ESCON   *Feature Chart*

The ESCON servo controllers are small-sized, powerful 4-quadrant PWM servo controller for the highly efficient control of permanent magnet-activated DC motors.

The featured operating modes – speed control (closed loop), speed control (open loop), and current control – meet the highest requirements. The ESCON servo controllers are designed being commanded by an analog set value and features extensive analog and digital I/O functionality and are being configured via USB interface using the graphical user interface «ESCON Studio» for Windows PCs.

Legend: (✔)a = only in use with DC Tacho or Encoder   /   (✔)b = rated current 5 A   /   nnnnnn = order number   /   * = details refer to the pin header allocation

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Feature	ESCON Module 24/2 (466023)	ESCON 36/2 DC (403112)	ESCON 36/3 EC (414533)	ESCON Module 50/4 EC-S (446925)	ESCON 50/5 (409510)	ESCON Module 50/5 (438725)	ESCON Module 50/8 (532872)	ESCON Module 50/8 HE (586137)	ESCON 70/10 (422969)
Product image									
Motors									
DC motors up to	48 W / 144 W	72 W / 144 W	—	—	250 W / 750 W	250 W / 750 W	400 W / 750 W	400 W / 750 W	700 W / 2'100 W
EC motors up to	48 W / 144 W	—	97 W / 324 W	200 W / 600 W	250 W / 750 W	250 W / 750 W	400 W / 750 W	400 W / 750 W	700 W / 2'100 W
Sensors									
Digital Incremental Encoder (2 channel with or without Line Driver)	✔	✔	—	—	✔	✔	✔	✔	✔
DC Tacho	✔	✔	—	—	✔	✔	✔	✔	✔
Without sensor (DC motors)	✔	✔	—	—	✔	✔	✔	✔	✔
Without sensor (EC motors, sensorless)	—	—	—	✔	—	—	—	—	—
Digital Hall Sensors (EC motors)	✔	—	✔	—	✔	✔	✔	✔	✔
Electrical Data									
Nominal operating voltage +V_{cc}	10…24 VDC	10…36 VDC	10…36 VDC	10…50 VDC	10…50 VDC	10…50 VDC	10…50 VDC	10…50 VDC	10…70 VDC
Max. output voltage	0.98 x +V_{cc}	0.98 x +V_{cc}	0.98 x +V_{cc}	0.96 x +V_{cc}	0.98 x +V_{cc}	0.98 x +V_{cc}	0.98 x +V_{cc}	0.98 x +V_{cc}	0.95 x +V_{cc}
Max. output current	6 A (<4 s)	4 A (<60 s)	9 A (<4 s)	12 A (<30 s)	15 A (<20 s)	15 A (<20 s)	15 A (<20 s)	15 A (<20 s)	30 A (<20 s)
Continuous output current	2 A	2 A	2.7 A	4 A	5 A	5 A	8 A	8 A	10 A
Pulse Width Modulation frequency	53.6 kHz								
Sampling rate PI current controller	53.6 kHz	53.6 kHz	53.6 kHz	—	53.6 kHz	53.6 kHz	53.6 kHz	53.6 kHz	53.6 kHz
Sampling rate PI speed controller	5.36 kHz								
Max. efficiency	92%	95%	95%	97%	95%	98%	99%	99%	98%
Max. speed (DC)	limited by max. permissible speed (motor) and max. output voltage (controller)	limited by max. permissible speed (motor) and max. output voltage (controller)	—	—	limited by max. permissible speed (motor) and max. output voltage (controller)	limited by max. permissible speed (motor) and max. output voltage (controller)	limited by max. permissible speed (motor) and max. output voltage (controller)	limited by max. permissible speed (motor) and max. output voltage (controller)	limited by max. permissible speed (motor) and max. output voltage (controller)
Max. speed (EC; 1 pole pair)	150'000 rpm	—	150'000 rpm	120'000 rpm	150'000 rpm	150'000 rpm	150'000 rpm	150'000 rpm	150'000 rpm
Built-in motor choke	—	300 µH; 2 A	3 x 47 µH; 2.7 A	—	3 x 30 µH; 5 A	—	—	—	3 x 15 µH; 10 A
Inputs / Outputs									
Hall sensor signals	H1, H2, H3	—	H1, H2, H3	—	H1, H2, H3	H1, H2, H3	H1, H2, H3	H1, H2, H3	H1, H2, H3
Encoder signals	A, A\, B, B\	A, A\, B, B\	—	—	A, A\, B, B\	A, A\, B, B\	A, A\, B, B\	A, A\, B, B\	A, A\, B, B\
Max. encoder input frequency differential (single-ended)	1 MHz (100 kHz)	1 MHz (100 kHz)	—	—	1 MHz (100 kHz)	1 MHz (100 kHz)	1 MHz (100 kHz)	1 MHz (100 kHz)	1 MHz (100 kHz)
Back-EMF signals	—	—	—	BEMF-W1, BEMF-W2, BEMF-W3	—	—	—	—	—
Potentiometers	—	1	1	1	2	1	—	—	2
Digital inputs	2								
Digital inputs/outputs	2								
Analog inputs	2								

