






















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 	EPOS4 Disk 60/8 CAN 	
	EPOS4 Module 50/15 	EPOS4 Compact 50/15 CAN 	EPOS4 Compact 50/15 EtherCAT 	EPOS4 Disk 60/8 EtherCAT 	
			EPOS4 Compact 24/5 EtherCAT 3-axes 	EPOS4 Disk 60/12 CAN 	
				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)

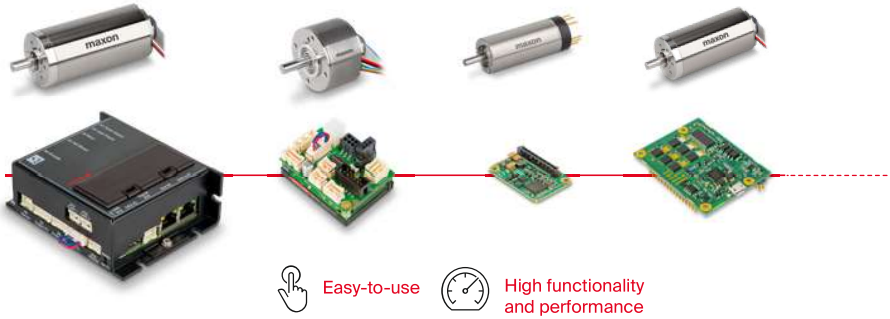
The master executes the path planning and sends the target torque cyclically and synchronously to the EPOS4 via the network. The torque (current) control loop runs on the EPOS4. The EPOS4 sends the measured actual position, speed and current values to the master. The CST mode is commonly used if a PID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



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 541-547.

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

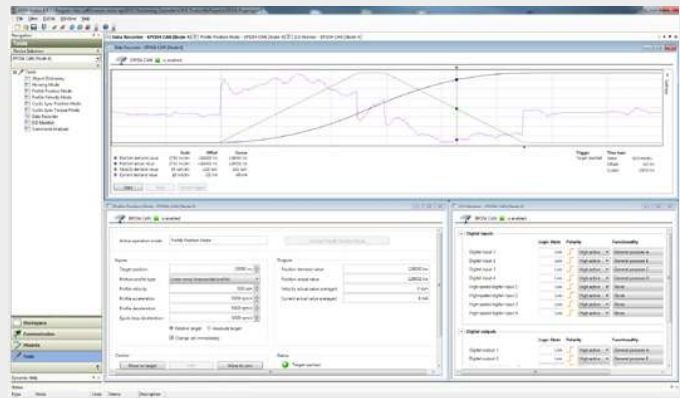
Available documentation

- 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.

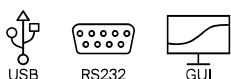
The complete package for your motion control solution with added value.



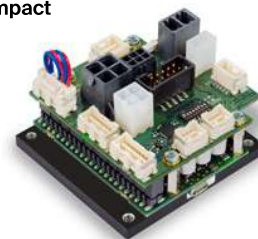
EPOS4 Positioning Controllers Overview

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												
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 558

Accessories EPOS4 Disk (not included in delivery)

710928	Brake Cable												
710931	CAN-CAN Cable												
710932	CAN-COM Cable												
751388	CAN ix Industrial Type B Plug												
696285	Encoder Cable												
710926	EPOS4 Disk Connector Set												
710934	EtherCAT-COM Cable												
710933	EtherCAT-EtherCAT Cable												
748166	EtherCAT ix Industrial Type A Plug												
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



EPOS4 Micro 24/5 CAN

Miniaturized OEM positioning controller module, designed for use with brushed DC motors with encoders and brushless EC motors (BLDC) with Hall sensors and encoders up to 120 W/360 W.

EPOS4 Micro 24/5 EtherCAT

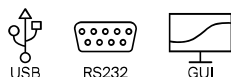
Miniaturized OEM positioning controller module, designed for use with brushed DC motors with encoders and brushless EC motors (BLDC) with Hall sensors and encoders up to 120 W/360 W.

