


















# EPOS4 Positioning Controllers Overview

motor control

## Modules

## Ready-to-connect units

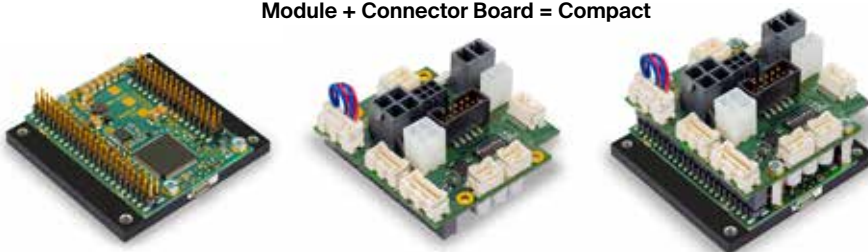
Micro	Module	Compact CAN	Compact EtherCAT	Encased housing
<p><b>NEW</b> EPOS4 Micro 24/5 CAN</p> 	<p>EPOS4 Module 24/1.5</p> 	<p>EPOS4 Compact 24/1.5 CAN</p> 	<p>EPOS4 Compact 24/1.5 EtherCAT</p> 	<p>EPOS4 50/5</p> 
<p><b>NEW</b> EPOS4 Micro 24/5 EtherCAT</p> 	<p>EPOS4 Module 50/5</p> 	<p>EPOS4 Compact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

### EPOS4

EPOS4 is the next generation of our CANopen positioning controller. It combines maximum power density with improved control performance and better functionality. The modular concept also provides for a wide variety of expansion options with Ethernet-based interfaces like EtherCAT or absolute rotary encoders. All these innovations combined with the proven concepts of the EPOS product line are consistently based on the successful principle of the Easy to use **PO**sitioning System.

As part of the new modular system, the EPOS4 controllers can be with ready-to-install connector boards into compact solutions that match a wide variety of requirements. Optional expansion modules make it possible to provide custom basic functionalities at low cost:

#### Module + Connector Board = Compact



EPOS4 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 1050 W continuous power. The variety of operating

modes provides high flexibility: The controllers are suitable for use in a wide range of drive systems in automation and mechatronics.

#### 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)

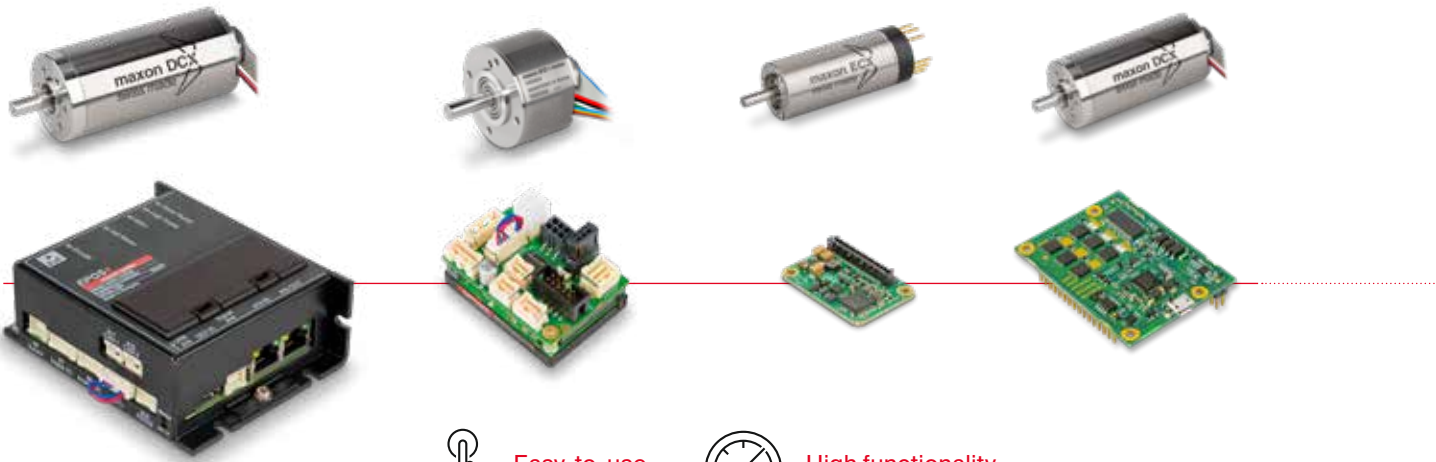
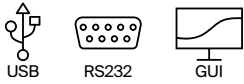
The master executes the path planning and sends the target speed cyclically and synchronously to the EPOS4 via the network. The speed control loop runs on the EPOS4. The EPOS4 sends the measured actual position, speed and current values to the master. The CSV mode is commonly used if a PI position control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



