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Electronics Data Publication



KOLLMORGEN

SERVOSTAR SC

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Kollmorgen

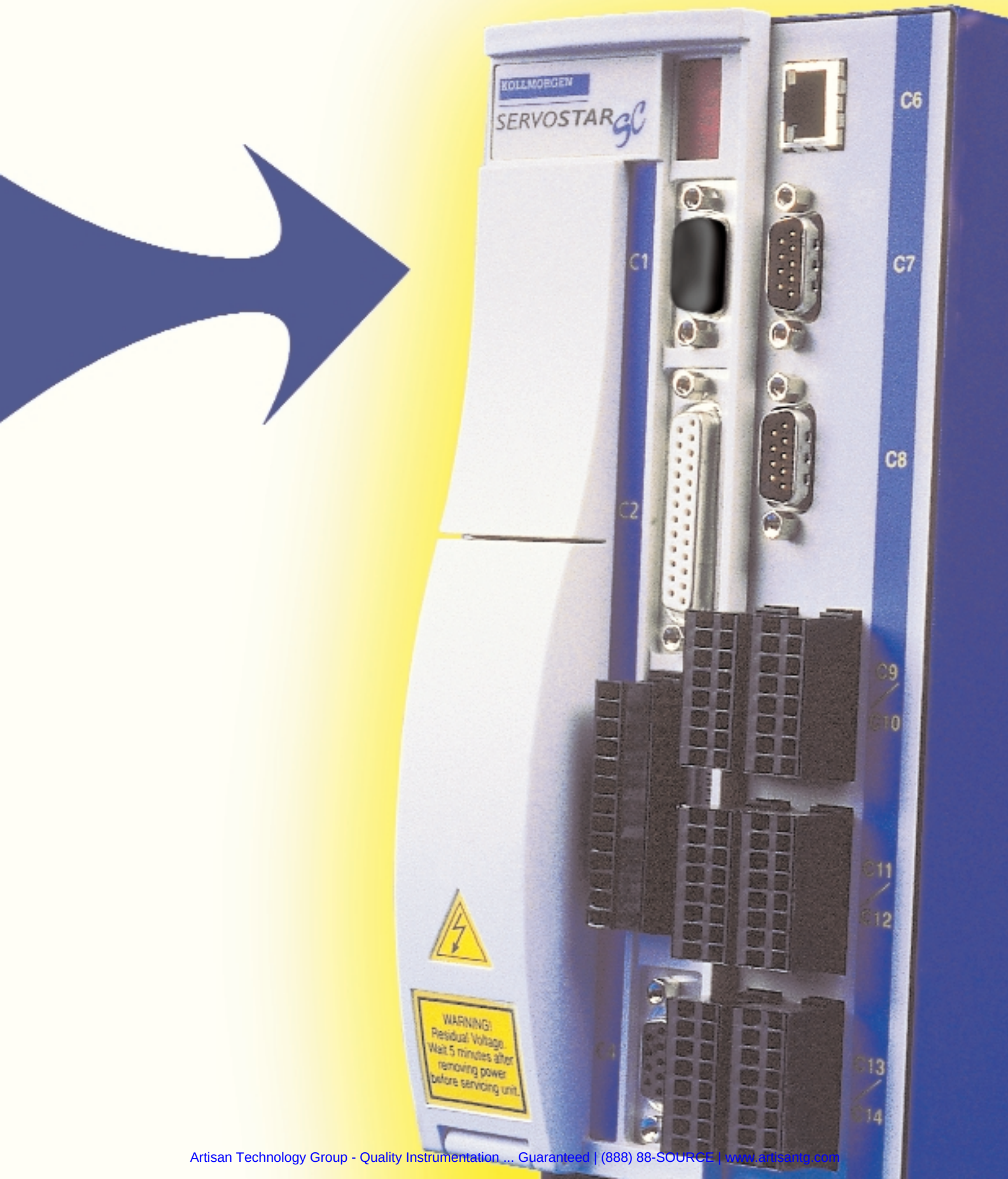
SERVOSTAR SC





The Kollmorgen SERVO**STAR**® SC Single Axis Controller combines the compact size, advanced servo control features, and proven reliability of the SERVO**STAR**® CD Compact Drive with the simple, yet flexible, programming capabilities of the SERVO**STAR**® MC Multi-Axis Controller. The SERVO**STAR**® SC offers a complete integrated power supply, drive amplifier, and single axis positioner in one compact package.

