


















EPOS4 Positioning Controllers Overview

motor control

Modules

Ready-to-connect units

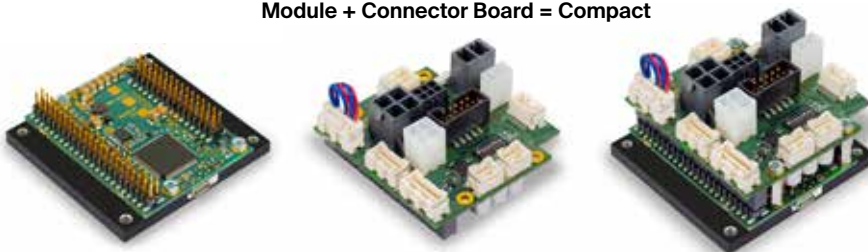
Micro	Module	Compact CAN	Compact EtherCAT	Encased housing
<p>NEW EPOS4 Micro 24/5 CAN</p> 	<p>EPOS4 Module 24/1.5</p> 	<p>EPOS4 Compact 24/1.5 CAN</p> 	<p>EPOS4 Compact 24/1.5 EtherCAT</p> 	<p>EPOS4 50/5</p> 
<p>NEW EPOS4 Micro 24/5 EtherCAT</p> 	<p>EPOS4 Module 50/5</p> 	<p>EPOS4 Compact 50/5 CAN</p> 	<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>NEW 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 POsitioning 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)

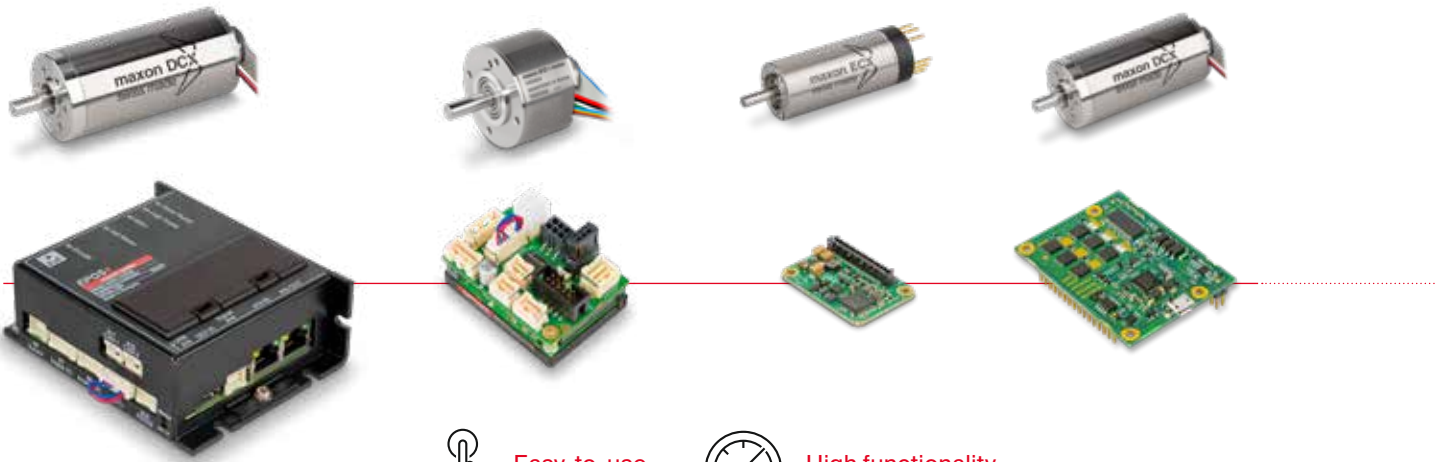
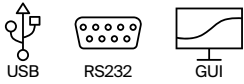
The master executes the path planning and sends the target speed cyclically and synchronously to the EPOS4 via the network. The speed control loop runs on the EPOS4. The EPOS4 sends the measured actual position, speed and current values to the master. The CSV mode is commonly used if a PI position control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

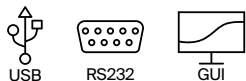
Available documentation

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

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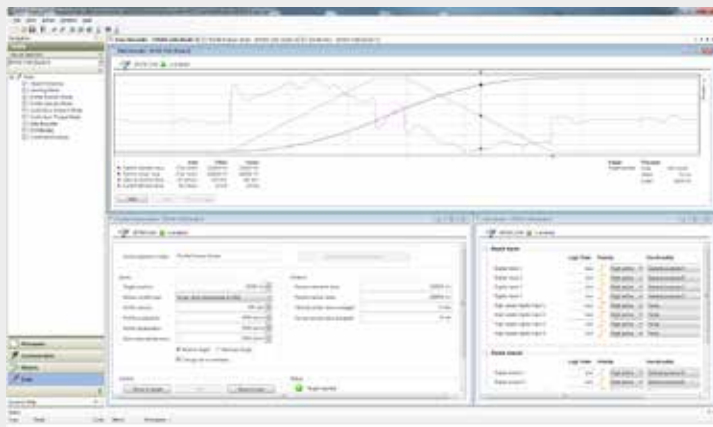
motor control

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		✓ (i)		✓ (i)	✓ (i)	✓ (i)	✓ (i)	✓ (i)	✓ (i)	✓ (i)	✓ (i)	✓ (i)	✓ (i)	✓ (i)	✓ (i)	✓ (i)	✓ (i)	✓ (i)	✓ (i)	✓ (i)
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 50/5 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 250/750 Watt.

EPOS4 Compact 50/5 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 250/750 Watt.

EPOS4 Compact 50/8 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 400/1500 Watt.

Controller version

CANopen Slave

EtherCAT Slave

CANopen Slave

Electrical data

10 - 50 VDC	10 - 50 VDC	10 - 50 VDC
10 - 50 VDC	10 - 50 VDC	10 - 50 VDC
0.9 x V _{CC}	0.9 x V _{CC}	0.9 x V _{CC}
15 A (<3 s)	15 A (<3 s)	30 A (<5 s)
5 A	5 A	8 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)
9.4 μH / 5 A	10 μH / 5 A	2.2 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)	-

Indicator

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

-30...+25 °C	-30...+25 °C	-30...+45 °C
+25...+70 °C; Derating: -0.111 A/°C	+25...+70 °C; Derating: -0.111 A/°C	+45...+77 °C; Derating: -0.250 A/°C
-40...+85 °C	-40...+85 °C	-40...+85 °C
5...90%	5...90%	5...90%

Mechanical data

approx. 58 g	approx. 76 g	approx. 86 g
55.0 x 40.0 x 31.1 mm	55.0 x 56.5 x 31.7 mm	59.5 x 58.5 x 33.0 mm
M2.5 screws	M2.5 screws	M2.5 screws

Part numbers

541718 EPOS4 Compact 50/5 CAN	628094 EPOS4 Compact 50/5 EtherCAT	520885 EPOS4 Compact 50/8 CAN
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Accessories

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