

# ACS ACTUATOR CONTROL SOLUTIONS

## SERVO DRIVE AND MOTORS

## STEPPER DRIVE AND MOTORS



EtherNet/IP™  Modbus

**LINEAR SOLUTIONS MADE EASY**

# ACS – Actuator Control Solutions

## WHAT IS THE ACS?

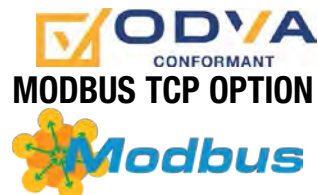
The ACS is an extremely easy-to-use servo or stepper drive & controller developed specifically to be used with electric actuators. Simply select the configured Tolomatic actuator in the software to automatically set-up most of the necessary parameters to create motion in the desired linear units (mm or inch).

## BASIC CAPABILITIES:

- Operation Modes
  - » 4, 8, or 16 configurable move commands (absolute, incremental, jog, or home move types) with motion commanded via digital inputs.
  - » Analog input positioning mode (0-10Vdc or 4-20mA)
  - » Pneumatic mode replaces pneumatic valve operation for simple motion
  - » Modbus RTU over RS485 provides infinite positioning
- Adjustable motion profile parameters. Position, velocity, accel, decel, force parameters are Independently configurable for up to 16 moves.
- Force limiting
- Zone output based on position
- Configurable digital I/O (24Vdc Opto-Isolated, sourcing or sinking)
- Ability to reduce holding current for energy savings [Stepper]
- Compatible with most 24Vdc 2-phase stepper motors [Stepper]
- Brake output

## ETHERNET/IP EtherNet/IP™ OPTION

- Infinite positioning with EtherNet/IP CIP I/O commands
- Dual port with internal switch for daisy chaining
- Analog output echoing actuator position
- ODVA Conformant



- Infinite positioning with Modbus TCP commands
- Dual port with internal switch for daisy chaining
- Analog output echoing actuator position

## Motors

### SERVO

- NEMA23 & NEMA34

### STEPPER

- NEMA11, NEMA17, NEMA23 & NEMA34



# ACS – Features

**ETHERNET (OPTION)**

Protocols:  
 • EtherNet/IP • Modbus TCP

**DUAL PURPOSE HEAT SINK**

- Removes heat from drive for optimal performance
- Panel mounting

**DIGITAL I/O**

- 8 Digital Inputs
- 4 Digital Outputs
- 24 VDC Opto-Isolated
- Sourcing or Sinking
- Configurable Inputs

**ANALOG I/O**

- 0-10 VDC or 4-20mA
- 1 Analog Input
- 1 Analog Output (optional)

**FEEDBACK**

- For Digital Encoder

**MOTOR POWER**

Servo Drive	Stepper Drive
• 10-60VDC Servo Motors	• 10-52 VDC Stepper Motors
• 10 Arms Continuous / 20 Arms Peak	

**BRAKE OUTPUT**

- Active high/low

**LED INDICATORS**

- Motor Power & Fault indicators

**COM PORT**

- USB Com Port

**RS485 COM PORT**

- Modbus RTU (Base Model)

**ACS POWER**

Servo Drive	Stepper Drive
• 10 - 52 VDC Keep-alive Power	• 10-52 VDC
• 24 VDC Brake Power	• 10-60VDC

## EASY TO USE CONFIGURATION SOFTWARE

**Windows® compliant**

**Digital I/O**

Inputs	Outputs
1 Enable	1 Motion Complete
2 Start Motion	2 Home Complete
3 Home	3 Fault
4 E-Stop	4 Zone
5 Move Select 1 (MS1)	
6 Move Select 2 (MS2)	
7 Move Select 3 (MS3)	
8 Move Select 4 (MS4)	

**Motion Profile**

Position: 4.685 in  
 Velocity: 1.00 in/sec  
 Accel: 100.0 in/sec<sup>2</sup>  
 Decel: 100.0 in/sec<sup>2</sup>  
 Force: 100.0 %

**Drive Status**

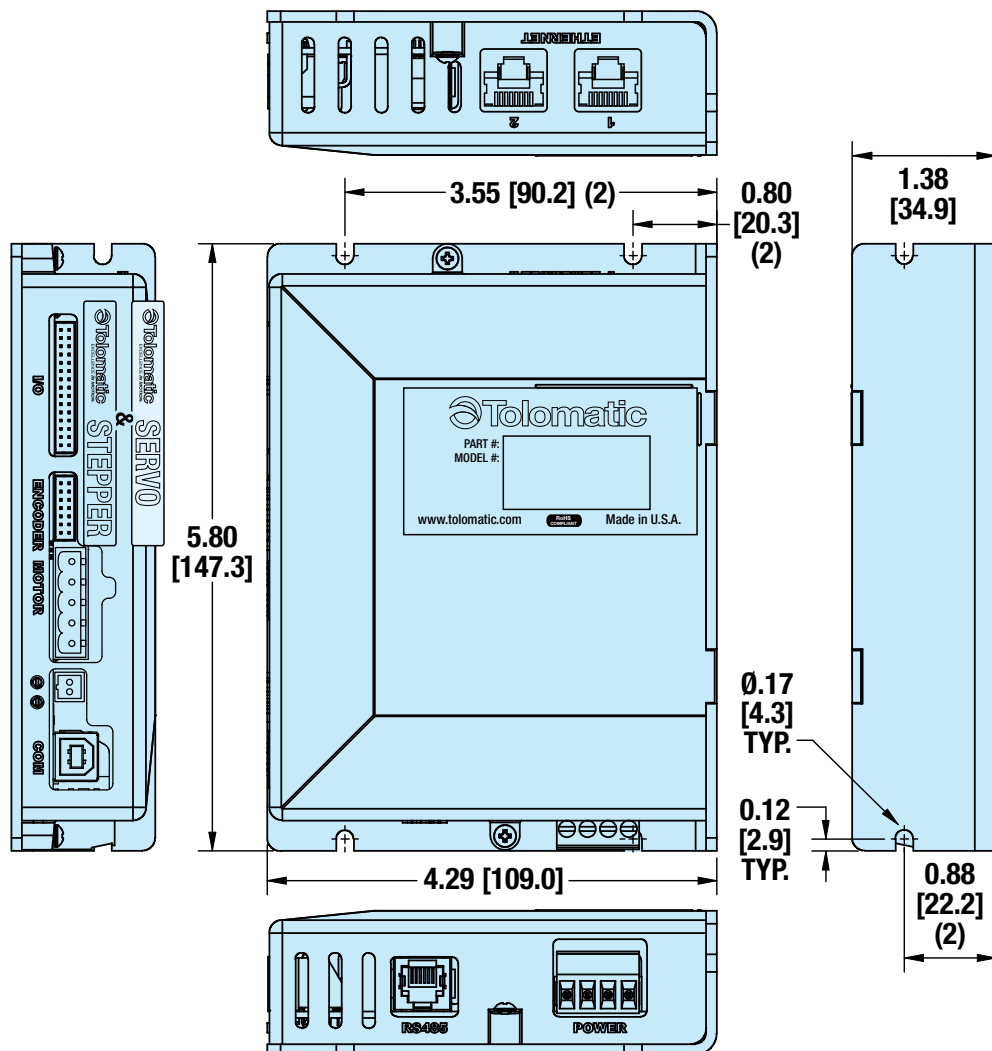
Drive Status	Safety Faults	Critical Faults
• Enabled	• Positive Limit Switch	• Feedback Error
• Homed	• Negative Limit Switch	• Over Current
• Motion Complete	• Software Stop	• Motor Over Temp
• Software Stop	• Position Error	• Drive Over Temp
• Hot in control		• Drive Over Voltage
		• Drive Under Voltage

# ACS – Actuator Control Solutions



**DIMENSIONS** 3D CAD available at [www.tolomatic.com](http://www.tolomatic.com)

## ACS SERVO & STEPPER DRIVE/CONTROLLER DIMENSIONS



## ACS Specifications

### SERVO

DRIVE POWER	
Current - Continuous (Max)	10A
Current - Peak (Max)	20A
Voltage Nominal	10V - 60V
Over Voltage	65V
Under Voltage	9V
Absolute Maximum Voltage	70V
Logic Current Draw (24V)	200 mA

See ACS Hardware and Installation Guide (Servo #3604-4181) for more details.

