MCSA-41x3

Multi-Axis Programmable Motion Controller

The MCSA-41x3 motion controller is a standalone motion controller.

The MCSA-41x3 is available as a box-level or card- level motion controller. The unit operates stand-alone or interfaces to a PC with Ethernet 10/100BASE-T, or USB. It includes optically isolated I/O in addition to analog inputs and outputs. The MCSA-41x3 controller and drive unit accepts power from a single 20-80 VDC source. The MCSA-41x3 is available in one through eight axis formats, and each axis is user-configurable for stepper or servo motor operation. The MCSA-41x3 can be optionally equipped with a multi-axis internal servo or stepper motor drive that resides inside the MCSA-41x3 enclosure. Standard programming features include PID compensation with velocity and acceleration feedforward, multitasking for simultaneously running up to eight programs, and I/O processing for synchronizing motion with external events. Modes of motion include point-to-point positioning, position tracking, jogging, linear and circular interpolation, contouring, electronic gearing and ECAM. The MCSA-41x3 controllers use a intuitive command language, making them very easy to program. The servo design software further simplifies system set-up with “one-button” servo tuning and real-time display of position and velocity information.

Features:

- Ethernet 10/100Base-T port; (1) USB - main; (1) RS-232 - aux
- Optional plug-in amplifier boards for driving stepper, brush, or brushless servo motors up to 750 Watts. Or connect to external drives of any power range.
- User configurable for stepper or servo motors on any combination of axes. Optional firmware for piezo-ceramic motors. Configurable for sinusoidal commutation.
- Accepts up to 15MHz encoder frequencies for servos and outputs up to 3MHz for steppers.
- PID compensation with velocity and acceleration feedforward, integration limits, notch filter and low-pass filter.
- Modes of motion include jogging, point-to-point positioning, contouring, PVT, linear and circular interpolation, electronic gearing and ECAM. Ellipse scaling, slow-down around corners, infinite segment feed and feedrate override.
- Over 200 English-like commands including conditional statements and event triggers.
- Non-volatile memory for programs, variables, and arrays.
- Multitasking for concurrent execution of up to eight programs.
- Optically isolated home input and forward and reverse end- of-travel limits for every axis.
- Uncommitted, isolated inputs and isolated outputs:
  - 1- 4-axis models: 8 inputs and 8 outputs (4mA default; 25mA or 500mA option)
  - 5- 8-axis models: 16 inputs and 16 outputs (4mA default; 25mA or 500mA option)
- High speed position latch for each axis and output compare.
- 8 uncommitted analog inputs.
- Dual encoder inputs for each servo axis.
- Accepts single 20-80 VDC input.
- Available as card-level or with metal enclosure.
- Communication drivers for Windows, Mac OSX, and Linux.

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Innovation in Linear Motion

Motion Controller	
Processor	RISC-based clock multiplying processor with DSP functions
Communication	10/100BASE-T Ethernet with Auto MDIX, USB port – main, RS232 port - aux
Program memory size	4000 lines x 80 characters
# of Variables	510
# of Arrays	24000 array elements in 30 arrays
Position Range	32-bit, automatic rollover
Maximum Velocity	15 million counts/s
Maximum Acceleration	1 billion counts/s^2

Power and Mechanical	
Power requirements	20-80 V_{DC}
Operational temperature	0 – 70º C
Humidity	20 – 95 % RH, non-condensing
Dimensions	**1-4 axes models:** 8.05" x 7.25" x 1.5" **5-8 axes models:** 11.5" x 7.25" x 1.5"

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RoHS Compliant

Configurable Filter Features
Proportional
Torque limit
Backlash compensation
Integral
Offset
Profile filtering
Derivative
Feed-forward acceleration
Low-pass filter (Pole)
Notch
Dual-loop feedback mode
Feed-forward velocity

Modes of Motion	
Position Relative & Position Absolute	Absolute and relative positioning following a trapezoidal velocity profile. Phase correction and profile smoothing available.
Jogging	Velocity control where no final endpoint is prescribed.
Vector Mode	2D motion path consisting of linear and arc segments. Motion along the path is continuous at the prescribed vector speed even at transitions between linear and circular segments.
Linear Interpolation	1-8 axes of coordinated linear profiling.
Gearing & Gantry Mode	Electronic gearing and gantry mode with ramped gearing.
Electronic camming (ECAM)	Following an arbitrary trajectory based upon a master encoder position.
Contour	Allows any arbitrary profile and any set of axes to be prescribed.
PVT	Motion path described in incremental position, velocity, and change of time.

Minimum Servo Update Rate	
# of axes	**Standard Firmware**
1-2	125 usec, 8 kHz
3-4	250 usec, 4 kHz
5-6	375 usec, 2.6 kHz
7-8	500 usec, 2 kHz

General Purpose I/O				
	Number of I/O		Voltage	Details
	1-4 axis	5-8 axis		
Opto-isolated inputs[1]	8	16	5-24 V_{DC}	Can be configured for use as high-speed latch (position capture).
Opto-isolated outputs	8	16	5-24 V_{DC}	500mA Sourcing, can be configured as brake output.
Analog Inputs	8	8	±10, ±5, 0-5, 0-10 V	12-bit, 16-bit optional, can be used as position feedback

