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Systems
Technical
Publication

SERVOSTAR® Cd

with Kollmorgen GOLDLINE® Xt



KOLLMORGEN

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6 AMP ***3 AMP***

Kollmorgen** SERVO**STAR**® **CD Amplifier

- **115 to 230 Volt Single Phase AC Input Power**
- **Resolver or Encoder Feedback**
- **Integrated Power Supply**
- **Fully Digital Control**

The SERVO**STAR CD** amplifier is a compact, fully digital amplifier designed to simplify installation and system set-up. Three control algorithms and self-tuning (to the load) functionality allows high performance operation to be achieved quickly and easily.

Since not one control algorithm is best for all machines, SERVO**STAR CD** contains Pole Placement, PI, and PDFF control algorithms. SERVO**STAR CD** utilizes the PC-based **MOTIONLINK®** for Windows™ which automatically takes you through the key steps of installation and start up.

FEATURES:

Servo Control
- Advanced patented sinewave commutation technology provides smooth, precise low-speed control and high-speed performance
- Accurate torque control due to precision balanced current loops with closed loop sensors
- Velocity loop bandwidths to 400 Hz
- Self-tuning to the load
- S-curve acceleration feature for reducing acceleration "jerk" and machine wear
- Patented torque angle control enhances motor performance
- Fully digital control loops
- Compact and attractive rugged metal package for space-saving, modern appearance - metal package minimizes electrical noise
- Pole Placement, PI, and PDFF control options
- Low Pass or Notch Filters for compliant & resonance machines
- Command modes: Torque (analog or serial); Velocity (analog or serial); Position (analog, serial, stored or pulse)
- Two current ratings: 3 & 6 amp RMS/phase continuous
- 3 to 1 peak/continuous current rating

Analog Command:
- 14 Bit analog conversion
- Simple absolute & incremental thru internal profile generator

Easy Connectivity
- Built in encoder equivalent output can eliminate the need for an additional position feedback device
- RS232 or RS485 Communication
- Unique multi-drop configuration allows a PC or PLC to communicate to multiple SERVO**STAR CD** amplifiers via single RS-232 connection
- SERVO**STAR CD**'s versatile communication capabilities make it easy to integrate machine control data directly from the factory floor to your information system
- Analog ±10V, pulse/direction, master encoder, serial port, command options

Robust Design
- Protection against miswired connection on 24 Volt I/O
- ESD rugged circuit design and fully metallic enclosure
- Self-protecting intelligent power modules
- Full protection against short circuit, overvoltage, undervoltage, heatsink overtemperature, motor overtemperature, overspeed, overcurrent, and feedback loss
- UL , cUL listed, and CE
- Flash memory

Windows Start-up Environment – MOTIONLINK®
- Advanced motion "wizard" automatically walks you through set-up
- Auto configuration function checks for correct wiring of motor and feedback
- PC "Oscilloscope" for measuring real-time motion performance

Motion Indexing
- Stores up to 4 motion profiles in memory
- Start motion through serial command or digital I/O
- Homing functions

Configurable I/O
- 3 digital inputs, 1 digital output, & 1 analog output can be configured to a variety of functions to customize the SERVO**STAR CD** to individual machines

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AUTO SET-UP

MOTIONLINK® for Windows takes the fear out of setting up a servo system. Designed for the novice as well as the advanced user, **MOTIONLINK** lets users quickly set-up and fine tune system performance.



The SERVO**STAR CD Auto Set-up consists of six steps to completely configure the** SERVO**STAR CD and motor for your machine:**

Set SERVO**STAR CD** for the Power Source. **MOTIONLINK** will tell you if your SERVO**STAR CD** was factory programmed for a line voltage. Push okay, if correct, if not, change to the appropriate voltage.

Set SERVO**STAR CD** up for the Motor. If the amplifier has been programmed to operate a specific motor, **MOTIONLINK** will indicate the motor type. Push okay and go to the next step. If not, you can select from a listing of standard Kollmorgen motors or enter in the specific nameplate parameters from the motors you will be using.

Setup Feedback Device. Setup your feedback device (encoder or resolver). You can also select auto-config and have MOTIONLINK perform the configuration for encoder systems.

Select the Operational Mode. Set SERVO**STAR CD** to run in position, electronic gearing, velocity, or current mode. Set the command to be serial, analog, or I/O.

Tune SERVO**STAR CD** for the Load. Simply select the bandwidth you want the system to operate and press the Auto-tune button .

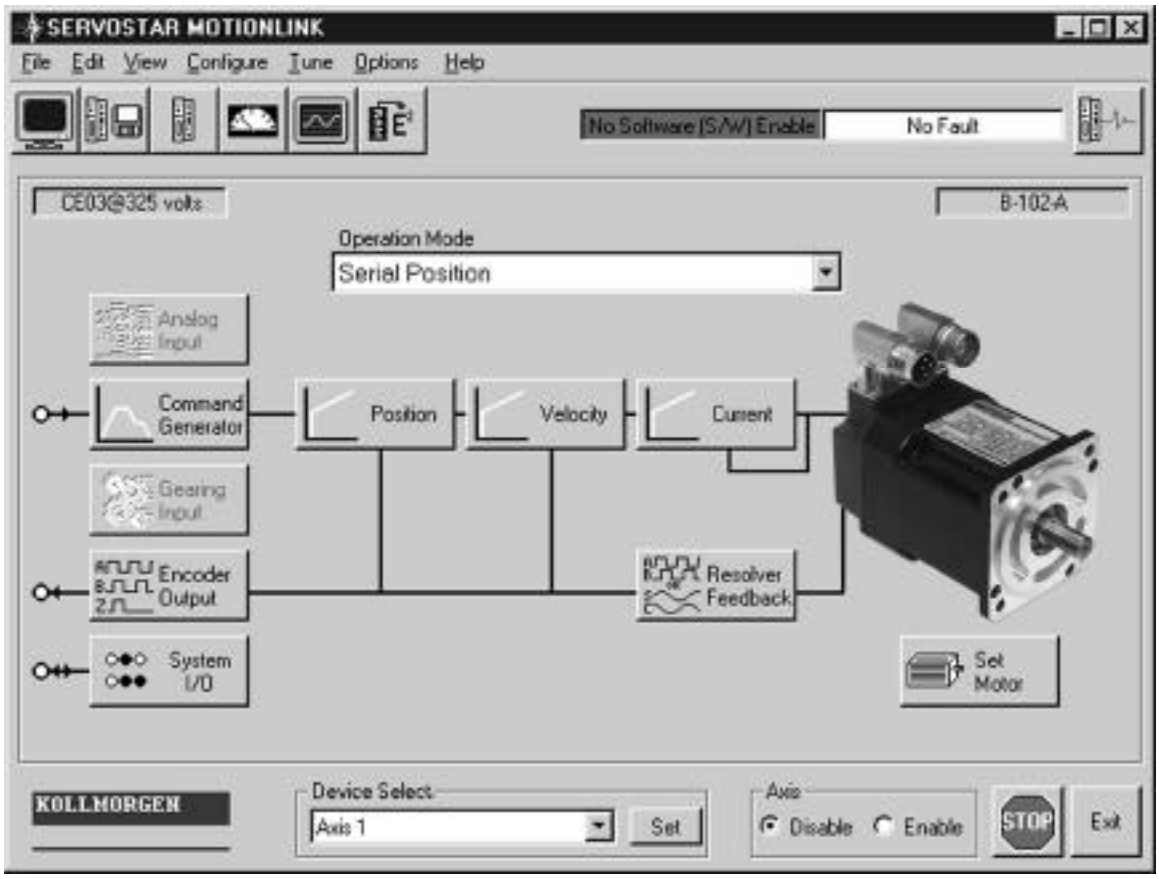
Store SERVO**STAR CD** Settings : The final step is storing the parameters in SERVO**STAR CD** and archiving on your hard drive or disk.

Now you're ready to run your machine!

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ADDITIONAL FUNCTIONS

MOTIONLINK® also includes other features that allow you to fine tune or monitor the performance of the system.