### OPERATING CONDITIONS

Ambient Temperature	77°F, 25°C Nominal
Operating Temperature	32 - 104°F, 0 - 40°C
Storage Temperature	32-158°F, 0-70°C
Humidity	0 - 90% non-condensing

### STEPPER

DRIVE POWER	
Current - Max	10 Arms
Voltage Nominal	10 - 52V
Over Voltage	55V
Under Voltage	9V
Absolute Maximum Voltage	60V
Logic Current Draw (24V)	200 mA

See ACS Hardware and Installation Guide (Stepper #3604-4183) for more details.

# Servo Motors

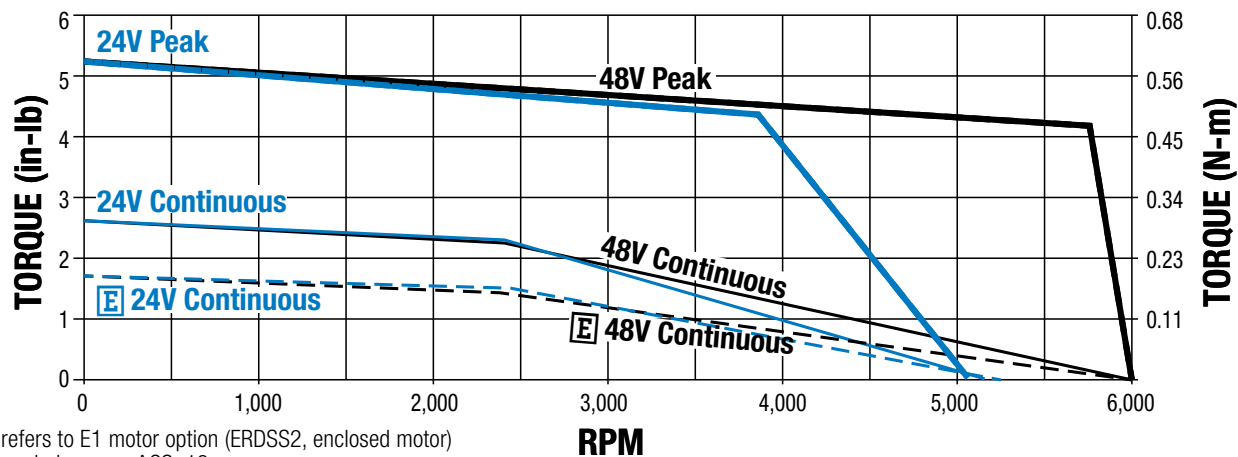
## MOTOR SPECIFICATIONS

	NEMA 23			NEMA 34	
	AMV2C1A1	AMV2C2A1	AMV2C3A1	AMV2D1A1	AMV2D2A1
<b>Continuous Torque</b>	2.63 in-lbs	4.25 in-lbs	4.29 in-lbs	5.9 in-lbs	9.87 in-lbs
<b>Peak Torque</b>	5.25 in-lbs	8.5 in-lbs	13 in-lbs	11.9 in-lbs	21.46 in-lbs
<b>Resistance</b>	0.23 Ohms	0.205 Ohms	0.616 Ohms	0.250 Ohms	0.208 Ohms
<b>Inductance</b>	0.244 mH	0.305 mH	0.915 mH	0.325 mH	0.399 mH
<b>Torque Constant (Kt)</b>	4.824 oz-in/A	8.189 oz-in/A	14.189 oz-in/A	11.068 oz-in/A	18.243 oz-in/A
<b>Back EMF Constant (Ke)</b>	3.570 V/kRPM	6.06 V/kRPM	10.5 V/kRPM	8.190 V/kRPM	13.5 V/kRPM
<b>Max. Continuous Current</b>	10 Amps	10 Amps	3.5 Amps	10 Amps	10 Amps
<b>Max. RPM</b>	6,000 RPM	6,000 RPM	6,000 RPM	5,000 RPM	5,000 RPM
<b>Rotor Inertia</b>	0.001 oz-in-s <sup>2</sup>	0.002 oz-in-s <sup>2</sup>	0.002 oz-in-s <sup>2</sup>	0.01 oz-in-s <sup>2</sup>	0.02 oz-in-s <sup>2</sup>
<b>Motor Poles</b>	8				
<b>Max Case Temp</b>	185°F (85°C)				
<b>Encoder</b>	Differential 500 lines/rev (2000 counts per rev)				

