

MAXPOS Positioning Controller Summary



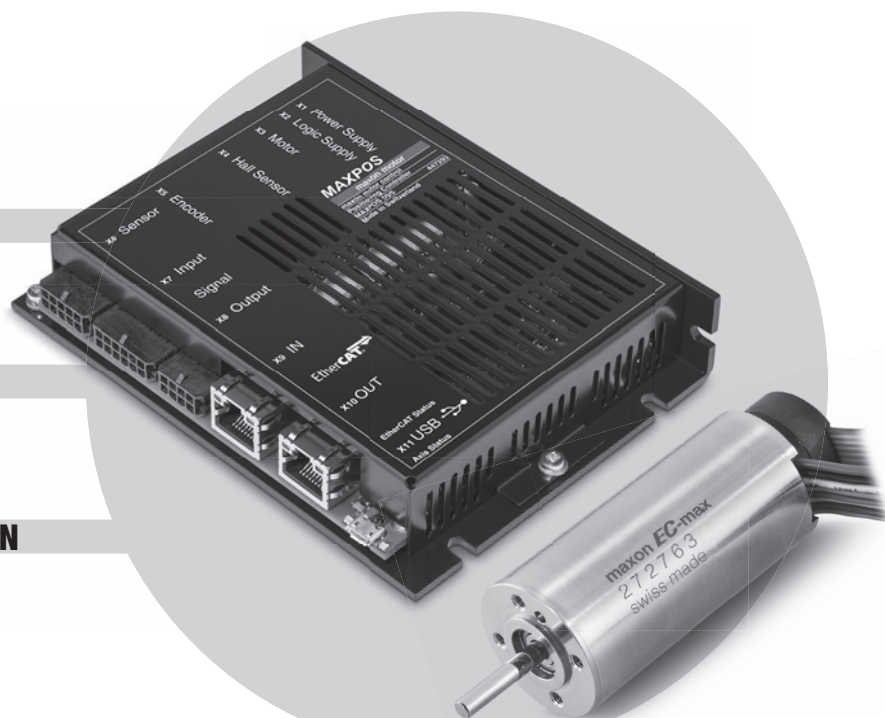
PRECISION



DYNAMIC



SYNCHRONIZATION



MAXPOS 50/5 EtherCAT Slave

The MAXPOS 50/5 is a motion controller for highly dynamic applications and receives motion and I/O commands from the higher-level EtherCAT master controlling the process. The extremely fast controllers together with the diverse feedback options provide ideal conditions for operation in high-performance applications, raising the bar for precision and synchronization. The MAXPOS 50/5 supports CoE (CAN application layer over EtherCAT).

to the EtherCAT master. If the PID position control loop is closed via the EtherCAT master, CST mode is often used.

Point to point

The "Profile Position Mode" moves the position of the motor axis from point A to point B. Positioning is in relation to the axis Home position (absolute) or the actual axis position (relative).

Position and Speed control with Feed Forward

The combination of feedback and feed forward control provides ideal motion behavior. Feed forward control reduces control error. MAXPOS supports feed forward for acceleration and speed.

Speed control

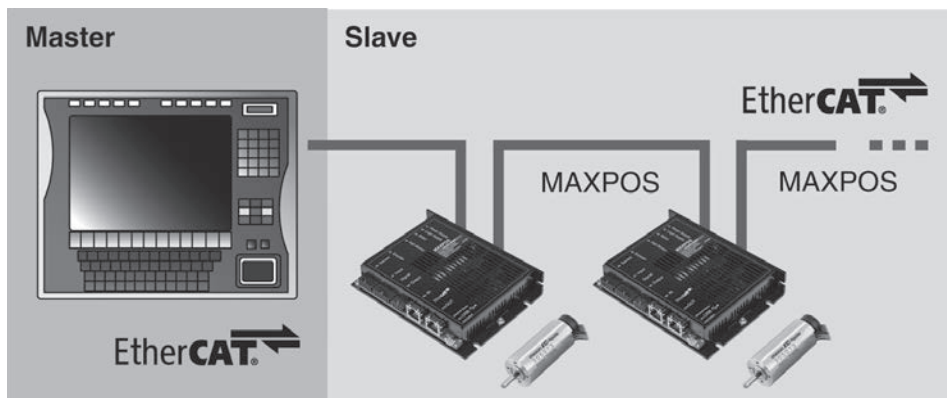
In "Profile Velocity Mode", the motor axis is moved with a set speed. The motor axis retains speed until a new speed is set.

Homing

The "Homing Mode" is for referencing to a special mechanical position. There is a wide variety of methods for achieving this.

Feedback options

Two different encoder signals can be evaluated simultaneously. In a suitable master unit, this enables dual loop control in order to compensate for mechanical backlash and elasticity. There is a wide range of suitable sensors: Digital incremental encoders, analog incremental encoders (sin/cos), SSI and BiSS-C absolute encoders (EnDat2.2 available soon).