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ESCON Servo Controllers
Feature Chart

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Feature		ESCON Module 24/2 (466023)	ESCON 36/2 DC (403112)	ESCON 36/3 EC (414533)	ESCON Module 50/4 EC-S (446925)	ESCON 50/5 (409510)	ESCON Module 50/5 (438725)	ESCON Module 50/8 (532872)	ESCON Module 50/8 HE (586137)	ESCON 70/10 (422969)
	Resolution	12-bit								
	Range	−10…+10 V								
	Circuit	differential								
Analog outputs		2								
	Resolution	12-bit								
	Range	−4…+4 V								
Auxiliary voltage output		+5 VDC (IL ≤10 mA)	+5 VDC (IL ≤40 mA)	+5 VDC (IL ≤80 mA)	+5 VDC (IL ≤110 mA)	+5 VDC (IL ≤10 mA)	+5 VDC (IL ≤10 mA)	+5 VDC (IL ≤10 mA)	+5 VDC (IL ≤10 mA)	+5 VDC (IL ≤10 mA)
Hall sensor supply voltage		+5 VDC (IL ≤30 mA)	—	+5 VDC (IL ≤30 mA)	—	+5 VDC (IL ≤30 mA)	+5 VDC (IL ≤30 mA)	+5 VDC (IL ≤30 mA)	+5 VDC (IL ≤30 mA)	+5 VDC (IL ≤30 mA)
Encoder supply voltage		+5 VDC (IL ≤70 mA)	+5 VDC (IL ≤70 mA)	—	—	+5 VDC (IL ≤70 mA)	+5 VDC (IL ≤70 mA)	+5 VDC (IL ≤70 mA)	+5 VDC (IL ≤70 mA)	+5 VDC (IL ≤70 mA)
Status Indicators		Operation: green LED / Error: red LED								
Connections										
J1	Power	Pin header (2.54 mm), 2 poles*	Pin header (2 mm), 2 poles	Pin header (2 mm), 2 poles	Pin header (2.54 mm), 4 poles*	Pluggable screw-type terminal block (3.5 mm), 2 poles	Pin header (2.54 mm), 4 poles*	Pin header (2.54 mm), 4 poles*	Pin header (2.54 mm), 4 poles*	Pluggable screw-type terminal block (5.0 mm), 2 poles
J2	Motor / Motor / Hall sensors / Motor / BEMF signals	Pin header (2.54 mm), 3 poles*	Pin header (2 mm), 3 poles	Mini module pin header, 8 poles	Pin header (2.54 mm), 9 poles*	Pluggable screw-type terminal block (3.5 mm), 4 poles	Pin header (2.54 mm), 6 poles*	Pin header (2.54 mm), 6 poles*	Pin header (2.54 mm), 6 poles*	Pluggable screw-type terminal block (5.0 mm), 4 poles
J2A	Motor / Motor / Hall sensors	—	Spring-loaded contacts, 2 poles	Spring-loaded contacts, 8 poles	—	—	—	—	—	—
J3	Hall sensors	Pin header (2.54 mm), 5 poles*	—	—	—	Pluggable screw-type terminal block (3.5 mm), 5 poles	Pin header (2.54 mm), 5 poles*	Pin header (2.54 mm), 5 poles*	Pin header (2.54 mm), 5 poles*	Pluggable screw-type terminal block (3.5 mm), 5 poles
J4	Encoder	Pin header (2.54 mm), 4 poles*	Pin header (2.54 mm), 5 x 2 poles	—	—	Pin header (2.54 mm), 5 x 2 poles	Pin header (2.54 mm), 4 poles*	Pin header (2.54 mm), 4 poles*	Pin header (2.54 mm), 4 poles*	Pin header (2.54 mm), 5 x 2 poles
J4A	Encoder	—	Pin header (1.27 mm), 5 x 2 poles	—	—	—	—	—	—	—
J5	Digital I/O	Pin header (2.54 mm), 5 poles*	Pin header (2 mm), 6 poles	Pin header (2 mm), 6 poles	Pin header (2.54 mm), 5 poles*	Pluggable screw-type terminal block (3.5 mm), 6 poles	Pin header (2.54 mm), 5 poles*	Pin header (2.54 mm), 5 poles*	Pin header (2.54 mm), 5 poles*	Pluggable screw-type terminal block (3.5 mm), 6 poles
J6	Analog I/O	Pin header (2.54 mm), 6 poles*	Pin header (2 mm), 7 poles	Pin header (2 mm), 7 poles	Pin header (2.54 mm), 6 poles*	Pluggable screw-type terminal block (3.5 mm), 7 poles	Pin header (2.54 mm), 6 poles*	Pin header (2.54 mm), 6 poles*	Pin header (2.54 mm), 6 poles*	Pluggable screw-type terminal block (3.5 mm), 7 poles
J7	USB	USB Type micro B female								
Mechanical Data										
Weight (approximate)		7 g	30 g	36 g	11 g	204 g	12 g	16 g	84 g	259 g
Dimensions (L x W x H)		35.6 x 26.7 x 12.7 mm	55 x 40 x 16.1 mm	55 x 40 x 19.8 mm	43.2 x 31.8 x 12.7 mm	115 x 75.5 x 24 mm	43.2 x 31.8 x 12.7 mm	53.3 x 37.5 x 14.5 mm	53.3 x 37.5 x 30.6 mm	125 x 78.5 x 27 mm
Mounting		Pluggable (female headers RM 2.54 mm)	M2.5 screws	M2.5 screws	Pluggable (female headers RM 2.54 mm)	M4 screws	Pluggable (female headers RM 2.54 mm)	Pluggable (female headers RM 2.54 mm) and M2.5 screws	Pluggable (female headers RM 2.54 mm) and M2.5 screws	M4 screws
Environmental Conditions										
Temperature – Operation		−30…+60 °C	−30…+45 °C	−30…+45 °C	−30…+45 °C	−30…+45 °C	−30…+45 °C	−40…+45 °C	−40…+65 °C	−30…+45 °C
Temperature – Extended range		+60…+80 °C; Derating: −0.1 A/°C	+45…+81 °C; Derating: −0.056 A/°C	+45…+78 °C; Derating: −0.082 A/°C	+45…+65 °C; Derating: −0.2 A/°C	+45…+85 °C; Derating: −0.111 A/°C	+45…+75 °C; Derating: −0.167 A/°C	+45…+85 °C; Derating see Hardware Reference	+65…+92 °C; Derating see Hardware Reference	+45…+82 °C; Derating: −0.270 A/°C
Temperature – Storage		−40…+85 °C								
Altitude – Operation		0…6'000 m MSL	0…6'000 m MSL	0…6'000 m MSL	0…6'000 m MSL	0…10'000 m MSL	0…6'000 m MSL	0…6'000 m MSL	0…6'000 m MSL	0…10'000 m MSL
Altitude – Extended range (Derating: see Hardware Reference)		6'000…10'000 m MSL	6'000…10'000 m MSL	6'000…10'000 m MSL	6'000…10'000 m MSL	—	6'000…10'000 m MSL	6'000…10'000 m MSL	6'000…10'000 m MSL	—
Humidity (condensation not permitted)		5…90%								
Protective coating		—	—	—	—	—	—	✓	✓	—