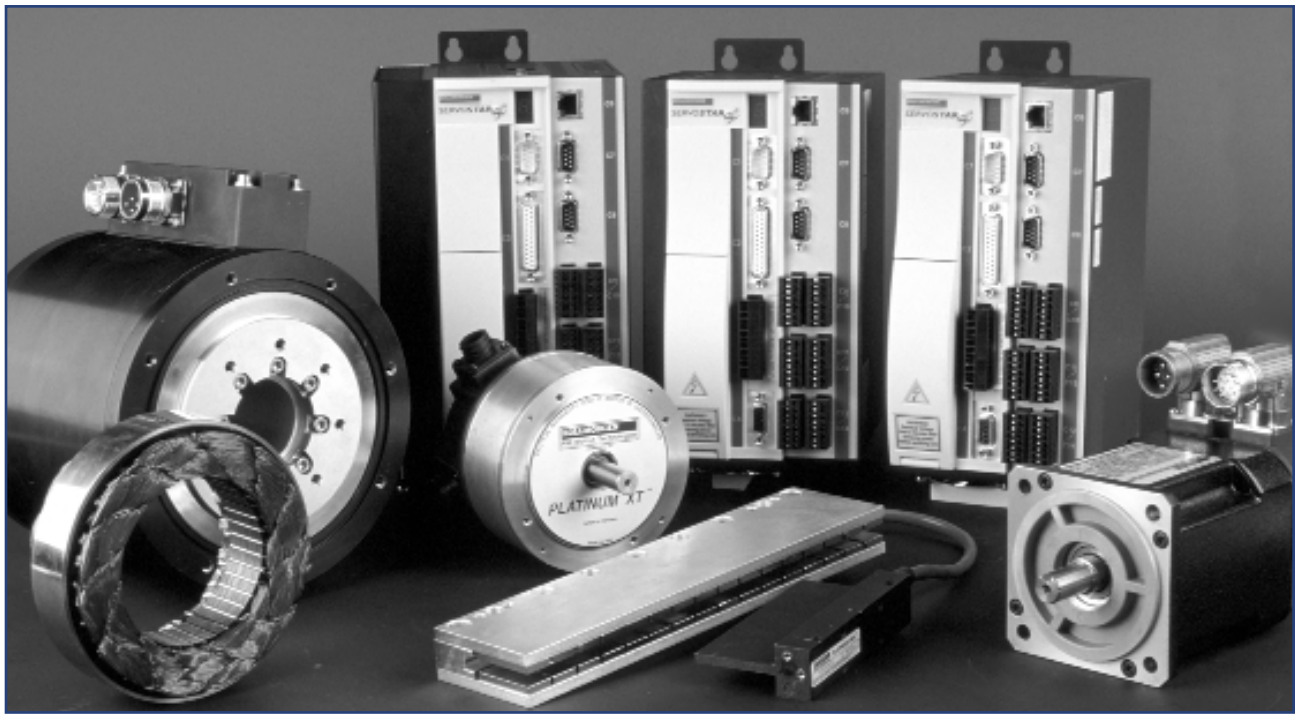
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Introduction

- **Compact size:** full single axis controller capability in the smallest space
- **Pre-configured for all Kollmorgen motors:** makes it easy to get started
- **Lots of standard I/O, digital & analog:** quickly integrate your whole system
- **Fully programmable, not just an indexing drive:** program whatever capability you need
- **Standard Ethernet support:** use Ethernet for industrial networking or I/O expansion
- **Plug-in option card capability:** add additional capability at the time of order or in the field



The SERVO**STAR**® SC provides tremendous motor flexibility. Capable of operating the complete range of Kollmorgen motors including **GOLD**LINE® rotary servomotors, **GOLD**LINE® DDR (Direct Drive Rotary), frameless motors, **PLATINUM**® DDL (Direct Drive Linear) and **PLATINUM**® XT Servodisc motors. No other manufacturer and no other single axis controller even comes close.

Kollmorgen's wide motor selection means no compromises in selecting the right motor for your application. With the SERVO**STAR**® SC all your single axis applications need only one controller.

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Servo

- Fully digital current, velocity and position loops
- Update rate
  - Reference generator - 1KHz (1ms)
  - Position loop - 2KHz (500µsec)
  - Velocity loop - 4KHz (250µsec)
  - Current loop - 16KHz (62.5µsec)
- Automatic control loop tuning
- Availible in 3, 6, and 10 amps, models (continous RMS current rating)
- Advanced velocity control algorithms (Comp mode, Pole Placement, and Extended Pole Placement)
- PID position loop tuning with feed forward
- Position, velocity, torque limits
- 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
- Patented torque angle control enhances motor performance
- Velocity loop bandwidths up to 400Hz
- Feedback
  - Resolver, encoder, sine encoder
  - Secondary encoder feedback, used to close a dual loop around the load, or as an input for master/slave or pulse-and-direction operation

Motion

- Profile - Sine acceleration + automatic/manual jerk control
- Profile - Trapezoidal velocity for rapid motions
- Operation modes:
  - Position - digital
  - Velocity - digital/analog
  - Torque - digital/analog
  - On the fly change between modes
  - Master/Slave - gear, cam
- Jogging, incremental/absolute moves, non-zero final velocity, advanced stop/proceed

Communication

- One serial port for use with BASIC MOVES Development Studio and MOTIONLINK®
- One Ethernet port at 10Mbit/sec for use with BASIC MOVES Development Studio and MOTIONLINK, Ethernet I/O (available 2001)
- One serial port (RS-232) for HMI support
- Fieldbus option card for DeviceNet (available 2001), and Profibus (available 2001)
- Protocol - Ethernet TCP/IP support, serial SLIP support

