

# MACS<sub>4</sub>-DC<sub>3</sub>

## 2-/3-AXIS COMPACT CONTROL UNIT INCL. SERVO-AMPLIFIERS

for highly accurate positioning with incremental encoders & glass scales

The **MACS<sub>4</sub>-DC<sub>3</sub>** is the optimized solution for all kind of devices requiring a highly accurate positioning linked to incremental or glass scale feedback signals.

The **MACS<sub>4</sub>-DC<sub>3</sub>** offers the interface for the direct connection of Heidenhain glass scales without expensive signal converters and adapters. Absolute positioning in the range of  $\mu\text{m}$  without homing in advance becomes affordable and easy to handle. The incremental encoders mounted on the motor shaft are used to guarantee a stable position regulation without the influence of gearbox backlash. The highly accurate target position is adjusted by the glass scale information. Jerk limited curve profiles provide a smooth movement for sophisticated positioning tasks.

The **MACS<sub>4</sub>-DC<sub>3</sub>** combines low-cost connector types, a compact housing, high-end motion control functionality and the most common interfaces to link it to a PLC or PC system.

### Your Chances / Your Benefit

- ◆ Compact and complete solution, including internal power stages and different encoder interfaces
- ◆ Highly accurate multi-axis positioning control without any library license fees
- ◆ Free programmable process control unit
- ◆ Direct encoder interfaces for Heidenhain glass scales
- ◆ CAN and USB interfaces for data exchange with PLC and PC hosts



### Application area

- ◆ X/Y/Z positioning of measuring equipment
- ◆ Multi-axis position control of small robots
- ◆ Motion control of handling devices

### Closed loop Control

- ◆ Position control
- ◆ Speed control
- ◆ Current control & limitation

### Positioning Functions

- ◆ Configurable homing
- ◆ Absolute & relative positioning
- ◆ Configurable velocity profiles

### I/O-Functions

- ◆ Set / reset of outputs
- ◆ Read & interrupt control of inputs
- ◆ Support of CANopen-I/O modules

### Bus & Control Functions

- ◆ CANopen master-/slave functionality
- ◆ Interrupts reacting on inputs, position data, bus bits, timer, etc.
- ◆ Arithmetic and bit handling
- ◆ Conditional branches and loops

### Debugging & Optimization

Performance optimization and testing is assisted by the development tool including a smart oscilloscope.

### Conclusion

**MACS<sub>4</sub>-DC<sub>3</sub>** = Maximum position accuracy for up to 3 drives at minimum costs.

### P.S.

The **MACS<sub>4</sub>-DC<sub>3</sub>** can also be used standalone; there is no must for a PLC or PC system.

**Electrical Data**

Control Unit: Supply voltage	24 V DC $\pm$ 25 %	200 mA	without I/O-load
Power Stage: Supply voltage	24 - 48V DC		

**CPU & Memory**

Microprocessor	DSP TI2812	150 MHz	
Workspace & program memory	1 Mbyte SRAM	512 kbytes Flash	Application & data

**Closed loop Controls**

Number of drives and control type	3	Position, Speed, Current	Closed loop Control
Position control	1 kHz	1 ms cycle time	PID control plus feedforward
Speed control	2.5 kHz	400 $\mu$ s cycle time	PI control
Current control	5 kHz	200 $\mu$ s cycle time	PI control plus current limitation

**Internal Power Stages** (alternatively for brush- or brushless-type motors)

Quantity	3 x brush-type motors	2 x brushless motors	alternatively configurable
Amplifier type & chopping frequency	4Q-PWM	24 kHz	
Max. output current (configurable)	3 A continuous	7 A peak (min. 60 sec.)	per amplifier, Period of time of peak current depends on cooling

**Motion-Control Functionality combined with Programmability**

Velocity and position control with configurable trapezoidal speed profile  
Velocity and position / angle synchronization with or without master / slave marker correction, CAM profile synchronization

**Encoder Inputs**

Encoder 1 ... 3	Incremental encoder	5 V, max. 32 MHz	TTL or differential (RS422)
Encoder 4 ... 6	SinCos encoder / glass scale	1 Vpp, max. 150 kHz	max. 400 kHz at 25% resolution
	Enc. 1 ... 6 configurable as slave (☞ positioning) or master inputs (☞ synchronization)		
Additional Encoder types	CANopen absolute encoders (max. 1 Mbaud)		
Hall Sensors	H1, H2, H3 for 2 motors	5 V	

**Encoder / Hall sensors Supply**

Internal Power Supply	5 V DC	max. 1A (totally)
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**Digital Inputs / Outputs**

Digital Inputs	4	Low: < 4.6 V / High: > 18 V	max. 45 V, max. 200 kHz
	Inputs 1 - 4 can be configured as marker inputs for hardware encoder position latching		
Digital Outputs	2	24 V, 100 mA, 300 kHz	

**Interfaces**

CAN interface	ISO/DIS 11898	max. 1 Mbaud	CAN master / slave functionality
Serial interface	USB		Development & visualization

**LEDs**

Status	4
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**Mechanical Data**

Type of housing / Mounting	Compact metal housing		
Length x Width x Height / Weight	approx. 180 x 105 x 65 mm	approx. 0.5 kg	
Connector type	DSUB, RJ45, Molex		

**Temperature Range**

Operation / Storage	0...+40 C / -20...+85 C	20...80 % humidity	non condensing
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**Product Types and Ordering Codes**

MACS4-DC3	Order-No. 001166
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**Customized connectors, housings, power stage design, and firmware functionality on request!**