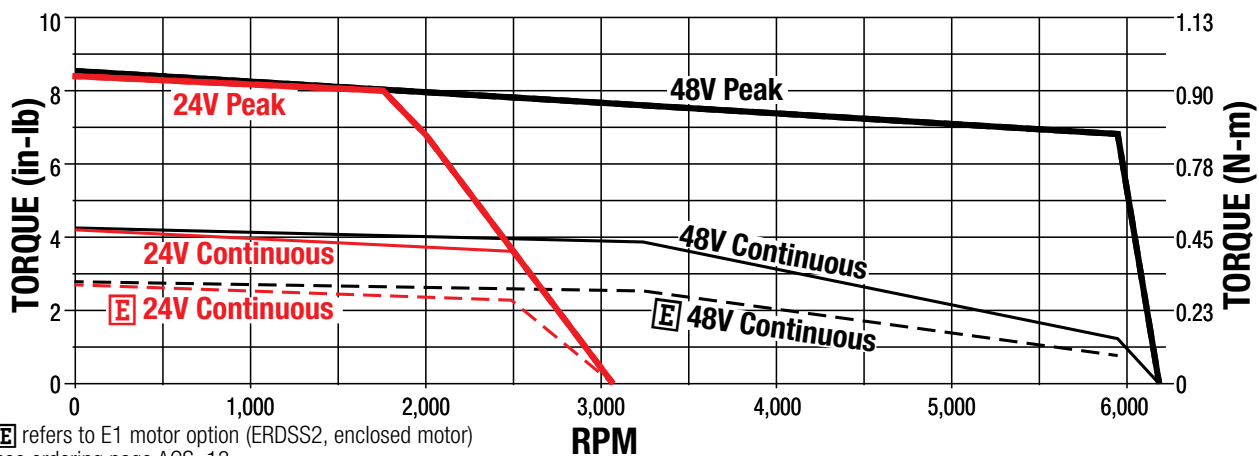
SIZING SOFTWARE  
 AVAILABLE AT WWW.  
 TOLOMATIC.COM  
**ACTUATOR**  
  
**SIZING**

## PERFORMANCE DATA WITH ACS DRIVE/CONTROLLER

### SPEED vs TORQUE - NEMA23 MOTOR, AMV2C1A1



### SPEED vs TORQUE - NEMA23 MOTOR, AMV2C2A1

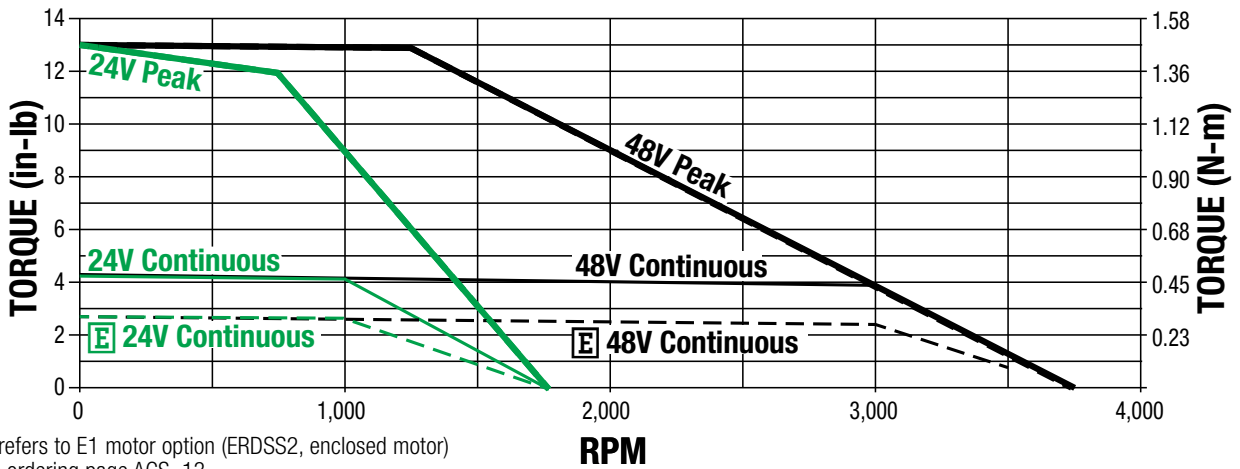


# Servo Motors

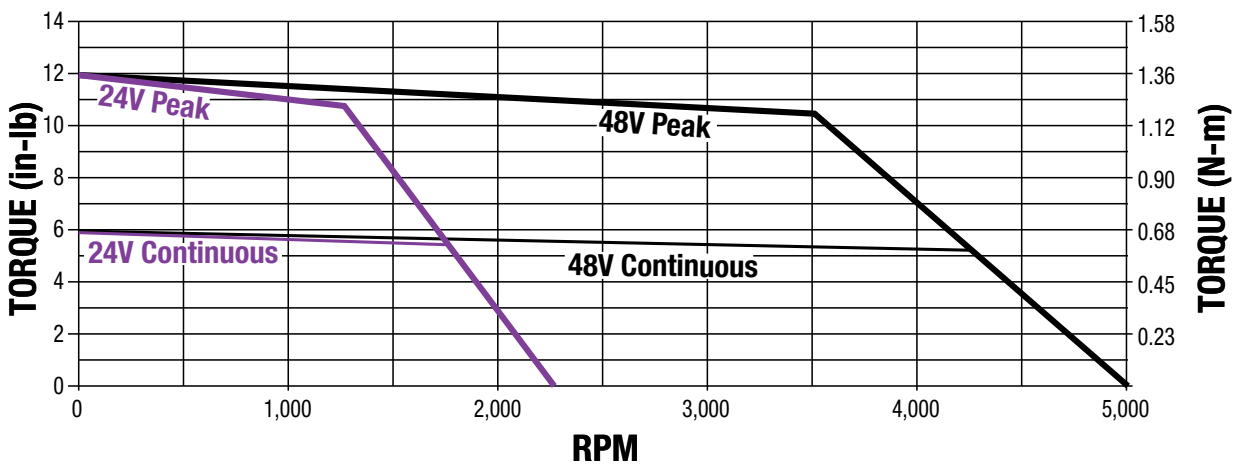
## PERFORMANCE DATA WITH ACS DRIVE/CONTROLLER



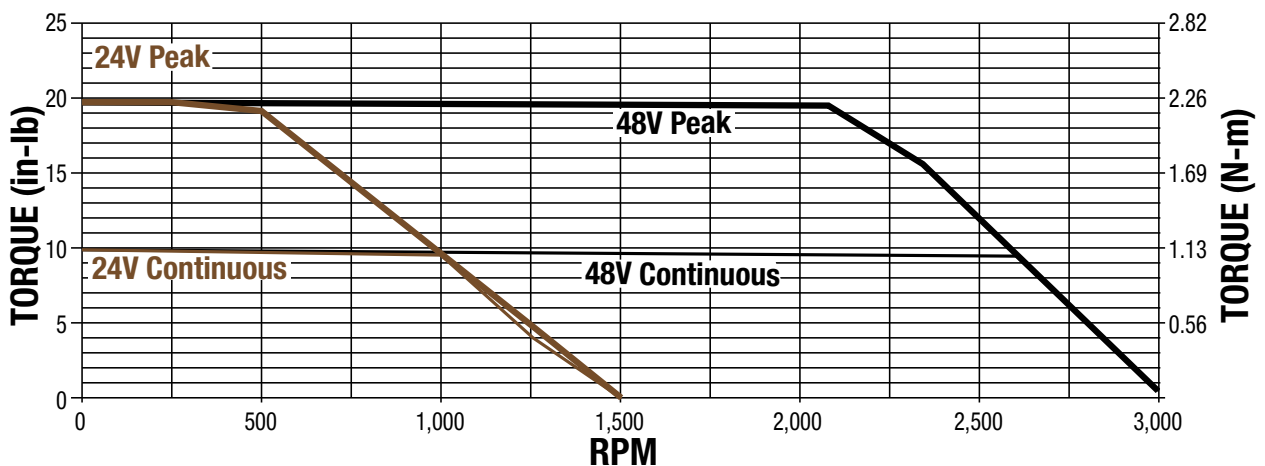
### SPEED vs TORQUE - NEMA23 MOTOR, AMV2C3A1



### SPEED vs TORQUE - NEMA34 MOTOR, AMV2D1A1



### SPEED vs TORQUE - NEMA34 MOTOR, AMV2D2A1



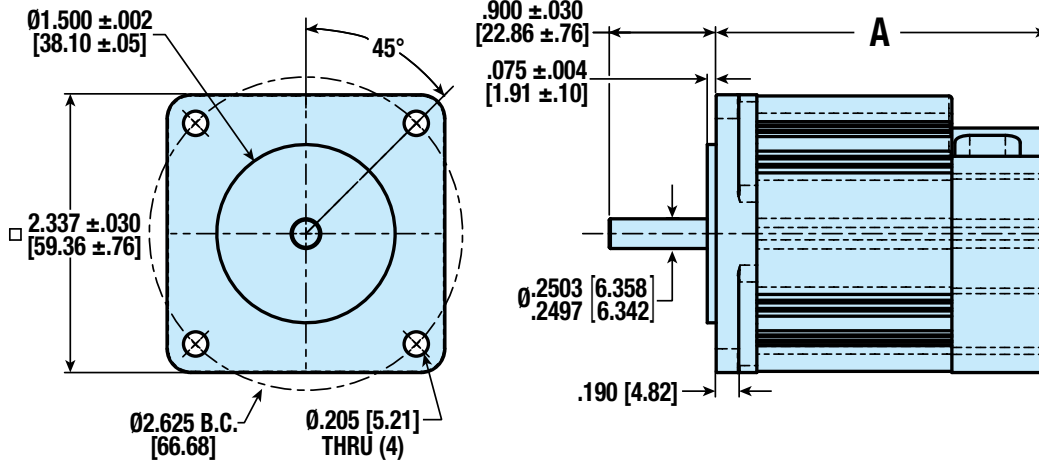
# Servo Motors

## MOTOR DIMENSIONS



3D CAD available at [www.tolomatic.com](http://www.tolomatic.com)

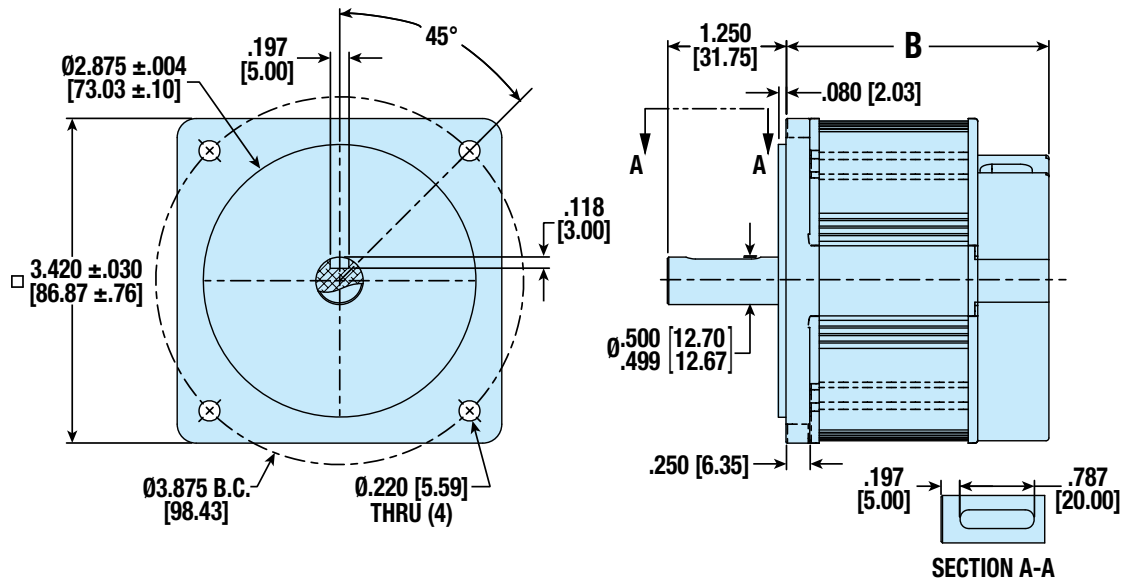
### NEMA23 DIMENSIONS



#### A

2.790" [70.87mm] ± 0.100" [2.54mm]
3.540" [89.92mm] ± 0.100" [2.54mm]
3.540" [89.92mm] ± 0.100" [2.54mm]

