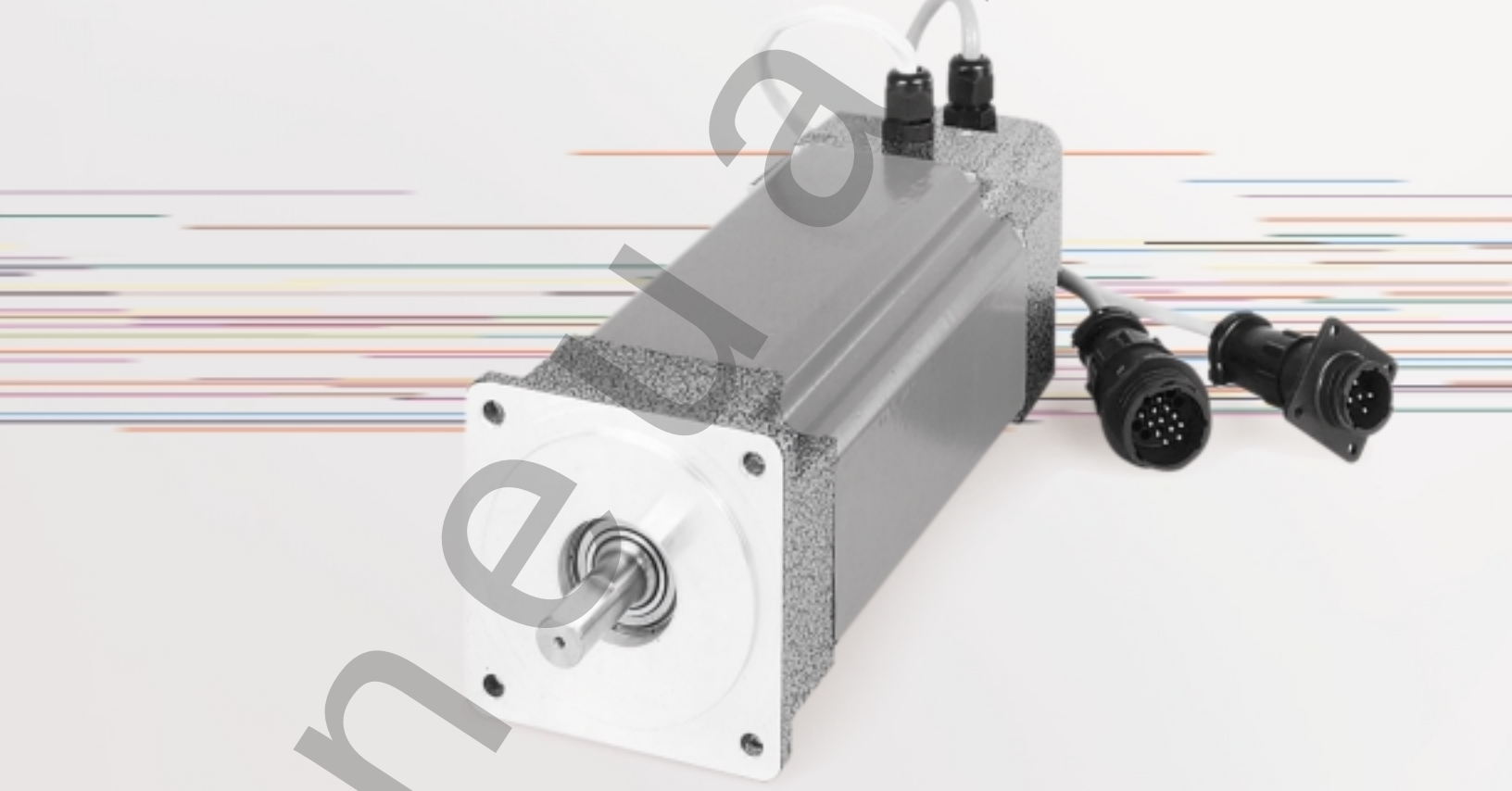
numatics®



Servo Motors and Control Packages

We're everywhere you need us to be!

Servo Systems

Rev. 2/04

Servo Motor Drive Components and Packages

LTS - Low Torque Series Servo Motors

The LTS series of light industrial servo motors are permanent magnet brushless servo motors engineered for high performance in a compact package. LTS motors provide from 5.5 to 37.5 lb-in (.6 to 4.2 Nm) continuous torque and 17.6 to 126 lb-in (2 to 14 Nm) peak torque. The LTS series of motors are mechanically equivalent to NEMA 23 and NEMA 34 step motors providing the perfect solution when upgrading new or existing stepper systems to servo performance. LTS motors employ rare earth magnets and low inertia rotors providing rapid acceleration and deceleration capabilities.

