

# ESCON2 Feature Chart

The ESCON2 line of products from maxon are small, powerful 4-quadrant PWM servo controllers. Their high power density allows flexible use for brushed DC motors and brushless EC (BLDC) motors up to 1,800 Watts with various feedback options, such as Hall sensors, incremental encoders, and absolute sensors in many drive applications. The devices are designed to be controlled by analog and digital set values or as a slave node in a CANopen network. You can also operate them via any USB or RS232 port on a Windows or Linux workstation. They feature extensive analog and digital I/O functions. They use the latest technology, such as field-oriented control (FOC) and acceleration/velocity feed forward, with high control cycle rates for easy and advanced motion control. The free Graphic User Interface (GUI) "Motion Studio" enables convenient configuration, quick monitoring and diagnostics, and automated tuning of all drive systems.



**Legend:**

\* = with use of sensor supply voltage output  
 features in gray will follow in an upcoming release



Feature	ESCON2 Module 60/30 (P/N 783722)	ESCON2 Compact 60/30 (P/N 783734)	ESCON2 Micro 60/5 (P/N 809631)	ESCON2 Nano 24/2 (P/N 809635)
Product image				
<b>Communication interfaces</b>				
CANopen slave	max. 1 Mbit/s	max. 1 Mbit/s	max. 1 Mbit/s	max. 1 Mbit/s (external CAN-transceiver required)
CANopen Application Layer and Communication Profile	CiA 301			
CANopen Layer Setting Services (LSS) and Protocol	CiA 305			
CANopen Device Profile for Drives and Motion Control	CiA 402			
Serial communication interface (RS232)	max. 115'200 bit/s (external RS232-transceiver required)	-	max. 115'200 bit/s (external RS232-transceiver required)	max. 115'200 bit/s (external RS232-transceiver required)
Gateway function RS232-to-CAN	✓	-	✓	✓
USB	Full Speed			
Gateway function USB-to-CAN	✓			
<b>Motors</b>				
Brushed DC motor up to (cont. / max.)	1'800 W / 3'600 W	1'800 W / 3'600 W	300 W / 900 W	48 W / 144 W
Brushless EC motor (BLDC) up to (cont. / max.)				
<b>Sensors (feedback)</b>				
Without sensor (DC motor)	Current mode only (IOCM)			
DC tachometer (DC motor)	✓			
Digital Hall sensors (EC motor)	✓			
Digital incremental encoder	✓			
SSI absolute encoder	✓			
BiSS C unidirectional absolute encoder	✓			
<b>Commutation</b>				
Digital Hall sensors (FOC)	✓			
Digital Hall sensors + digital incremental encoder (FOC)	✓			
Digital Hall sensors + absolute encoder (FOC)	✓			
Absolute encoder (FOC)	✓			