Programming Language

- MC BASIC (Motion Control BASIC)
- 'Unlimited' number of tasks and events
- 16 priority levels
- Events - for handling a-synch scenarios
- Advanced error handling - line, task, system
- Data types - integers, doubles, strings, arrays
- Libraries - functions any task can use
- Task control commands - idle, continue, kill, re-start
- Debugger - step(s), breakpoints, watch

I/O

- Self locking wire clamp connectors, digital I/O is opto-isolated
- Digital Inputs:
  - 5 dedicated inputs - home, limit, capture, remote enable/disable, allow/prohibit motion
  - 19 digital inputs; user defined
- Digital Outputs:
  - Motor brake; dedicated
  - 10 digital outputs; user defined
- Analog I/O:
  - 2 analog inputs, 14 bit resolution
  - 2 analog outputs, 12 bit resolution
  - Output status relay

Memory

- Disk On Chip - for storage of user programs and data - 8Mbyte
- RAM - execution environment - 8Mbyte DRAM
- NvRAM - for rapid storage of user data - 32Kbyte
- Real Time Clock
  - Date/Time of day
  - Time stamp of system errors and notes

Robust Design

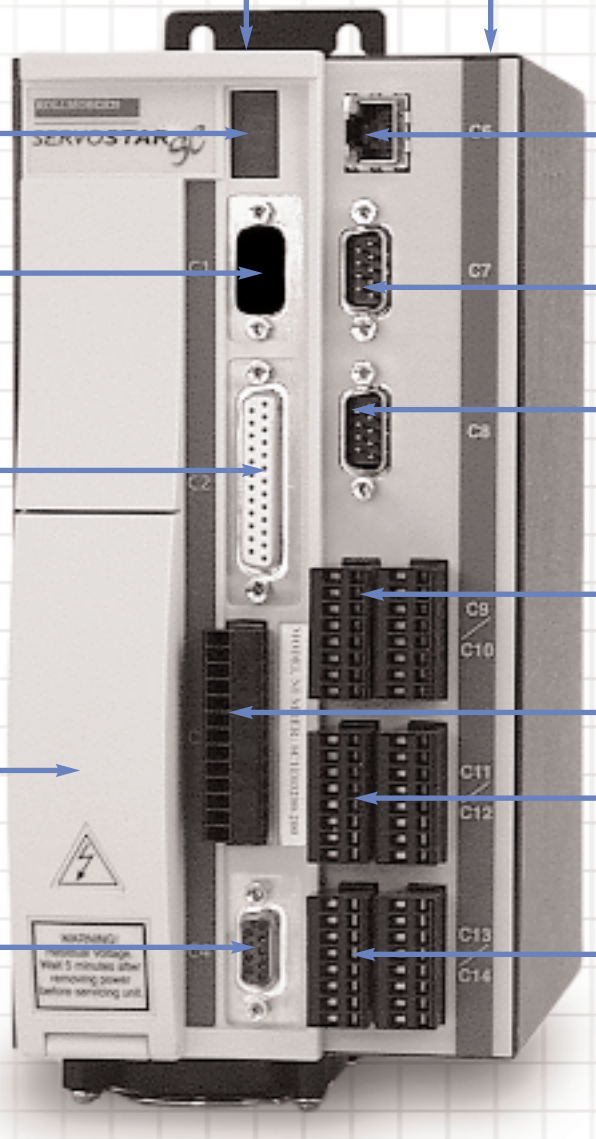
- Self-protecting power modules
- Full protection against short circuit, over-voltage, under-voltage, motor and drive over-temperature, over-current and feedback loss
- Flexible current foldback protection

Development Tools

- MOTIONLINK for:
  - Configuration
  - Setup
  - Tuning
- BASIC MOVES Development Studio for:
  - Application building, editing
  - Debugging
  - Maintenance

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Connectors



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Resistive Regeneration Sizing/Outline Dimentions

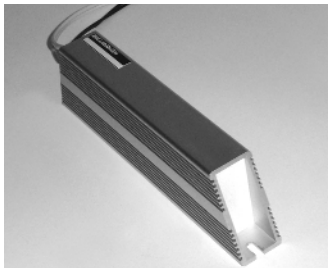
Resistive Regeneration Sizing

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 ASU001H details a calculation method to determine proper regeneration sizing.

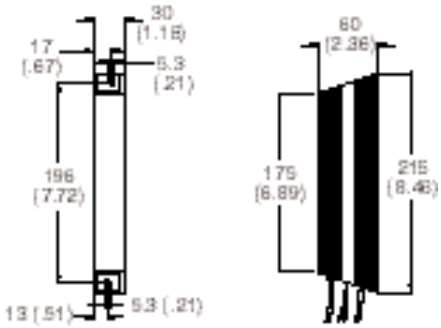
Transformer Sizing (Required only for voltage matching)

The SERVO**STAR** SC can be connected directly to a power 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, the transformer KVA ratings should be two times the SC amplifier output power rating.