Features:

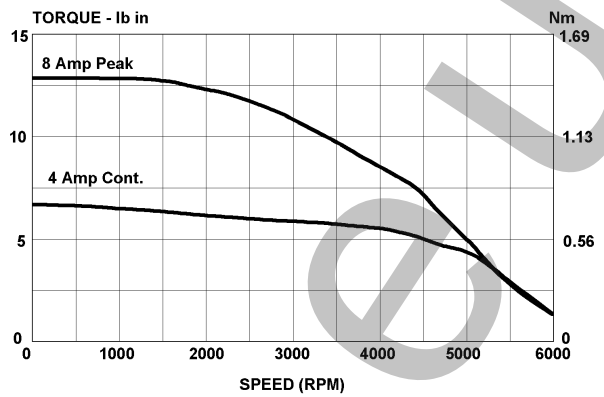
NEMA 23 and NEMA 34 standard frame size
6.94 to 46.56 lb-in (.8 to 5.3 Nm) continuous stall torque
1000 LPR differential encoder standard
Hall effect commutation
Twist on connectors standard
IP40 sealing

Motor Specifications

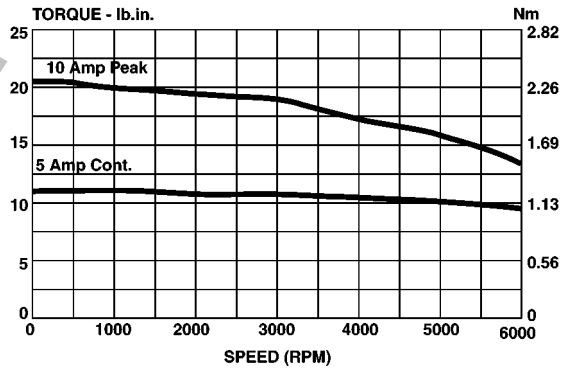
MOTOR	POWER	RATED TORQUE CONT.	STALL TORQUE CONT.	PEAK STALL TORQUE	CURRENT CONT.	PEAK LINE CURRENT	MAX. OPERATING SPEED	SPEED AT RATED TORQUE	TORQUE SENSITIVITY (±10%)	BACK EMF LINE TO LINE (±10%)	DC RESIST-ANCE (±10%)	INDUCT-ANCE (±30%)	ROTOR INERTIA	THRUST (AXIAL) LOAD RATING (1)	OVERHANG (RADIAL) LOAD RATING (1)	WEIGHT
UNITS	HP (W)	Lb-in (Nm)	Lb-in (Nm)	Lb-in (Nm)	Amp	Amp	RPM	RPM	Lb-in/Amp (Nm/Amp)	Vo-pk/ KRPM	Ohm	mH	Lb-in-sec2 (Kg-m2)	Lb(Kg)	Lb(Kg)	Lb(Kg)
LTS 234	0.40 (299)	5.5 (0.621)	6.94 (0.784)	17.43 (1.99)	3.89	11.7	6000	4600	1.78 (0.201)	23.9	2.3	4.63	0.000204 (0.000023)	10 (4.5)	15 (7)	2.8 (1.27)
LTS 342	0.63 (470)	8.0 (0.904)	11.19 (1.26)	30.19 (3.41)	4.96	14.9	6000	5000	2.26 (0.255)	30.3	1.86	8.8	0.000424 (0.000048)	30 (14)	50 (23)	3.92 (1.78)
LTS 344	1.08 (809)	13.69 (1.55)	18.9 (2.13)	46.56 (5.26)	5.9	16.3	6000	5000	3.17 (0.358)	42.6	1.40	8.2	0.000813 (0.000092)	30 (14)	50 (23)	5.8 (2.65)
LTS 348	0.94 (700)	37.5 (4.24)	45.56 (5.15)	125.2 (14.14)	9.43	28.8	6000	1550	4.83 (0.546)	64.9	0.87	6.06	0.002356 (0.000266)	30 (14)	50 (23)	13.9 (6.32)