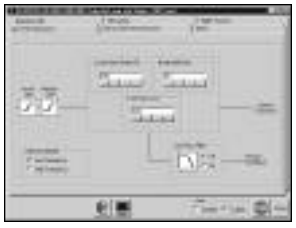
PC Oscilloscope: For closely evaluating system performance **MOTIONLINK** includes the functionality of an oscilloscope. You can very easily excite the load then review performance graphically on your computer screen.

Direct Terminal Mode: This mode turns your computer into a "dumb terminal." Variables or parameters can be monitored and changed using the SERVO**STAR CD**'s command language. This mode is ideal for advanced users who want to get directly in the "heart" of the SERVO**STAR CD**.



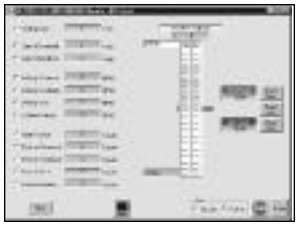






Selectable Tuning Algorithms: No one control scheme is ideal for all applications. SERVO**STAR CD** has three control schemes to choose from: Pole Placement (Standard), PI, and PDFF. Although the Pole Placement will meet the needs of most applications, PI and PDFF control is also available. So whether your critical need is steady speed control, high accelerations or quick response to load variations, etc., SERVO**STAR CD** provides the greatest opportunity to achieve the best machine performance.

Monitor Mode: Allows you to jog the motor to monitor key operation variables. Speed and torque can be viewed in real time in linear gauge format. Up to three variables can be monitored at a time.





MOTIONLINK includes many other features like:

- Setting resolution of encoder "equivalent" output
- Activating position limits
- Displaying amplifier status
- Setting acceleration amps
- Limiting max speed or torque

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PROGRAMMABLE FUNCTIONS

Current Control/Motor Configuration

Description	Variables
• Conversion to Linear motor units	MOTORTYPE, MPITCH
• Digital current loop control receiving serial	Torque Mode - OPMODE 2 or 3 T *or analog command*
• Current loop adaptive gain	MLGAINC, MLGAINP, MLGAINZ
• System current-limiting capability	ILIM, ILIM2, IMAX, ISCALE, ISTOP, MICONT, MIPEAK

Velocity Control

Description	Variables
• Serial or analog digital velocity loop control	Velocity Mode - OPMODE 0 or 1
• Stepping and jogging capability	STEP, JOG *or analog command*
• Autotuning	TUNE
• Configurable system speed limits	VLIM, VOSPD, VSCALE
• Advanced control algorithms	COMPMODE
1. Proportional-Integral (PI)	GV, GVI
2. Pseudo-Derivative w/Feed Forward (PDFF)	KV, KVI, KVFR
3. Standard Pole Placement	BW, MJ, LMJR, TF
• First & second-order low pass filtering capability	FILTMODE, LPFHZ1, LPFHZ2,COMPFILT
• Notch filtering capability	FILTMODE, NOTCHHZ, NOTCHBW
• Bandwidths up to 400Hz	ANLPFHZ
• Configurable positive motion direction	DIR
• Toggling capability between velocity and current (torque) control	INx, INxMODE
• I/O controlled velocity	INx, INxMODE, MISPEED

Position Control / Motion Indexing

Description	Variables
• Serial digital position loop control	Position Mode - OPMODE 8
• Incremental & absolute positioning with an “in position” indicator	MI, MA, INPOS, PEINPOS,
• Simple absolute & incremental indexing with triggering capability through either the serial port or the hardware configurable inputs	MAPOS, MASPEED, MIDIST, & MISPEED INx, INxMODE
• Homing capability	MH, HOMESPD, HOMESTATE, HOMETYPE, INx, INxMODE
• PID position loop tuning with feed-forward acceleration gain input to both the velocity & current loops and feed-forward velocity gain input to the velocity loop	GP, GPD, GPI GPAFR,GPAFR2 GPVFR
• Software position limits	PLIM, PMAX, PMIN
• Configurable integrator dynamics through travel range	GPISATOUT, GPISATIN
• Cumulative, revolution, and error position counters	PFB, HWPOS, PRD, PE
• Position configuration parameters	INPOS, PEINPOS, PE, PEMAX, PFB, PFBOFF

Gear Mode

Description	Variables
• Electronic gearing featuring Pulse Following or Master Encoder capability with resolution up to 3MHz through C8 connector	Position Mode - OPMODE 4 GEAR, GEARMODE, GEARI, GEARO, PEXT, PEXTOFF, VEXT, XENCRES, XENCDIR, INxMODE

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PROGRAMMABLE FUNCTIONS

Acceleration/Deceleration Control

Description	Variables
• Electronic braking	STOPMODE, ISTOP
• Accel/Decel linear ramping control in velocity mode	ACC, DEC, PROFMODE
• Controlled decelerating	DECSTOP, DISSPEED, DISTIME
when the drive is left enabled or becomes disabled	STOP, HOLD, CWLIM, LIMIDS
also can be used in conjunction with the electronic braking feature	K, S, ACKFAULT, DIS

Feedback Devices

Description	Variables
• Device zeroing mode that rotates the motor to an electrical null point	ZERO, IZERO
Resolvers:	
• Variety of motor/resolver pole combinations	MPOLES, MRESPOLES
• Resolver-zero offsetting	MPHASE
• Inter-LSB interpolation between least significant bits	ILSBMODE
• Automatic resolution configuration based on application speed requirements	RDRES, VMAX
Encoders:	
• Maximum frequencies to 3MHz before quad	
• Up to 10 million counts per motor mechanical cycle	MENCRES
• Configures automatically	ENCINIT, ENCINITIST, ENCSTART, IENCSTART
• Index pulse offsetting capability for commutation	MENCOFF
• Variety of encoder types	MENCTYPE
1. encoder with or without index	
2. encoder-hall effects with or without index	MHINVA, MHINVB, MHINVC

System Communications

Description	Variables
Three communication interfaces:	
1. Serial port	address setting through DIPswitch on top of drive
• RS232 single & up to 31 axis MultiDrop addressing through C1/C7 connectors	ADDR
• RS485 single & up to 31 axis MultiDrop addressing through C1 connector	ADDR
• Data transmission baud rates of 9600 or 19200	DUMP, GET, LIST, MLIST, GETMODE hardware DIP switch
• Configurable Protocol	ECHO, PROMPT, ACKMODE, GETMODE, MSG
• Interface through Kollmorgen's MotionLink® or a dumb terminal	
2. Differential Analog Input command through C3 connector	
• +/-10v @ 14 bit resolution	
• signal filtering	ANLPFHZ
• signal deadband and offsetting capability	ANIN, ANDB, ANOFF, ANZERO
• Encoder equivalent output signal with before quad resolution up to 16,384 line/revolution for a resolver-based system and up to 3MHz for an encoder-based system. This eliminates the need for an additional position feedback device.	
1. resolver-based systems: developed through R/D circuit with configurable resolution	ENCOUT, ENCOUTO
2. encoder-based systems: actual encoder signal from motor	MENCRES

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PROGRAMMABLE FUNCTIONS

Fault and Safety Detection

Description	Variables
• Watchdog faults	
• General faults	ACKFAULT
• Configurable UnderVolts protection	UVMODE, UVTIME, UVRECOVER
• Overspeed protection	VOSPD
• Fatal and non-fatal error coding with text explanation to the host also included is a run-time counter that records the time the error occurred	ERR, FLTHIST, FLTCLR TRUN
• Configurable motor thermal protection that accepts various thermostat types	THERM, THERMODE, THERMTYPE, THERMTIME
• Configurable drive thermal protection through the Foldback feature It set the maximum time limit the drive can provide peak current (2:1 Sx, 3:1 Cx) to the motor.	FOLD, FOLDMODE, FOLDBACK
• Configurable end-travel limits:	
- hardware limit switch detection INxMODE where x is 1, 2, 3	CCWLIM, CWLIM, LIMDIS, INx,
- configurable software position limits	PLIM, PMAX, PMIN
• Fault relay output	RELAY, RELAYMODE, DISTIME
• Active disable feature that allows the user to determine how the system should react at the occurrence of a fault. The system can immediately disable, where the motor will coast to a stop, or it can be programmed to a controlled decelerated stop.	ACKFAULT DECSTOP, DISSPEED, DISTIME, STOPMODE, ISTOP
• Active enable indicator in the status display decimal	ACTIVE, DRIVEOK, SWEN, READY, REMOTE, DIPEN