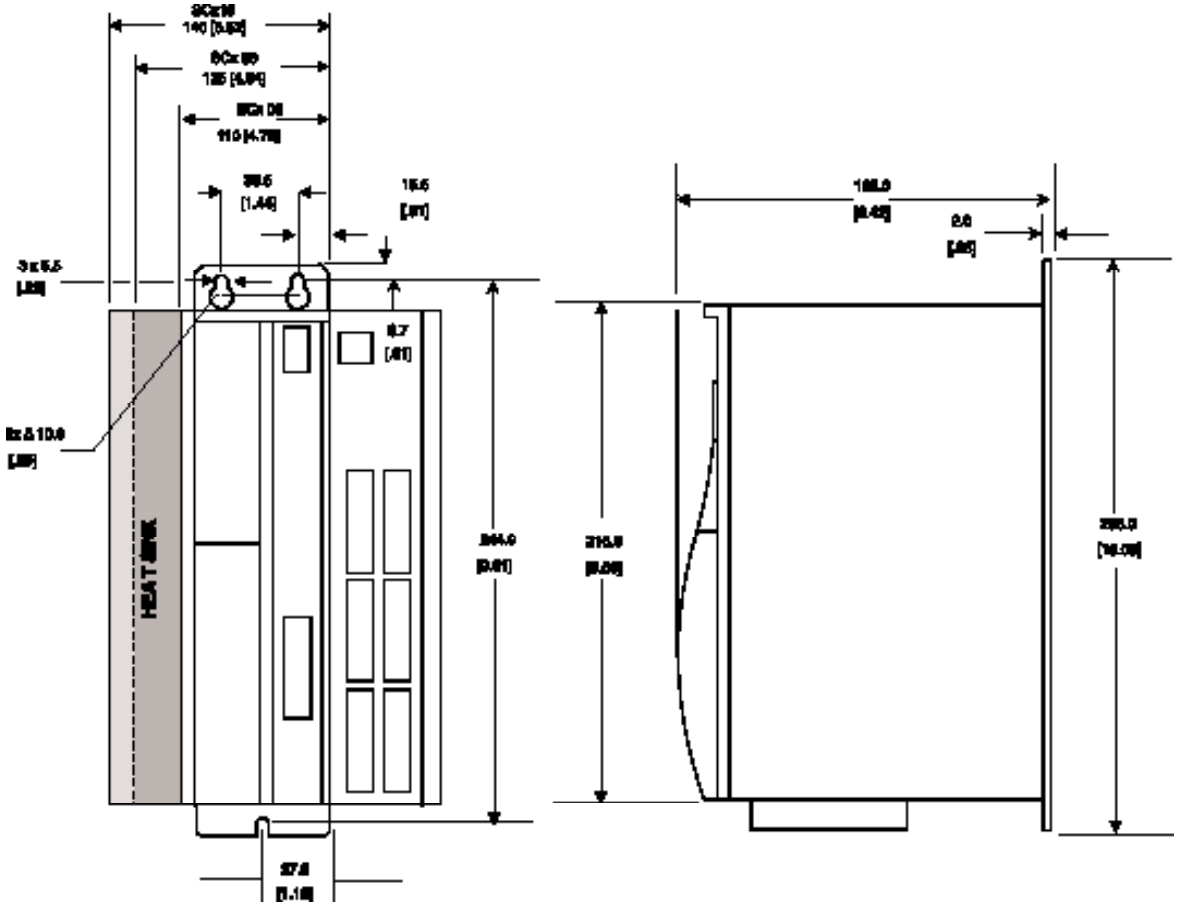
Model	Transformer kVA rating	
SCx03	2.2	1 phase
SCx06	4.4	1 phase
SCx10	5.6	3 phase