Controller version	CANopen Slave	EtherCAT Slave
Electrical data		
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}	15 A (<10 s)	15 A (<10 s)
Continuous output current I_{cont}	5 A	5 A
Switching frequency of power stage	50 kHz	50 kHz
Sampling rate of PI current controller	25 kHz (40 μ s)	25 kHz (40 μ s)
Sampling rate of PI speed controller	2.5 kHz (400 μ s)	2.5 kHz (400 μ s)
Sampling rate of PID position controller	2.5 kHz (400 μ s)	2.5 kHz (400 μ 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	-	-
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, Data	Clock, Data
Digital inputs	4 (logic level)	4 (logic level)
Digital inputs "High-speed"	1	1
Analog inputs	2 (12-bit resolution, -10...+10 V)	2 (12-bit resolution, -10...+10 V)
CAN ID / DEV ID	configurable with external wiring	-
Outputs		
Digital outputs	2	2
Digital outputs "High-speed"	1	1
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. 120 mA	+5 VDC, max. 120 mA
Hall sensor voltage output	+5 VDC, max. 30 mA	+5 VDC, max. 30 mA
Auxiliary voltage output	-	-
Interfaces		
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)
Indicator		
LED green = READY, red = ERROR	Green LED, red LED	Green LED, red LED
Environmental conditions		
Temperature - Operation	-30...+45°C	-30...+40°C
Temperature - Extended Range	+45...+70°C; Derating: -0.200 A/°C	+40...+60°C; Derating: -0.25 A/°C
Temperature - Storage	-40...+85°C	-40...+85°C
Humidity (condensation not permitted)	5...90%	5...90%
Mechanical data		
Weight	approx. 6 g	approx. 7 g
Dimensions (L x W x H)	32.0 x 22.0 x 7.0 mm	36.5 x 27.0 x 7.0 mm
Mounting	M2 screws	M2 screws
Part numbers		
	638328 EPOS4 Micro 24/5 CAN	654731 EPOS4 Micro 24/5 EtherCAT
Accessories		
	309687 DSR 50/5 Shunt regulator	309687 DSR 50/5 Shunt regulator
	Order accessories separately, see page 558	Order accessories separately, see page 558

EPOS4 Positioning Controllers Data

motor control

EtherCAT  CANopen 



EPOS4 Module 24/1.5

OEM position control module, designed for use with brushed DC motors with encoders or brushless EC motors with Hall sensors and encoders up to 36/108 Watt.

EPOS4 Module 50/5

OEM position control module, designed for use with brushed DC motors with encoders or brushless EC motors with Hall sensors and encoders up to 250/750 Watt.

Controller version	CANopen Slave with EtherCAT option	CANopen Slave with EtherCAT option
Electrical data		
Operating voltage V_{CC}	10 - 24 VDC	10 - 50 VDC
Logic supply voltage V_C (optional)	10 - 24 VDC	10 - 50 VDC
Max. output voltage	$0.9 \times V_{CC}$	$0.9 \times V_{CC}$
Max. output current I_{max}	4.5 A (<30 s)	15 A (<3 s)
Continuous output current I_{cont}	1.5 A	5 A
Switching frequency of power stage	100 kHz	50 kHz
Sampling rate of PI current controller	25 kHz (40 μ s)	25 kHz (40 μ s)
Sampling rate of PI speed controller	2.5 kHz (400 μ s)	2.5 kHz (400 μ s)
Sampling rate of PID position controller	2.5 kHz (400 μ s)	2.5 kHz (400 μ 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	-	-
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	A, A\, B, B\, I, I\, Clock, Clock\, Data, Data\	A, A\, B, B\, I, I\, Clock, Clock\, Data, Data\
Digital inputs	4 (logic level)	4 (logic level)
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 external wiring	configurable with external wiring
Outputs		
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
Interfaces		
RS232	RxD; TxD (max. 115 200 bit/s)	RxD; TxD (max. 115 200 bit/s)
CAN	high; low (max. 1 Mbit/s)	high; low (max. 1 Mbit/s)
USB 2.0/3.0	Data+; Data- (Full Speed)	Data+; Data- (Full Speed)
EtherCAT	Optional 581245 EPOS4 EtherCAT Card available	Optional 581245 EPOS4 EtherCAT Card available
Indicator		
LED green = READY, red = ERROR	Green LED, red LED	Green LED, red LED
Environmental conditions		
Temperatrue - Operation	-30...+60°C	-30...+45°C
Temperature - Extended Range	+60...+73°C; Derating: -0.115 A/°C	+45...+75°C; Derating: -0.167 A/°C
Temperature - Storage	-40...+85°C	-40...+85°C
Humidity (condensation not permitted)	5...90%	5...90%
Mechanical data		
Weight	approx. 17 g	approx. 17 g
Dimensions (L x W x H)	53.8 x 38.8 x 11.1 mm	53.8 x 38.8 x 11.1 mm
Mounting	Socket header 1.27 mm or M2.5 screws	Socket header 1.27 mm or M2.5 screws
Part numbers		
	536630 EPOS4 Module 24/1.5	534130 EPOS4 Module 50/5
Accessories		
	309687 DSR 50/5 Shunt regulator Order accessories separately, see page 558	309687 DSR 50/5 Shunt regulator Order accessories separately, see page 558