* Internal Brake not available on LTS Series

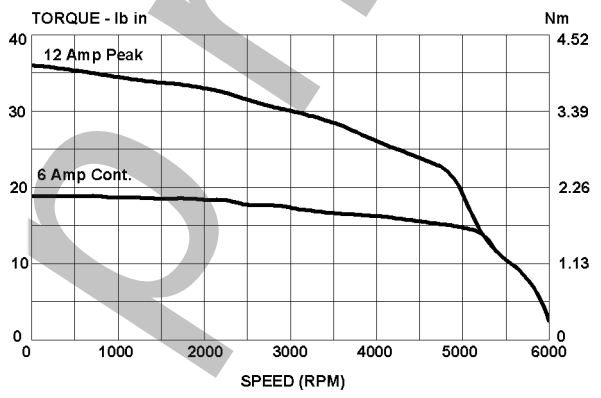
LTS Motor Torque Curves



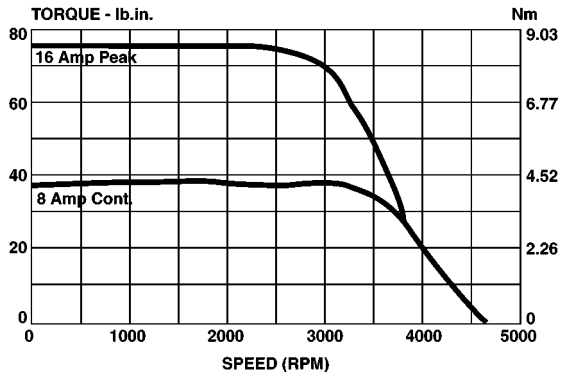
LTS-234 • 115 Vac, 4 STACK



LTS-342 • 230 Vac, 2 STACK



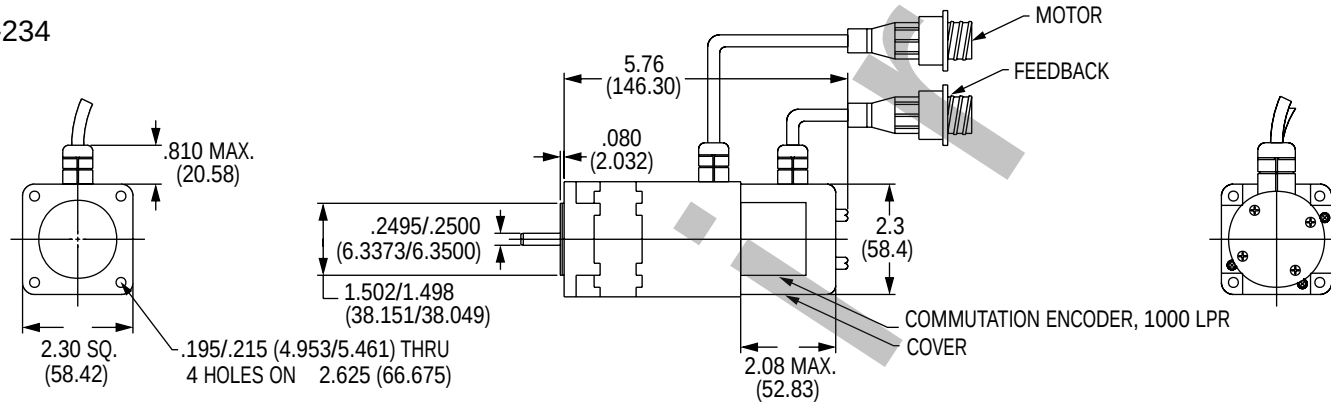
LTS-344 • 230 Vac, 4 STACK



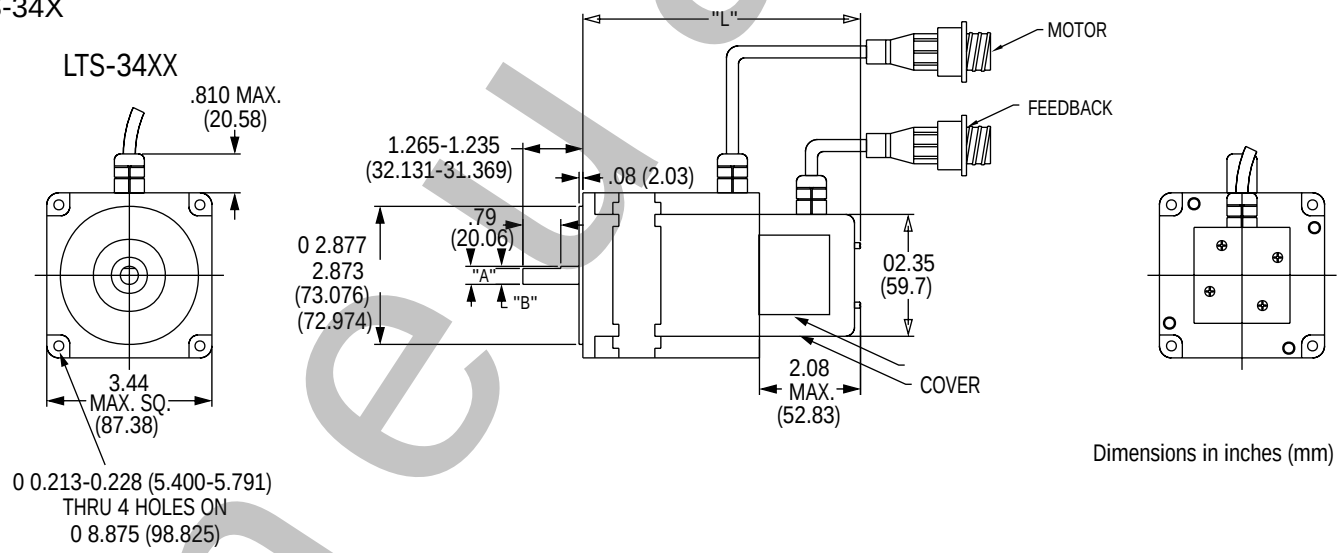
LTS-348 • 230 Vac, 8 STACK

LTS Servo Motor Dimensions

LTS-234



LTS-34X



Dimensions in inches (mm)

MODEL #	"L"	"A"	"B"
LTS-342	5.37 (136.40)	0.3745-0.3750 (9.5`13-9.53)	0.331 (8.41)
LTS-344	6.32 (160.53)	0.3745-0.3750 (9.5`13-9.53)	0.331 (8.41)
LTS-348	9.99 (243.75)	0.4995-0.5000 (12.69-12.70)	0.455 (11.56)

LTS Series Servo Motor Cable Kits

P/N	DESCRIPTION
SCLT015	15 Feet
SCLT030	30 Feet

* Kit includes 2 cables

Servo Control and Drive Packages

Contact factory for available Servo Controllers and Drive packages.

Mac Programmable Multi-Axis Motion Controller

This fully programmable, powerful DSP-based motion controller features its own built-in power supply and, in most cases, can serve as the only controller necessary even in complex and sophisticated machine control systems.

Depending on which model you choose, the MAC2000 can simultaneously operate up to 8 step motor or servo axes while performing up to 7 concurrent tasks. It has been designed for use with all step motor drives (up to 50,000 micro-steps per revolution) and any analog or digital servo amplifier.

The MAC2000 Windows®-based software simplifies programming from a host computer through a serial data port. The software contains numerous screens so you can quickly and easily establish your system parameters. Plus, with built-in subroutine and looping (nestable up to 16 levels), your programming flexibility is greatly enhanced.

For ease of communication with the controller, two serial ports are provided. The host port is switch-selectable for RS232 or RS485 protocol. There's also an auxiliary serial port that's factory set for RS232, and is jumper configurable for RS485.

With full servo and following capabilities, the MAC2000 facilitates easy-to-program servo gains and on-screen servo tuning while providing a complete selection of following commands.

