EPOS4 Positioning Controllers Overview

Modules Ready-to-connect units Micro Module Compact CAN Compact EtherCAT Encased housing / Disk FPOS4 Micro FPOS4 Module **EPOS4 Compact EPOS4 Compact** FPOS4 24/5 CAN 24/1.5 24/1.5 CAN 24/1.5 EtherCAT 50/5 **EPOS4 Micro EPOS4 Module EPOS4** Compa **EPOS4** Compact EPOS4 24/5 EtherCAT 50/5 50/5 CAN 50/5 EtherCAT 70/15 **EPOS4 Module** EPOS4 Compac **EPOS4** Compac **NEW EPOS4 Disk** 50/8 50/8 CAN 50/8 EtherCAT 60/8 CAN **EPOS4 Module EPOS4** Compac **EPOS4 Compact NEW** EPOS4 Disk 50/15 50/15 CAN 50/15 FtherCAT 60/8 FtherCAT **EPOS4** Compact **NEW** EPOS4 Disk 60/12 CAN 24/5 EtherCAT 3-axes **NEW FPOS4 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 handing 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 Synchronuous 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 Synchronuous 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 Synchronuous 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.



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.

Homina

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 to 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 ouputs, 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

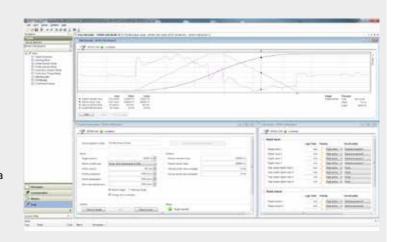
Firmware Specification Communication Guide

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.



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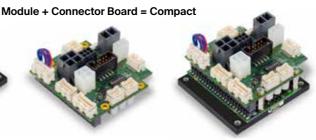












Accessories EPOS4 Module & Micro (not included in delivery)							
403968 USB Type A - micro B Cable	Z		√ LC	√ √5	√ 8/	√ į	15
536997 EPOS4 CB 24/1.5 CAN	გ	TGAT	√ 4	50,	50,		20
620048 EPOS4 CB 24/1.5 EtherCAT	1/5	T T	√ C	<u>e</u>	<u>e</u>		
534133 EPOS4 CB 50/5 CAN	5	Ĭ.	1	√ bo	lpo		Module
620044 EPOS4 CB 50/5 EtherCAT	<u> </u>	24/5	DOM		Ž		š
520884 EPOS4 CB Power CAN	Σ	5	, c	130	√ 88	✓	383
604594 EPOS4 CB Power EtherCAT	328		96.	341	√ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \	* ·	4 I
581245 EPOS4 EtherCAT Card	6383	2	✓ (a) 🔓	√ (a) 😘	✓ (a) 😘	✓ (a)	20
638677 EPOS4 EB Micro	√ 6	✓ <u>8</u>					
659508 EPOS4 MB Micro EtherCAT 3-axes		A 7 5547					
590738 EPOS4 Module SMT socket 2 x 23 poles			✓	✓			
677324 EPOS4 Micro SMT socket 2 x 40 poles	✓	✓					

(a) with matching motherboard

(a) with matering motherboard																					
Accessories EPOS4 Compact & Encas	ed hou	sin	g (not i	ncl	uded in	d	elivery)														
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691408 EPOS4 MB 3-axes Conn. Set	✓	Ę		ompa	5	1	Ē		#		ompac				m E	Ú	٥				
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275878 Hall Sensor Cable	✓	24		14 C	2		✓ 718	1		✓	0885	✓	Compact	✓	98	✓	Compact	✓	,	✓	
275851 Motor Cable	✓	act		11	Š	3	✓ ;		√ ن	✓	08	✓	- 1	✓	0886	√ (3	✓	١,	✓	
520851 Motor Cable High Current		ompa		5467	00	70	541)	60		52		298	✓	22		20		,	✓	
275829 Power Cable	✓ (b)	S		4	Ó	8			2809	✓ (b)		√ (b)	305	√ (b)		√ (b)	20	✓	١,	√ (b)	
520850 Power Cable High Current	√ (c)	19			62	0			0	√ (c)		√ (c)	Ø	√ (c)		√ (c)	٦		,	√ (c)	
520856 RS232-COM Cable		45	✓				✓			✓				✓				✓	١,	✓	
520852 Sensor Cable 5 x 2core	✓	89	✓		✓		✓		✓	✓		✓		✓		✓		✓	,	✓	
520854 Signal Cable 7core	✓		✓		✓		✓	1	✓	✓		✓		✓		✓		✓	١,	✓	
520853 Signal Cable 8core	✓		✓		✓		✓		✓	✓		✓		✓		✓		✓	,	✓	
520860 STO Idle Connector X9			✓ (i)		✓ (i)		✓ (i)		✓ (i)	✓ (i)		✓ (i)		✓ (i)		✓ (i)		✓ (i)	,	✓ (i)	
403968 USB Type A - micro B Cable	✓		✓		✓		✓		✓	✓		✓		✓		✓		✓	١,	✓	