EPOS4 Positioning Controllers Data



EPOS4 Module 50/8

OEM position control module, designed for use with brushed DC motors with encoders or brushless EC motors with Hall sensors and encoders up to 400/1500 Watt.

EPOS4 Module 50/15

OEM position control module, designed for use with brushed DC motors with encoders or brushless EC motors with Hall sensors and encoders up to 750/1500 Watt.

EPOS4 Compact 24/5 EtherCAT 3-axes

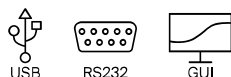
Ready-to-install 3-axis compact solution, designed for use with brushed DC motors with encoders or brushless EC motors with Hall sensors and encoders up to 120/360 W per axis.

Controller version		
CANopen Slave with EtherCAT option	CANopen Slave with EtherCAT option	EtherCAT Slave
Electrical data		
10 - 50 VDC	10 - 50 VDC	10 - 24 VDC
10 - 50 VDC	10 - 50 VDC	10 - 24 VDC
0.9 x V _{CC}	0.9 x V _{CC}	0.9 x V _{CC}
30 A (<5 s)	30 A (<60 s)	15 A (<10 s) per axis
8 A	15 A	5 A per axis
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)
-	-	-
Inputs		
H1, H2, H3	H1, H2, H3	H1, H2, H3 per axis
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\ per axis
4 (logic level)	4 (logic level)	4 (level switchable: logic/PLC) per axis
4, differential	4, differential	-
2 (12-bit resolution, -10...+10 V) configurable with external wiring	2 (12-bit resolution, -10...+10 V) configurable with external wiring	2 (12-bit resolution, -10...+10 V) per axis
-	-	-
Outputs		
2	2	2 per axis
1, differential	1, differential	-
2 (12-bit resolution, -4...+4 V, max. 1 mA)	2 (12-bit resolution, -4...+4 V, max. 1 mA)	1 (12-bit resolution, -4...+4 V, max. 1 mA) per axis
+5 VDC, max. 70 mA	+5 VDC, max. 70 mA	+5 VDC, max. 100 mA per axis
+5 VDC, max. 30 mA	+5 VDC, max. 30 mA	+5 VDC, max. 30 mA per axis
+5 VDC, max. 150 mA	+5 VDC, max. 150 mA	
Interfaces		
RxD; TxD (max. 115200 bit/s)	RxD; TxD (max. 115200 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) per axis
Optional 581245 EPOS4 EtherCAT Card available	Optional 581245 EPOS4 EtherCAT Card available	100 Mbit/s (Full Duplex)
Indicator		
Green LED, red LED	Green LED, red LED	Green LED, red LED
Environmental conditions		
-30...+45°C	-30...+25°C	-30...+25°C
+45...+77°C; Derating: -0.250 A/°C	+25...+77°C; Derating: -0.288 A/°C	+25...+50°C; Derating: -0.200 A/°C
-40...+85°C	-40...+85°C	-40...+85°C
5...90%	5...90%	5...90%
Mechanical data		
approx. 23 g	approx. 70 g	approx. 85 g
59.5 x 46.0 x 14.1 mm	59.5 x 62.0 x 16.4 mm	90.0 x 56.0 x 29.0 mm
Socket header 2.54 mm or M2.5 screws	Socket header 2.54 mm or M3 screws	M2.5 screws
Part numbers		
504384 EPOS4 Module 50/8	504383 EPOS4 Module 50/15	684519 EPOS4 Compact 24/5 EtherCAT 3-axes
Accessories		
235811 DSR 70/30 Shunt regulator	235811 DSR 70/30 Shunt regulator	235811 DSR 70/30 Shunt regulator
Order accessories separately, see page 558	Order accessories separately, see page 558	Order accessories separately, see page 558

