

## Motion Controller

For Electromagnetic Motors



### SMC Hydra

- 2-D vector motion with linear interpolation, independent single-axis motion
- Digital inputs and outputs
- Optional: Encoder-based trigger output
- Optional: Position capture input: Position detection in real time via digital input
- Optional: Dynamic position correction
- Joystick operation via CAN bus

### Universal digital motion controller

For DC servo and brushless DC motors (BLDC), linear and torque motors (2 / 3 phases), 2-phase stepper motors. 24 V / 48 V DC output voltage, up to 200 W power per channel. Maximum output current 10 A per phase (effective). Sine-commutated operation. Servo frequency 4 kHz.

### Extensive functions, software support

Automatic detection of the motor phase. PID controller for position and velocity. Extensive software support, e.g., for LabVIEW, dynamic libraries for Windows and Linux.

### Interfaces

Commanding via TCP/IP, RS-232. RM version only: USB as well. Manual operation with joystick via CAN bus (accessory). Digital inputs and outputs for automation. Opto-decoupled inputs, 4 analog outputs.

### Factory default options

- DeltaStar und DeltaStar Eco encoder interface modules  
Required for control of closed-loop drives (rotation or linear encoder). Differential signal transmission for digital (A/B) or analog (sin/cos) encoder signals, inputs for limit switch signals. Please specify when ordering.  
Trigger options with DeltaStar: Trigger outputs, position capture input (position detection in real time via digital input)  
Trigger options with DeltaStar Eco: Trigger outputs
- Dynamic position correction  
Position deviations for a selected configuration of linear or rotation stages are determined with a highly accurate measuring system and saved in a table of corrections in the controller. Correction is also dynamic. Single-axis mapping, only available as factory default in conjunction with a PI positioning system. Please specify when ordering.

## Specifications

	SMC Hydra
Function	Motion controller for electromagnetic motors Hydra TT: Benchtop device with integrated power supply Hydra CM: Compact device Hydra RM: 19" rack unit with integrated power supply
Axes	Hydra TT / Hydra CM: 2 Hydra RM: 2 / 4
Sensor channels	Hydra TT / Hydra CM: 2 Hydra RM: 2 / 4
Supported functions	Linear vector motion, independent point-to-point motion. Automatic detection of the motor phase.
Safety features	Switch-off via external switch. Overload protection of the motor driver. Overheat protection of the motor ( $I^2t$ ). Overcurrent protection of the system.

Motion and control	SMC Hydra
Controller type	PID controller, also adaptive for position and velocity as well as velocity and acceleration feed-forward, parameter changing during operation
Servo frequency	4 kHz
Profile generator	Trapezoidal velocity profile, setting of maximum velocity and acceleration 2-D vector control with linear interpolation
Encoder input	Analog signals (sin/cos) max. 150 kHz (line count) Digital signals (A/B differential via RS-422) max. 4 MHz (line count) Positioning range: $\pm 4.3 \cdot 10^{12}$ mm / deg
Stall detection	Position error, peak current, $I^2t$ limit
Microsteps per full step	3000
Limit switches	2 per channel, 5 to 24 V (programmable polarity) N/O contact / N/C contact; NPN / PNP
Reference point switch	Index signal of the encoder
Motor brake	1x per channel, TTL, configurable via software

Electrical properties	SMC Hydra
Maximum output voltage	24 V / 48 V
Maximum output power per channel	200 W
Maximum output current per channel	10 A <sub>rms</sub>

Interfaces and operation	SMC Hydra
Communication interfaces	TCP/IP: 10/100 Mbit; RS-232: Sub-D 9 (m), 9.6 to 115.2 kBaud Hydra RM: USB as well
Motor connection per channel	Sub-D 15 (f)
Sensor connection per channel	Sub-D 15 (f)
I/O lines	6 inputs, opto decoupled, 5-24 V (2 each reserved per channel for limit switch) Input for motor switch-off on all axes, opto decoupled Open drain output (100 mA) 2 TTL outputs 4 analog outputs, 10-bit resolution, 0 to 3.3 V (not for Hydra TT)  With DeltaStar interface as factory default option: Fast trigger output, max. 400 kHz, equidistant or from freely definable table (max. 3000 axis positions)

Interfaces and operation	
	<b>SMC Hydra</b> Position capture input, max. 4 kHz (> 3,000,000 axis positions) With the factory default DeltaStar Eco interface option: Trigger output, 2 kHz, equidistant, jitter 10-30 µs
Command set	Venus-3 ASCII interpreter Dynamic library for PI General Command Set (GCS)
User software	Venus-3 demo program LabVIEW (source code & executable) Terminal program (Venus-3 DLL) PIMikroMove via dynamic libraries for Windows
Software drivers	LabVIEW drivers, dynamic libraries for Windows and Linux (GCS) GCS2 DLL 32/64-bit Venus3 DLL 32/64-bit / .net wrapper DLL incl. example source code
Manual operation	Joystick via CAN bus (accessory)
Miscellaneous	
Operating voltage	Hydra TT: 90 - 260 V, integrated wide-range-input power supply Hydra CM: 24 V / 48 V, external power supply (not in scope of delivery) Hydra RM: 90 - 260 V, integrated wide-range-input power supply
Max. power consumption	Hydra TT: 300 W Hydra CM: 120 W Hydra RM: 1000 W
Max. current consumption	11 A
Operating temperature range	10 to 40 °C
Weight	Hydra TT: 2.65 kg Hydra CM: 0.45 kg Hydra RM: 6 kg
Dimensions	Hydra TT: 225 mm x 515 mm x 56 mm Hydra CM: 76 mm x 156 mm x 56 mm Hydra RM: 84 HP, 2 RU, 310 mm depth

## Drawings and Images



*SMC Hydra TT, rear panel*



*SMC Hydra CM, 2-axis motion controller*

## Ordering Information

### **71609601**

SMC Hydra TT motion controller, 24 V, TCP/IP, RS-232, 2 axes, benchtop device

### **71609602**

SMC Hydra TT motion controller, 48 V, TCP/IP, RS-232, 2 axes, benchtop device

### **71609604**

SMC Hydra RM motion controller, 24 V, TCP/IP, RS-232, USB, 4 axes, 19" controller

### **71609605**

SMC Hydra RM motion controller, 48 V, TCP/IP, RS-232, USB, 4 axes, 19" controller

### **71609638**

SMC Hydra RM motion controller, 48 V, TCP/IP, RS-232, USB, 2 axes, 19" controller

### **71609600**

SMC Hydra CM motion controller, 24 V, TCP/IP, RS-232, 2 axes, compact device

### **71609603**

SMC Hydra CM motion controller, 48 V, TCP/IP, RS-232, 2 axes, compact device

## Power supplies for CM versions

### **71609626**

Power supply for SMC Hydra CM, 24V, 120 W

### **71609625**

Power supply for SMC Hydra CM, 48V, 120 W

## Default option, please specify when ordering

### **71609632**

SMC Hydra DeltaStar Eco encoder interface module

### **71609631**

SMC Hydra DeltaStar encoder interface module

### **71609644-0000**

SMC Hydra dynamic position correction for linear stages incl. axis measurement and measurement log (laser interferometer)

### **71609644-0001**

SMC Hydra dynamic position correction for rotation stages incl. axis measurement and measurement log (Heidenhain RON-905 master encoder)

## Accessories

### **71609633**

Joystick for SMC Hydra, 2 axes

### **71609634**

Trigger cable for SMC Hydra DeltaStar, Mini HDMI to Sub-D 9 (f)

### **71609635**

Trigger cable for SMC Hydra DeltaStar, Mini HDMI to BNC