The high performance, built-in power supply is AC line operated with a built-in line filter and MOV, and features flexible input power from 90 to 265 VAC, 50/60 Hz.

MAC2000 optional input/output boards are available to suit your specific applications.

- Digital Input/Output Board – This board features a "bulletproof" design while providing 24 optically isolated and filtered inputs along with 16 short circuits proof outputs. Sinking or sourcing operation is switch-selectable, and the board provides terminal strip access to the system's isolated, built-in 24Vdc power supply.
- Expansion Input/ Output BCD Board – Two 50-pin headers allow you to connect up to 48 industry standard, high powered, OPTO-22 style input or output modules. Each header also can accommodate up to 4 BCD switch banks.
- Dual-Axis Interface Board – For your increased operating efficiency, the Dual-Axis board signals for most stepper drives and servo amplifiers along with inputs for two incremental encoders. This board also provides two sets of connections for limit, home, and mark registration sensors.

When you need flexible performance with reliability, MAC 2000 controllers are your best choice.

Features

- Full coordinated motion control including linear interpolation of up to 8 axes, circular interpolation and polynominal splining among any two axes.
- Programmable using Windows® based BASIC-like coding soft ware (included) or one of the optional software utilities, Motion Workbench or CAD-to-Motion.
- Full math functions including Trig, Logs, and Square roots.
- Subroutine capability (up to 16 nested levels)
- Multi-tasking of up to 7 concurrent tasks.
- Up to 8 axes of stepper pulse and direction outputs, with Boost and Reduce.
- Up to 8 axes of Encoder inputs and analog I/O.
- Optical isolation, with built-in 24Vdc 0.75 amp power supply for I/O power.
- Up to 352 I/O points available using optional boards.
- Easy to connect removable screw clamp terminations.
- Flash memory enhances ease of programming and firmware updates.
- 2 serial ports, operating at up to 38 Kbaud.
- Flexible 90-265 Vac 50/60 hertz input including built in line filter with MOV.
- MAC2000-2A and MAC2000-6A Units UL Recognized.