Monitoring and Diagnostic Tools

Description	Variables
• Performance recording	RECDONE, RECING, RECOFF, RECORD, RECRDY, RECTRIG
• System status checking	STAT, STATUS, STATUS2
• Control loop monitoring:	
1. current/torque	I, IA, IC, ICMD, IMAX, ICONT,
2. speed	V, VCMD, VE
3. position	PCMD, PFB, PE, HALLS, HWPOS, INPOS, PRD, PEXT
• Analog output (configurable) resolution through C3 connector that can be configured to monitor speed, torque, current, power, velocity error, & position following error (Should be used as a monitoring tool only.)	ANOUT
• Digital output (configurable) dual-state digital output through C3 connector that toggles according to various absolute current, speed, & position parameter settings. Also can be used to communicate occurances of Foldback, Brake mode, Drive enable & Encoder INIT complete	O1, O1MODE, O1RST, O1TRIG
• Status Display indicator that communicates operational & fault characteristics	TESTLED
• Real-time reading of the 10-position DIPswitch	DIP, DIPEN, ADDR
• Indicator provided for Configurable Inputs	INx, INxMODE

Others

Description Variables	
• Many enabling and disabling features	K, S, STOP, REMOTE, EN, DIS
• Flash firmware memory for easy field installation	

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AMPLIFIER SPECIFICATIONS

Electrical characteristics
- Closed loop velocity bandwidth up to 400 Hz
- Motor current ripple frequency (16-32 kHz)
- Long term speed regulation (0.01%)
- Position loop update rate 500 µs (2 kHz)
- Velocity loop update rate 250 µs (4 kHz)
- Commutation update rate 62.5 µs (16 kHz)
- Current loop update rate 62.5 µs (16 kHz)

Fault protection
- Output phase to phase short circuit protection
- Overvoltage
- Undervoltage
- Overtemperature (motor and amplifier)
- Overspeed
- Overcurrent
- Feedback loss
- Foldback
- Supply loss
- Excessive position error

Environmental
- Operation range
  - Ambient 0 to 45°C
  - Storage -20°C to 70°C
- Humidity (non-condensing) 10% to 90%

Velocity Loop Compensation
- Vel: PI, PDFF or Pole Placement selectable algorithms
- Factory preset or field tunable
- **MOTIONLINK**® software provides tuning programming via RS-232 or RS-485 serial interface
- Adjustable filters

Position Loop Compensation
- PID

Operational modes
- Torque control — from analog or serial command
- Velocity control — from analog or serial command
- Pulse following / Up-Down count
- Gearing from quad encoder input
- Position control

Inputs
- Analog command: ±10V
  Resolver feedback models: 14 bit resolution provides up to 16,000 to 1 dynamic speed range
  Encoder feedback models: 15 bit resolution provides up to 32,000 to 1 dynamic speed range
- Remote enable: 24V
- Three multi-purpose 24V inputs Configurable to: CW limit switch, CCW limit switch, gear enable, start motion, second current limit, change velocity to torque mode, home switch, search for home, move to home registration capture, active disable, control fault relay, hold position plus using two inputs, up to four stored indexes or speeds can be executed
- Pulse command: up/down, pulse/direction, pulse or quadrature encoder format into RS-485 receivers or opto isolators

Communications
- RS-232 or RS-48S serial interface 9600 or 19.2 kb
- Drive-to-Drive multidrop

Outputs
- Fault: contact closure rated for 1 Amp, 24 Volt
- One multi-purpose 24V output configurable to: speed exceeded, current exceeded, amplifier in foldback, brake enable, motion complete, in position, zero speed detect, encoder INIT complete

Diagnostics
- Seven segment LED display
- Error history log
- Internal variable monitoring
- PC scope

Motor Feedback
- Resolver: sine/cosine 2V peak to peak (SERVO**STAR CD** provides 4.25V peak to peak for resolver excitation)
- Encoder: 5V differential quadrature with or without Halls, with or without marker, up to 3 MHz before quadrature (12 MHz after quadrature)

Amplifier Ratings

Model	Output Continuous Current PerPhase (RMS/phase)	Output Peak Current Per Phase (1/2 sec)	Rated Output Continuous Power (kW)	Internal Power Dissipation (Watts)	PWM Switching Frequency (kHz)	AC Input Line Voltage (1 phase)	Rated Input Power (kW)	Regen. Option
Cx03	3	9	1.1	37	16	115-230	1.7	ERH-26
Cx06	6	18	2.2	84	8	115-230	2.8	ERH-26

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Resistive Regeneration Sizing

Shunt regeneration is required to dissipate energy that is pumped back into the DC bus during load deceleration. The amount of shunt regeneration required is a function of the sum of simultaneously decelerating loads. The loads need to be defined in terms of system inertia, maximum speed, and deceleration time. In addition, the duty cycle must be known. Application Note A-SU-001-H details a calculation method to determine proper regeneration sizing.

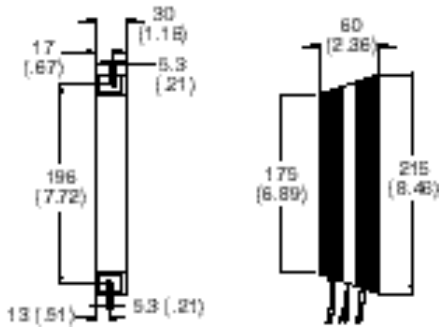
Transformer Sizing (Required only for voltage matching)

The SERVO**STAR CD** can be connected to a line. Built-in soft-start circuitry protects power supply components and eliminates nuisance tripping of breakers or fuse blowing due to large in-rush currents. Transformers are only required for voltage matching purposes. In this case, the transformer should have a 115 or 230 VAC secondary depending on the operating voltage. The kVA rating of the transformer should take into account not only the servo output load requirements but also losses in the system and power factor. For single phase operated systems such as these, the transformer KVA ratings should be two times the CD amplifier output power rating.

