
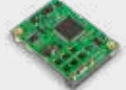





















# EPOS4 Positioning Controllers Overview

motor control

## Modules

## Ready-to-connect units

Micro	Module	Compact CAN	Compact EtherCAT	Encased housing / Disk
EPOS4 Micro 24/5 CAN 	EPOS4 Module 24/1.5 	EPOS4 Compact 24/1.5 CAN 	EPOS4 Compact 24/1.5 EtherCAT 	EPOS4 50/5 
EPOS4 Micro 24/5 EtherCAT 	EPOS4 Module 50/5 	EPOS4 Compact 50/5 CAN 	EPOS4 Compact 50/5 EtherCAT 	EPOS4 70/15 
	EPOS4 Module 50/8 	EPOS4 Compact 50/8 CAN 	EPOS4 Compact 50/8 EtherCAT 	<b>NEW</b> EPOS4 Disk 60/8 CAN 
	EPOS4 Module 50/15 	EPOS4 Compact 50/15 CAN 	EPOS4 Compact 50/15 EtherCAT 	<b>NEW</b> EPOS4 Disk 60/8 EtherCAT 
			EPOS4 Compact 24/5 EtherCAT 3-axes 	<b>NEW</b> EPOS4 Disk 60/12 CAN 
				<b>NEW</b> EPOS4 Disk 60/12 EtherCAT 

maxon EPOS4 products are small, completely digital, intelligent positioning controllers. Their high power density provides high flexibility for use with brushed DC and brushless EC (BLDC) motors up to approx. 1050 W with various feedback options such as Hall sensors, incremental encoders and absolute encoders, in a variety of drive applications.

### Modules

Robotic, analysis and handling systems require compact integration of a large number of energy-efficient drives, combined with highly dynamic controllers and a linked bus system. With the established EPOS4 Module and Micro, modular multi-axis systems can be set up using CANopen or EtherCAT, without needing high investment in development.

### Ready-to-connect units

For prototypes and small batches, the large variety of ready-to-connect controllers, available in various power classes and designs, provide attractive, economical options for using EPOS4 products in your application.

### EPOS Studio

The EPOS Studio software, which is available free of charge, includes intuitive tools and

wizards that make commissioning easy. It provides a basic overview of the EPOS4 functions and a command option. Analysis tools such as the Data Recorder or Command Analyzer supplement the features in EPOS Studio.

### CANopen / EtherCAT

As a standardized motion control slave, EPOS4 can easily be integrated into the system manager tools and motion libraries of various PLC manufacturers. The data exchange and command functions make use of the CiA® 402 protocol (Device Profile for Drives and Motion Control).

### Cyclic Synchronous Position (CSP)

The master executes the path planning and sends the target position cyclically and synchronously to the EPOS4 via the network. The position control loop runs on the EPOS4. The EPOS4 sends the measured actual position, speed and current values to the master.

### Cyclic Synchronous Velocity (CSV)

The master executes the path planning and sends the target speed cyclically and synchronously to the EPOS4 via the network. The speed control loop runs on the EPOS4. The EPOS4 sends the measured actual position, speed and current values to the master. The CSV mode is

commonly used if a PI position control loop is closed via the master.

### Cyclic Synchronous Torque (CST)

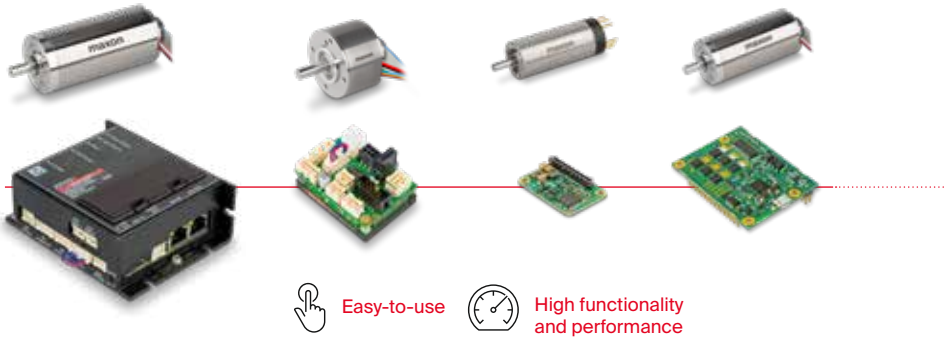
The master executes the path planning and sends the target torque cyclically and synchronously to the EPOS4 via the network. The torque (current) control loop runs on the EPOS4. The EPOS4 sends the measured actual position, speed and current values to the master. The CST mode is commonly used if a PID position control loop is closed via the master.