Feature	ESCON2 Module 60/30 (P/N 783722)	ESCON2 Compact 60/30 (P/N 783734)	ESCON2 Micro 60/5 (P/N 809631)	ESCON2 Nano 24/2 (P/N 809635)
<b>Electrical data</b>				
Nominal power supply voltage $V_{CC}$	10...60 VDC	10...60 VDC	10...60 VDC	5...24 VDC 6...24 VDC *
Nominal logic supply voltage $V_C$	10...60 VDC	10...60 VDC	10...60 VDC	-
Absolute supply voltage limits $V_{min} / V_{max}$	8 VDC / 62 VDC	8 VDC / 62 VDC	8 VDC / 62 VDC	4.75 VDC / 28 VDC 5.8 VDC / 28 VDC *
Output voltage (max.)	$0.95 \times V_{CC}$	$0.95 \times V_{CC}$	$0.95 \times V_{CC}$	$0.90 \times V_{CC}$
Output current $I_{cont} / I_{max}$	30 A / 60 A (< 4 s)	30 A / 60 A (< 4 s)	5 A / 15 A (< 4 s)	2 A / 6 A (< 6.5 s)
Pulse width modulation (PWM) frequency	50 kHz			
Sampling rate PI current controller	50 kHz			
Sampling rate PI speed controller	10 kHz			
Sampling rate analog input	50 kHz			
Max. efficiency	98.5 %	98.5 %	97.5 %	93 %
Max. speed DC motor	Limited by max. permissible motor speed			
Max. speed EC motor (FOC)	120'000 rpm (1 pole pair)			
Built-in motor choke per phase	-	470nH / 30A	-	-
<b>Inputs &amp; outputs</b>				
Sensor 1      Digital Hall sensor	H1, H2, H3 (0...24 VDC, internal pull-up)			
Sensor 2 (choice between multiple functions)				
Digital incremental encoder	2-channel (EIA/RS422, max. 6.67 MHz)	2-channel (EIA/RS422, max. 6.67 MHz)	2-channel (EIA/RS422, max. 6.67 MHz)	2-channel (single-ended, 0...12 VDC, max. 6.25 MHz)
SSI absolute encoder	Configurable (single-ended, 0...12 VDC, 0.1...2 MHz)			
BiSS C unidirectional absolute encoder	Configurable (single-ended, 0...12 VDC, 0.1...4 MHz)			
High-speed digital inputs 1...2	EIA/RS422, max. 6.67 MHz	EIA/RS422, max. 6.67 MHz	EIA/RS422, max. 6.67 MHz	0...12 VDC, max. 6.25 MHz
High-speed digital inputs 3...4	0...12 VDC, max. 6.25 MHz			
High-speed digital output 1	3.3 VDC / $R_i = 270 \Omega$	3.3 VDC / $I_L \leq 24 \text{ mA} / R_i = 75 \Omega$	3.3 VDC / $R_i = 270 \Omega$	3.3 VDC / $R_i = 270 \Omega$
Digital inputs 1...4	0...25 VDC, inputs 1...2 PWM capable 10 kHz			
Digital outputs 1...2	3.3 VDC / $R_i = 270 \Omega$ , PWM capable 25 kHz	Open drain, max. 36 VDC / $I_L \leq 500 \text{ mA}$ , internal pull-up, PWM capable 25 kHz	3.3 VDC / $R_i = 270 \Omega$ , PWM capable 25 kHz	3.3 VDC / $R_i = 270 \Omega$ , PWM capable 25 kHz
Analog inputs 1...2	Resolution 12-bit, $\pm 10 \text{ VDC}$ (differential), 10 kHz	Resolution 12-bit, $\pm 10 \text{ VDC}$ (differential), 10 kHz	Resolution 12-bit, $\pm 10 \text{ VDC}$ (differential), 10 kHz	Resolution 12-bit, 0...5 VDC (referenced to GND), 10 kHz
Analog outputs 1...2	Resolution 12-bit, $\pm 4 \text{ VDC}$ (referenced to GND), 25 kHz	Resolution 12-bit, $\pm 4 \text{ VDC}$ (referenced to GND), 25 kHz	Resolution 12-bit, $\pm 4 \text{ VDC}$ (referenced to GND), 25 kHz	Resolution 12-bit, 0...3.3 VDC (referenced to GND), 25 kHz
Motor temperature sensor	Resolution 12-bit, 0...3.3 VDC (internal pull-up)			
Sensor supply voltage $V_{Sensor}$	5 VDC / $I_L \leq 145 \text{ mA}$			
Peripheral supply voltage $V_{Peripheral}$	3.3 VDC / $I_L \leq 20 \text{ mA}$	-	3.3 VDC / $I_L \leq 20 \text{ mA}$	3.3 VDC / $I_L \leq 20 \text{ mA}$
Status indicators (LEDs)	- (external LEDs required)	Green (operation) / red (warning/error)	- (external LEDs required)	- (external LEDs required)