General

Processor	Texas Instruments TMS 320C31, 32 bit, Floating Point, Digital Signal Processor
Speed	33 Mhz
Flash EPROM	4Mbit (512K x 8 bit), 2Mbit (256K x 8 bit) available for user programs
RAM	4Mbit (128K x 32 bit), zero wait state, volatile
Mutli-Tasking	Up to 7 concurrent Tasks

Physical Characteristics

MAC2000-2A	Size (Inches)	5.34 wide x 7.48 deep x 10.63 high
	Size (mm)	163 wide x 190 deep x 270 high
	Weight	8.25 lbs (3.75 kg)
MAC2000-6A	Size (Inches)	9.34W x 10.63H x 7.54D
	Size (mm)	237.3W x 270H x 190D
	Weight	11.0 lbs (5.0 kg)
MAC2000-8A	Size (Inches)	19.0W x 10.63H x 7.54D
	Size (mm)	482.6W x 270H x 191.6D
	Weight	12.0 lbs (5.45 kg)

Input power

MAC2000-2A,-6A	Power Requirement	90-265 VAC, 50/60 Hertz
	Current	<0.5 Ampere at 115 VAC
	Fuse	2A (normal blow), 250 VAC, 3AG type (2 required)
MAC2000-8A	Power Requirement	90-132 VAC or 175-264 VAC, 50/60 Hz.
	Current	<3 A at 115 VAC
	Fuse	3A (slow blow), 250 VAC

Analog Output

Output Range	-10 Vdc to +10 Vdc	
Output Loading	5 milliamps maximum (2 Kohm)	
Resolution	12 bits	
Accuracy	Zero Output Error	+/- 0.03 Vdc
	Full Scale Output Error	+/- 0.11 Vdc

Axis Inputs

Sink Input	On-State Voltage	0-3 Vdc
	On-State Current	10.5mA with Vin=0
	Off-State Voltage	24 Vdc
Source Input	On-State Voltage	12-24 Vdc
	On-State Current	10.5 mA with Vin=24 Vdc
	Off-State Voltage	0-3 Vdc
Analog Inputs	Resolution	12 bits
	Sample Rate	1950 samples/sec.
	Voltage Range	-10 to +10 Vdc
	Input Impedance (IN=/IN- to AGND)	20 Kohm
	Full Scale Input Accuracy	+/- 0.1 Vdc

Stepper Drive Interface

Output Signals	Open Collector Drivers (TTL types 7406 or 7407)	
	Off-State Voltage Rating	30 Vdc
	On-State Current Rating	40 mA
Input Signal	Input Signal Loading	10 Kohm
(Ready)	High Level Input Voltage	3.5 to 5.0 Vdc
	Low Level Input Voltage	0.0 to 0.9 Vdc

Encoder Interface

High Level Current	7.3 mA typ. at Vin = 5 Vdc	(A+, B+, I+)
	0.0 mA typ. at Vin = 0 Vdc	(A-, B-, I-)
Low Level Current	-7.3 mA typ. at Vin = 0 Vdc	

Expansion I/O BCD Port (MAC2000-2A AND MAC2000-6A)

Input Characteristics	On-State Input Voltage	0 – 1.5 Vdc
	On-State Input Current	1 mA max. (Vin=0)
	Input Voltage	2.9 –30 Vdc or open circuit
Output Characteristics	Load Voltage	30 Vdc maximum
	On-State Voltage	0.5 Vdc (15 mA load current)
	On-State Current	15mA maximum

Digital I/O Port (MAC2000-2A AND MAC2000-6A)

Input Signals (Sinking)	On-State Voltage Range	0-12 Vdc
	Input Current @ 12V	2.3 mA
	Input Current @ 0V	6.5 mA
(Sourcing)	On-State Voltage Range	10-24 Vdc
	Input Current @ 10V	2.3 mA
	Input Current @ 24V	6.5 mA
Output Signals (Sink)	Load Power Supply	Built-in 24Vdc or External 12-24 Vdc
	Current Rating	50 mA
	Voltage Rating	24 Vdc
	On State Voltage @ 50 mA	2.0 Vdc maximum
	Off State Leakage @ 24 Vdc	0.6 mA maximum
(Source)	Current Rating	50 mA
	On State Voltage @ 50 mA	20 Vdc maximum
	Off State Leakage @ 24 Vdc	0.6 mA maximum

