MACS5
Motion Control Module serves as EtherCAT Slave and Master for Positioning and Synchronization of Multiple Axis

Every motion control module of the new MACS5 product line offers full featured functionality for multi-axis positioning and drive synchronization of servo and asynchronous motors. Integrated interfaces for different types of incremental and absolute feedback systems allow dual evaluation of position information for automatic slip compensation in high-precision applications. Free programmability makes it possible to adapt the functionality exactly to the machine or device requirements. The MACS5 module can even be used as the stand-alone controller in small devices. For more complex machines, the MACS5 modules can be linked by EtherCAT, CAN, Ethernet, and USB to a PLC or PC network. Each MACS5 module can serve as an EtherCAT slave of a PLC and as an EtherCAT master of a sub-network used to control servo amplifiers and frequency converters.

Prospects / Advantages
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. => Downsize the PLC hardware.

The integrated encoder inputs and the license free, highly sophisticated motion control functions of the MACS5 reduces your hardware and software expenses. => NO additional or hidden costs for motion control libraries, external encoder interfaces, or bus converters.

Application Range
- 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.

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

CAM Functions
- Interactive graphical CAM editor with position, velocity and acceleration diagram
- Definition of curve points by data input or drag and drop
- Calculation of minima / maxima

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.

Bus and Control Functions
- USB & Ethernet Interface
- 2 independent CAN bus interfaces with CANopen-Master and -Slave functionality each
- EtherCAT® Slave
- EtherCAT® Master for drives & I/Os
- Interrupts reacting on inputs, position data, bus bits, timer, etc.
- Arithmetic and bit handling
- Conditional branches and loops

Debugging & Optimization
Performance optimization of your machine and process task is assisted by the development environment with an integrated curve editor and a smart oscilloscope tool.

Conclusion
MACS5 is the most competitive multi-axis control without license fees.
P.S.: The MACS5 can also be used standalone for devices without a supervisor system.
MACS5 - Preliminary data sheet - Subject to change without prior notice!

**Electrical Data**
- Supply voltage, current consumption: 24 V DC ±25 %, 200 mA, current consumption without I/O-load

**CPU & Memory**
- Microprocessor: DSP TI C28346
- Workspace & program memory: 1 Mbyte SRAM, 4 Mbyte Flash
- Micro SD memory card: up to 1 Gbyte
- e.g. for SW update or data recording

**Control Characteristics**
- 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

**Motion-Control Functionality combined with Programmability**
- Velocity and position control with linear, S-profile or jerky 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
- Encoder 1 - 6: 5 V, max. 5 MHz or 1 Vpp, max. 150 kHz
- Encoder 1 - 6: Enc. 1 … 6 configurable as slave (° positioning) or master inputs (° synchronization)
- Encoder 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 types: CANopen absolute encoder (max. 1 MBaud)
- On request: Hiperface or EnDat Encoder

**Digital Inputs / Outputs**
- Digital Inputs: 16, Low: <4.6 V / High >18 V, max. 45 V, max. 200 kHz
- Inputs 1 - 8 can be configured as marker inputs for hardware encoder position latching
- Digital Outputs: 8, 24 V, 100 mA, 300 kHz

**Analog Inputs/Outputs**
- Analog inputs: 6 analog inputs, 0…-12 V, 10 Bit, max. 5 kHz
- Alternatively it is possible to mount internally one of two analog option modules (replacing the standard analog inputs using the X9 connector):
  - Analog option #1 can be used to control up to three external servos 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.
- Encoder option #1: 1 analog input, ±10 V, 12 Bit, max. 5 kHz
- Encoder option #2: 3 analog outputs, ±10 V, 12 Bit, 20 mA, 10 kHz
- Encoder inputs: 6 analog inputs, (No analog outputs), ±10 V, 13 Bit, max. 5kHz
- Encoder inputs: 6 analog inputs, (No analog outputs), ±10 V reference voltage (max. 20 mA)

**Interfaces**
- USB: Data exchange & visualization
- Ethernet: Ethernet TCP/IP, max. 100 MBit/Sec
- RS232: Special protocols on request
- CAN-Bus 1 (e.g. CAN-Slave)
- CAN-Bus 2 (e.g. CAN-Master)
- EtherCAT® Slave (HW-Option): max. 100 MBit/Sec
- EtherCAT® Master: Optimized EtherCAT® Master, e.g. for sub-networks with servo drives and frequency converters and for I/O-extension modules
- SW-Option: EtherCAT® Master, specifically in place of Ethernet (nom. 7 mA, max. 35 mA
- Options: Profinet, Profinet, PowerLink

**Integrated Power Amplifiers**
- Only for MACS5-AMP-... versions or as customized OEM products (min. 500 pcs.)

**MACS5-AMP-...**
- Standard version
  - No. of AX-PWM power stages: 6 x DC / 4 x EC
  - Supply voltage: 12 … 48 V DC
  - Continuous / peak output current: 2 A / 10 A
  - Speed / current control frequency: 1 kHz / 8 kHz
- HighPower or OEM version
  - No. of AX-PWM power stages: 6 x DC / 4 x EC
  - Supply voltage: 12 … 48 V DC
  - Continuous / peak output current: 10 A / 30 A
  - Speed / current control frequency: 1 kHz / 8 kHz

**LEDs**
- Red: Power-down Save
- Green: Power-on, Status, I/O
- Amber: USB / EtherCAT
- Blue: 16 / 8 / 3 / 2 / 3

**Power-down Save**
- Power-down Save: User-defined data can be saved automatically at power-down (e.g. in case of mains failure).

**Mechanical Data**
- (without connectors, actual size depends on the type of connector board in use)
  - Type of housing, mounting: Alural compact housing, Top hat rail mounting
  - MACS5 (L x W x H): approx. 140 x 108 x 55 mm
  - MACS5-AMP (L x W x H): approx. 192 x 108 x 55 mm
  - Connector type: Tension spring clamp on a pluggable connector board
  - OME versions with customized housings or connector types on request!

**Temperature Range**
- Operation / Storage: 0…+40°C / –20…+85°C
- 20 … 80 % humidity
- Not condensing

**Product Types and Ordering Codes**
- MACS5 (Standard): PN 001416
- MACS5-IFi (EtherCAT-Slave): PN 001416

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