Model	Transformer KVA rating
Cx03	2.2
Cx06	4.4

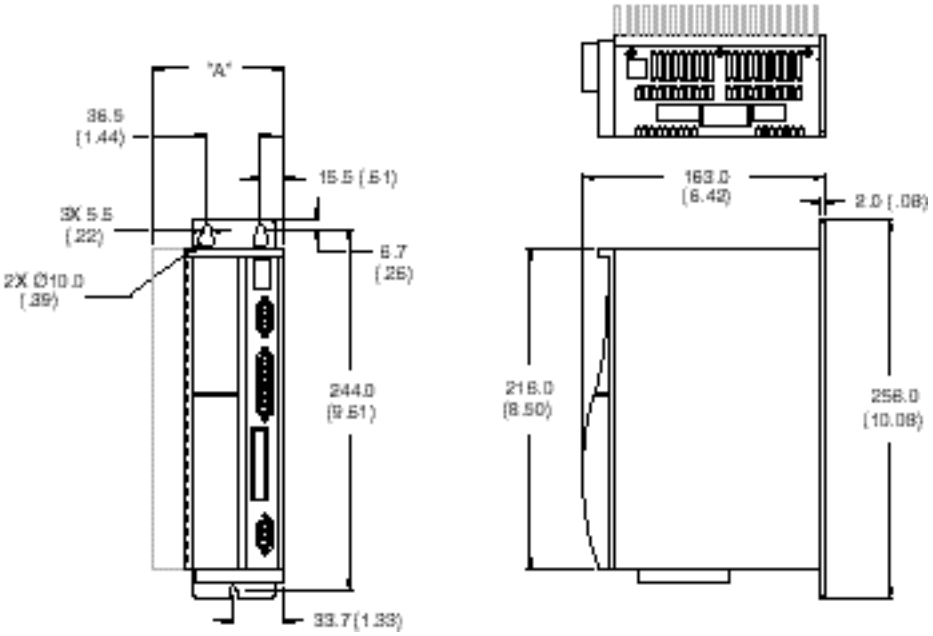


Model	Watts	Ohms
ERH-26	200	20



Resistive Regen ERH-26

SERVO**STAR Cx03 / 06 DIMENSIONS**

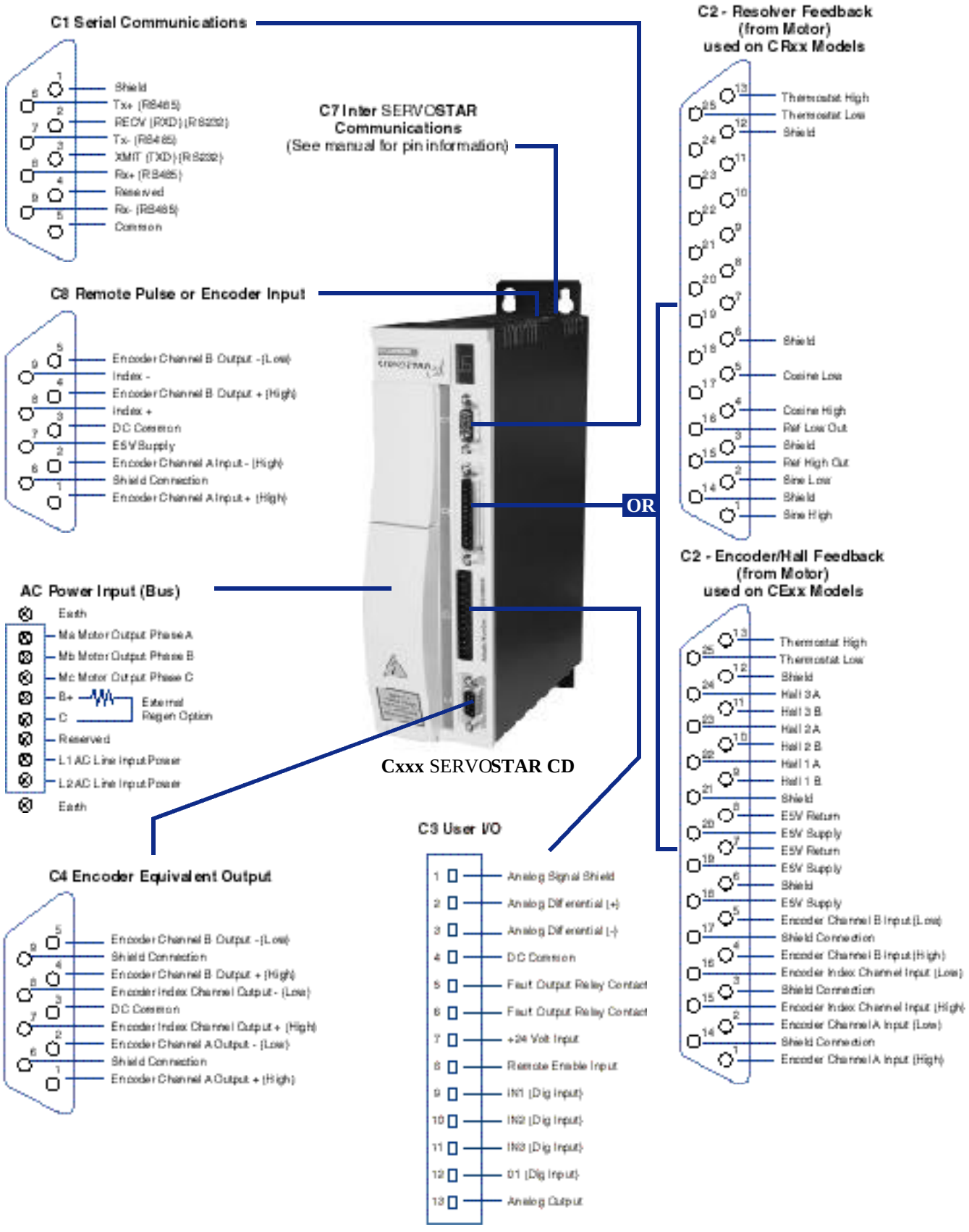


	DIM. "A"
3 AMP	67.4 (2.65)
6 AMP	88.4 (3.48)

Dimensions in mm (inches)

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CONNECTOR INFORMATION



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SYSTEM ORDERING INFORMATION

C R 06 200 - 2 G 402 B

SERVO**STAR Family**
C - SERVO**STAR CD** Compact Drive

Feedback
R - Resolver
E - Encoder

Current Rating (Cont. A/Ø)
(Compact Drive: 03,06 Amp ratings)

Winding
0 - No Comp

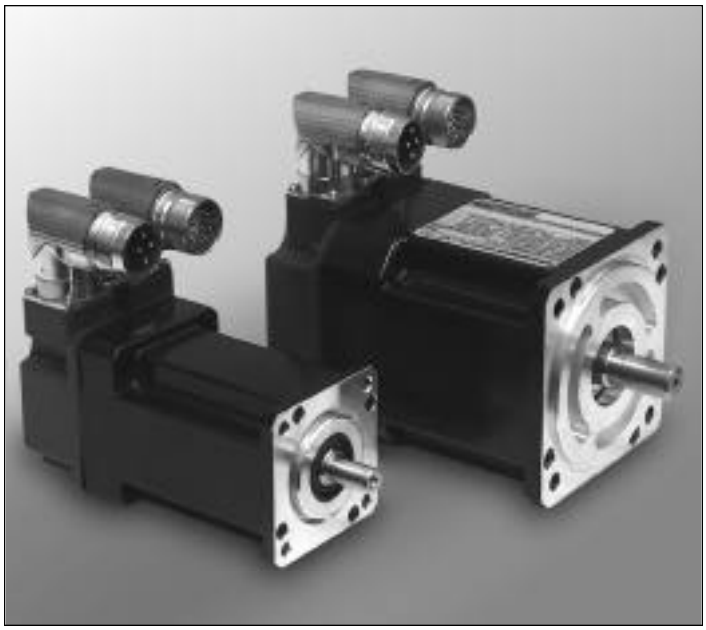
Motor Frame and Stack
000 - No Comp

Motor Model
O - No Comp
G - **GOLD**LINE (B, BE, M, ME, XT, EB)

Voltage Level
0 - No Comp
2 - Standard
Y - Special Compensation
three digit extension follows
the Y designator

Model
200 - Standard model

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Kollmorgen GOLDLINE® XT30 & XT150Series

- **0.44 to 4.8 N-m (0.32 to 3.5 lb-ft) Continuous Torque**
- **Up to 18.7 N-m (13.8 lb-ft) Peak Torque**
- **60mm (2.35 in) and 90mm (3.5 in) Square Frames**
- **Encoder or Resolver Feedback**
- **Speeds up to 6000 RPM**

Kollmorgen **GOLD**LINE **XT15** and **30** series servomotors provide high performance, cost-effective solutions in compact, rugged NEMA 23 and 34 packages.

Kollmorgen's patented magnetic design allows high torque-to-inertia for rapid acceleration, while providing extremely low cogging and torque ripple for smooth operation.

The proprietary stator assembly provides more efficient heat transfer for high torque density (compact size), and at the same time increases thermal time constants to allow longer overloads on machines.

The **GOLD**LINE **XT** series base models designed for use with the SERVO**STAR**® **CD** drive come equipped with an integral, industrial grade optical encoder (2048 Lines Per Revolution), and rugged, CE compliant, rotatable connectors. Optional resolver feedback is also available.

