MCSA-3x01x

Single-Axis Programmable Motion Controller

The MCSA-3x01x is a single-axis standalone motion controller.

The MCSA-3x01x motion controller series is H2W's latest generation single-axis motion controller. It uses a 32- bit RISC processor to provide higher speed than older models. The MCSA-3x01x is available as a compact card-level or box-level unit and connects to a stepper or servo motor amplifier of any power range. Alternatively, the MCSA-3x01x can be purchased with an internal 800-Watt brushless sine drive or stepper drive which minimizes space, cost, and wiring. The MCSA-3x01x operates stand-alone or can be networked to a PC via Ethernet.

Features include PID compensation with velocity and acceleration feed forward, program memory with multitasking for concurrent execution of four programs, and uncommitted optically isolated inputs and outputs for synchronizing motion with external events. Modes of motion Include point-to-point positioning, jogging, contouring, PVT, electronic gearing, and electronic cam.

These controllers use an 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.

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Features:

- Single-axis motion controller with optional servo or stepper motor drive in compact enclosure:
  - MCSA-3x012—Brushed/brushless sine drive; 10 A cont., 15 A peak,20-80 VDC
  - MCSA -3x014—Brushed/brushless linear drive; 1 A cont., 2 A peak, 15-40 VDC
  - MCSA -3x016—Stepper drive; 1.4 A/phase, 12-30 VDC
  - MCSA-3x017—Microstep drive; 6 A/phase, 20-80 VDC

- Also available as card-level or box- level unit which can connect to external stepper or servo amplifier of any power range

- Two daisy-chainable Ethernet 100 Base-T ports:
  - One 115kbaud RS232 port

- Ethernet supports multiple masters and slaves. TCP/IP, UDP and Modbus TCP master and slave protocol for communication with I/O devices

- Encoder feedback up to 15MHz. Quadrature standard; SSI, BiSS, sine/cosine, and sinusoidal encoder options. Main and auxiliary encoder inputs

- PID compensation with velocity and acceleration feed forward, integration limits, notch filter and low-pass filter

- Modes of motion include jogging, point-to-point positioning, contouring, PVT, electronic gearing, and electronic cam

- Over 200 English-like commands including conditional statements and event triggers

- Non-volatile memory for programs, variables, and arrays. Concurrent execution of up to four programs

- Optically isolated forward and reverse limit inputs and homing input

- 8 uncommitted, isolated digital inputs and 4 digital isolated outputs

- High speed position latch and output compare (pulse on position)

- 2 uncommitted analog inputs and 1 analog output
  - 16-bit analog input option available (MCSA-3**1**01x)

- Controller available with optional dc-to-dc converter for 20–80 VDC input

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Motion Controller	
Processor	RISC-Based with DSP functions
Communication	Two Ethernet 10/100 Base-T Ports - RS232 port up to 115 kbaud Commands are sent in ASCII. Daisy-chain Ethernet (no external hub required).
Program memory size	1000 lines x 80 characters
# of Variables	254
# of Arrays	3000 array elements in up to 6 arrays
Position Range	32-bit, automatic rollover
Maximum Velocity	15million counts/s
Maximum Acceleration	67 million counts/s^2

Environmental	
Operational temperature	0 – 70 deg C
Humidity	20 – 95 % RH, non-condensing

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	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.

General Purpose I/O			
I/O	**Quantity**	**Voltage**	**Details**
Opto-isolated inputs	8	5-24 V_{DC}	Can be configured for use as high-speed latch (position capture).
Opto-isolated outputs	4	5-24 V_{DC}, 12-24 V_{DC} optional	4mA Sinking default (25mA Sourcing or Sourcing options available) (500mA Sinking or Sourcing options available).Can be configured as brake output.
Analog Inputs	2	0-5 V_{DC}	12-bit, 16-bit optional, can be used as position feedback
Analog Outputs	1	± 10 V_{DC}	Used as motor command line for DMC-3x010 and DMC-3x011