Easy-to-use



High functionality and performance

tioning 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.

**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, un-

der- 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 495–501.

**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

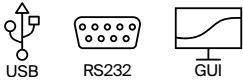
**Available documentation**

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

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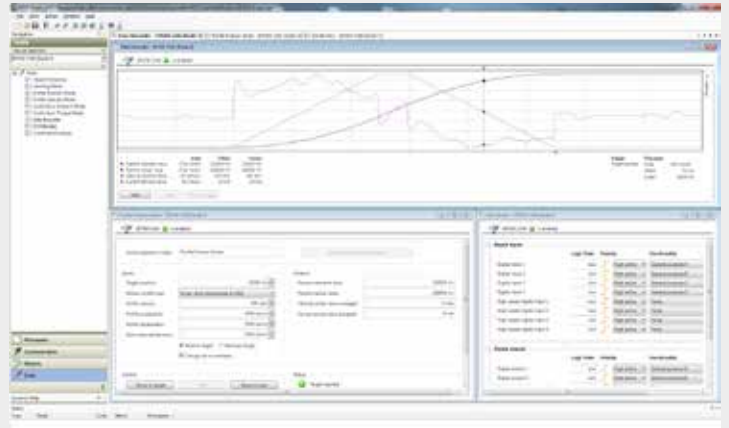
motor control

EtherCAT  CANopen 



### 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.

### Accessories EPOS4 (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																			

520858	CAN-CAN Cable																			
520857	CAN-COM Cable																			
275934	Encoder Cable																			
275878	Hall Sensor Cable	✓																		
520854	Signal Cable 7core	✓																		
520853	Signal Cable 8core	✓																		
275851	Motor Cable	✓																		
520851	Motor Cable High Current																			
275829	Power Cable	✓ (a)																		
520850	Power Cable High Current	✓ (b)																		
520856	RS232-COM Cable																			
520852	Sensor Cable 5 x 2core	✓																		
520860	STO Idle Connector X9																			
403968	USB Type A - micro B Cable	✓																		
422827	Ethernet Cable	✓																		
581245	EPOS4 EtherCAT Card																			
520859	EPOS4 Connector Set																			
309687	DSR 50/5	✓																		
235811	DSR 70/30	✓																		

(a) optional for separate logic supply (b) mandatory for supply of power stage (c) with matching motherboard (i) included  
Additional accessories from page 513

# EPOS4 Positioning Controllers Data



## EPOS4 Compact 50/15 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 750/1500 Watt.

## EPOS4 50/5

Positioning controller in a robust housing, designed for use with brushed DC motors with encoders or brushless EC motors with Hall sensors and encoders up to 250/750 Watt.

## EPOS4 70/15

Positioning controller in a robust housing, designed for use with brushed DC motors with encoders or brushless EC motors with Hall sensors and encoders up to 1050/2100 Watt.