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Directive & Standards									
Generic standards	IEC/EN 61000-6-2; IEC/EN 61000-6-3								
Applied standards	IEC/EN 55022 (CISPR22) IEC/EN 61000-4-3 IEC/EN 61000-4-4 IEC/EN 61000-4-6	IEC/EN 55022 (CISPR22) IEC/EN 61000-4-3 IEC/EN 61000-4-4 IEC/EN 61000-4-6	IEC/EN 55022 (CISPR22) IEC/EN 61000-4-3 IEC/EN 61000-4-4 IEC/EN 61000-4-6	IEC/EN 55022 (CISPR22) IEC/EN 61000-4-3 IEC/EN 61000-4-4 IEC/EN 61000-4-6	IEC/EN 55022 (CISPR22) IEC/EN 61000-4-2 IEC/EN 61000-4-3 IEC/EN 61000-4-4 IEC/EN 61000-4-6	IEC/EN 55022 (CISPR22) IEC/EN 61000-4-3 IEC/EN 61000-4-4 IEC/EN 61000-4-6	IEC/EN 55022 (CISPR22) IEC/EN 61000-4-3 IEC/EN 61000-4-4 IEC/EN 61000-4-6	IEC/EN 55022 (CISPR22) IEC/EN 61000-4-3 IEC/EN 61000-4-4 IEC/EN 61000-4-6	IEC/EN 55022 (CISPR22) IEC/EN 61000-4-2 IEC/EN 61000-4-3 IEC/EN 61000-4-4 IEC/EN 61000-4-6
Environmental standards	IEC/EN 60068-2-6; MIL-STD-810F								
Safety standards (UL File Number; unassembled PCB)	E148881	E207844	E207844	E76251	E207844	E243951	E108467	E108467	E207844
Reliability (MIL-HDBK-217F; MTBF)	1'044'089 hours	511'401 hours	403'301 hours	634'498 hours	398'363 hours	639'548 hours	380'195 hours	517'288 hours	280'383 hours
Functionality									
Operating Mode									
Current controller (torque control)	✓	✓	✓	—	✓	✓	✓	✓	✓
Speed controller (closed loop)	✓	✓	✓	✓	✓	✓	✓	✓	✓
with encoder feedback	✓	✓	—	—	✓	✓	✓	✓	✓
with DC Tacho feedback	✓	✓	—	—	✓	✓	✓	✓	✓
with Hall sensor feedback	✓	—	✓	—	✓	✓	✓	✓	✓
with BEMF feedback	—	—	—	✓	—	—	—	—	—
Speed controller (open loop)	✓	✓	✓	✓	✓	✓	✓	✓	✓
with static IxR Compensation	✓	✓	✓	✓	✓	✓	✓	✓	✓
with adaptive IxR Compensation	✓	(✓)a	✓	✓	✓	✓	✓	✓	✓
Set Value									
Analog set value					✓				
PWM set value					✓				
RC Servo set value					✓				
Fixed set value					✓				
2 fixed set values					✓				
Digital I/O Functionality									
Enable					✓				
Enable CW					✓				
Enable CCW					✓				
Enable CW + CCW					✓				
Enable + Direction					✓				
Stop					✓				
Ready					✓				
Speed Comparator					✓				
Current Comparator					✓				
Commutation frequency	✓	—	✓	✓	✓	✓	✓	✓	✓

