

Multi-Axis Controller MACS5-AMP2

Motion Control Unit with integrated High Power Amplifiers

Everything included: Control unit + 6 amplifiers, each 1.5 kW peak

The **MACS5-AMP2** combines a modern motion control unit with high power amplifiers in a compact housing. Each of the internal amplifiers offers 400 W continuous and 1500 W peak for direct control of powerful drives.

The **MACS5-AMP2** is the economic solution to move up to six brush-type or up to four brushless motors in the most dynamic and accurate way. Position feedback or master signals are processed by encoder inputs for direct connection of incremental and absolute encoders, and glass scales. A variety of digital and analog inputs and outputs process sensor signals and commands actuators are integrated. The number of I/Os can easily be extended by CANopen I/O modules.

Bus interfaces like EtherCAT, CAN, Ethernet, USB, and RS232 enable an open and efficient data exchange with PCs and PLCs. The MACS5-AMP2 can be integrated in PLC networks as a DS402 multi axis slave.

An easy but very efficient programming language combined with powerful motion control commands is the key for stand-alone control of simple machines and devices (without the need of a PC or PLC at all).

Application Range

- ◆ Fast and accurate positioning or synchronization of highly dynamic drives, e.g. in labeling machines or feeding systems.
- ◆ Automation of adjustable mechanical stops in all types of machines.
- ◆ Work piece and tool positioning, e.g. in a revolving transfer machine.
- ◆ Standalone control of devices and simple machines.



zub Standards

- ◆ **Control functions:** Interrupts reacting on inputs, position data, bus bits, timer, etc.; arithmetic and bit handling; conditional branches and loops.
- ◆ **Closed loop control:** Position and speed control, current control and current limitation.
- ◆ **Positioning functions:** Absolute and relative positioning, configurable homing, configurable speed profiles.
- ◆ **Synchronization Functions:** Velocity synchronization, position / angle synchronization, Synchronization including correction depending on slave / master marker.
- ◆ **Free programmability** by the extensive automation software APOSS®-win and license free Motion Control Library.
- ◆ **Interactive graphic editors** like CAM-, Array- and Path-Editor.
- ◆ **Debugging & Optimization:** Smart-Oscilloscope and integrated graphic CAM-Editor.
- ◆ **State-Machine Support:** APOSS® supports the automatic execution of hierarchic State Machines.

Bus Functions

CANopen master slave functionality, EtherCAT® slave, and optional EtherCAT® master functionality.

Advantages

- ◆ Compact multi-axis solution with integrated power amplifiers.
- ◆ Configurable for brush-type and brushless motors up to 400 W continuous power and up to 1500 W peak power.
- ◆ MACS5-AMP2 can serve as a stand-alone control unit.
- ◆ MACS5-AMP2 can be integrated into CANopen and EtherCAT networks as a fully featured DS402 multi axis slave device.
- ◆ No hidden additional costs: All motion control features, servo amplifiers, encoder inputs, bus interfaces and development tools are included!

MACS5-AMP2

Electrical Data

Control Unit: Supply voltage / Current	24 V DC ±25 %	200 mA	without I/O load
Amplifiers: Supply voltage / Fuse	12 - 50 V DC	90 A (internal SMD fuse)	

CPU & Memory

Microprocessor	DSP TI C28346 (32 Bit)	300 MHz	
Workspace and program memory	1 Mbyte SRAM	4 Mbyte Flash	Application & data

Closed loop Controls

Number of drives and control type	6	Position, Speed, Current	Closed loop control
Position control	1 kHz	1 ms cycle time	PID control plus feed forward
Speed control	1 kHz	1 ms cycle time	PI control
Current / torque control	8 kHz	125 µs cycle time	PI control plus current limitation

Internal Servo Amplifiers

Quantity and type of motors	6 x brush-type or 4 x brushless or 3 steppers or mixed operation		
Amplifier type and chopping frequency	4Q-PWM / 24 kHz		
Max. output current (configurable)	10 A continuous current / 30 A peak current (max. 5 seconds) per servo amplifier		

Motion Control Features

Free programmable velocity, position, synchronization and process control.
 Highly accurate position control by single or duplex evaluation of encoders mounted on the motor shaft and moved load.
 Optional "DS402 Multi-Axis Drive" functionality for the integration of a MACS5-AMP2 as a CANopen or EtherCAT slave of a PLC.