Feature Specific I/O				
	Number of I/O		Description	Details
	1-4 axis	5-8 axis		
Reverse/Forward Limit Switches	per Axis		5-24 V_{DC} Opto-isolated	
Home Input	per Axis		5-24 V_{DC}, Opto-isolated	
Amplifier Enable Output	per Axis		+5, +12V_{DC} controller powered or 5-24V_{DC} Opto-isolated	Configurable with jumpers.
Stepper (Step/Dir signals)	per Axis		0-5 V_{DC} Step/Dir TTL Signal	3 MHz max output
Servo control (Motor command line)	per Axis		±10V analog output	16-bit resolution
Quadrature Encoder Inputs	2 per Axis[1]		+/-12V_{DC} or TTL	15 MHz input max
Hall inputs	per Axis		3x 0-5V TTL inputs	When equipped with some AMP Modules
Abort	1		5-24V_{DC} Opto-isolated	
Reset	1		5-24V_{DC} Opto-isolated	
Electronic lock-out	1		5-24V_{DC} Opto-isolated	When equipped with AMP Modules
Output compare	1	2	0-5V TTL	Also known as pulse on position
Error out	1		0-5V TTL	

[1] Each unused auxiliary encoder can be used as 2 additional digital in

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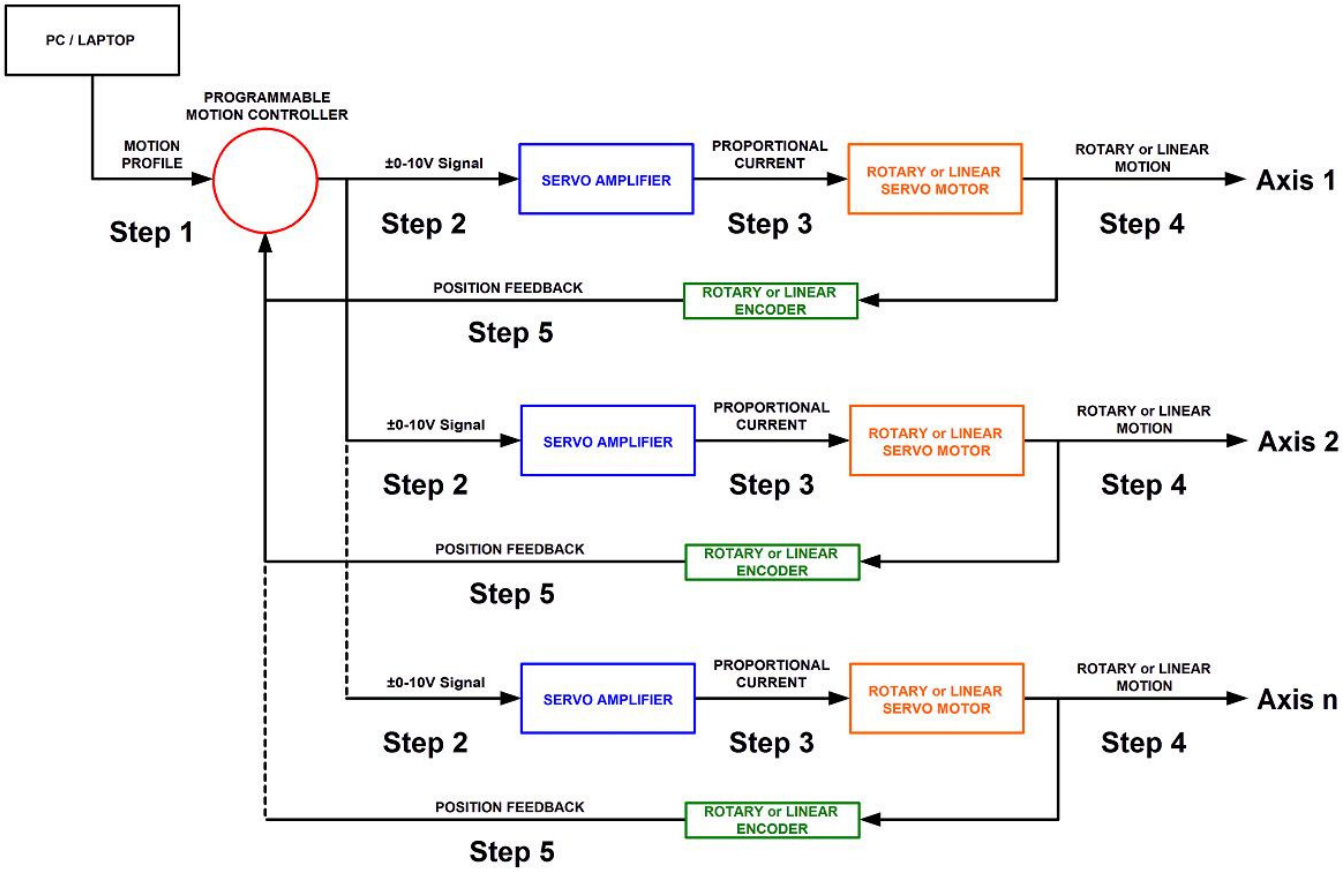

Step 1. A program or motion profile will be written on a PC or laptop and downloaded to the motion controller. This program will contain parameters such as speed, acceleration, deceleration, PIDs, desired position, etc…

Step 2. Based on the program parameters, the motion controller will send a +/- 10V reference signal to the servo amplifier.

Step 3. The servo amplifier will take the reference input signal and provide the necessary current to generate the required force from the motor to move to the desired position.

Step 4. The motor will move to the desired position at the programmed speed and acceleration.

Step 5: Motor position is sent back to the controller to verify that the desired position has been reached and maintained.

NOTES:

- The program or motion profile will have specific parameters for each axis of motion. Parameters such as speed, acceleration, deceleration, desired position, etc… can be different for each axis.
- The motion controller can simultaneously monitor the feedback of multiple axis for coordinated motion control.
- Depending on the particular motion controller used, the number of independent axis will vary from 2-32 axis of motion.