### Controller version

#### EtherCAT Slave

#### CANopen Slave with EtherCAT option

#### CANopen Slave with EtherCAT option

#### Electrical data

10 - 50 VDC	10 - 50 VDC	10 - 70 VDC
10 - 50 VDC	10 - 50 VDC	10 - 70 VDC
0.9 x V <sub>CC</sub>	0.9 x V <sub>CC</sub>	0.9 x V <sub>CC</sub>
30 A (<60 s)	15 A (<15 s)	30 A (<60 s)
15 A	5 A	15 A
50 kHz	50 kHz	50 kHz
25 kHz (40 µs)	25 kHz (40 µs)	25 kHz (40 µs)
2.5 kHz (400 µs)	2.5 kHz (400 µs)	2.5 kHz (400 µs)
2.5 kHz (400 µs)	2.5 kHz (400 µs)	2.5 kHz (400 µs)
50 000 rpm (sinusoidal), 100 000 rpm (block)	50 000 rpm (sinusoidal), 100 000 rpm (block)	50 000 rpm (sinusoidal), 100 000 rpm (block)
2.2 µH / 15 A	15 µH / 5 A	15 µH / 15 A

#### Inputs

H1, H2, H3	H1, H2, H3	H1, H2, H3
A, A\, B, B\, I, I\ (max. 6.25 MHz)	A, A\, B, B\, I, I\ (max. 6.25 MHz)	A, A\, B, B\, I, I\ (max. 6.25 MHz)
A, A\, B, B\, I, I\, Clock, Clock\, Data, Data\	A, A\, B, B\, I, I\, Clock, Clock\, Data, Data\	A, A\, B, B\, I, I\, Clock, Clock\, Data, Data\
4 (level switchable: logic/PLC)	4 (level switchable: logic/PLC)	4 (level switchable: logic/PLC)
4, differential	4, differential	4, differential
2 (12-bit resolution, -10...+10 V)	2 (12-bit resolution, -10...+10 V)	2 (12-bit resolution, -10...+10 V)
configurable with DIP switch 1...5	configurable with DIP switch 1...5	configurable with DIP switch 1...5

#### Outputs

2	2	2
1, differential	1, differential	1, differential
2 (12-bit resolution, -4...+4 V, max. 1 mA)	2 (12-bit resolution, -4...+4 V, max. 1 mA)	2 (12-bit resolution, -4...+4 V, max. 1 mA)
+5 VDC, max. 70 mA	+5 VDC, max. 70 mA	+5 VDC, max. 70 mA
+5 VDC, max. 30 mA	+5 VDC, max. 30 mA	+5 VDC, max. 30 mA
+5 VDC, max. 150 mA	+5 VDC, max. 150 mA	+5 VDC, max. 150 mA

#### Interfaces

-	RxD; TxD (max. 115 200 bit/s)	RxD; TxD (max. 115 200 bit/s)
-	high; low (max. 1 Mbit/s)	high; low (max. 1 Mbit/s)
Data+; Data- (Full Speed)	Data+; Data- (Full Speed)	Data+; Data- (Full Speed)
100 Mbit/s (Full Duplex)	Optional 581245 EPOS4 EtherCAT Card available	Optional 581245 EPOS4 EtherCAT Card available

#### Indicator

Green LED, red LED	Green LED, red LED	Green LED, red LED
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#### Environmental conditions

-30...+25 °C	-30...+50 °C	-30...+50 °C
+25...+77 °C; Derating: -0.288 A/°C	+50...+80 °C; Derating: -0.167 A/°C	+50...+85 °C; Derating: -0.429 A/°C
-40...+85 °C	-40...+85 °C	-40...+85 °C
5...90%	5...90%	5...90%

#### Mechanical data

approx. 140 g	approx. 206 g	approx. 372 g
59.5 x 79.5 x 37.8 mm	105.0 x 83.0 x 38.7 mm	125.0 x 94.5 x 38.7 mm
M3 screws	Flange for M4-screws	Flange for M4-screws

#### Part numbers

<b>605299</b> EPOS4 Compact 50/15 EtherCAT	<b>546047</b> EPOS4 50/5	<b>594385</b> EPOS4 70/15
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#### Accessories

<b>235811</b> DSR 70/30 Shunt regulator	<b>309687</b> DSR 50/5 Shunt regulator	<b>235811</b> DSR 70/30 Shunt regulator
Order accessories separately, see page 512	Order accessories separately, see page 512	Order accessories separately, see page 512