FEATURES:

- Multiple stack lengths
- Short overall motor lengths
- Excellent torque-to-inertia ratio
- Low cogging/torque ripple
- Speeds to 6000 RPM standard
- Increased thermal time constant
- English and Metric standard mounting
- UL recognized, CE compliant
- Optimized windings to match SERVO**STAR CD**
- Rotatable connectors
- Rugged 2048 LPR encoder feedback
- Built-in thermostat (XT30) or thermistor (XT15)
- IP65 sealing

OPTIONS:

- IP67 sealing
- Integral electrically-released brake (24 or 90 VDC)
- Resolver feedback
- Mating connectors

Performance Curves notes (opposite page):

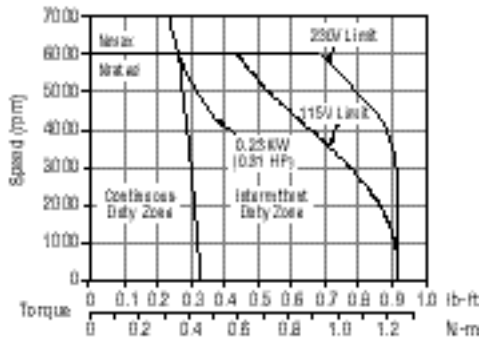
1. Continuous duty operation is with motor mounted to 8" x 12" x 3/8" aluminum faceplate.
2. All curves shown at 60Hz input. Derate max speed and peak power by 15% for 50 Hz operation.
3. For motor models with shaft seals, derate torque at all speeds by 0.026 lb-ft (0.035 N-m).
4. All curves represent typical performance. Always allow appropriate safety factor when sizing systems.

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XT150 SYSTEM PERFORMANCE CURVES

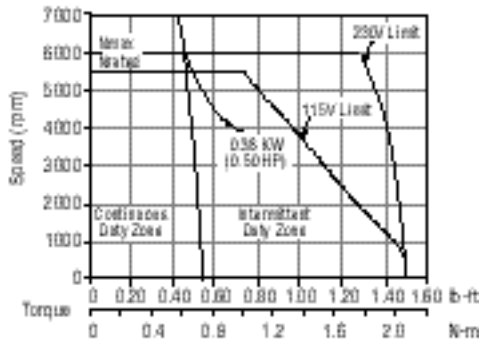
1 ■ Motor MT1502A ■ Amplifier: Cx03

Performance Specification	Symbol	Units	
Cont. Torque at stall	Tc	lb-ft	0.32
		N-m	0.44
Peak Torque at stall	Tp	lb-ft	0.92
		N-m	1.25
[1]Max. Speed	Nmax	RPM	6000
[1]Continuous Power	HPrated	HP	0.31
	W rated	Watts	231
[1]Rated Speed	Nr	RPM	6000
[2]MotorInertia x 10^{-4}	Jm	lb-ft-s^2	0.076
		kg-m^2	0.104
Motor Weight	Wt	lb	2.4
		kg	1.1



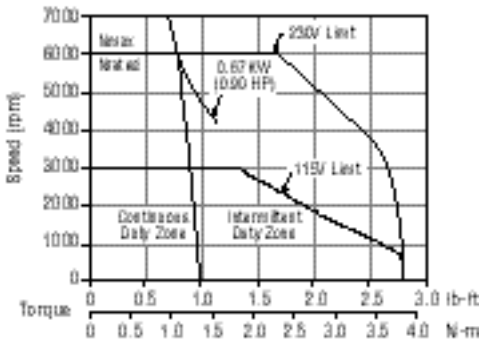
2 ■ Motor MT1504A ■ Amplifier: Cx03

Performance Specification	Symbol	Units	
Cont. Torque at stall	Tc	lb-ft	0.55
		N-m	0.74
Peak Torque at stall	Tp	lb-ft	1.50
		N-m	2.03
[1]Max. Speed	Nmax	RPM	6000
[1]Continuous Power	HPrated	HP	0.50
	W rated	Watts	373
[1]Rated Speed	Nr	RPM	6000
[2]MotorInertia x 10^{-4}	Jm	lb-ft-s^2	0.126
		kg-m^2	0.171
Motor Weight	Wt	lb	2.9
		kg	1.3



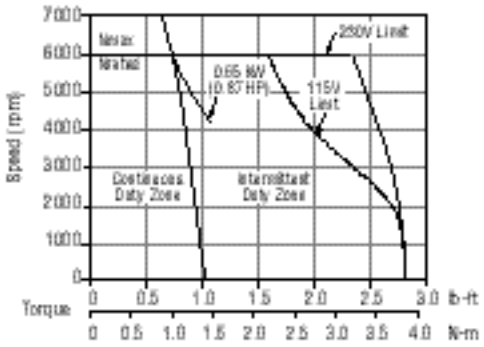
3 ■ Motor MT1506A ■ Amplifier: Cx03

Performance Specification	Symbol	Units	
Cont. Torque at stall	Tc	lb-ft	1.00
		N-m	1.35
Peak Torque at stall	Tp	lb-ft	2.80
		N-m	3.80
[1]Max. Speed	Nmax	RPM	6000
[1]Continuous Power	HPrated	HP	0.90
	W rated	Watts	671
[1]Rated Speed	Nr	RPM	6000
[2]MotorInertia x 10^{-4}	Jm	lb-ft-s^2	0.217
		kg-m^2	0.294
Motor Weight	Wt	lb	4.1
		kg	1.9



4 ■ Motor MT1506B ■ Amplifier: Cx06

Performance Specification	Symbol	Units	
Cont. Torque at stall	Tc	lb-ft	1.02
		N-m	1.38
Peak Torque at stall	Tp	lb-ft	2.88
		N-m	3.90
[1]Max. Speed	Nmax	RPM	6000
[1]Continuous Power	HPrated	HP	0.87
	W rated	Watts	649
[1]Rated Speed	Nr	RPM	6000
[2]MotorInertia x 10^{-4}	Jm	lb-ft-s^2	0.217
		kg-m^2	0.294
Motor Weight	Wt	lb	4.1
		kg	1.9



Notes:

[1] Values for 230 VAC operation.

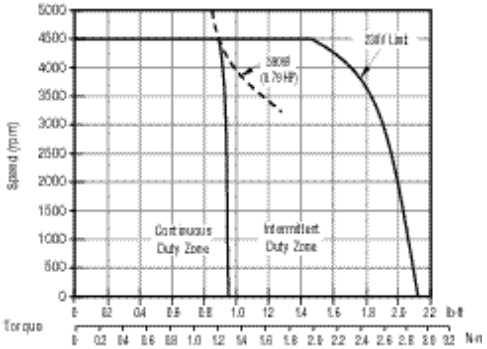
[2] Values for encoder feedback version. For resolver add: 0.017 x 10^{-4} lb-ft-s^2 (0.023 x 10^{-4} kg-m^2)

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XT30 SYSTEM PERFORMANCE CURVES

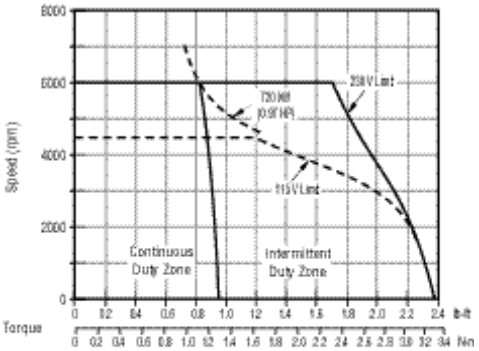
5 ■ Motor MT302A ■ Amplifier: Cx03

Performance Specification	Symbol	Units	
Cont. Torque at stall	Tc	lb-ft	0.95
		N-m	1.29
Peak Torque at stall	Tp	lb-ft	2.15
		N-m	2.92
Continuous Power	HPrated	HP	0.79
	W rated	Watts	590
Max. Speed	N	RPM	4500
MotorInertia x 10^{-4}	Jm	lb-ft-s^2	0.343
		kg-m^2	0.465
Motor Weight	Wt	lb	5.6
		kg	2.5