### NEMA34 DIMENSIONS



#### B

2.770" [70.36mm] ± 0.100" [2.54mm]
3.510" [89.15mm] ± 0.100" [2.54mm]

# Stepper Motors

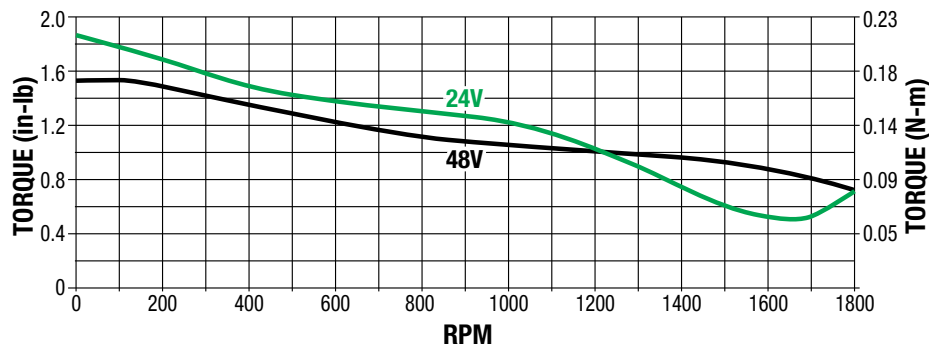


## MOTOR SPECIFICATIONS

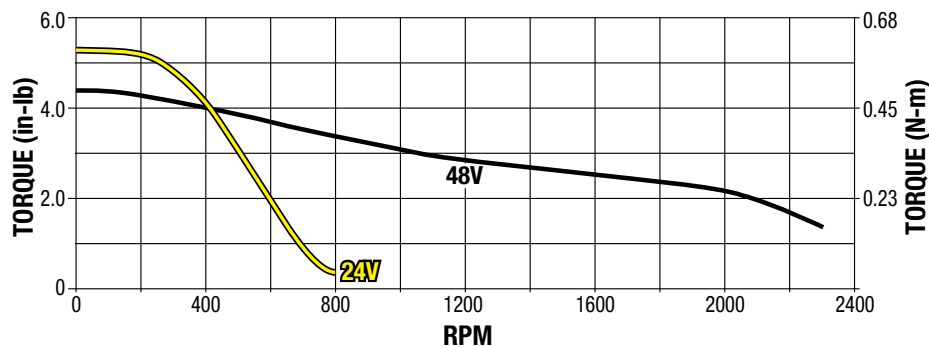
Specifications	Units	NEMA 11	NEMA 17	NEMA 23 1STK	NEMA 23 2STK	NEMA 34 1STK	NEMA 34 2STK
<b>Resistance</b>	(Ohms)	3.5	2.4	1.5	0.39	0.138	0.188
<b>Inductance</b>	(mH)	2.3	4.5	3.7	1.53	1.13	2
<b>Rated Current</b> (Amps-Peak/Phase)		1	1.5	2	5	10	10
<b>Max. Torque</b>	(in-lbs)	1.85	5.26	7.53	13.4	24.3	53
<b>Maximum RPM</b>		1800	2000	1200	2000	2000	1850
<b>Degree per Step</b>		1.8°	1.8°	1.8°	1.8°	1.8°	1.8°
<b>Rotor Inertia</b>	(lb-in <sup>2</sup> )	0.006	0.028	0.075	0.133	0.324	0.546
<b>Motor Type</b>	Bipolar Stepper, 1.8° per Step						
<b>Encoder</b>	Differential; 500 line/rev (2000 count post quad)/rev						

## PERFORMANCE DATA WITH ACS DRIVE/CONTROLLER

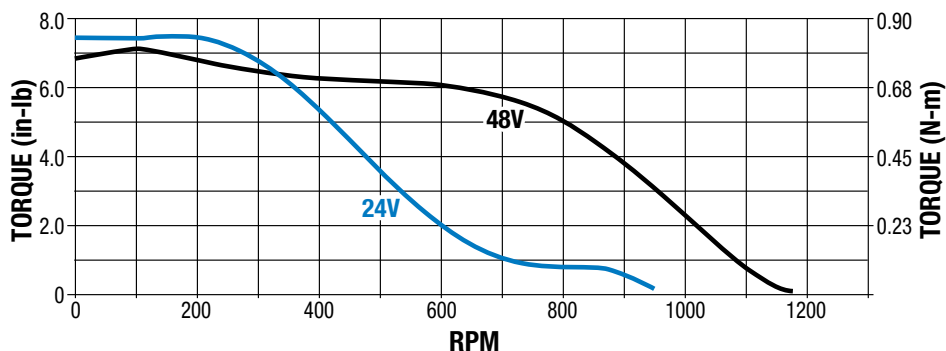
### SPEED vs TORQUE - NEMA11 MOTOR - AMS1A1C1



### SPEED vs TORQUE - NEMA17 MOTOR - AMS1B1C1



### SPEED vs TORQUE - NEMA23 1 STACK MOTOR - AMS1C1C1



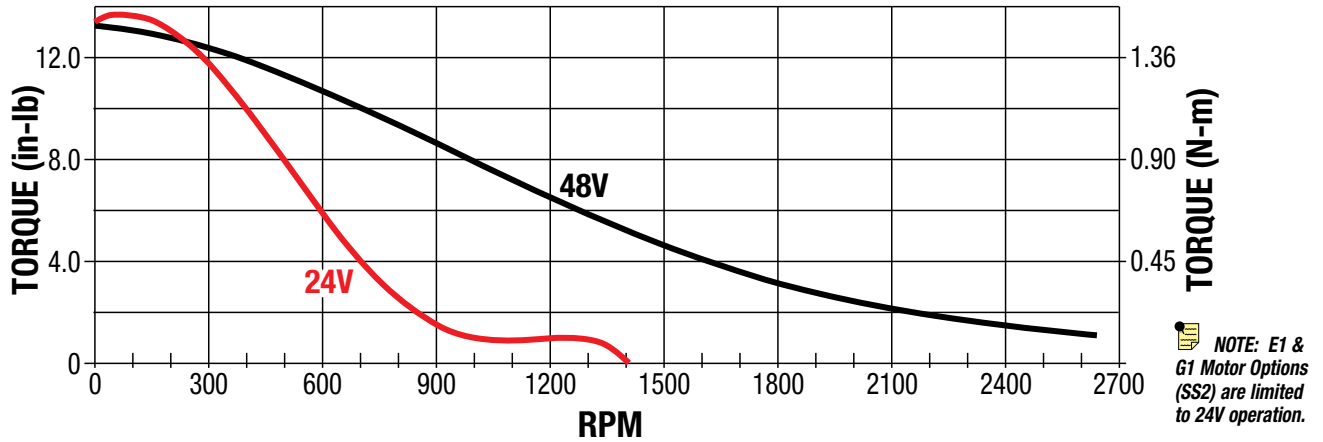
**NOTE:** E1 & G1 Motor Options (SS2) are limited to 24V operation.