EPOS4 Positioning Controllers Data

motor control

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
Electrical data		
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 μ s)	25 kHz (40 μ s)
Sampling rate of PI speed controller	2.5 kHz (400 μ s)	2.5 kHz (400 μ s)
Sampling rate of PID position controller	2.5 kHz (400 μ s)	2.5 kHz (400 μ 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 μ H / 1.5 A	100 μ H / 1.5 A
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	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
Outputs		
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
Interfaces		
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)
Indicator		
LED green = READY, red = ERROR	Green LED, red LED	Green LED, red LED
Environmental conditions		
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%
Mechanical data		
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
Part numbers		
	546714 EPOS4 Compact 24/1.5 CAN	628092 EPOS4 Compact 24/1.5 EtherCAT
Accessories		
	309687 DSR 50/5 Shunt regulator Order accessories separately, see page 558	309687 DSR 50/5 Shunt regulator Order accessories separately, see page 558

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

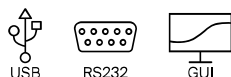
Ready-to-install compact solution, designed for use with brushed DC motors with encoders or brushless EC motors with Hall sensors and encoders up to 400/1500 Watt.

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. 115200 bit/s)	-	RxD; TxD (max. 115200 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
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
Accessories		
309687 DSR 50/5 Shunt regulator	309687 DSR 50/5 Shunt regulator	235811 DSR 70/30 Shunt regulator
Order accessories separately, see page 558	Order accessories separately, see page 558	Order accessories separately, see page 558

EPOS4 Positioning Controllers Data

motor control

EtherCAT  CANopen 



EPOS4 Compact 50/8 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 400/1500 Watt.

EPOS4 Compact 50/15 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 750/1500 Watt.

Controller version	EtherCAT Slave	CANopen Slave
Electrical data		
Operating voltage V_{CC}	10 - 50 VDC	10 - 50 VDC
Logic supply voltage V_C (optional)	10 - 50 VDC	10 - 50 VDC
Max. output voltage	$0.9 \times V_{CC}$	$0.9 \times V_{CC}$
Max. output current I_{max}	30 A (<5 s)	30 A (<60 s)
Continuous output current I_{cont}	8 A	15 A
Switching frequency of power stage	50 kHz	50 kHz
Sampling rate of PI current controller	25 kHz (40 μ s)	25 kHz (40 μ s)
Sampling rate of PI speed controller	2.5 kHz (400 μ s)	2.5 kHz (400 μ s)
Sampling rate of PID position controller	2.5 kHz (400 μ s)	2.5 kHz (400 μ 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	2.2 μ H / 15 A	2.2 μ H / 15 A
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	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
Outputs		
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
Interfaces		
RS232	-	RxD; TxD (max. 115200 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)	-
Indicator		
LED green = READY, red = ERROR	Green LED, red LED	Green LED, red LED
Environmental conditions		
Temperature - Operation	-30...+45°C	-30...+25°C
Temperature - Extended Range	+45...+77°C; Derating: -0.250 A/°C	+25...+77°C; Derating: -0.288 A/°C
Temperature - Storage	-40...+85°C	-40...+85°C
Humidity (condensation not permitted)	5...90%	5...90%
Mechanical data		
Weight	approx. 100 g	approx. 126 g
Dimensions (L x W x H)	59.5 x 79.5 x 35.7 mm	59.5 x 65.5 x 35.1 mm
Mounting	M2.5 screws	M3 screws
Part numbers		
	605298 EPOS4 Compact 50/8 EtherCAT	520886 EPOS4 Compact 50/15 CAN
Accessories		
	235811 DSR 70/30 Shunt regulator Order accessories separately, see page 558	235811 DSR 70/30 Shunt regulator Order accessories separately, see page 558

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

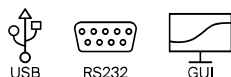
Positioning controller in a robust housing, designed for use with brushed DC motors with encoders or brushless EC motors with Hall sensors and encoders up to 1050/2100 Watt.

