MACS5 - Multi-Axis Controller for Positioning and Synchronization of up to 6 axes

Open Interfaces: CANopen, EtherCAT, POWERLINK, Ethernet, USB

Every **MACS5** module offers full featured functionality for multi-axis positioning and synchronization of servo and asynchronous motors. Interfaces for incremental, SinCos, and SSI encoders, as well as high-speed latching inputs are onboard.

Free programmability makes it possible to adapt the functionality exactly to the machine or device requirements and enable you even to enhance the DS402 features.

The MACS5 module can be used for autarkic control of small devices.

For more complex machines, the MACS5 modules can be linked by CANopen, EtherCAT, POWERLINK, Ethernet, and USB to a PLC or PC network. Each MACS5 module can also serve as a CANopen or EtherCAT master of a sub-network and command servo amplifiers, frequency converters, and I/O modules.

The MACS5 is the most competitive and high-performance link in between your process control and drive units. Your supervisor PLC needs no processing power and no special features for the motion control tasks, thus downsize of the PLC hardware is possible. The integrated encoder inputs and the license free, highly sophisticated motion control functions of reduces the hardware and software expenses.

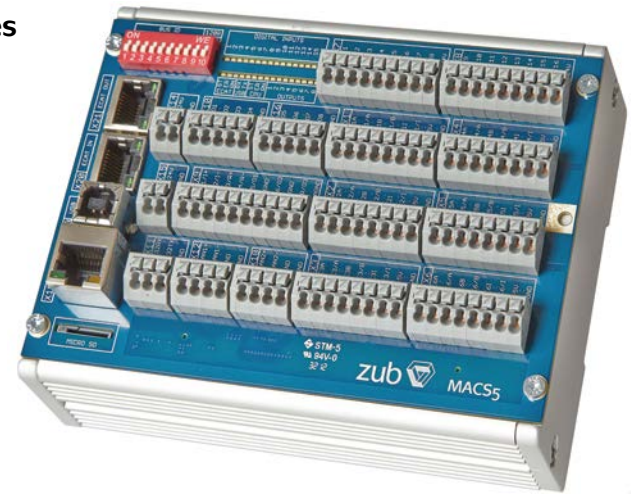
Application Range

- X/Y/Z-Positioning
- **Storage:** Cart positioning
- **Feeding:** Synchronous feeding
- **Winding:** Position synchronization
- **Labeling:** Marker synchronization

Did we miss your application?
Please, call us! zub machine control AG will offer you an appropriate solution for that as well.

Multiple Bus Interfaces

- USB and Ethernet for PC, PLC or visualization
- CANopen, EtherCAT®, POWERLINK to integrate MACS5 modules as "intelligent" slaves into any kind of PLC systems
- EtherCAT® and CANopen master functionality for drives and I/Os



zub Standards

- **Control Functions:** Interrupts reacting on inputs, position data, bus bits, timer, etc.; arithmetic and bit handling; conditional branches and loops.
- **Positioning Functions:** Configurable homing, absolute and relative positioning, programmable velocity 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.
- **On-the-fly Flexibility:** The entire set of motion or regulation parameters and the mode of operation can be altered on the fly with automatic recalculation of the motion profile.

Options

- **Integrated amplifiers**:
  6 x DC or 4 x EC or 3 steppers or mixed operation:

	cont. / peak current
MACS5-AMP1	2A / 10A per amplifier
MACS5-AMP2	10A / 30A per amplifier

- **Analog Options**
  The analog option 1 can be used to control up to three external servo amplifiers or frequency converters by a ±10 V command signal.
  Analog option 2 can be used to read in potentiometric position scales in a more accurate way (i.e. 13 bit) than by the standard analog inputs.
- **Interfaces**
  Alternatively or additionally further interfaces are possible as option e.g. EtherCAT slave or for OEM products on request e.g. POWERLINK.