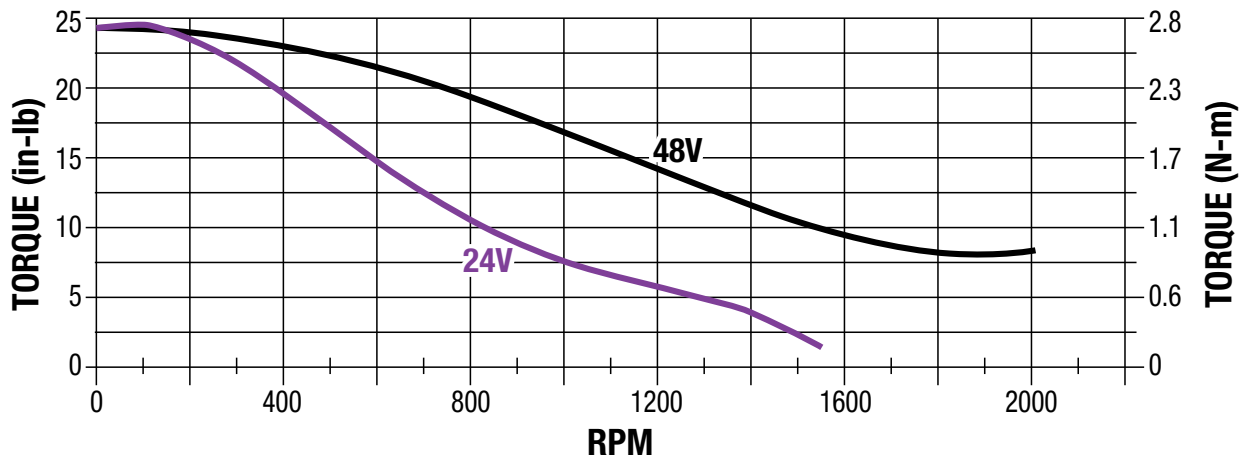
# Stepper Motors

## PERFORMANCE DATA WITH ACS DRIVE/CONTROLLER

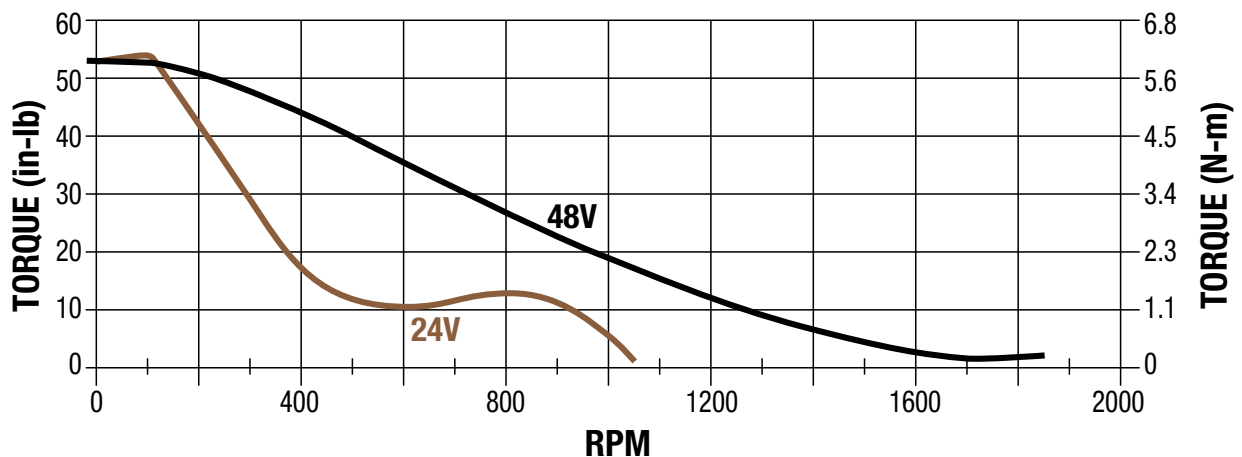
### SPEED vs TORQUE - NEMA23 2 STACK MOTOR - AMS1C2C1



### SPEED vs TORQUE - NEMA34 1 STACK MOTOR - AMS1D1C1



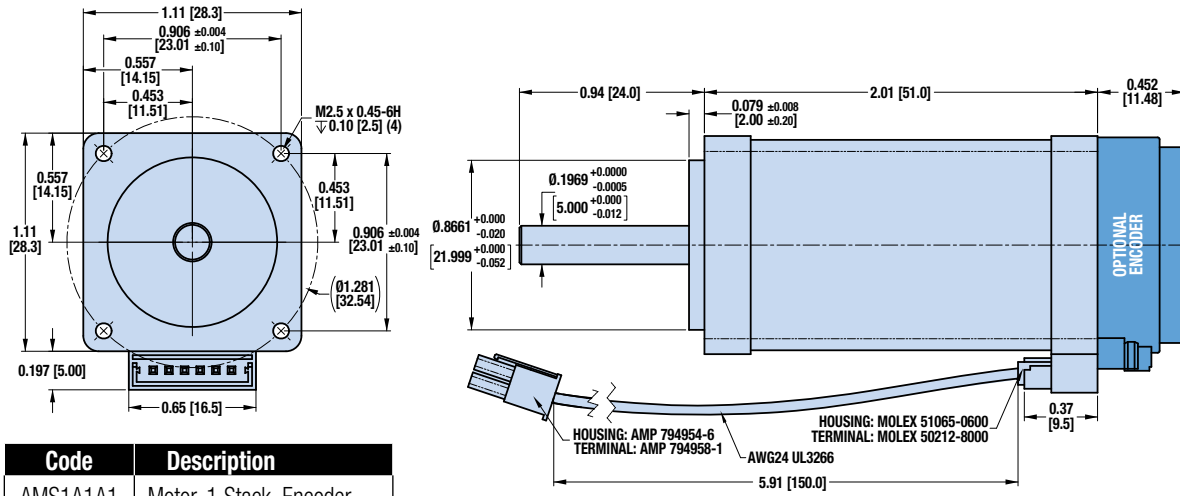
### SPEED vs TORQUE - NEMA34 2 STACK MOTOR - AMS1D2C1



# Stepper Motors

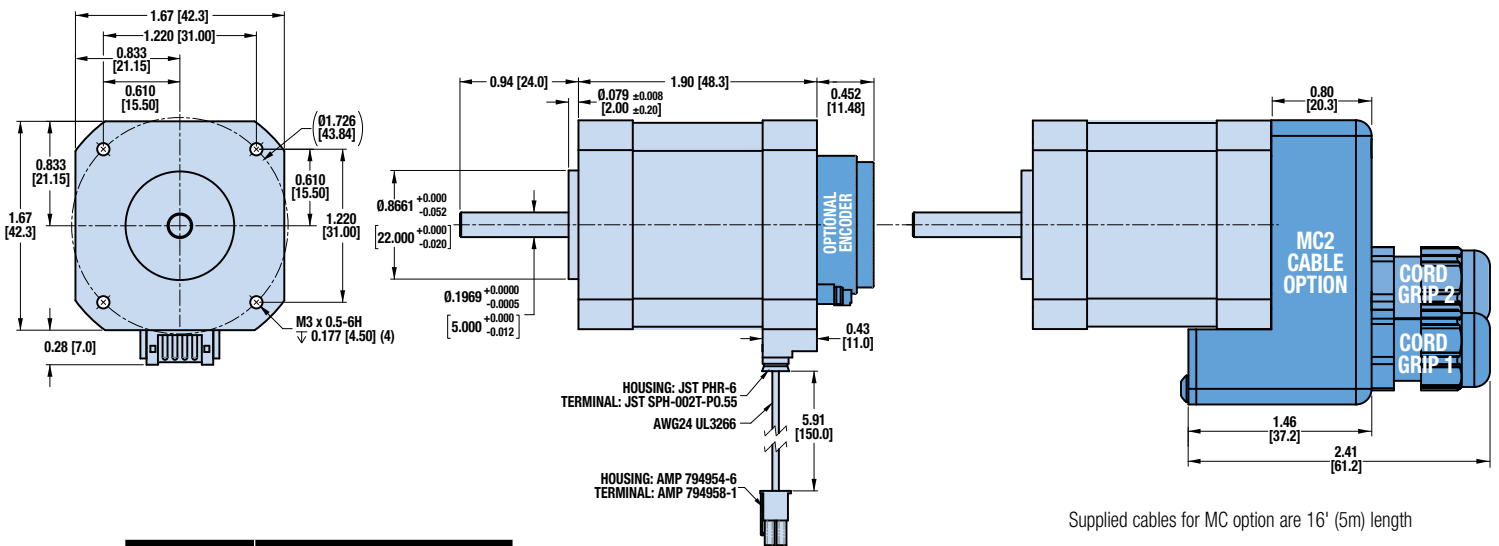
**MOTOR DIMENSIONS**  3D CAD available at [www.tolomatic.com](http://www.tolomatic.com)