Enviromental Constraints

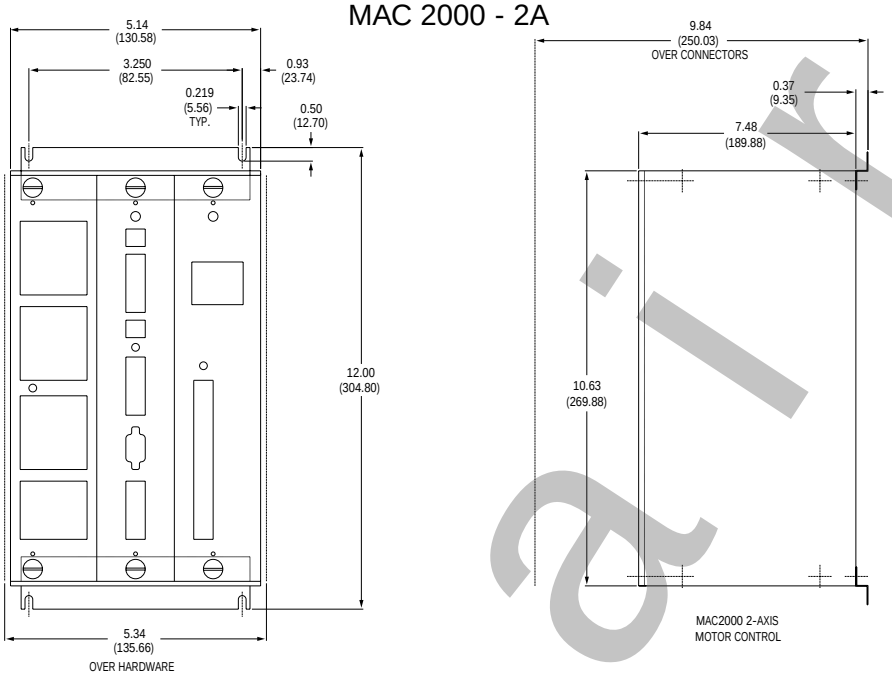
Operating Temp	+32 deg. F to +122 deg F (0 to +50 deg C)
Storage Temp Rating	-40 deg F to +167 deg F (-40 deg C to +75 deg C)
Humidity	95% maximum, noncondensing
Altitude	10,000 Feet (3048m) above sea level

Design Features

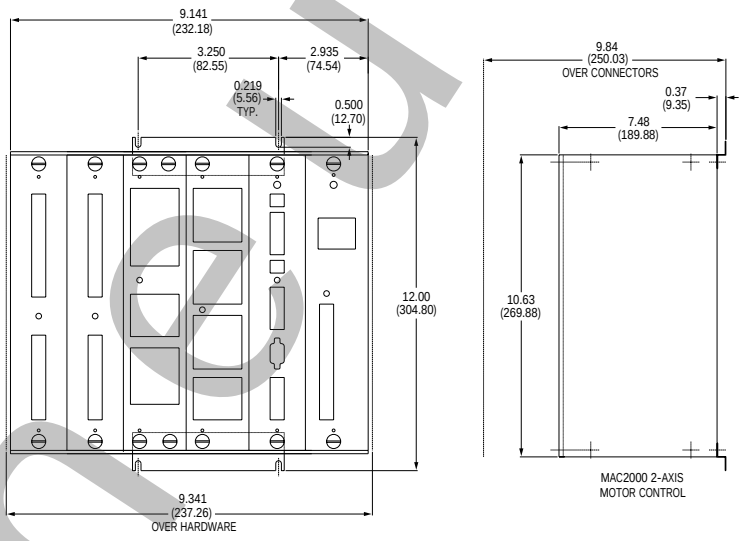
Wall Mountable
Removable printed circuit boards
Removable clamp terminations
Advanced programming capability
Input/Output Expansion – BCD port
Advanced DSP- based Machine control circuitry
Expansion capability in the MAC2000-6A and MAC2000-8A
Optional I/O boards available for MAC2000-6A and MAC2000-8A