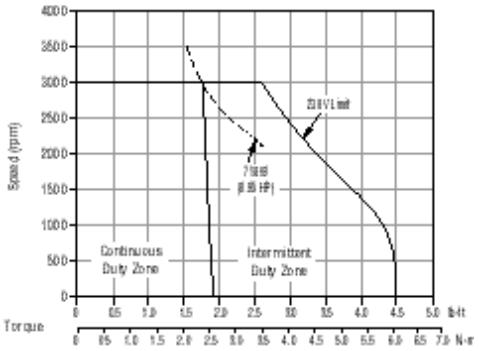
6 ■ Motor MT302B ■ Amplifier: Cx06

Performance Specification	Symbol	Units	
Cont. Torque at stall	Tc	lb-ft	0.94
		N-m	1.27
Peak Torque at stall	Tp	lb-ft	2.38
		N-m	3.22
Continuous Power	HPrated	HP	0.97
	W rated	Watts	720
Max. Speed	N	RPM	6000
MotorInertia x 10^{-4}	Jm	lb-ft-s^2	0.343
		kg-m^2	0.465
Motor Weight	Wt	lb	5.6
		kg	2.5



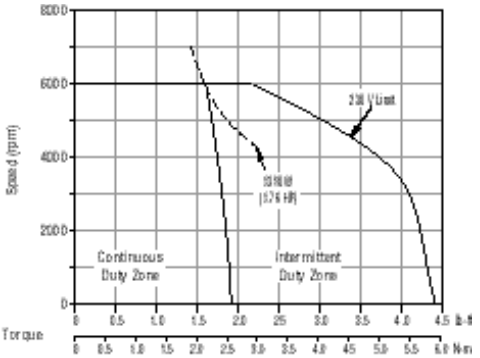
7 ■ Motor MT304A ■ Amplifier: Cx03

Performance Specification	Symbol	Units	
Cont. Torque at stall	Tc	lb-ft	1.86
		N-m	2.52
Peak Torque at stall	Tp	lb-ft	4.51
		N-m	6.12
Continuous Power	HPrated	HP	0.95
	W rated	Watts	710
Max. Speed	N	RPM	3000
MotorInertia x 10^{-4}	Jm	lb-ft-s^2	0.60
		kg-m^2	0.81
Motor Weight	Wt	lb	7.3
		kg	3.3



8 ■ Motor MT304B ■ Amplifier: Cx06

Performance Specification	Symbol	Units	
Cont. Torque at stall	Tc	lb-ft	1.81
		N-m	2.45
Peak Torque at stall	Tp	lb-ft	4.35
		N-m	5.90
Continuous Power	HPrated	HP	1.76
	W rated	Watts	1310
Max. Speed	N	RPM	6000
MotorInertia x 10^{-4}	Jm	lb-ft-s^2	0.60
		kg-m^2	0.81
Motor Weight	Wt	lb	7.3
		kg	3.3



Notes:

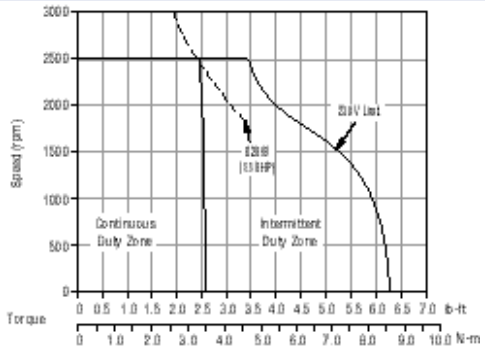
1. Continuous duty operation is based on using 8”x 12”x 3/8” aluminum plate.
2. All curves shown at 60 Hz input, derate max. speed and peak power by 15% for 50 Hz operation.
3. For motor models with shaft seals, derate torque at all speeds by .059 ft-lb (.08 N-m).
4. All curves represent typical performance. Always allow appropriate safety factor when sizing systems.

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XT30 SYSTEM PERFORMANCE CURVES

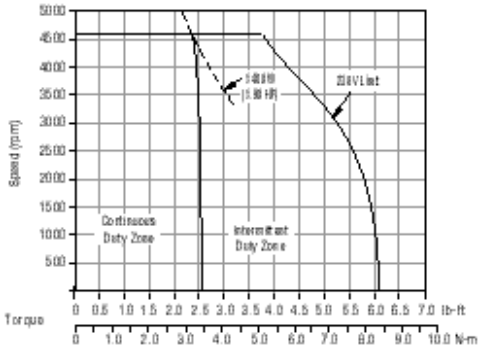
9 ■ Motor MT306A ■ Amplifier: Cx03

Performance Specification	Symbol	Units	
Cont. Torque at stall	Tc	lb-ft	2.449
		N-m	3.38
Peak Torque at stall	Tp	lb-ft	6.34
		N-m	8.60
Continuous Power	HPrated	HP	1.10
	W rated	Watts	820
Max. Speed	N	RPM	2500
MotorInertia x 10^{-4}	Jm	lb-ft-s^2	0.819
		kg-m^2	1.11
Motor Weight	Wt	lb	8.36
		kg	3.8



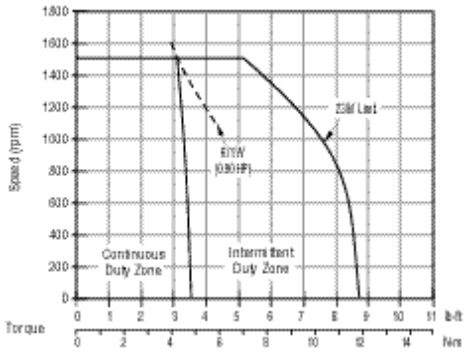
10 ■ Motor MT306B ■ Amplifier: Cx06

Performance Specification	Symbol	Units	
Cont. Torque at stall	Tc	lb-ft	2.45
		N-m	3.32
Peak Torque at stall	Tp	lb-ft	6.09
		N-m	8.26
Continuous Power	HPrated	HP	1.98
	W rated	Watts	1480
Max. Speed	N	RPM	4600
MotorInertia x 10^{-4}	Jm	lb-ft-s^2	0.819
		kg-m^2	1.11
Motor Weight	Wt	lb	8.36
		kg	3.8



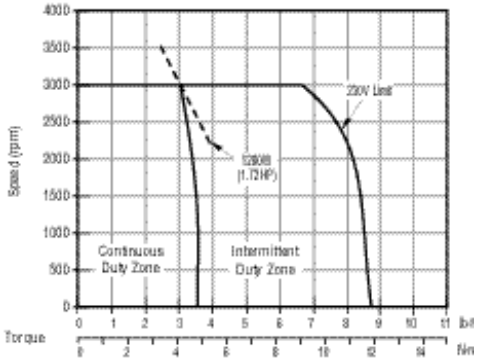
11 ■ Motor MT308A ■ Amplifier: Cx03

Performance Specification	Symbol	Units	
Cont. Torque at stall	Tc	lb-ft	3.53
		N-m	4.79
Peak Torque at stall	Tp	lb-ft	8.7
		N-m	11.8
Continuous Power	HPrated	HP	0.90
	W rated	Watts	671
Max. Speed	N	RPM	1500
MotorInertia x 10^{-4}	Jm	lb-ft-s^2	1.29
		kg-m^2	1.75
Motor Weight	Wt	lb	11.3
		kg	5.1



12 ■ Motor MT308B ■ Amplifier: Cx06

Performance Specification	Symbol	Units	
Cont. Torque at stall	Tc	lb-ft	3.53
		N-m	4.79
Peak Torque at stall	Tp	lb-ft	8.7
		N-m	11.8
Continuous Power	HPrated	HP	1.72
	W rated	Watts	1280
Max. Speed	N	RPM	3000
MotorInertia x 10^{-4}	Jm	lb-ft-s^2	1.29
		kg-m^2	1.75
Motor Weight	Wt	lb	11.3
		kg	5.1