### 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 velocity control with feed forward

The combination of feedback and feed forward control provides ideal motion behavior. Feed forward control reduces control error. EPOS4 supports feed forward acceleration and speed control.



 Easy-to-use  High functionality and performance

### Speed control

In the Profile Velocity Mode, the motor axis is moved with a defined set speed. The motor axis keeps the speed constant until a new speed set value is given.

### Homing

The Homing Mode is used for referencing to a specific mechanical position. There is a wide variety of methods available.

### Feedback options and dual loop

Two different encoder signals can be evaluated simultaneously. This allows dual-loop control, which can be tuned automatically to compensate for mechanical backlash and elasticity. A wide range of sensors is permitted: digital incremental encoders, analog incremental encoders (sin/cos), and SSI 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.

### Safe Torque Off (STO)

With this safety feature based on IEC61800-5-2 (not certified), 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. The inputs and outputs are optically isolated.

### Capture Inputs (Touch Probe)

The digital inputs can be configured so that the actual position value is stored whenever a positive or negative edge occurs at an input.

### Trigger Output (Position Compare)

The digital outputs can be configured so that a digital signal is sent at a selectable position value (on request).

### Control of Holding Brakes

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

Supplementary information for technical data page 509–515.

### Operating modes/Control

- Cyclic Synchronous Position (CSP)
- Cyclic Synchronous Velocity (CSV)
- Cyclic Synchronous Torque (CST)
- Profile Position, Profile Velocity and Homing Mode
- Speed and Acceleration Feed Forward
- Sinusoidal or Block Commutation for EC motors
- Alternative set value input via analog commands
- Dual-loop Position and Speed Control

### Communication/Configuration

- Communication via CANopen and/or USB 2.0/3.0 and/or RS232
- EtherCAT (CoE)
- USB to CAN and RS232 to CAN gateway

### Inputs/Outputs

- STO (Safe Torque Off) inputs and outputs, optically isolated, not certified
- Free digital inputs, configurable e.g. for limit/reference switches
- Free digital outputs, configurable e.g. for brake
- Free analog inputs, configurable
- Free analog outputs, configurable

### Available software

- EPOS Studio
- Windows DLL (32-/64-bit) with programming examples
- Linux shared object library (X86 32-/64-bit, ARMv6/v7/v8 32-bit, ARMv8 64-bit for Raspberry Pi and BeagleBone) with programming examples
- Firmware

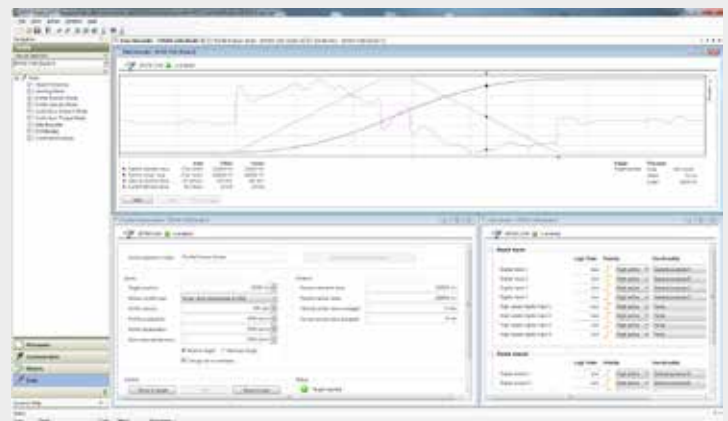
### Available documentation

- Feature Chart
- Hardware Reference
- Firmware Specification
- Communication Guide
- Application Notes

### EPOS4 performance characteristics

- Maximum power density.
- Convincing control performance even with highly dynamic motors.
- Comprehensive feedback options.
- Diverse I/O connection options for peripherals.
- Uncompromising protective features for controller and drive.
- Configuration and communication via CANopen (CiA 301, 402, 305), RS232, USB, or EtherCAT. IEC 61158 type 12 EtherCAT slave: CoE (CAN application layer over EtherCAT) compliant with IEC 61800-7 profile type 1 (CiA 402). Easy integration into existing EtherCAT systems. Can be connected to a network of other EtherCAT units.
- Easy commissioning via EPOS studio GUI and intuitive tools.
- Libraries and programming examples for efficient integration in a wide variety of systems.
- All software components are freely available at any time.
- Full documentation and outstanding support.