## NEMA11 DIMENSIONS



Code	Description
AMS1A1A1	Motor, 1 Stack, Encoder
AMS1A1C1	Motor, 1 Stack, No Encoder

## NEMA17 DIMENSIONS



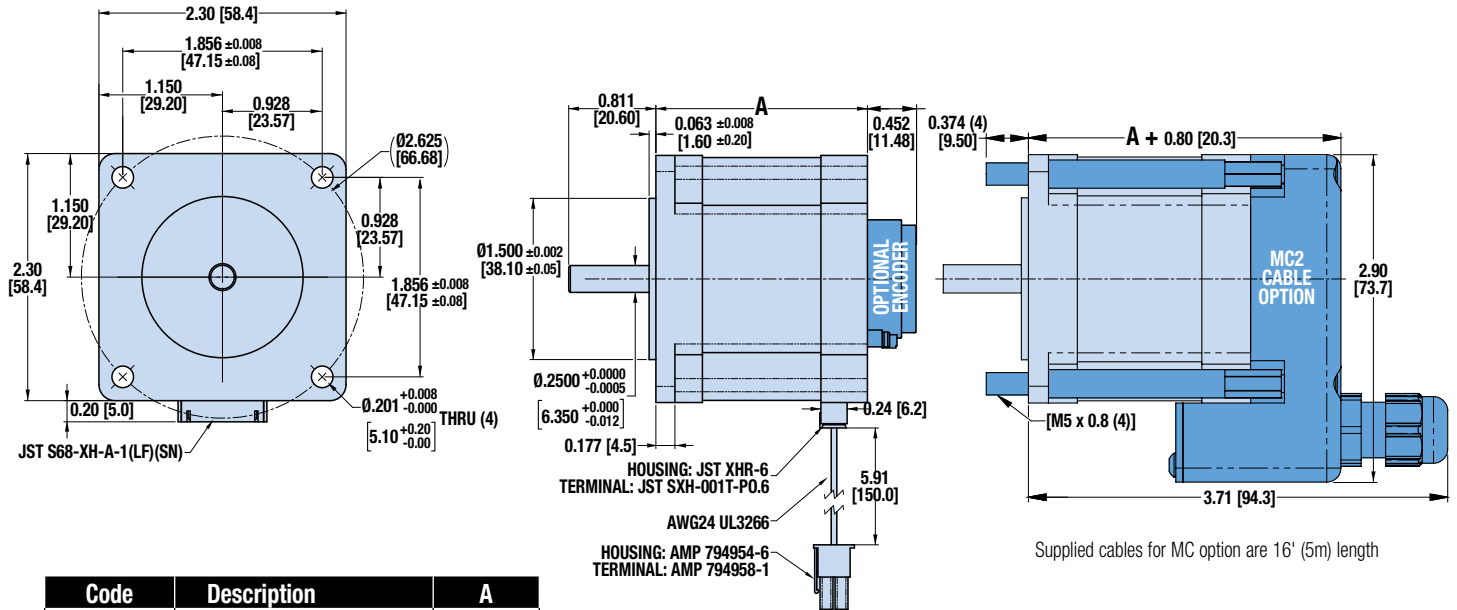
Code	Description
AMS1B1A1	Motor, 1 Stack, Encoder
AMS1B1E1	Motor, 1 Stack, Encoder
AMS1B1C1	Motor, 1 Stack, No Encoder
AMS1B1G1	Motor, 1 Stack, No Encoder

Supplied cables for MC option are 16' (5m) length

# Stepper Motors

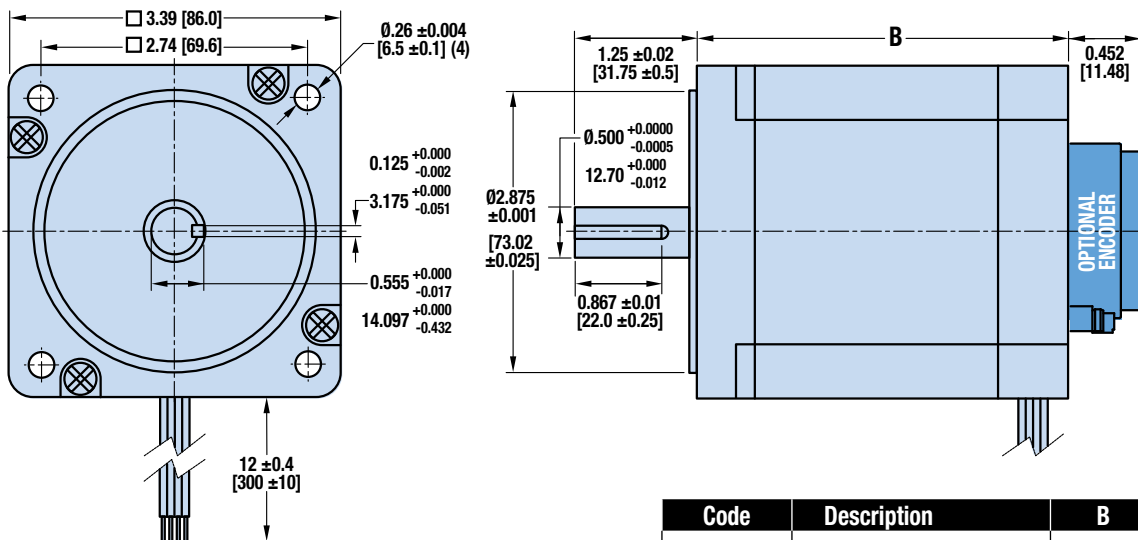
**MOTOR DIMENSIONS**  3D CAD available at [www.tolomatic.com](http://www.tolomatic.com)

## NEMA23 DIMENSIONS



Code	Description	A
AMS1C1A1 AMS1C1E1	Motor, 1 Stack, Encoder	1.97 [50.0]
AMS1C1C1 AMS1C1G1	Motor, 1 Stack, No Encoder	
AMS1C2A1 AMS1C2E1	Motor, 2 Stack, Encoder	3.03 [77.0]
AMS1C2C1 AMS1C2G1	Motor, 2 Stack, No Encoder	

## NEMA34 DIMENSIONS



Code	Description	B
AMS1D1A1	Motor, 1 Stack, Encoder	3.82 [97.0]
AMS1D1C1	Motor, 1 Stack, No Encoder	
AMS1D2A1	Motor, 2 Stack, Encoder	4.96 [126.0]
AMS1D2C1	Motor, 2 Stack, No Encoder	

# Electronic Motor Brake

## SPECIFICATIONS

The electronic motor brake is available in NEMA 23 & 34 frame sizes.

It fits on 23 & 34 frame stepper and servo motors see dimensional drawings to confirm shaft size and other dimensions.

The brake is recommended for vertical or inclined applications where there can be no backdrive during power off.

When 24 VDC is connected, the brake will be deactivated and the motor can turn freely. It is recommended to use the brake only as a holding brake and not as an emergency brake.

The Electronic Motor Brake comes with a 5m cable with M8 connector.



NEMA FRAME SIZE	HOLDING TORQUE	INPUT SHAFT DIA.	OUTPUT SHAFT DIA.	CONNECTION	CURRENT @24VDC	WEIGHT (W/O CABLE)	IP RATING
	in-lbs	inch	inch		Amp	lb	
	[Nm]	[mm]	[mm]			[kg]	
23	13.28	0.250	0.250	M8	0.45 Amp	0.99	IP55
	[1.5]	[6.35]	[6.35]			[0.45]	
34	15.05	0.500	0.500	M8	0.23 Amp	3.13	IP55
	[1.7]	[12.7]	[12.7]			[1.42]	

Recommended torque clamping Screw 2.5 ft-lbs [3.4 Nm]

Electronic Motor Brakes are primarily sold as part of a complete assembly including actuator and motor. Tolomatic will install and test the completed actuator, Electronic Motor Brake, and motor assembly before shipping. **Call Tolomatic if you wish to install an Electronic Motor Brake on an existing actuator.**

Contact Tolomatic for other motor mounting options.