MAXPOS is a modular, digital positioning controller. It is suitable for permanent magnet-activated DC brushed and brushless (maxon EC) motors with incremental or absolute encoders with an operational range of up to 250 W. A wide range of operating modes allows flexible use in a variety of fields in drive systems, automation, and mechatronics.

Cyclic Synchronous Position (CSP)

The EtherCAT master executes the path planning and sends the target position cyclically and synchronously via the EtherCAT network to the MAXPOS.

The position control loop runs in the MAXPOS. The MAXPOS delivers the measured actual position, speed and current values to the EtherCAT master.

Cyclic Synchronous Velocity (CSV)

The EtherCAT master executes the path planning and sends the target speed cyclically and synchronously via the EtherCAT network to the MAXPOS. The speed control loop runs in the MAXPOS. The MAXPOS delivers the measured actual position, speed and current values to the EtherCAT master. If the PI position control loop is closed via the EtherCAT master, CSV mode is often used.

Cyclic Synchronous Torque (CST)

The EtherCAT master executes the path planning and sends the target torque cyclically and synchronously via the EtherCAT network to the MAXPOS. The torque (current) control loop runs in the MAXPOS. The MAXPOS delivers the measured actual position, speed and current values

Protection

The positioning controller has protective circuits against overcurrent, excess temperature, under- and overvoltage, voltage transients, short-circuits in the motor cable, and against feedback signal loss. An adjustable current limitation protects the motor and load. The digital inputs and outputs are galvanically isolated and protected against overvoltage.

Safe Torque Off (STO)

With this safety feature based on IEC61800-5-2, the drive can be brought to a safe state at any time, from two independent digital inputs. The supply of torque-generating power is interrupted. The state can be monitored via an additional digital output.

Capture inputs (Touch Probe)

Digital inputs can be configured so that the actual position value is saved when a positive and/or negative edge of an input appears.

Trigger output (Position Compare)

Digital outputs can be configured so that a digital signal is emitted at a set position value (available soon).

Control of Holding Brakes

Control of the holding brake can be integrated in the device status management. Thereby the delay times can be individually configured for switching on and off.

Additional information for technical data of page 435

Standardized

IEC 61158 type 12 EtherCAT slave: CoE (CAN Application Layer over EtherCAT) according to IEC 61800-7 profile type 1 (CiA 402) CANopen standard device profile for drives and motion control. Easily integrated in existing EtherCAT systems. It can be connected to a network of other EtherCAT units. Alternatively configurable via serial interface (USB 2.0/3.0).

Flexible, modular

The same technology for DC and EC motors. Configurable inputs and outputs for limit switches, reference switches, holding brakes and for other sensors and indicators near the drive.

Easy start-up procedure

Graphic user interface with many functions and wizards for start-up procedure, automatic control settings, I/O configuration, tests.

Optimal control characteristics

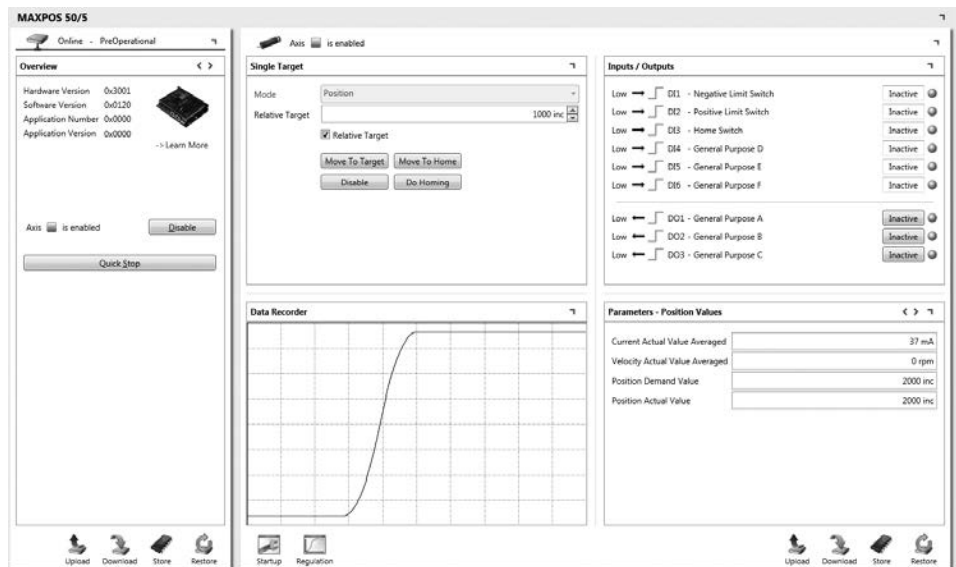
The fast controller rates and short cycle times of the EtherCAT communication enable applications with exacting requirements for the dynamics of the drive system. Control input from the EtherCAT master can be accepted by the MAXPOS at a frequency of up to 10 kHz and transmitted to the controllers. Distributed Clocks are supported to optimize synchronization of multiple drive axes. With MAXPOS, all the requirements are met for optimal performance in a wide range of high-performance applications.