Feature	ESCON2 Module 60/30 (P/N 783722)	ESCON2 Compact 60/30 (P/N 783734)	ESCON2 Micro 60/5 (P/N 809631)	ESCON2 Nano 24/2 (P/N 809635)	
<b>Connections</b>					
X1	Power supply	Socket 6 poles 2.00 mm (Pins A1...A6 ) Samtec UMPS	Header 2 poles 10.00 mm Molex Mini-Fit Sr.	Header 2x40 poles 0.40 mm (Pins A1...A80) Samtec ST4	
X2	Logic supply	Socket 2x25 poles 0.80 mm (Pin C1) Samtec ERF8	Header 2 poles 4.20 mm Molex Mini-Fit Jr.		
X3a	Motor	Socket 10 poles 2.00 mm (Pins B1...B10) Samtec UMPS	Header 3 poles 10.00 mm Molex Mini-Fit Sr.		
X3b			Header 2x2 poles 5.70 mm Molex Mega-Fit		
X4	Hall sensor (Sensor 1)	Socket 2x25 poles 0.80 mm (Pins C2...C50) Samtec ERF8	Header 2x3 poles 3.00 mm Molex Micro-Fit 3.0		Header 2x30 poles 0.40 mm (Pins A1...A60) Panasonic P4SP
X5	Sensor (Sensor 2)		Header 2x5 poles 2.54 mm DIN 41651		
X7	Digital I/Os		Receptacle 8 poles 1.50 mm Molex CLIK-Mate		
X8	Analog I/Os		Receptacle 7 poles 1.50 mm Molex CLIK-Mate		
X10	SCI (RS232)		-		
X11	CAN 1		Receptacle 4 poles 1.50 mm Molex CLIK-Mate		
X12	CAN 2		Receptacle 4 poles 1.50 mm Molex CLIK-Mate		
X13	USB		USB Type C		
X16	Motor temperature sensor		Header 2 poles 3.00 mm Molex Micro-Fit 3.0		
<b>Mechanical data</b>					
Dimensions (L x W x H)	67 x 43 x 7.8 mm	93.5 x 46 x 41 mm	36.8 x 23.8 x 6.5 mm		23 x 16 x 4.5 mm
Weight (approx.)	19 g	128 g	6 g		2.5 g
Mounting	Pluggable (using sockets) and M2.5 screws	M3 screws	Pluggable (using header) and M2 screws	Pluggable (using header) and M2 screws	
<b>Environmental conditions</b>					
Temperature					
Operation	-30 °C...+25 °C	-30 °C...+25 °C	-30 °C...+50 °C	-30 °C...+45 °C	
Extended range and derating	25 °C...75 °C (for derating check «Hardware Reference»)	25 °C...75 °C (for derating check «Hardware Reference»)	50 °C...70 °C (for derating check «Hardware Reference»)	45 °C...70 °C (for derating check «Hardware Reference»)	
Storage	-40...+85 °C				
Altitude					
Operation	0...500 m MSL				
Extended range	500...10'000 m MSL (for derating check «Hardware Reference»)				
Humidity	5...90 % (condensation not permitted)				
<b>Directives &amp; standards</b>					
EMC Generic	IEC/EN 61000-6-2; IEC/EN 61000-6-3				
EMC Applied	IEC/EN 55032 (CISPR32); IEC/EN 61000-4-3; IEC/EN 61000-4-4; IEC/EN 61000-4-6				
Environment	IEC/EN 60068-2-6; MIL-STD-810F				
Safety (UL 94 V-0, unassembled PCB)	✓	✓	✓	✓	
Reliability (MIL-HDBK-217F, MTBF)	317'416 hours	225'850 hours	347'202 hours	988'899 hours	

Feature	ESCON2 Module 60/30 (P/N 783722)	ESCON2 Compact 60/30 (P/N 783734)	ESCON2 Micro 60/5 (P/N 809631)	ESCON2 Nano 24/2 (P/N 809635)
<b>Operating modes</b>				
IOCM	I/O current mode (analog & digital commanding)		✓	
IOVM	I/O velocity mode open loop with IxR compensation (analog & digital commanding)		✓	
IOVM	I/O velocity mode closed loop (analog & digital commanding)		✓	
CST	Cyclic Synchronous Torque Mode		✓	
CSV	Cyclic Synchronous Velocity Mode		✓	
PVM	Profile Velocity Mode		✓	
<b>Features</b>				
Advanced automatic control settings (Auto Tuning)			✓	
Custom persistent memory			✓	
Feed forward (acceleration/velocity for inertia and friction compensation)			✓	
Field-oriented Control (FOC) sinusoidal commutation			✓	
<b>Digital I/O functionalities</b>				
Inputs (configurable)			✓	
	Direction		✓	
	Drive enable		✓	
	Enable CW / CCW		✓	
	General purpose		✓	
	Limit switch		✓	
	Mode switch (between IOCM & IOVM)		✓	
	PWM current limit		✓	
	PWM set value		✓	
	PWM set value offset		✓	
	PWM velocity limit		✓	
	PWM velocity ramp		✓	
	Quick stop		✓	
	RC servo current limit		✓	
	RC servo set value		✓	
	RC servo set value offset		✓	
	RC servo velocity limit		✓	
	RC servo velocity ramp		✓	
	Set value switch (between up to 4 fixed set values)		✓	
Outputs (configurable)			✓	
	Current compare		✓	
	Fault		✓	
	General purpose		✓	
	Hall sensor frequency (commutation / rotation)		✓	
	Holding brake		✓	
	Limitation		✓	
	Set brake		✓	
	Velocity compare		✓	