Multi Axis Control

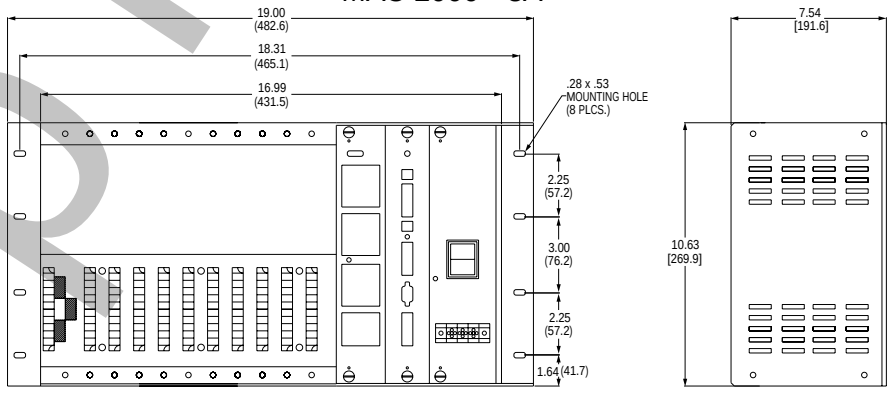
MAC 2000 - 2A



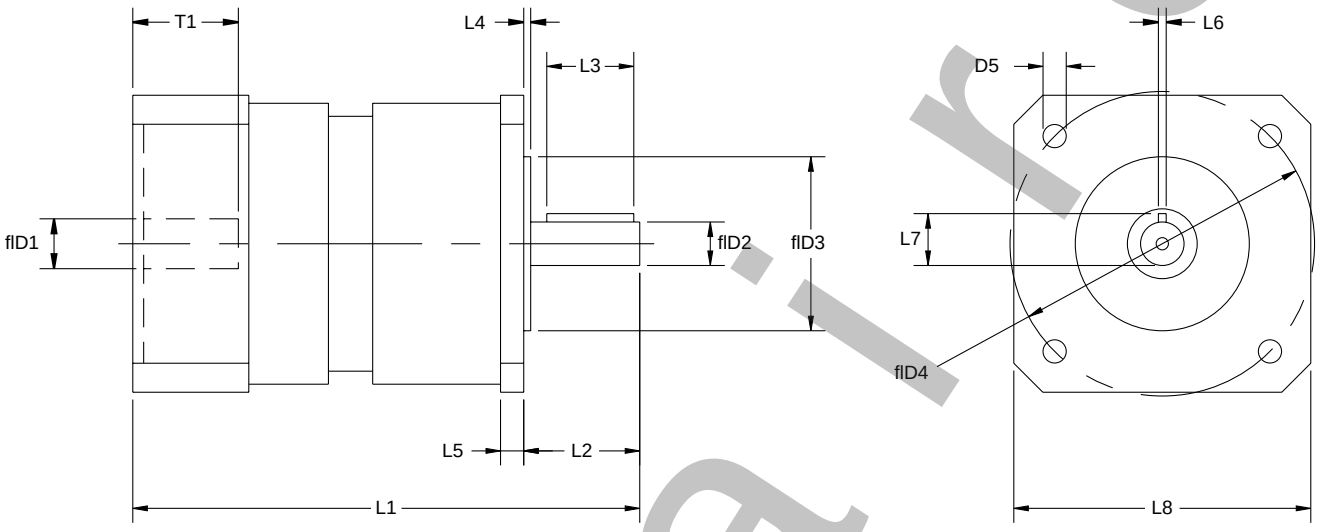
MAC 2000 - 6A



MAC 2000 - 8A



Inline Gearboxes



NEMA Series	NEMA 23		NEMA 34		NEMA 42	
	mm	(in)	mm	(in)	mm	(in)
L1 1-STAGE*	111	(4.37)	147	(5.79)	185	(7.28)
L1 2-STAGE*	133	((5.24)	180	(7.09)	225.5	(8.88)
L1 3-STAGE*	155	(6.10)	213	(8.39)	266	(10.47)
L2	25.4	(1.00)	31.8	(1.25)	38.1	(1.50)
L3	19	(0.75)	27	(1.06)	29	(1.14)
L4	1.6	(0.06)	1.7	(0.07)	2.4	(0.09)
L5	5	(0.20)	10	(0.39)	13	(0.51)
L6	-	(-)	3.2	(0.125)	4.8	(0.1875)
L7	-	(-)	14.3	(0.5625)	18.26	(0.7188)
L8	65	(2.56)	90	(3.54)	120	(4.72)
D1max	11	(0.43)	19	(0.75)	24	(0.94)
D2	9.252	(0.375)	12.7	(0.500)	15.875	(0.625)
D3	38.1	(1.500)	73	(2.875)	55.55	(2.185)
D4	66.7	(2.625)	98.4	(3.875)	125.7	(4.95)
D5	5	(0.20)	5.5	(0.22)	7.1	(0.28)
T1*	23	(0.91)	30	(1.18)	40	(1.57)