EtherCAT Master: Integration made easy

Integration of the MAXPOS 50/5 position controller in a wide variety of master systems is simplified with the provided device description file (ESI file) and device-specific configuration instructions. For a current overview, please visit <http://maxpos.maxonmotor.com>

State-of-the-art

Digital position, speed and current/torque control. Sinusoidal commutation (FOC) for smooth operation of EC motors.



Operating modes

Cyclic Synchronous Position (CSP),
Cyclic Synchronous Velocity (CSV), Cyclic
Synchronous Torque (CST)
Profile Position-, Profile Velocity- and Homing
Mode

Feed forward for velocity and acceleration
Sinusoidal commutation for EC motors

Communication

Communication via EtherCAT with:
– CoE/FoE
– Distributed Clocks Support
– CSP, CSV, CST with cycle times up to 100µs
– Variable PDO mapping

Configuration

Configuration via EtherCAT or USB 2.0/3.0

Inputs/Outputs

Free configurable digital inputs e.g. for limit
switches and reference switches
Free configurable digital outputs e.g.
for holding brakes

Available software

MAXPOS Studio (Graphical User Interface)
Firmware

Available documentation

Feature Chart
Hardware Reference
Firmware Specification
Communication Guide
Application Notes

Cable

A comprehensive range of cables is available
as an option. Details can be found on page
437.

MAXPOS Positioning Controller Data

High Performance

EtherCAT

USB

GUI



MAXPOS 50/5

Matched with DC brush motors with encoder or brushless EC motors with Hall sensors and encoder to 250 watts.

maxon motor control

| Controller versions | |
|--|--|
| | EtherCAT Slave |
| Electrical data | |
| Operating voltage V_{CC} | 10 - 50 VDC |
| Logic supply voltage V_C (optional) | 10 - 50 VDC |
| Max. output voltage | $0.95 \times V_{CC}$ |
| Max. output current I_{max} (<1.5 s) | 15 A |
| Continuous output current I_{cont} | 5 A |
| Switching frequency of power stage | 100 kHz |
| Sample rate of PI - current controller | 100 kHz (10 μ s) |
| Sample rate of PI - speed controller | 10 kHz (100 μ s) |
| Sample rate of PID - positioning control | 10 kHz (100 μ s) |
| Max. speed (DC) | limited by max. speed (motor) and max. output voltage (controller) |
| Max. speed (EC; 1 pole pair) | 200 000 rpm (sinusoidal) |
| Built-in motor choke per phase | 22 μ H / 10 A |
| Input | |
| Hall sensor signals | H1, H2, H3 |
| Encoder signals | A, A \backslash , B, B \backslash , I, I \backslash (max. 5 MHz) |
| Sensor signals | A, A \backslash , B, B \backslash , I, I \backslash , Clock+, Clock-, Data+, Data- |
| Digital inputs | 6 (galvanically isolated) |
| Output | |
| Digital outputs | 4 (galvanically isolated) |
| Encoder voltage output | +5 VDC, max. 70 mA |
| Hall sensor voltage output | +5 VDC, max. 30 mA |
| Sensor voltage output | +5 VDC, max. 150 mA |
| Auxiliary voltage output | +24 VDC, max. 300 mA when $V_{CC} > 30$ VDC |
| | $V_{CC}-5$ V, max. 300 mA when $V_{CC} < 30$ VDC |
| Interface | |
| EtherCAT | IEEE 802.3 100 Base T (100 Mbit/s, Full Duplex) |
| USB 2.0/3.0 | Data+; Data- (full speed) |
| Indicator | |
| Axis Status | green LED, red LED |
| EtherCAT Status | green LED, red LED |
| EtherCAT Port Activity/Link State | green LED |
| Environmental conditions | |
| Temperature – Operation | -30...+45°C |
| Temperature – Extended range | +45...+56°C; Derating: -0.455 A/°C |
| Temperature – Storage | -40...+85°C |
| Humidity (condensation not permitted) | 5...90% |
| Mechanical data | |
| Weight | Approx. 302 g |
| Dimensions (L x W x H) | 140 x 103.5 x 27 mm |
| Mounting | Flange for M4-screws |
| Part numbers | |
| | 447293 MAXPOS 50/5 |
| Accessories | |
| | 309687 DSR 50/5 Shunt regulator |
| | Order accessories separately, see page 437 |