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Monitoring Outputs									
Monitor Current					✔				
Monitor Speed					✔				
Analog Settings									
Set value					✔				
Current limit					✔				
Offset adjust set value					✔				
Speed ramp					✔				
Current gain (using potentiometer)	—	✔	✔	—	✔	✔	—	—	✔
Speed gain (using potentiometer)	—	✔	✔	✔	✔	✔	—	—	✔
IxR Factor (using potentiometer)	—	✔	✔	✔	✔	✔	—	—	✔
Protection									
Overcurrent					✔				
Current limiter (adjustable)					✔				
Thermal overload					✔				
Undervoltage					✔				
Overvoltage					✔				
Voltage transients					✔				
Short-circuit of motor winding					✔				
Software									
Installation Program					ESCON Setup				
Graphical User Interface					ESCON Studio				
Startup Wizard					✔				
Regulation Tuning					✔				
Diagnostics					✔				
Firmware Update					✔				
Controller Monitor					✔				
Parameters					✔				
Data Recording					✔				
Online Help					✔				
Language					German, English, French, Italian, Spanish, Japanese, Chinese				
Operating System					Windows 10, 8, 7, XP SP3				
Communication interface					USB 2.0 / USB 3.0 (full speed)				

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Accessories (not included in delivery)									
418719 Adapter BLACK FPC11poles	—	—	✔	—	—	—	—	—	—
418723 Adapter BLUE FPC8poles	—	—	✔	—	—	—	—	—	—
418721 Adapter GREEN FPC8poles	—	—	✔	—	—	—	—	—	—
403962 DC Motor Cable	—	✔	—	—	—	—	—	—	—
275934 Encoder Cable	—	✔	—	—	✔	—	—	—	✔
404404 ESCON 36/2 DC Connector Set	—	✔	—	—	—	—	—	—	—
425255 ESCON 36/3 EC Connector Set	—	—	✔	—	—	—	—	—	—
486400 ESCON Module 24/2 Motherboard	✔	—	—	—	—	—	—	—	—
586048 ESCON Module 50/8 Motherboard	—	—	—	—	—	—	✔	✔	—
438779 ESCON Module Motherboard	—	—	—	—	—	✔	(✔)b	(✔)b	—
450237 ESCON Module Motherboard Sensorless	—	—	—	✔	—	—	—	—	—
586142 ESCON Module 50/8 Thermal Pad	—	—	—	—	—	—	✔	—	—
409286 ESCON USB Stick	✔	✔	✔	✔	✔	✔	✔	✔	✔
403965 I/O Cable 6core (Digital I/Os)	—	✔	✔	—	—	—	—	—	—
403964 I/O Cable 7core (Analog I/Os)	—	✔	✔	—	—	—	—	—	—
403957 Power Cable	—	✔	✔	—	—	—	—	—	—
403968 USB Type A - micro B Cable	✔	✔	✔	✔	✔	✔	✔	✔	✔

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