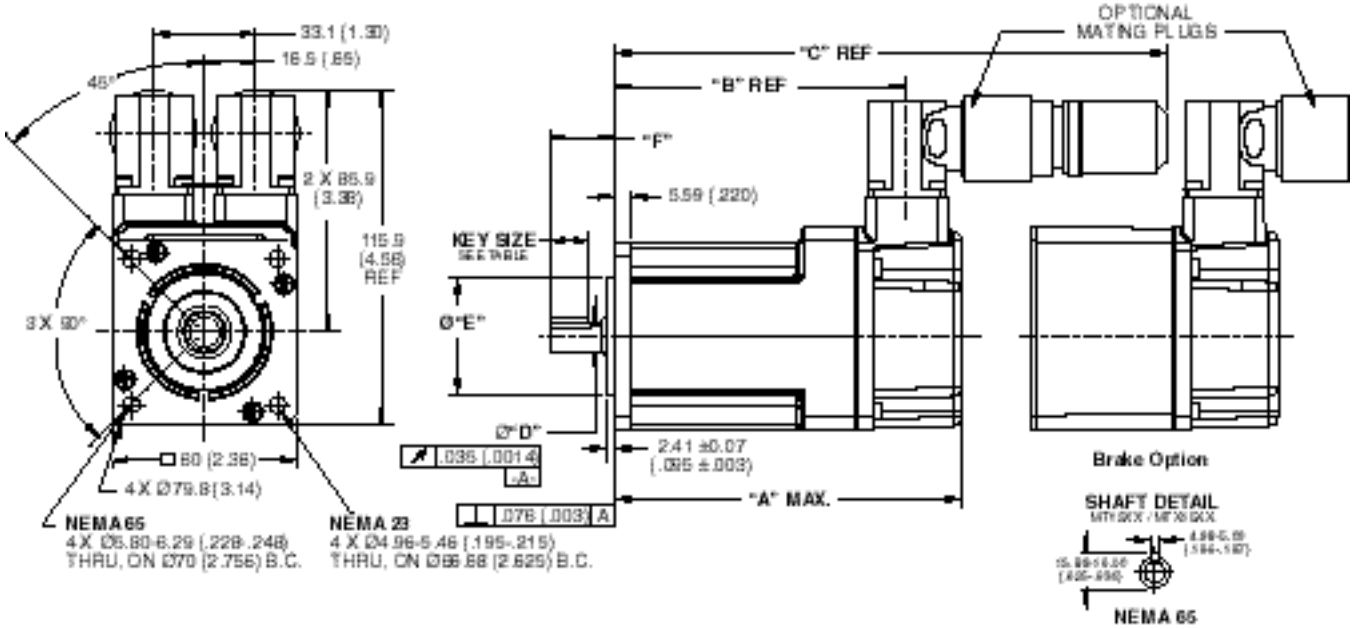
Notes:

1. Continuous duty operation is based on using 8”x 12”x 3/8” aluminum plate.
2. All curves shown at 60 Hz input, derate max. speed and peak power by 15% for 50 Hz operation.
3. For motor models with shaft seals, derate torque at all speeds by .059 ft-lb (.08 N-m).
4. All curves represent typical performance. Always allow appropriate safety factor when sizing systems.

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DIMENSIONS

MT150x

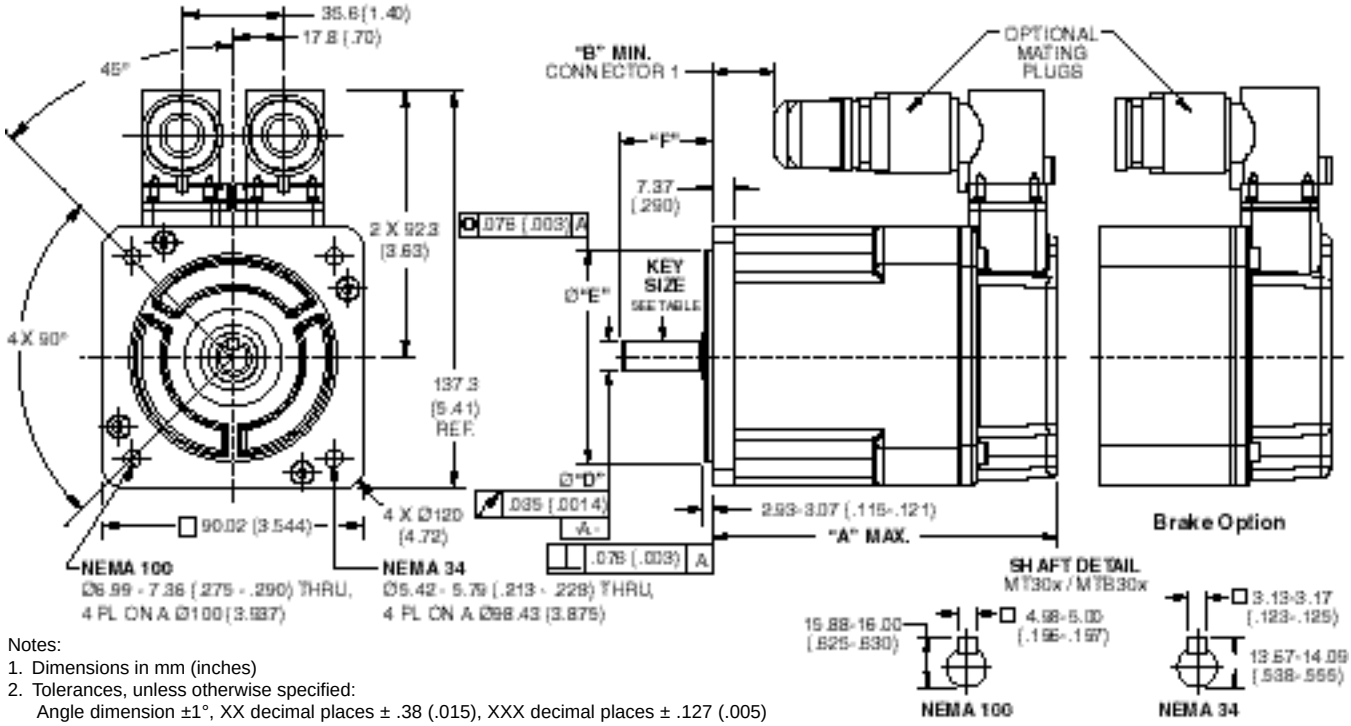


Notes:
1. Dimensions in mm (inches)
2. Tolerances, unless otherwise specified:
   Angle dimension ±1°, XX decimal places ± .38 (.015), XXX decimal places ± .127 (.005)
3. Motor receptacles can be rotated.

Model	"A"MAX.		"B" REF		"C" REF		"D"		"E"		"F" ±0.5 (±.020)		Key Length	
	w/ brake	w/o brake	w/ brake	w/o brake	w/ brake	w/o brake	NEMA23	NEMA65	NEMA23	NEMA65	NEMA23	NEMA65	NEMA23	NEMA65
MT(B)1502	158.70 (6.248)	113.4 (4.465)	140.33 (5.525)	95.31 (3.752)	230.38 (9.07)	185.42 (7.30)	9.513	13.997	38.05	49.99	20.83	30	no	20 (.79)
MT(B)1504	174.24 (6.860)	128.94 (5.077)	155.88 (6.137)	110.85 (4.364)	245.87 (9.68)	200.91 (7.91)	9.525 (.3745	14.006 (.5511	38.15 (1.498	50.01 (1.968	(.820)	(1.181)	keyway	20 (.79)
MT(B)1506	205.23 (8.080)	160.03 (6.301)	186.97 (7.361)	141.94 (5.588)	277.11 (10.91)	231.90 (9.13)	.3750)	.5515)	1.502)	1.969)				20 (.79)

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MT30x



Notes:
1. Dimensions in mm (inches)
2. Tolerances, unless otherwise specified:
   Angle dimension ±1°, XX decimal places ± .38 (.015), XXX decimal places ± .127 (.005)
3. Connectors rotate for models MT302. DIM "B" is too small for cable bend radius.
   Rotate connector 35° MIN.