Encoder Inputs and Outputs

All encoder inputs configurable as feedback signal inputs of the motor control or as master signal inputs for drive synchronization.

Encoder 1 ... 3 (inputs only)	Increment. 5V, max.32MHz	SinCos 1Vpp, max.150kHz	Resolution: 1 Sinus = 256 qc max. 400 kHz at 25% resolution
Encoder 4 ... 6 (inputs or outputs)	Increment. 5V, max.32MHz	SSI max.32Bit, 39kHz-5MHz	SSI passive or active
Output supply voltage (for encoders)	5 V DC, max. 200 mA each encoder, max. 1A total		
Other feedback devices	CANopen encoders (max. 1 Mbaud), Analog feedback devices (e.g. linear potentiometer)		

Digital Inputs & Outputs

Digital inputs 1-8 can be configured as marker input signal for real-time encoder position latching.

Digital inputs	16	Low < 4.6 V / High > 8 V	max. 45 V, max. 200 kHz
Digital outputs	8	24 V, 100 mA, 300 kHz	

Analog Inputs & Outputs

Analog Inputs (standard configuration)	6	0-10 V, 12 Bit, max. 5 kHz	Not available, if analog opt. in use
Alternatively it is possible to mount internally one of two analog option modules (replacing the standard analog inputs using X9).			
Analog option 1 (...-IO1-...)	1 analog Input 3 analog Outputs	±10 V, 12 Bit, max. 5 kHz ±10 V, 12 Bit, 20 mA, 10 kHz	±10 V Reference voltage (max. 20 mA)
Analog option 2 (...-IO2-...)	6 analog Inputs	0-10 V, 13 Bit, max. 5 kHz	±10 V Reference voltage (nom. 7 mA, max. 35 mA)

Interfaces

USB			Data exchange & visualization
Ethernet	Ethernet TCP/IP	max. 100 Mbaud	Data exchange & visualization
RS232	Special protocols on request		RS485 on request
CAN-Bus 1 (e.g. CANopen slave)	ISO/DIS 11898	max. 1 Mbaud (bus termination on/off switch)	2 separate CAN interfaces each with CANopen master / slave functionality
CAN-Bus 2 (e.g. CANopen master)			
EtherCAT® Slave	HW option ...-IF1-...	max. 100 Mbaud	Optional internal module required
EtherCAT® Master	SW option instead of Ethernet	max. 100 Mbaud	Just for control of external power stages and I/Os
Additional bus systems	On request from 500 pcs. onwards: Profibus, Profinet, POWERLINK, Modbus, Sercos		

LEDs

Control unit: 16 input / 8 output / 3 status / 2 USB / 3 EtherCAT Power stage: 1 power / 1 fuse / 1 over current

Mechanical Data

Type of housing and mounting	Alurail compact housing with top hat rail mounting		
Size (H x W x D) / weight	55 x 260 x 108 mm / 1.45 kg / Total height depends of connectors in use		
Connector types	Tension spring clamps with grid 3.5 (control unit) and high power connectors (power stages)		
OEM versions with customized housings or connector types on request!			

Temperature Range

Operation / Storage	0...+40° C / -20...+85° C	20...80 % humidity	non-condensing
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Typical Product Versions

Part number / product name	001451: MACS5-AMP2	001454: MACS5-AMP2-IF1	001503: MACS5-AMP2-IO2
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EtherCAT® is a registered trademark and patented technology, licensed by Beckhoff Automation GmbH, Germany.



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