Model	Watts	Ohms
ERH-26	200	20

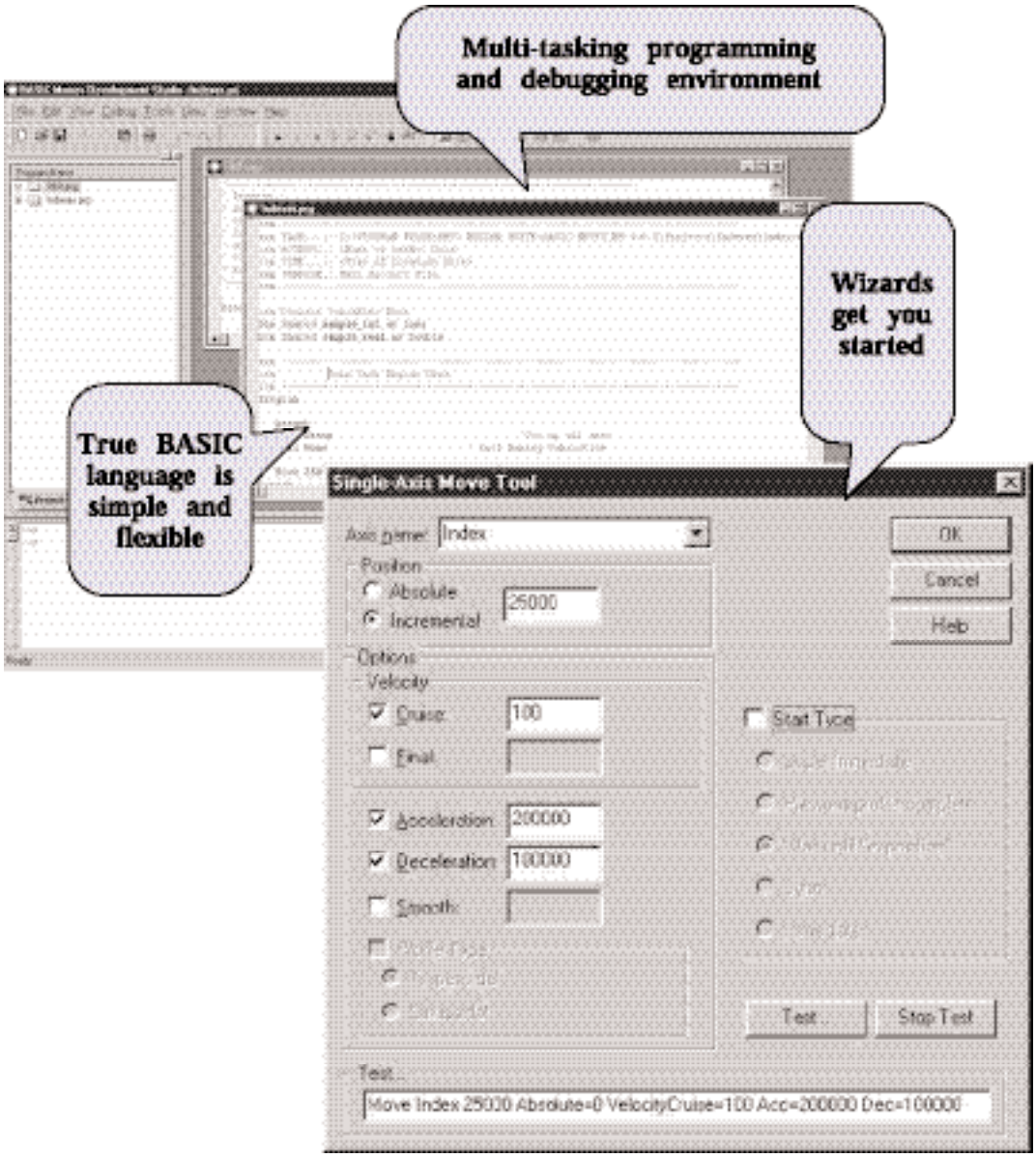


Dimensions



BASIC MOVES Development Studio

BASIC MOVES Development Studio is the ideal development environment for multi-tasking, single-axis motion control. BASIC MOVES Development Studio lets you write your programs as independent tasks. It makes the process easier by providing wizards where you need only fill in the blanks to run your motion program. When you're ready, BASIC MOVES Development Studio bundles up your project and transports it to the SERVOSTAR SC. BASIC MOVES Development Studio now turns into a debugger, setting breakpoints visually. It marks the line in one task with the breakpoint, but continues to monitor the other tasks. Single step, step in, step over, step out.



Key Features of BASIC Moves:

- Easy multi-tasking
- Simple debugging
- Project control
- Windows 95, 98 or NT

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MOTION

Loops and Limits

Acceleration, Deceleration, SmoothFactor..... Point-to-point parameters
AccelerationMax, DecelerationMax, Vmax..... Point-to-point limits
GPISATIN..... Position loop integrator input saturation limit
GPISATOUT..... Position loop integrator output saturation limit
HomeDistanceMax..... Maximum homing distance
ICONT..... System load limit
MIPEAK..... Peak motor current
MSpeed..... Maximum motor speed
PositionErrorMax..... Maximum following error
PositionErrorSettle..... Maximum error allowed and still be considered settled
PositionMax..... Upper position limit
PositionMin..... Lower position limit
StartType..... Motion start point
TimeSettleMax..... Maximum time to settle
TuneVelocity..... Bipolar velocity limit
VelocityCruise..... Point-to-point speed
VelocityMax..... Maximum velocity
VelocityOverSpeed..... Overspeed limit
VLIM..... Velocity limit

I/O

System I/O

System.DIN..... On-board isolated inputs
System.DOUT..... On-board isolated outputs

Drive I/O

ANDB..... Analog input dead band
ANIN..... Scaled analog input
ANLPFHZ..... Analog input frequency
ANOFF..... Analog offset
ANOUT..... Analog output
ANOUTMODE..... Analog output mode
IN..... Digital input
INMODE..... Digital input mode

Errors

Error..... Error messsage
ErrorHistory..... Review recent error set
ErrorHistoryClear..... Clear error history
ErrorNumber..... Number of last error

Programmable Limit Switch (PLS)

Common…Shared..... As PLS
CreatePLSData..... Number of points, PLS Name
DeletePLS..... Delete PLS
PLSAxisName..... PLS axis name

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MC Basic

PLSEnable.....Enable PLS
PLSHysteresis..... PLS hysteresis
PLSOutput.....PLS output
PLSPolarity..... PLS polarity
PLSPosition.....PLS position
PLSRepeat.....Repeat PLS