Model	"A"MAX.		"B" MIN.		"D"		"E"		"F" ±.76 (±.030)		Key Length	
	with brake	without brake	with brake	without brake	NEMA34	NEMA100	NEMA34	NEMA100	NEMA34	NEMA100	NEMA34	NEMA100
MT(B)302	165.6 (6.520)	120.1 (4.730)	65.14 (2.565)	19.93 (.785)	9.512-9.525	14.01	73.05	80.03			no	20 (.79)
MT(B)304	183.1 (7.210)	137.7 (5.420)	82.67 (3.255)	37.46 (1.475)	(.3745-.3750)	13.99	73.00	79.99	31.75	30	keyway	20 (.79)
MT(B)306	198.6 (7.820)	153.2 (6.030)	98.16 (3.865)	52.95 (2.085)	12.69-12.70	(.5515 .5511)	(2.876 2.874)	(3.151 3.149)	(1.250)	(1.181)	19 (.75)	20 (.79)
MT(B)308	231.7 (9.120)	186.2 (7.330)	131.2 (5.165)	85.97 (3.385)	(.4995-.5000)						19 (.75)	20 (.79)

Connections:

MotorReceptacle:

Pin	3	- Phase A (brown)
Pin	4	- Phase B (red)
Pin	1	- Phase C (white)
Pin	2	- Ground (green/yellow)
Pin	A	- (Optional)Brake (+) (blue)
Pin	B	- (Optional)Brake (-) (blue)

EncoderReceptacle:

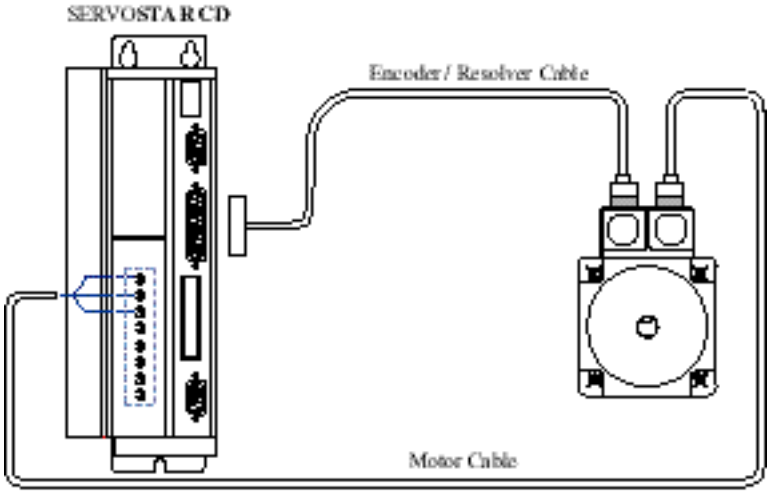
Pin	1	- A (blue)	Pin	16	- Hbc=S2 (gray)
Pin	2	- $\overline{A}$ (blue/black)	Pin	15	- Hca=S3 (white)
Pin	3	- B (green)	Pin	10	- +5Vdc (red)
Pin	4	- $\overline{B}$ (green/black)	Pin	7	- Common (black)
Pin	5	- Z (violet)	Pin	8	- Thermostat (yellow)
Pin	6	- $\overline{Z}$ (violet/black)	Pin	9	- Thermostat (yellow)
Pin	17	- Hab=S1 (brown)			

ResolverReceptacle:

Pin	9	- R1 (Red/White)
Pin	5	- R2 (Yel/White)
Pin	7	- S1 (Red)
Pin	3	- S3 (Black)
Pin	8	- S2 (Yellow)
Pin	4	- S4 (Blue)
Pin	2	- Thermostat (Yellow)
Pin	6	- Thermostat (Yellow)

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SYSTEM INTERCONNECT DIAGRAM



System Summary and Configurations

Motor	Continuous Torque lb-ft (N-m)	Peak Torque lb-ft (N-m)	Continuous Power HP(W)	Max Speed RPM	Amplifier[1]	Amplifier Cont/Peak Current (RMS/Phase)	Cable Set[2, 3]	Curve Number
MT1502A	0.32 (0.44)	0.92 (1.25)	0.31 (231)	6000	CE03200-2G1502A1	3/9	CS-SS-CHA1HE-03	1
MT1504A	0.55 (0.74)	1.72 (2.33)	0.50 (373)	6000	CE03200-2G1504A1	3/9	CS-SS-CHA1HE-03	2
MT1506A	1.00 (1.35)	3.41 (4.62)	0.90 (671)	6000	CE03200-2G1506A1	3/9	CS-SS-CHA1HE-03	3
MT1506B	1.02 (1.38)	3.44 (4.66)	0.87 (649)	6000	CE06200-2G1506B1	6/18	CS-SS-CHA1HE-03	4
MT302A	1.00 (1.36)	2.38 (3.23)	0.83 (619)	4500	CE03200-2G302A1	3/9	CS-SS-CHA1HE-03	5
MT302B	0.99 (1.34)	2.38 (3.23)	1.02 (761)	6000	CE06200-2G302B1	6/18	CS-SS-CHA1HE-03	6
MT304A	1.95(2.64)	5.46 (7.40)	1.00 (746)	3000	CE03200-2G304A1	3/9	CS-SS-CHA1HE-03	7
MT304B	1.90 (2.58)	5.46 (7.40)	1.85 (1380)	6000	CE06200-2G304B1	6/18	CS-SS-CHA1HE-03	8
MT306A	2.61 (3.54)	8.47 (11.5)	1.15 (857)	2500	CE03200-2G306A1	3/9	CS-SS-CHA1HE-03	9
MT306B	2.58 (3.50)	8.50 (11.5)	2.08 (1550)	4600	CE06200-2G306B1	6/18	CS-SS-CHA1HE-03	10
MT308A	3.72 (5.04)	14.1 (19.2)	0.95 (708)	1500	CE03200-2G308A1	3/9	CS-SS-CHA1HE-03	11
MT308B	3.72 (5.04)	14.1 (19.1)	1.81 (1350)	3000	CE06200-2G308B1	6/18	CS-SS-CHA1HE-03	12

Notes:

[1] Part numbers shown are for encoder feedback. For resolver feedback: C**R**xx200-2Gxxxx1

[2] Part numbers shown are for encoder feedback. For resolver feedback: CS-SS-RHA1HE-03
For encoder models with brake: CS-SS-CHAAHBE-03, for resolver models with brake: CS-SS-RHAAHBE-03

[3] Cable part numbers reflect 3 meter length. Cables are available in 3, 6, and 9 meter lengths (-03, -06, -09).
Maximum encoder cable length is 30 meters. Maximum resolver cable length is 75 meters.

Electrically Released Brake

Motor	Input Voltage[1] VDC	Input Current ADC	Static Holding Torque[2] lb-ft (N-m)	Inertia lb-ft-s^2 (kg-m^2)
MTB15xxx	90	0.071	1.14 (1.55)	0.0000074 (0.00001)
MTC15xxx	24	0.33	1.14 (1.55)	0.0000074 (0.00001)
MTB3xxx	90	0.18	4.4 (5.97)	0.0000125 (0.0000169)
MTC3xxx	24	0.75	4.4 (5.97)	0.0000125 (0.0000169)

Notes:

[1] ± 10% on inputs

[2] Static holding torque only. Must not be used in dynamic braking.

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External Regen Resistor Module:	ERH-26	200 Watts
Communications Cable:	A-97251-004	RS-232 communications cable
Connector Kit:	CK100	Mating connectors* for C1, C2, C4, C7 & C8 *Screw terminal mating connectors C3 and C5 are included with the SERVO**STAR CD** amplifier.

Note: Custom mechanicals - special shafts, keyways, and mounting are available.
Contact the **K**ollmorgen **C**ustomer **S**upport **N**etwork (1-800-77 SERVO) for more information.

Ordering Information

MT B[a] 30 2 A 1 - E 1 C 1 - xxx[b]

Brake Option
B - 90 VDC brake
C - 24 VDC brake

Frame Size
150 - 60 mm
30 - 90 mm

Stack Length, Number
2, 4, 6, 8 (XT30 only)

Winding Letter
A, B

Rotor Inertia
1 - Minimum Inertia

[a] - Omit if not specified
[b] - Omit if not special

Feedback Option
E - 2048 LPR incremental encoder
R - Resolver

Mounting Option
1 - NEMA65 (XT15)
NEMA100 (XT30)

2 - NEMA23 (XT15)
NEMA34 (XT30)

Connector Option
C - 90° rotatable receptacles
D - 90° rotatable w/ CE mating plugs

Shaft Seal Option
1 - Standard w/ shaft seal (IP65)
2 - IP67 and shaft seal
3 - No shaft seal

Sequential number for specials

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