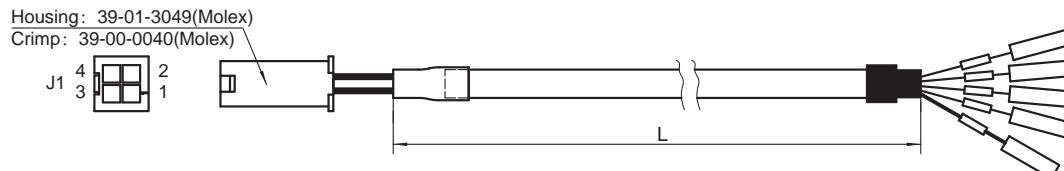
P/N	Length (L)
1114-100	1M
1114-300	3M
1114-500	5M
1114-1000	10M

Wiring Diagram	
PIN (J1)	Color (Signal)
1	Blue (B-)
2	Red (B+)
3	Green (A-)
4	Black (A+)

• Encoder Extension Cable between SS-EC drive and AM11SS Motor

Housing: 501646-1200(Molex)
Crimp: 501648-1000(Molex)

Housing: 501646-1600(Molex)
Crimp: 501648-1000(Molex)
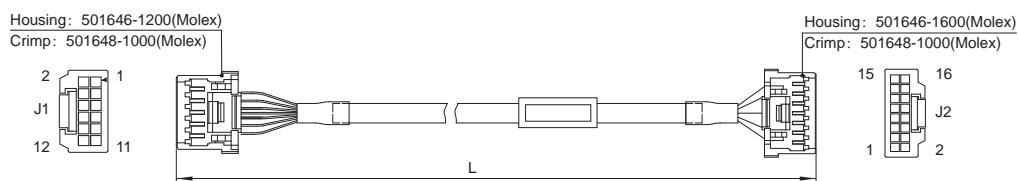
P/N	Length (L)
2118-100	1M
2118-300	3M
2118-500	5M
2118-1000	10M

Wiring Diagram					
PIN (J1)	Color (Signal)	PIN (J2)	PIN (J1)	Color (Signal)	PIN (J2)
10	Blue (A+)	1		Brown (U+)	
9	Blue/Black (A-)	2		Brown/Black (U-)	
8	Green (B+)	3		Gray (V+)	
7	Green/Black (B-)	4		Gray/Black (V-)	
6	Yellow (Z+)	5	1	White (W+)	15
5	Yellow/Black (Z-)	6	2	White/Black (W-)	16
3	Red (+5V)	7	12	Shield	10
4	Black (GND)	8			

- Encoder Extension Cable between SS-EC drive and AM17/23/24/34SS-N Motor

Housing: 1-1903130-0(TYCO)
Crimp: 1903120-1(TYCO)

Housing: 501646-1600(Molex)
Crimp: 501648-1000(Molex)
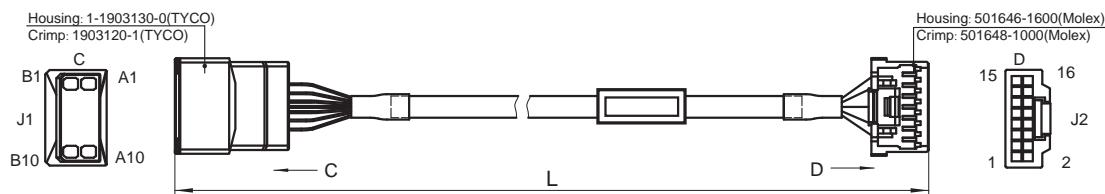
P/N	Length (L)
2117-100	1M
2117-300	3M
2117-500	5M
2117-1000	10M

Wiring Diagram					
PIN (J1)	Color (Signal)	PIN (J2)	PIN (J1)	Color (Signal)	PIN (J2)
A9	Blue (A+)	1	B5	Shield	10
B9	Blue/Black (A-)	2	A4	Brown (U+)	11
A8	Green (B+)	3	B4	Brown/Black (U-)	12
B8	Green/Black (B-)	4	A3	Gray (V+)	13
A7	Yellow (Z+)	5	B3	Gray/Black (V-)	14
B7	Yellow/Black (Z-)	6	A2	White (W+)	15
A6	Red (+5V)	7	B2	White (W+)	16
B6	Black (GND)	8			

- USB Cable

P/N	Length (L)
2620-150	1.5M
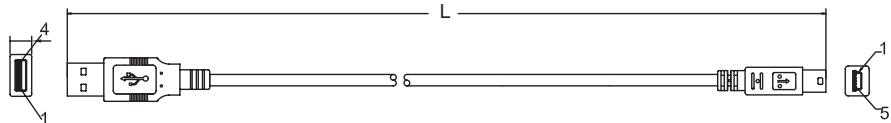
- Network Cable

Common Type	Shielded Type	Length (L)
2012-030 *	2013-030	0.3M
2012-300	2013-300	3M

* 2012-030 is included in the drive package.
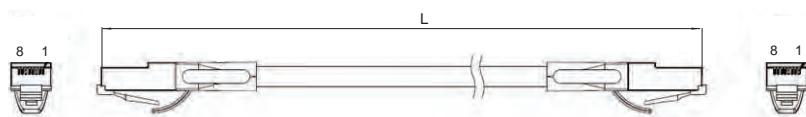
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Fax: +86 (0)25 52785485

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Jiangdong District, Ningbo, 315040 P.R. China
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Fax: +86 (0)574 87052365

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Fax: +86 (0)20 38103661

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APPLIED MOTION PRODUCTS, INC.
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Tel: +1 831 7616555
Fax: +1 831 7616544

LIN ENGINEERING, INC.
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