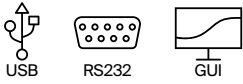
**The complete package for your motion control solution with added value.**



# EPOS4 Positioning Controllers Overview

motor control

EtherCAT  CANopen 



Module + Connector Board = Compact



## Accessories EPOS4 Module & Micro (not included in delivery)

403968	USB Type A - micro B Cable																
536997	EPOS4 CB 24/1.5 CAN																
620048	EPOS4 CB 24/1.5 EtherCAT																
534133	EPOS4 CB 50/5 CAN																
620044	EPOS4 CB 50/5 EtherCAT																
520884	EPOS4 CB Power CAN																
604594	EPOS4 CB Power EtherCAT																
581245	EPOS4 EtherCAT Card																
638677	EPOS4 EB Micro																
659508	EPOS4 MB Micro EtherCAT 3-axes																
590738	EPOS4 Module SMT socket 2 x 23 poles																
677324	EPOS4 Micro SMT socket 2 x 40 poles																
	(a) with matching motherboard																

## Accessories EPOS4 Compact & Encased housing (not included in delivery)

520858	CAN-CAN Cable																
520857	CAN-COM Cable																
275934	Encoder Cable																
520859	EPOS4 Connector Set																
581245	EPOS4 EtherCAT Card																
691408	EPOS4 MB 3-axes Conn. Set	✓															
422827	Ethernet Cable	✓															
275878	Hall Sensor Cable	✓															
275851	Motor Cable	✓															
520851	Motor Cable High Current																
275829	Power Cable	✓ (b)															
520850	Power Cable High Current	✓ (c)															
520856	RS232-COM Cable																
520852	Sensor Cable 5 x 2core	✓															
520854	Signal Cable 7core	✓															
520853	Signal Cable 8core	✓															
520860	STO Idle Connector X9		✓ (i)	✓ (i)	✓ (i)	✓ (i)	✓ (i)	✓ (i)	✓ (i)	✓ (i)	✓ (i)	✓ (i)	✓ (i)	✓ (i)	✓ (i)	✓ (i)	✓ (i)
403968	USB Type A - micro B Cable	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓

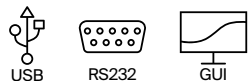
(b) optional for separate logic supply (c) mandatory for supply of power stage (i) included Additional accessories from page 529

## Accessories EPOS4 Disk (not included in delivery)

710928	Brake Cable	✓															
710931	CAN-CAN Cable	✓															
710932	CAN-COM Cable	✓															
696285	Encoder Cable	✓															
710926	EPOS4 Disk Connector Set	✓															
710934	EtherCAT-COM Cable	✓															
710933	EtherCAT-EtherCAT Cable	✓															
275878	Hall Sensor Cable	✓															
696284	Hall Sensor Cable	✓															
710930	Motor Cable High Current	✓															
696283	Power & Motor Cable	✓															
710929	Power Cable High Current	✓															
696286	Sensor Cable 3x2core	✓															
520852	Sensor Cable 5x2core	✓															
696288	Signal Cable 7core	✓															
696287	Signal Cable 8core	✓															
696289	USB Type A - Micro-Lock Cable	✓															

# EPOS4 Positioning Controllers Data

EtherCAT  CANopen



## EPOS4 Compact 24/1.5 CAN

Ready-to-install compact solution, designed for use with brushed DC motors with encoders or brushless EC motors with Hall sensors and encoders up to 36/108 Watt.

## EPOS4 Compact 24/1.5 EtherCAT

Ready-to-install compact solution, designed for use with brushed DC motors with encoders or brushless EC motors with Hall sensors and encoders up to 36/108 Watt.