*Value can vary depending on the motor

How to Order

GH ____ ____ I

Motor Frame Size
23 = Nema 23
34 = Nema 34
42 = Nema 42

Gear Ratio
Minimum 3 to 1
5:1, 7:1,
10:1, 20:1,
50:1, 75:1,
Maximum 1000:1

Servo Systems

NEMA Series				NEMA 23	NEMA 34	NEMA 42
Rating	**Symbol**	**Unit**	**Ratio**			
Nominal Output Torque	**T2n**	Nm (lb-in)	i=3	18 (159)	40 (354)	100 (885)
			i=4,5,7	18 (159)	54 (478)	120 (1062)
			i=10	14 (124)	40 (354)	104 (920)
			i=100,1000	16 (142)	60 (531)	120 (1062)
			i=all other ratios	18 (159)	60 (531)	120 (1062)
Maximum Output Torque	**T2n**	Nm (lb-in)		18 (159)	60 (531)	120 (1062)
Max. Input Speed	**n1n**	RPM		6000	5000	5000
Nominal Input Speed	**n1n**	RPM		3000	3000	3000
Standard Output Backlash	**j**	arcmin	1- stage	< 10	< 10	<10
			2-stage	< 15	< 15	< 15
			3- stage	< 20	< 20	<20
Weight	**m**	kg (lb)	1- stage	1 (2.2)	2.3 (5)	5.8 (13)
			2- stage	1.3 (2.9)	3.1 (7)	7.9 (17)
			3- stage	1.6 (3.5)	3.9 (9)	10 (22)
Mass Moment of Inertia	**j_1**	**kgcm2** (lb-in2)	i=3	0.176 (0.06)	0.542 (0.18)	2.54 (0.9)
			i=4	0.159 (0.05)	0.424 (0.14)	1.76 (0.6)
			i=5	0.15 (0.05)	0.379 (0.13)	1.48 (0.5)
			i=7,10	0.138 (0.05)	0.332 (0.11)	1.14 (0.4)
			i=12-35	0.156 (0.05)	0.407 (0.14)	1.51 (0.5)
			i=40-1000	0.136 (0.05)	0.327 (0.11)	1.07 (0.4)

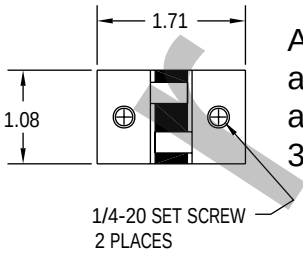
Ratios Available	1-stage: 3/4/5/7/10 2-stage: 12/16/20/25/35/40/50/70/100 3-stage: 120/160/200/250/350/490/700/1000
Efficiency at Maximum Loading	1-stage:90% 2-stage: 85% 3-stage: 80%
Service Life	>20,000 hours
Operating Temperature Range	-20°C to 90°C

ORDER ONLINE

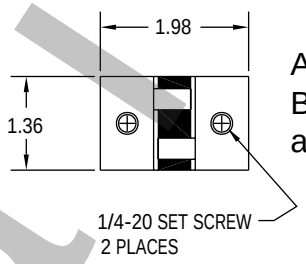
Shaft Coupler Ordering

Product	NEMA 23*	NEMA 34**	NEMA 42
BSG106	SCP10623*	SCP10634	—
BSG150	SCP15023*	SCP15034	—
BSG200	—	SCP20034	SCP20042
BDU50	SCP5023*	SCP5034	—
BDU55	SCP5523	SCP5534	—
BDU75	—	SCP7534	SCP7542
BDU90	—	SCP9034	SCP9042
BDU100	—	SCP10034	SCP10042

*NOTE: Add suffix “A” for all NEMA 23, 3 Stack Motors
Example: SCP5023A
** Add suffix “B” for LTS 342 and 344 motors



All 23 frame BDU’s and BSG’s, BSG 106 and BSG 150 with 34 frame motor



All 34 and 42 frame BDU’s, BSG 20034 and BSG 20042

Accessory Items

RS232 Programming Cable for NSMC Controller and NSDP6C Motor Drive Controller
Part Number PC232 10 foot length

RS232 Programming Cable for SAC300-8A
Part Number PCS232 5 foot length

RS232 to RS485 Converter
Part Number C232-485