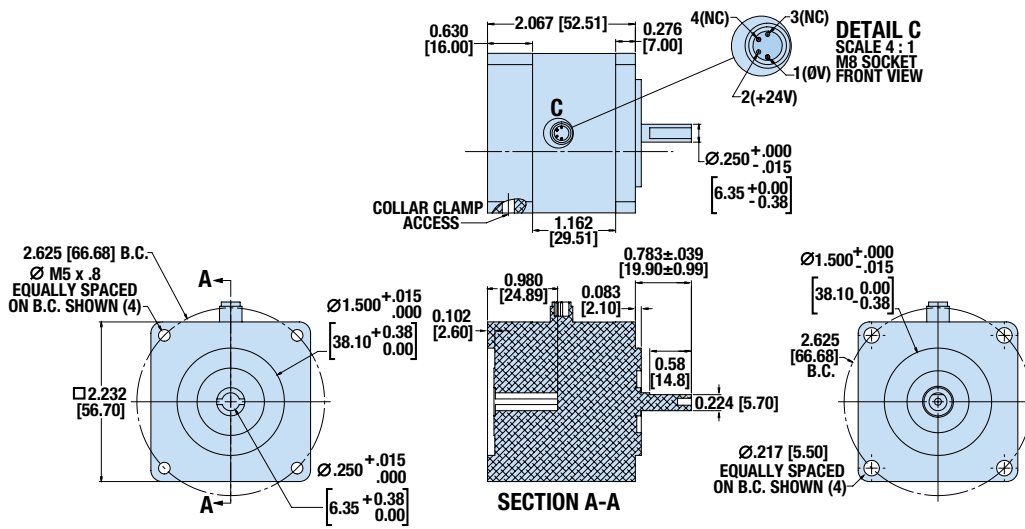
**⚠** Tolomatic assumes no responsibility that an electronic motor brake will fit or perform with your motor or actuator if sold separately.)

# Electronic Motor Brake

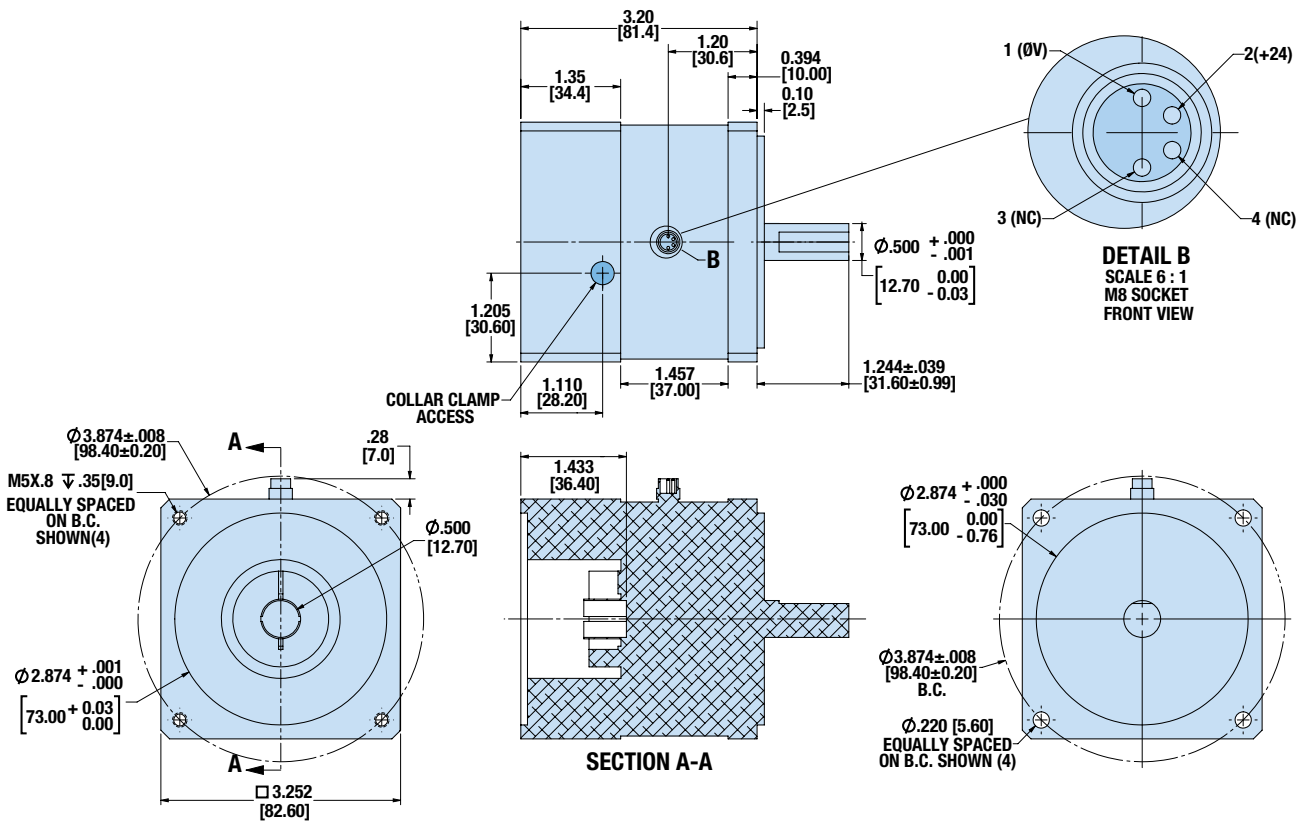
SIZE: ALL

**DIMENSIONS**  3D CAD available at [www.tolomatic.com](http://www.tolomatic.com)

## NEMA23 DIMENSIONS



## NEMA34 DIMENSIONS





# ACS – Service Parts Ordering

## ACS DRIVE/CONTROLLER, CABLES & MOTOR REPLACEMENT PARTS

SERVO MOTORS			
Code	Part No.	Frame Size	Description
AMV2C1A1	3604-1845	Nema 23	Motor, 1 Stack, Encoder, Winding B
AMV2C2A1	3604-1847	Nema 23	Motor, 2 Stack, Encoder, Winding B
AMV2C3A1	3604-1846	Nema 23	Motor, 2 Stack, Encoder, Winding A
AMV2D1A1	3604-1849	Nema 34	Motor, 1 Stack, Encoder, Winding B
AMV2D2A1	3604-1851	Nema 34	Motor, 2 Stack, Encoder, Winding B

STEPPER MOTORS			
Code	Part No.	Frame Size	Description
AMS1A1A1	3604-1780	Nema 11	Motor, 1 Stack, Encoder
AMS1A1C1	3604-1779	Nema 11	Motor, 1 Stack, No Encoder
AMS1B1A1 AMS1B1E1	3604-1776	Nema 17	Motor, 1 Stack, Encoder
AMS1B1C1 AMS1B1G1	3604-1775	Nema 17	Motor, 1 Stack, No Encoder
AMS1C1A1 AMS1C1E1	3604-1778	Nema 23	Motor, 1 Stack, Encoder
AMS1C1C1 AMS1C1G1	3604-1777	Nema 23	Motor, 1 Stack, No Encoder
AMS1C2A1 AMS1C2E1	3604-1955	Nema 23	Motor, 2 Stack, Encoder
AMS1C2C1 AMS1C2G1	3604-1954	Nema 23	Motor, 2 Stack, No Encoder
AMS1D1A1	3604-1957	Nema 34	Motor, 1 Stack, Encoder
AMS1D1C1	3604-1956	Nema 34	Motor, 1 Stack, No Encoder
AMS1D2A1	3604-1962	Nema 34	Motor, 2 Stack, Encoder
AMS1D2C1	3604-1961	Nema 34	Motor, 2 Stack, No Encoder

**Servo**  
 **Servo-NOTE: Items 1,2,4,5 & 6 from table below are recommended for complete ACS system. Order items 1,2,4,5 & 6 by part numbers**

**Stepper**  
 **Stepper-NOTE: All 6 items from table below are recommended for complete ACS system. Order items 1-6 by part numbers**