Events
EventDelete..... Delete event watch
EventList..... Look at all events running
EventOff..... Disable event watch
EventOn.....Enable event watch

Enabling Motion
Enable..... Enable and disable amplifiers
Delay..... Delay motion
Motion..... Allow or disallow motion
Simulated..... Simulated or real axis

Point-to-Point Moves
Home.....Move to start point
Jerk.....Axis jerk
Jog..... Axis jog
Move..... Point-to-point move
Proceed.....Restart axis motion
ProceedType..... Proceed mode for axis
StartType..... Motion start point
Stop..... On-path or immediate stop
StopType..... Stop mode for axis
VelocityOverride..... Lower speed of axis

Gearing and CAMming
Common…Shared As CAM.....Set global CAM tables
CAMList..... List CAM tables
CAM.Cycle..... Set number of CAM cycles
CAM.InUse..... Show CAM tables in use
CAM.IsMonotonic..... Check CAM monotonic
CAM.MasterData..... Discrete master data CAM element
CAM.Next..... Next CAM table
CAM.Next.Name..... Show next CAM table name
CAM.Previous.....Previous CAM table
CAM.Previous.Name.....Previous CAM table name
CAM.SlaveData..... Discrete slave data CAM element
CreateCAMData.....Create CAM data structure
GearRatio..... Double-float gear ratio

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Multi-Tasking

Attach	Attach task
ContinueTask	Restart paused task
Detach	Detach task
IdleTask	Pause a task
KillTask	End a task permanently
Sleep	Delay a task for a fixed time
StartTask	Start a task immediately
TaskList	Look at all the running tasks

System

System.Active	System state
System.Clock	Set current time
System.ControllerOK	System controller status
System.MaxMemBlock	System free memory size
System.Motion	System motion
System.NoMotion	Bypass system motion flag
System.PrintMode	System print format
System.Ready	System status
Version	Get current version

Printing

Print	Unformatted print
Print #	Serial port printing
PrintUsing	Formatted printing

Data Types

Double	Double-precision floating-point
Long	32-bit integer

Debugging

AddBreakPoint	Used by BASIC Moves Development Studio
ClearBreakPoint	Used by BASIC Moves Development Studio
ListBreakPoint	Used by BASIC Moves Development Studio
RecordClose	Stop recording and close file
Recording	Set up data record
RecordOff	Stop recording
RecordOn	Start recording
Step	Perform steps in routine
StepIn	Step into a routine
StepOut	Step until leaving routine
StepOver	Step over routine

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MC Basic

Program Flow Control

Do…..Loop
For…Next
GoTo
If….Then…..Else
Select Case……End Select
While….End While

BASIC Operators

^, *, /, +, -.....Math operators
>, >=, <, <=, <>, =.....Comparison operators
AND, OR, XOR, NOT.....Logic operators
BAND, BOR, BNOT, BXOR.....Bitwise operators

Math

ABS.....Absolute value
ACOS.....Arcosine
ASIN.....Arcsine
ATAN2.....Absolute and quadrant value
ATN.....Arc Tangent
COS.....Cosine
EXP.....Exponential
LOG.....Natural logarithm
Round.....Round to nearest integer
SIN.....Sine
SQRT.....Square root
TAN.....Tangent

String Functions

CHR$.....ASCII character string
LCASE$.....Lower-case string
LEFT$.....Left side of string
LTRIM$.....Cut off left side of string
MID$.....Center of string
RIGHT$.....Right side of string
RTRIM$.....Cut off right side of string
SPACE$.....String with blank spaces
STR$.....String
STRING$.....Create string

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MOTIONLINK® Set up Software

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

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

Set SERVO**STAR** SC up for the Motor. If the amplifier has been programmed to operate a specific motor, **MOTIONLINK** indicates 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 for the motor 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 the SERVO**STAR** SC to run in position, electronic gearing, velocity, or tourque mode. Set the command to be serial, analog, or I/O.