Feature	ESCON2 Module 60/30 (P/N 783722)	ESCON2 Compact 60/30 (P/N 783734)	ESCON2 Micro 60/5 (P/N 809631)	ESCON2 Nano 24/2 (P/N 809635)
<b>Analog I/O functionalities</b>				
Inputs (configurable)			✓	
Analog current limit			✓	
Analog set value			✓	
Analog set value offset			✓	
Analog velocity limit			✓	
Analog velocity ramp			✓	
General purpose			✓	
Outputs (configurable)			✓	
Current monitor			✓	
General purpose			✓	
Temperature monitor			✓	
Velocity monitor			✓	
<b>Built-in limitations &amp; protections</b>				
Current limiter (adjustable)			✓	
Overcurrent			✓	
Short-circuit of motor winding			✓	
Thermal motor protection with sensor (adjustable)			✓	
Thermal motor protection model based (adjustable)			✓	
Thermal controller protection logic & power stage (adjustable)			✓	
Overvoltage (adjustable)			✓	
Undervoltage (adjustable)			✓	
Voltage transients			✓	
Velocity limiter (adjustable)			✓	
Loss of feedback signal			✓	
System monitoring			✓	
Error & warning behavior management			✓	

Feature	ESCON2 Module 60/30 (P/N 783722)	ESCON2 Compact 60/30 (P/N 783734)	ESCON2 Micro 60/5 (P/N 809631)	ESCON2 Nano 24/2 (P/N 809635)
<b>Software (en)</b>				
Installation program			Motion Installer	
Graphical user interface			Motion Studio	
Startup			✓	
Regulation tuning			✓	
Firmware update			✓	
Parameter upload / download			✓	
Motion commander			✓	
I/O monitor			✓	
Parameters (Object dictionary)			✓	
Status monitor			✓	
Data recorder			✓	
Command analyzer			✓	
CANopen wizard			✓	
Online help			✓	
Operating system			Windows 11, 10	
Windows DLL for PC			✓	
Linux shared object library			✓	
<b>Accessories (not included in delivery)</b>				
783729	ESCON2 CB 60/30	✓	-	-
802197	ESCON2 Module 60/30 Thermal Pad	✓	-	-
816161	ESCON2 Module 60/30 Heat Spreader	✓	-	-
520858	CAN-CAN Cable	-	✓	-
520857	CAN-COM Cable	-	✓	-
275934	Encoder Cable	-	✓	-
275878	Hall Sensor Cable	-	✓	-
846645	Motion Connector Set Highest Current	-	✓	-
520851	Motor Cable High Current	-	✓	-
838460	Motor Cable Highest Current	-	✓	-
847301	NTC Cable	-	✓	-
275829	Power Cable	-	✓	-
838459	Power Cable Highest Current	-	✓	-
520854	Signal Cable 7core	-	✓	-
520853	Signal Cable 8core	-	✓	-
838461	USB Type A–Type C cable	-	✓	-
845854	USB Type C–Type C cable	-	✓	-
809646	ESCON2 EB Micro	-	-	✓
841890	ESCON2 Micro 60/5 Thermal Accessory Kit	-	-	✓
834838	ESCON2 EB Nano	-	-	✓
876085	ESCON2 Nano 24/2 Thermal Accessory Kit	-	-	✓

## Copyright

In the present document, registered brand names are not tagged with their respective trademark. It must be understood that the brands (below list is not necessarily concluding) are protected by copyright and/or other intellectual property rights even if their legal trademarks are omitted.

BiSS	© iC-Haus GmbH, DE-Bodenheim
CANopen®, CiA®	© CiA CAN in Automation e.V, DE-Nuremberg
Molex®	© Molex, LLC United States of America
Panasonic®	© Panasonic Holdings Corporation (Kadoma, Präfektur Ōsaka, Japan)
Samtec®	© Samtec Inc. (520 Park East Blvd. New Albany, INDIANA UNITED STATES 47151)
Windows®	© Microsoft Corporation, USA-Redmond, WA

© 2024 maxon. All rights reserved. Any use, in particular reproduction, editing, translation, and copying, without prior written approval is not permitted (contact: maxon international ltd., Brünigstrasse 220, CH-6072 Sachseln, +41 41 666 15 00, [www.maxongroup.com](http://www.maxongroup.com)). Infringements will be prosecuted under civil and criminal law. The mentioned trademarks belong to their respective owners and are protected under trademark laws. Subject to change without prior notice.

CCMC | ESCON2 Feature Chart | Edition 2024-10 | Document ID rel12603