# ECS-FOC3430
# Sensorless Field-Oriented Motor Control (FOC) for EC Motors
# 34 VDC, 30 A Phase Current

- Field-oriented control (FOC) for speed and torque control
- FOC algorithm implemented entirely in software, minimizing hardware requirements while maximizing flexibility
- Sensorless sinusoidal commutation with sinusoidal motor currents
- Outstanding speed stability and smooth, low-noise, vibration-free motor operation
- Suitable for brushless three-phase EC motors in delta or star (wye) configuration, with either surface-mounted or interior permanent magnets
- FOC algorithm based on a 32-bit microcontroller
- PID controllers for speed and torque control, with an underlying current control loop
- Sensorless rotor position detection at standstill, providing improved torque characteristics during startup
- Space Vector Modulation (SVM) for optimal torque generation
- Field-weakening operation for high-speed applications
- Dimensions: 100 × 130 × 40 mm
- Supply voltage: 9 to 34 VDC, unregulated
- Continuous winding current: 30 A
- Interfaces: USB, CAN, RS-232
- 4 galvanically isolated inputs
- Windows-based configuration software for easy commissioning, including automatic calculation of the parameters required for the motor model
- Optional plug-in module for user-specific features

ECS-FOC3430 is a sensorless field-oriented control (FOC) drive for permanent-magnet synchronous machines (EC motors).

The control system consists of a speed controller with an underlying current control loop, ensuring excellent speed stability as well as smooth, low-noise, vibration-free motor operation.

Rotor position is determined sensorlessly by calculating a mathematical motor model and generating the appropriate phase signals for the power driver. Rotor position detection at standstill is achieved by measuring the motor’s inductance distribution. Optional Hall sensor or encoder feedback is also supported.

The control concept provides sinusoidal motor currents (sinusoidal commutation). Only the three phase currents are required as feedback signals.

A powerful and cost-effective 32-bit microcontroller executes the FOC algorithm entirely in software, minimizing hardware complexity while providing maximum flexibility for application-specific adaptations.

Space Vector Modulation (SVM) is implemented for optimal control of the power stage. A field-weakening mode extends the maximum operating speed of the EC motor.

Supply voltage is continuously monitored during regenerative operation. In the event of energy feedback, either an external braking resistor can be activated or the motor windings can be short-circuited. The desired behavior is configurable via software.

The power stage consists of a discrete MOSFET output stage with an efficiency of up to 98.5%.

The maximum continuous winding current is 30 A. Current control is performed in software, while hardware shutdown of the power stage is triggered at a phase current of 35 A.

Operating from 9 to 34 VDC, the ECS-FOC3430 is ideally suited for both 12 V and 24 V applications.

Four galvanically isolated inputs are provided. Speed can be commanded via a PWM signal.

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## ECS-FOC3430 – Technical Specifications



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|---|---|
| Operating Modes: | • Sensorless field-oriented control (FOC) with field-weakening operation<br>• Space Vector Modulation (SVM)<br>• Speed control<br>• Torque control<br>• Sinusoidal commutation |
| Motor Type: | EC-motors |
| Rotor Types: | • Surface-mounted permanent magnet (SPM) rotors<br>• Interior permanent magnet (IPM) rotors |
| Rotor Position Detection: | • Sensorless via mathematical motor model<br>• Sensorless rotor position detection at standstill<br>• Optional Hall sensor or encoder interface |
| Supply Voltage | 9 VDC to 34 VDC, unregulated |
| Maximum Motor Current per Phase (Amplitude): | 30 A |
| Power Stage:<br>• Switching Frequency:<br><br>• Maximum Continuous Phase Current:<br>• Maximum Current (ITrip = Shutdown Current): | <br>PWM switching frequency: 10 kHz to 17.5 kHz, adjustable (default setting: 14.4 kHz)<br><br>30A<br><br>35A |
| Connections:<br>Supply Voltage and Motor Phases: | 6.3 mm quick-connect tab terminals (straight) or solder pads with 3 mm drill diameter |
| Interfaces: | USB 2.0 Full-Speed<br>CAN, 6-pin IDC Header<br>RS232, 10-pin IDC Header |
| Expansion Interface: | Pin headers, 2 x 8-pin and 2 x 10-pin |
| Inputs:<br>• Galvanically Isolated:<br>• Encoder Interface: | <br>4 galvanically isolated inputs (9–24 V)<br>5 V, line-driver interface, 10-pin IDC header |
| Dimensions: | 130 x 100 x 40 mm |
| Operating Temperature Range: | 0 ... +50 °C |
| Storage Temperature Range: | -40 ... +85 °C |