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

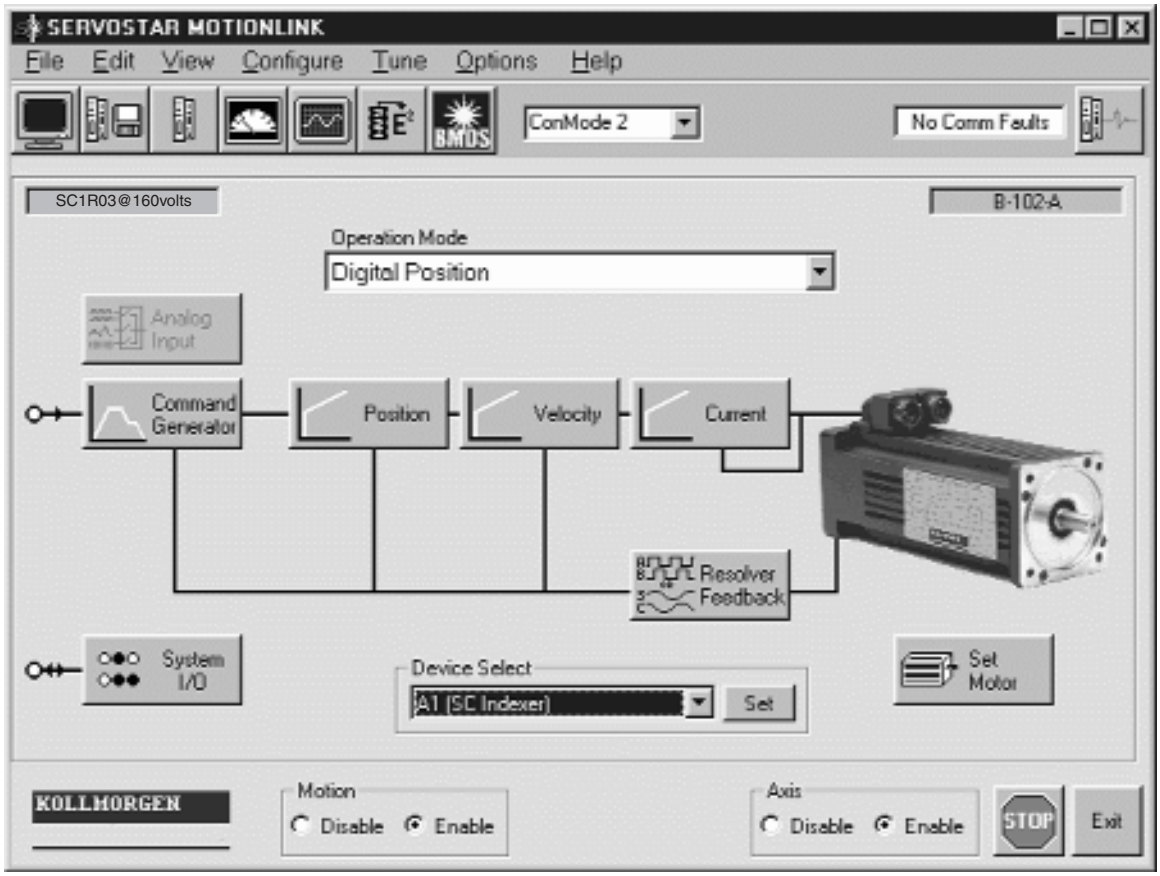
Store SERVO**STAR** SC Settings : The final step is storing the parameters in the SERVO**STAR** SC and archiving them on your hard drive or disk.

Now you're ready to run your machine

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MOTIONLINK®

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** SC's command language. This mode is ideal for advanced users who want to get directly to the "heart" of the SERVO**STAR** SC.



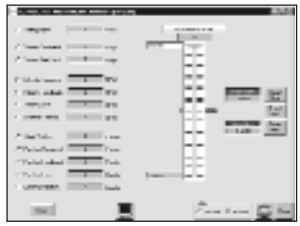






Selectable Tuning Algorithms: No one control scheme is ideal for all applications. The SERVO**STAR** SC has three control schemes to choose from: Pole Placement, PI, and PDFF. So whether your critical need is steady speed control, high accelerations or quick response to load variations, etc., SERVO**STAR** SC 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 realtime 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
- Displaying amplifier status
- Setting acceleration amps
- Limiting max speed or torque

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Rating					
Model	Output Continuous Current Per Phase (RMS/phase)	Output Peak Current Per Phase (RMS/Phase)	AC Input Voltage	Rated Input Power (kVA) 115/230-1ø/230-3ø	Rated Output Continuous (kVA) Based on input voltage 115/230-1ø/230-3
SC03	3 Amp	9 Amp. (0.5 sec)	115 or 230 VAC	.44/.89/1.4	.35/.7/1.1
SC06	6 Amp	18 Amp. (0.5 sec)	115 or 230 VAC	.89/1.8/2.8	.7/1.4/2.2
SC10	10 Amp	20 Amp. (2.0 sec)	230 VAC	-/-/4.6	-/-/3.5

Ordering Information

SC 1 E 03 260 - 2 G 000 0 0- 0000 00

Series Name
SC ServoStar SC

Configuration
1 - Single Axis

Feedback
R - Resolver
E - Encoder
B - Sine Encoder

Current Rating
3 - 3 Amp
6 - 6 Amp
10 - 10 Amp

Model
260 - 24VDC Logic supply

Reserved
(Not normally specified)

Firmware Version
0100 - Version 1.0
(Not specified = most recent version)

Inertia/Feedback*

Motor Winding
0 - No comp

Motor Frame & Stack
000 - No comp

Motor Model
0 - No comp
C - GOLDLINE DDL Iron Core
D - GOLDLINE DDR
G - GOLDLINE (B, BE, M, ME, XT, EB)
L - GOLDLINE DDL Ironless
P - Platinum XT Series
R - RBE

Voltage Rating
0 - No Comp
1 - 115 VAC (160 VCD)
2 - 230 VAC (325 VDC)
Y - Special Compensation
(three digit extension follows the Y designator)