Power and Mechanical				
Controller	**Supply Voltage**	**Amplifier/Motor Type**	**Current Spec**	**Dimensions**
DMC-3x010	5 V_{DC}, ± 12 V_{DC}	N/A	N/A	CARD:3.0" ×4.0" BOX: 3.9" ×4.2" ×1.5"
DMC-3x011	9-48 V_{DC}			
DMC-3x012	20-80 V_{DC}	PWM; Brushed or Brushless Servos	10 A continuous, 15 A peak	BOX: 3.9" ×5.0" ×1.5"
DMC-3x014	15-40 V_{DC}	Linear; Brushless Servos	1 A continuous, 2 A peak	
DMC-3x016	12-30 V_{DC}	Stepper; Two-Phase Steppers	1.4 A/phase	
DMC-3x017	20-80 V_{DC}	Micro-Stepper or PWM;2-Phase Steppers, 3-Phase Brushless or 2-Phase Brushless	2-Stepper: 6 A/phase 3-Phase & 2-Phase Brushless: 10 A continuous, 15 A peak	

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Feature Specific I/O Local Axes			
I/O	**Quantity**	**Description**	**Details**
Reverse/Forward Limit Switches	2	5-24 V_{DC}opto-isolated	
Home Input	1	5-24 V_{DC}, opto-isolated	
Amplifier Enable Output	1	+5, +12V_{DC} controller powered	opto-isolated amp enable depends on out option
Stepper (Step/Dir signals)	1	0-5 V_{DC} Step/Dir TTL Signal	3 MHz max output
Servo control (Motor command line)	1	±10V_{DC} analog output	16-bit resolution
Quadrature Encoder Inputs	2	+/-12V_{DC} or TTL	15 MHz input max
Hall inputs	1	3x 0-5V_{DC} TTL inputs	
Abort	1	5-24V_{DC}opto-isolated	
Reset	1	5-24V_{DC}opto-isolated	
Electronic lock-out	1	5-24V_{DC}opto-isolated	
Output compare	1	0-5 V_{DC} TTL	Also known as pulse on position
Error out	1	0-5 V_{DC} TTL	

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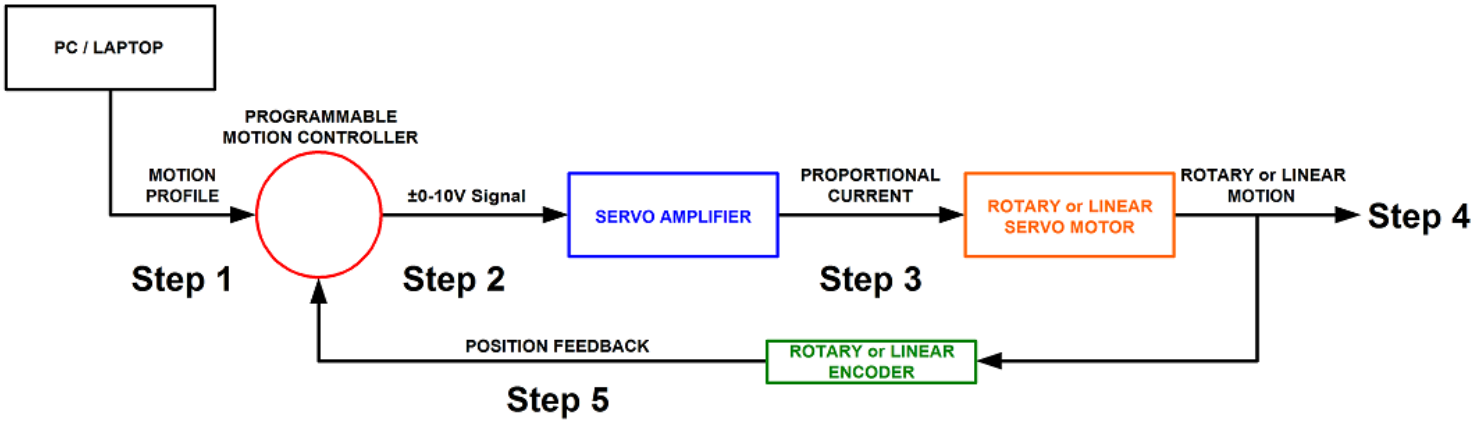

Step 1. A program or motion profile will be written on a PC or laptop and downloaded to the motion controller. This program will contain parameters such as speed, acceleration, deceleration, PIDs, desired position, etc…

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 (typically 500 times per second) to verify that the desired position has been reached and maintained.