Electrical Data			
Supply voltage, current cons.	24 V DC ±25 %	200 mA	current consumption without I/O-load
CPU & Memory			
Microprocessor	DSP TI C28346	300 MHz	
Workspace & program memory	1 Mbyte SRAM	4 Mbyte Flash	firmware, application, and data
Micro SD memory card	up to 1 Gbyte		e.g. for SW update or data recording
Control Characteristic			
Axis control: number and type	1…6	PID with feed forward	number depends on configuration
Position control frequency	1 kHz	1 ms cycle time	configurable (faster when less than 6 axes are used)
Motion-Control Functionality combined with Programmability			
Velocity and position control with linear, S-profile or jerk limited ramps Velocity and position / angle synchronization with or without master / slave marker correction, CAM profile synchronization			
Encoder Terminals			
Encoder 1 … 6	Incremental encoder or SSI encoder or Sin/Cos-Geber	5 V, max. 5 MHz max. 32 Bit, 39 kHz … 5 MHz 1 Vpp, max. 150 kHz	Encoder 1 - 6 only Encoder 4 – 6 only Encoder 1 – 3
Enc. 1 … 6	configurable as slave (positioning) or master inputs (synchronization)		
Enc. 4 … 6	configurable as a virtual master output (0.037 Hz … 625 kHz) or as SSI clock		
Encoder power supply output	5 V DC, max. 200 mA per encoder, total: max. 1A		
Additional supported encoder	CANopen absolute encoder (max. 1 Mbaud); on request: Hiperface or EnDat Encoder		
Digital Inputs / Outputs			
Digital Inputs	16 Inputs 1 - 8 can be configured as marker inputs for hardware encoder position latching.	Low: < 4.6 V / High: > 18 V	max. 45 V, max. 200 kHz
Digital Outputs	8	24 V, 100 mA, 300 kHz	24 V encoder simulation configurable
Analog Inputs/Outputs			
Analog inputs	6 analog inputs	0-10 V, 10 Bit, max. 5 kHz	(not available, if analog opt. module in use)
Alternatively it is possible to mount internally one of 2 analog option modules (replacing the standard analog inputs using the X9 connector): Analog option 1 can be used to control up to three external servo amplifiers or frequency converters by a ±10 V command signal. Analog option 2 can be used to read in potentiometric position scales more precisely (i.e. 13 bit) than by the standard analog inputs.			
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. 5KHz	+10 V reference voltage (nominal 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 (instead of RS232) on request
RS485	On request		
CAN-Bus 1 (e. g. CAN-Slave) CAN-Bus 2 (e. g: CAN-Master)	ISO/DIS 11898	max. 1 Mbaud (switchable bus termination)	2 independent CAN interfaces offering master and slave functionality
EtherCAT® Slave	HW option **-IF1-**	max. 100 Mbaud	internally mounted option module
EtherCAT® Master (alternatively in place of Ethernet)	SW option specific only for drives & I/Os	max. 100 Mbaud	Optimized EtherCAT® Master, e.g. for sub-networks with servo drives and FCs and for I/O-extension modules.
POWERLINK, Profibus, ProfiNet	On request for OEM products (min. 500 pcs.).		
LEDs			
16 inputs / 8 outputs / 3 status / 2 USB / 3 EtherCAT			
Power-down Save			
User-defined data can be saved automatically at power-down (e.g. in case of mains failure).			
Mechanical Data			
Type of housing, mounting	Alurail compact housing with top hat rail mounting		
Dimension and weight	140 x 108 x 55 mm, 0.8 kg (without connecting; effective height depends from the type of used connector boards)		
Connector type	Tension spring clamp on a pluggable connector board.		
OEM versions with customized housings or connector types on request.			
Temperature Range			
Operation / storage	0…+40° C / -20°…+85° C; 20…80 % humidity, not condensing		
Typical product types			
Part numbers	001414: MACS5 001416: MACS5-IF1	001417: MACS5-IO1 001423: MACS5-IF1-IO1	

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