Part No.	Description
2190-1304	Input Power Connector

ACCESSORIES		
	Part No.	Description
1.	3604-9661	ACS Servo Drive/Controller (basic)
	3604-9662	ACS Servo Drive/Controller, EtherNet/IP (Analog Output)
	3604-9663	ACS Servo Drive/Controller, Modbus TCP (Analog Output)
1.	3604-9665	ACS Stepper Drive/Controller
	3604-9666	ACS Stepper Drive/Controller, EtherNet/IP (Analog Output)
	3604-9667	ACS Stepper Drive/Controller, Modbus TCP (Analog Output)
2.	3604-1842	Servo - Motor Power/Encoder Cable (3 m)
	3604-1843	Servo - Motor Power/Encoder Cable (5 m)
	3604-1943	Servo - Motor Power/Encoder Cable (10 m)
2.	3604-1708	Stepper - Motor Power Cable (3 m)
	3604-1709	Stepper - Motor Power Cable (5 m)
	3604-1710	Stepper - Motor Power Cable (10 m)

ACCESSORIES		
	Part No.	Description
3.	3604-1768	11,17,23 Stepper - Encoder Cable (3 meter length)
	3604-1769	11,17,23 Stepper - Encoder Cable (5 meter length)
	3604-1969	11,17,23 Stepper - Encoder Cable (10 meter length)
	3604-1971	34 Stepper - Encoder Cable (3 meter length)
	3604-1972	34 Stepper - Encoder Cable (5 meter length)
	3604-1973	34 Stepper - Encoder Cable (10 meter length)
4.	3604-1770	I/O Cable (3 meter length)
	3604-1771	I/O Cable (5 meter length)
	3604-1949	Replacement Brake Cable (5 meter length)
5.	3604-9526	Tolomatic Motion Interface CD
	3604-1852	Servo - USB Type B Cable
6.	2180-1163	Shunt Regulator 50W, 24-80 VDC

# Servo Ordering

## DRIVE

ACS V 20 48 UD CR 53

SERVO ORDER CODE	
SV	Tolomatic ACS Servo Drive

CURRENT	
20	20 Amp

VOLTAGE	
48	48 / 24 Volts

DRIVE ORDER CODE	
UD	Standard/Basic Drive with ModBus RTU over RS485
ED	Standard/Basic Drive with EtherNet /IP
MD	Standard/Basic Drive with Modbus TCP

CABLE(S) ORDER CODE	
CR3[_]	Cable(s) of 3m Length
CR5[_]	Cable(s) of 5m Length
CR10[_]	Cable(s) of 10m Length
[2]	Motor and Encoder Cables
[3]	Motor, Encoder and I/O Cables*
[5]	I/O Cables*

\*I/O Cables are 3 meter length - for 5 meter I/O cable order via part number (3604-1771)

## MOTOR

AM V2 C1 A1

MOTOR ORDER CODE	
AM	Tolomatic Motor

MOTOR TYPE	
V2	Servo Motor

FRAME SIZE	
C1	23 Frame Motor, 1 stack
C2	23 Frame Motor, 2 stack
C3	23 Frame Motor, 2 stack
D1	34 Frame Motor, 1 stack
D2	34 Frame Motor, 2 stack

MOTOR OPTIONS									
Code	Encoder	Gearhead	Brake	SS2	Code	Encoder	Gearhead	Brake	SS2
A1	Yes	-	-	-	B1	Yes	-	Yes	Yes
A2	Yes	5:1	-	-	B2	Yes	5:1	Yes	Yes
A3	Yes	10:1	-	-	B3	Yes	10:1	Yes	Yes
					E1	Yes	-	-	Yes

# Stepper Ordering

## DRIVE

ACS T 10 48 UD CR 53

STEPPER ORDER CODE	
ST	Tolomatic ACS Stepper Drive

CURRENT	
10	Current

VOLTAGE	
48	Voltage

DRIVE ORDER CODE	
UD	Standard/Basic Drive with ModBus RTU over RS485
ED	Standard/Basic Drive with EtherNet /IP
MD	Standard/Basic Drive with Modbus TCP

CABLE(S) ORDER CODE	
CR3[_]	Cable(s) of 3m Length
CR5[_]	Cable(s) of 5m Length
CR10[_]	Cable(s) of 10m Length
[1]	Motor Cable
[2]	Motor and Encoder Cables
[3]	Motor, Encoder and I/O Cables*
[4]	Motor and I/O Cables*
[5]	I/O Cables*

\*I/O Cables are 3 meter length - for 5 meter I/O cable order via part number (3604-1771)

## MOTOR

AM S1 C1 E1 MC2

MOTOR ORDER CODE	
AM	Tolomatic Motor

MOTOR TYPE	
S1	Stepper Motor

†NOTE: MC Cable Option available for 17 & 23 frame 1 stack motors ONLY

FRAME SIZE	
A1	11 Frame Motor
B1†	17 Frame Motor
C1†	23 Frame 1 Stack Motor
C2	23 Frame 2 Stack Motor
D1	34 Frame 1 Stack Motor
D2	34 Frame 2 Stack Motor

MOTOR OPTIONS									
Code	Encoder	Gearhead	Brake	SS2	Code	Encoder	Gearhead	Brake	SS2
A1	Yes	-	-	-	C2	-	5:1	-	-
A2	Yes	5:1	-	-	C3	-	10:1	-	-
A3	Yes	10:1	-	-	D1	-	-	Yes	-
B1	Yes	-	Yes	-	D2	-	5:1	Yes	-
B2	Yes	5:1	Yes	-	D3	-	10:1	Yes	-
B3	Yes	10:1	Yes	-	E1	Yes	-	-	Yes
C1	-	-	-	-	G1	-	-	-	Yes

MOTOR COVER ENCODER PROTECTION OPT.	
†MC_	Cord/Cable Grips
0	0 No Cord Grips
1	1 Cord Grips
2	2 Cord Grips
Supplied cables for MC option are 16' (5m) length	

NOTE: Gearhead and Brake available for 23 & 34 frame motors ONLY

# THE TOLOMATIC DIFFERENCE

What you expect from the industry leader:



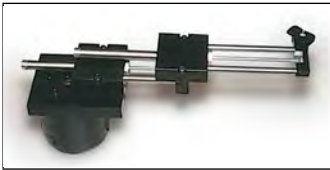
## EXCELLENT CUSTOMER SERVICE & TECHNICAL SUPPORT

Our people make the difference! Expect prompt, courteous replies to all of your application and product questions.



## INDUSTRY LEADING DELIVERIES

Tolomatic continues to offer the fastest delivery of standard catalog products. Modified and custom products ship weeks ahead of the competition.



## INNOVATIVE PRODUCTS

From standard catalog products... to modified products... to completely unique custom products, Tolomatic designs and builds the best solutions for your challenging applications.



## ONLINE SIZING & SELECTION SOFTWARE

Online sizing that is easy to use, accurate and always up-to-date. Input your application data and the software will determine a Tolomatic electric actuator to meet your requirements.



## 3D MODELS & 2D DRAWINGS AVAILABLE ON THE WEB

Easy to access CAD files are available in many popular formats.

## ALSO CONSIDER THESE OTHER TOLOMATIC PRODUCTS:

### PNEUMATIC PRODUCTS



*RODLESS CYLINDERS: Band Cylinders, Cable Cylinders, MAGNETICALLY COUPLED CYLINDERS/SLIDES; GUIDED ROD CYLINDER SLIDES*

"FOLDOUT" BROCHURE #9900-9075  
PRODUCTS BROCHURE #9900-4028

### ELECTRIC PRODUCTS



*ROD & GUIDED ROD STYLE ACTUATORS, HIGH THRUST ACTUATORS, SCREW & BELT DRIVE RODLESS ACTUATORS, MOTORS, DRIVES AND CONTROLLERS*

"FOLDOUT" BROCHURE #9900-9074  
PRODUCTS BROCHURE #9900-4016

### POWER TRANSMISSION PRODUCTS



*GEARBOXES: Float-A-Shaft®, Slide-Rite®; DISC CONE CLUTCH; CALIPER DISC BRAKES*

"FOLDOUT" BROCHURE #9900-9076  
PRODUCTS BROCHURE #9900-4029



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