(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	✓	¥ ✓	H	√ z	✓	ပ္	√ <u></u>	₹ ✓	ပ္ပ
710931 CAN-CAN Cable	✓	O	5	✓ VAN	√	SSC	ζ	5	SSC
710932 CAN-COM Cable	✓	€0/8	EtherCAT	√ 5	· /	CAN	9		Ă
696285 Encoder Cable	✓	9 √	Ш	√ 09	√	2 C	√ <u>"</u>	<u> </u>	er.
710926 EPOS4 Disk Connector Set	✓	Disk	8/09		✓	0/1	√ <u>}</u>	V √	EtherC
710934 EtherCAT-COM Cable		02	بر 9	<u>5</u>		9	√ ď	5 ✓	
710933 EtherCAT-EtherCAT Cable		► ✓	Disk			709859 Disk 60/12	√ <u>3</u>	<u> </u>	Disk 60/12
275878 Hall Sensor Cable		988	22	`	✓	66	√ [, X
696284 Hall Sensor Cable	✓	✓	6887	√ "	√	386	√	✓	
710930 Motor Cable High Current			68	✓	✓	ő	√ ö	✓ ✓	709862
696283 Power & Motor Cable	✓	✓							86
710929 Power Cable High Current				✓	✓		✓	✓	20
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







NEW

EPOS4 Disk 60/12 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 720/2160 Watt.

EPOS4 Disk 60/12 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 720/2160 Watt.

Controller version		
	CANopen Slave	EtherCAT Slave
Electrical data		
Operating voltage V _{CC}	12 - 60 VDC	12 - 60 VDC
Logic supply voltage V _C (optional)	12 - 60 VDC	12 - 60 VDC
Max. output voltage	0.9 x V _{CC}	0.9 x V _{cc}
Max. output current I _{max}	36 A (<5 s)	36 A (<5 s)
Continuous output current I _{cont}	12 A	12 A
Switching frequency of power stage	50 kHz	50 kHz
Sampling rate of PI current controller	25 kHz (40 μs)	25 kHz (40 μs)
Sampling rate of PI speed controller	2.5 kHz (400 μs)	2.5 kHz (400 μs)
Sampling rate of PID position controller	2.5 kHz (400 µs)	2.5 kHz (400 μs)
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		
Inputs		
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	Clock, Clock Data, Data\	Clock, Clock Data, Data\
Digital inputs	4 (logic level)	4 (logic level)
Digital inputs "High-speed"	1, differential	1. 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 14	Configurable with DIP switch 14
Outputs	Configurable with Dir Switch i+	Configurable with Dir Switch I4
Digital outputs	2	2
· ·	1, differential	1. differential
Digital outputs "High-speed" Analog outputs	1 (12-bit resolution, -4+4 V, max. 1 mA)	,
• .		1 (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
Interfaces		
RS232	-	-
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)
Indicator		
LED green = READY, red= ERROR	Green LED, red LED	Green LED, red LED
Environmental conditions		
Temperatrue - Operation	-30+50°C	-30+45°C
Temperature – Extended Range	+50+75°C; Derating: -0.480 A/°C	+45+70°C; Derating: -0.480 A/°C
Temperature – Storage	-40+85°C	-40+85°C
Humidity (condensation not permitted)	590%	590%
Mechanical data		
Weight	approx. 43 g	approx. 45 g
Dimensions (L x W x H)	90.0 x 90.0 x 26.0 mm	90.0 x 90.0 x 26.0 mm
Mounting	M3 screws	M3 screws
Part numbers		
	688775 EPOS4 60/12 CAN	688777 Disk 60/12 EtherCAT
	709859 EPOS4 60/12 CAN SSC	709862 Disk 60/12 EtherCAT SSC
Accessories		
Accessories	235811 DSR 70/30 Shunt regulator	235811 DSR 70/30 Shunt regulator

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