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 _{CC}	0.9 x V _{CC}	0.9 x V _{CC}
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
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		
605299 EPOS4 Compact 50/15 EtherCAT	546047 EPOS4 50/5	594385 EPOS4 70/15
Accessories		
235811 DSR 70/30 Shunt regulator	309687 DSR 50/5 Shunt regulator	235811 DSR 70/30 Shunt regulator
Order accessories separately, see page 558	Order accessories separately, see page 558	Order accessories separately, see page 558

EPOS4 Positioning Controllers Data

motor control

EtherCAT  CANopen 



EPOS4 Disk 60/8 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 480/1440 Watt.

EPOS4 Disk 60/8 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 480/1440 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	$0.9 \times V_{CC}$	$0.9 \times V_{CC}$
Max. output current I_{max}	24 A (<10 s)	24 A (<10 s)
Continuous output current I_{cont}	8 A	8 A
Switching frequency of power stage	50 kHz	50 kHz
Sampling rate of PI current controller	25 kHz (40 μ s)	25 kHz (40 μ s)
Sampling rate of PI speed controller	2.5 kHz (400 μ s)	2.5 kHz (400 μ s)
Sampling rate of PID position controller	2.5 kHz (400 μ s)	2.5 kHz (400 μ 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	-	-
Inputs		
Hall sensor signals	H1, H2, H3	H1, H2, H3
Encoder signals	A, A \bar , B, B \bar , I, I \bar (max. 6.25 MHz)	A, A \bar , B, B \bar , I, I \bar (max. 6.25 MHz)
Sensor signals	Clock, Clock \bar , Data, Data \bar	Clock, Clock \bar , Data, Data \bar
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 1...4	Configurable with DIP switch 1...4
Outputs		
Digital outputs	2	2
Digital outputs "High-speed"	1, differential	1, differential
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		
Temperature - Operation	-30...+45°C	-30...+35°C
Temperature - Extended Range	+45...+75°C; Derating: -0.267 A/°C	+35...+65°C; Derating: -0.267 A/°C
Temperature - Storage	-40...+85°C	-40...+85°C
Humidity (condensation not permitted)	5...90%	5...90%
Mechanical data		
Weight	approx. 24 g	approx. 26 g
Dimensions (L x W x H)	60.0 x 60.0 x 22.0 mm	60.0 x 60.0 x 22.0 mm
Mounting	M2 screws	M2 screws
Part numbers		
	688770 EPOS4 Disk 60/8 CAN	688772 EPOS4 Disk 60/8 EtherCAT
Accessories		
	235811 DSR 70/30 Shunt regulator	235811 DSR 70/30 Shunt regulator
	Order accessories separately, see page 558	Order accessories separately, see page 558

EPOS4 Positioning Controllers Data



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	$0.9 \times V_{CC}$	$0.9 \times V_{CC}$
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 μ s)	25 kHz (40 μ s)
Sampling rate of PI speed controller	2.5 kHz (400 μ s)	2.5 kHz (400 μ s)
Sampling rate of PID position controller	2.5 kHz (400 μ s)	2.5 kHz (400 μ 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	-	-
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 1...4	Configurable with DIP switch 1...4
Outputs		
Digital outputs	2	2
Digital outputs "High-speed"	1, differential	1, differential
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		
Temperature - 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)	5...90%	5...90%
Mechanical data		
Weight	approx. 43 g	approx. 45 g
Dimensions (L x W x H)	90.0 x 90.0 x 27.6 mm	90.0 x 90.0 x 27.6 mm
Mounting	M3 screws	M3 screws
Part numbers		
	688775 EPOS4 60/12 CAN 709859 EPOS4 60/12 CAN SSC	688777 Disk 60/12 EtherCAT 709862 Disk 60/12 EtherCAT SSC
Accessories		
	235811 DSR 70/30 Shunt regulator Order accessories separately, see page 558	235811 DSR 70/30 Shunt regulator Order accessories separately, see page 558