Inertia/Feedback*

For SC1B
3 - Min inertia 1 turn Endat (512)
4 - Max inertia 1 turn Endat (512)
5 - Min inertia Multi-turn Endat (512)
6 - Max inertia Multi-turn Endat (512)
7 - Min inertia 1 turn Endat (2048)
8 - Max inertia 1 turn Endat (2048)
9 - Min inertia Multi-turn Endat (2048)
C - Min inertia w/brake (XT15), 1 turn Endat (512)
D - Max inertia w/brake (XT15), 1 turn Endat (512)
E - Min inertia w/brake (XT15), Multi-turn Endat (512)
F - Max inertia w/brake (XT15), 1 turn Endat (512)
G - Max inertia Multi-turn Endat (2048)
H - Min inertia w/brake (XT15), 1 turn Endat (2048)
J - Max inertia w/brake (XT15), 1 turn Endat (2048)
K - Min inertia w/brake (XT15), Multi-turn Endat (2048)
L - Max inertia w/brake (XT15), Multi-turn Endat (2048)

For SC1E, SC1R
0 - No comp
1 - Minimum inertia
2 - Maximum inertia
A - Min inertia w/brake (XT15)
B - Max inertia w/brake (XT15)

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Kollmorgen Sales Offices

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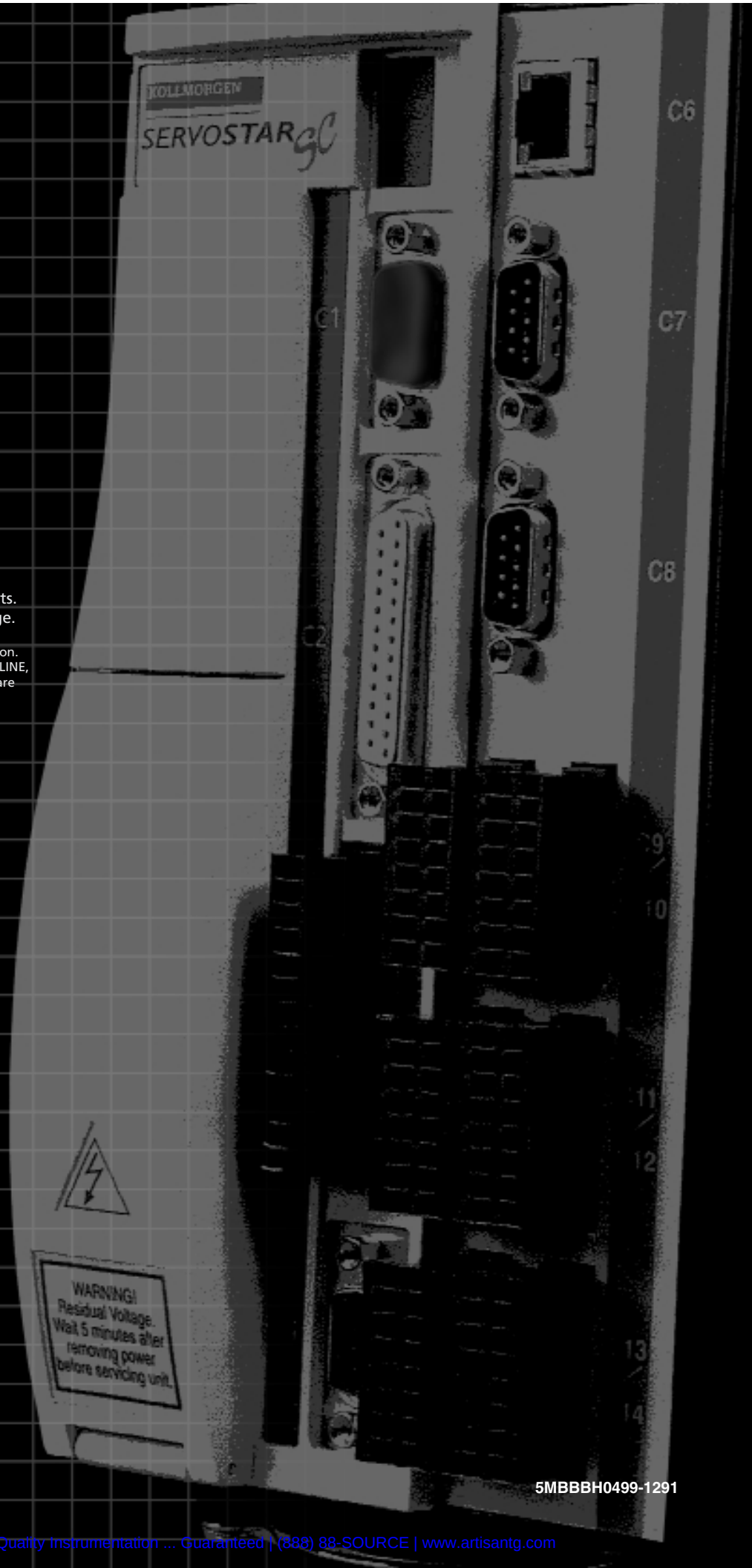
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