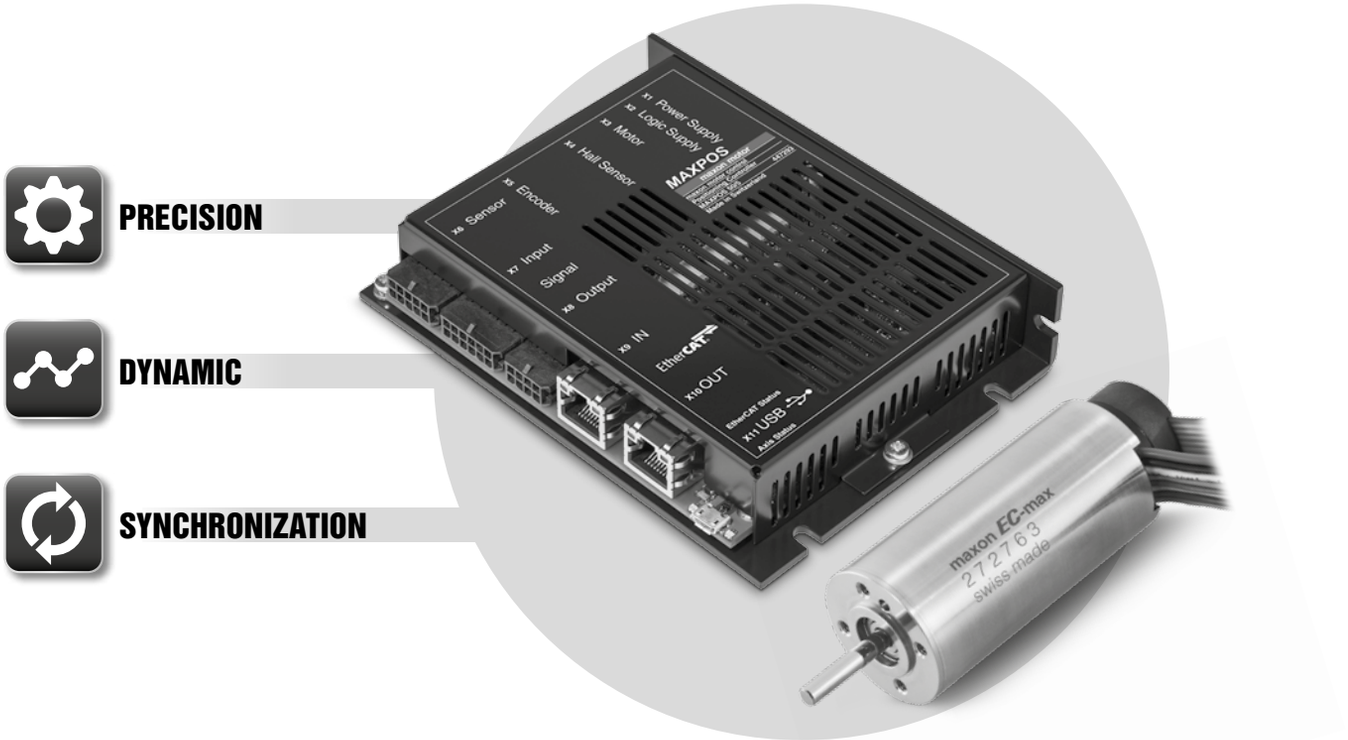
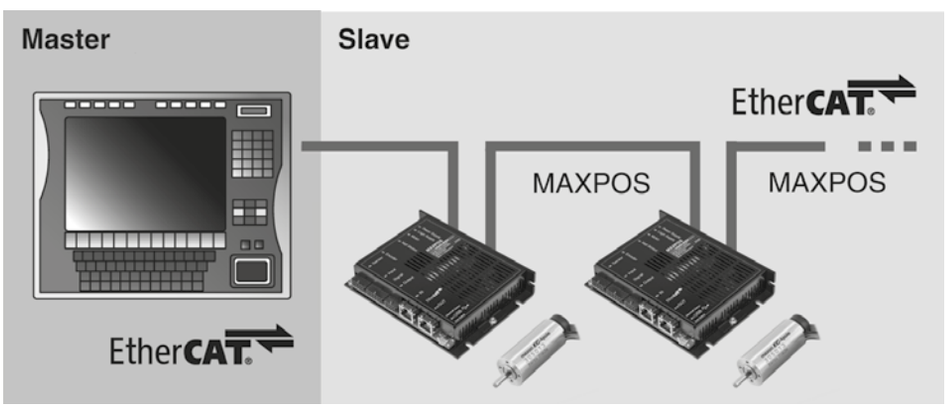
MAXPOS Positioning Controller Summary



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).



MAXPOS is a modular, digital positioning controller. It is suitable for permanent magnet-activated DC motors and brushless, electronically commutated EC motors with incremental or absolute encoders with an operational range of up to 250 W continuous power.
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 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 permitted sensors: Digital incremental encoders, analog incremental encoders (sin/cos), SSI and BiSS-C absolute encoders.

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.

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 447

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).

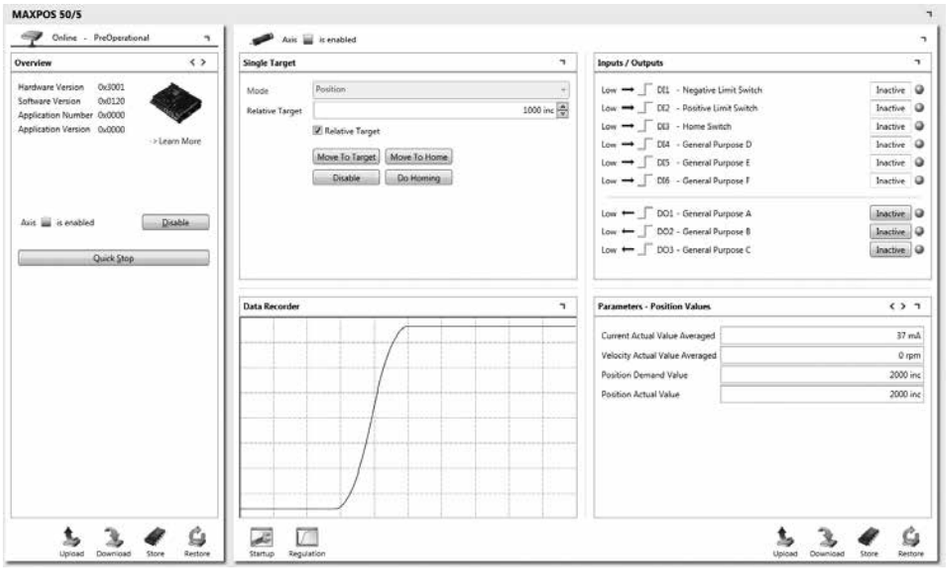
Flexible, modular
The same technology for DC and EC motors. Configurable inputs and outputs for limit switches, reference switches, holding brakes and for other sensors and indicators near the drive.

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 Synchronuous Position (CSP), Cyclic Synchronuous Velocity (CSV), Cyclic Synchronuous 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 449.

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.

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 x 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 µs)
Sample rate of PI - speed controller	10 kHz (100 µs)
Sample rate of PID - positioning control	10 kHz (100 µs)
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 µH / 10 A
Input	
Hall sensor signals	H1, H2, H3
Encoder signals	A, A\, B, B\, I, I\ (max. 5 MHz)
Sensor signals	A, A\, B, B\, I, I\, Clock+, Clock-, Data+, Data-
Digital inputs	6 (galvanically isolated)
Output	
Digital outputs	3 (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 449