Controller version	CANopen Slave	EtherCAT Slave
<b>Electrical data</b>		
Operating voltage $V_{CC}$	10 - 24 VDC	10 - 24 VDC
Logic supply voltage $V_C$ (optional)	10 - 24 VDC	10 - 24 VDC
Max. output voltage	$0.9 \times V_{CC}$	$0.9 \times V_{CC}$
Max. output current $I_{max}$	4.5 A (<30 s)	4.5 A (<30 s)
Continuous output current $I_{cont}$	1.5 A	1.5 A
Switching frequency of power stage	100 kHz	100 kHz
Sampling rate of PI current controller	25 kHz (40 $\mu$ s)	25 kHz (40 $\mu$ s)
Sampling rate of PI speed controller	2.5 kHz (400 $\mu$ s)	2.5 kHz (400 $\mu$ s)
Sampling rate of PID position controller	2.5 kHz (400 $\mu$ s)	2.5 kHz (400 $\mu$ s)
Max. speed (1 pole pair)	50 000 rpm (sinusoidal), 100 000 rpm (block)	50 000 rpm (sinusoidal), 100 000 rpm (block)
Built-in motor choke per phase	94 $\mu$ H / 1.5 A	100 $\mu$ H / 1.5 A
<b>Inputs</b>		
Hall sensor signals	H1, H2, H3	H1, H2, H3
Encoder signals	A, A\, B, B\, I, I\ (max. 6.25 MHz)	A, A\, B, B\, I, I\ (max. 6.25 MHz)
Sensor signals	A, A\, B, B\, I, I\, Clock, Clock\, Data, Data\	A, A\, B, B\, I, I\, Clock, Clock\, Data, Data\
Digital inputs	4 (level switchable: logic/PLC)	4 (level switchable: logic/PLC)
Digital inputs "High-speed"	4, differential	4, differential
Analog inputs	2 (12-bit resolution, -10...+10 V)	2 (12-bit resolution, -10...+10 V)
CAN ID / DEV ID	configurable with DIP switch 1...5	configurable with DIP switch 1...5
<b>Outputs</b>		
Digital outputs	2	2
Digital outputs "High-speed"	1, differential	1, differential
Analog outputs	2 (12-bit resolution, -4...+4 V, max. 1 mA)	2 (12-bit resolution, -4...+4 V, max. 1 mA)
Encoder voltage output	+5 VDC, max. 70 mA	+5 VDC, max. 70 mA
Hall sensor voltage output	+5 VDC, max. 30 mA	+5 VDC, max. 30 mA
Auxiliary voltage output	+5 VDC, max. 150 mA	+5 VDC, max. 150 mA
<b>Interfaces</b>		
RS232	RxD; TxD (max. 115 200 bit/s)	-
CAN	high; low (max. 1 Mbit/s)	-
USB 2.0/3.0	Data+; Data- (Full Speed)	Data+; Data- (Full Speed)
EtherCAT	-	100 Mbit/s (Full Duplex)
<b>Indicator</b>		
LED green = READY, red = ERROR	Green LED, red LED	Green LED, red LED
<b>Environmental conditions</b>		
Temperature - Operation	-30...+45°C	-30...+45°C
Temperature - Extended Range	+45...+70°C; Derating: -0.060 A/°C	+45...+70°C; Derating: -0.060 A/°C
Temperature - Storage	-40...+85°C	-40...+85°C
Humidity (condensation not permitted)	5...90%	5...90%
<b>Mechanical data</b>		
Weight	approx. 58 g	approx. 78 g
Dimensions (L x W x H)	55.0 x 40.0 x 31.1 mm	55.0 x 56.5 x 31.7 mm
Mounting	M2.5 screws	M2.5 screws
<b>Part numbers</b>		
	<b>546714 EPOS4 Compact 24/1.5 CAN</b>	<b>628092 EPOS4 Compact 24/1.5 EtherCAT</b>
<b>Accessories</b>		
	<b>309687 DSR 50/5 Shunt regulator</b>	<b>309687 DSR 50/5 Shunt regulator</b>
	Order accessories separately, see page 529	Order accessories separately, see page 529