H60
Sensorless Field-Oriented Control for EC Motors
12 to 48 VDC / 14 A Phase Current

- Field-oriented control (FOC) for speed and torque control
- FOC algorithm based on a 32-bit microcontroller, implemented entirely in software for minimal hardware complexity and maximum 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
- 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: Ø55 mm × 20 mm
- SSI interface for a magnetic rotary encoder, enabling optional rotor position feedback and positioning operation
- Supply voltage: 12 to 48 VDC
- Maximum phase current: 14 A RMS
- Interface: CAN (CANopen protocol)
- Four 24 V inputs: Direction, Enable, Emergency Stop, STO (Safe Torque Off)
- One analog input (0–10 V) for speed reference
- Four open-drain outputs: Frequency Output, Error, Ready, OUT1
- One PWM output for fan control
- One PWM output for brake control
- Windows-based configuration software for easy commissioning, including automatic calculation of the parameters

H60 is a sensorless field-oriented control (FOC) drive for permanent-magnet synchronous machines (EC motors).
The control architecture combines a speed controller with an underlying current control loop, ensuring excellent speed stability together with smooth, low-noise, vibration-free motor operation.
Rotor position is determined from a mathematical motor model, which also generates the appropriate phase signals for the power stage. Sensorless detection at standstill is achieved by measuring the motor's inductance distribution. An optional magnetic rotary encoder with SSI interface provides rotor position feedback and enables positioning applications.

The control concept inherently produces sinusoidal motor currents (sinusoidal commutation), using only the three phase currents as feedback signals. A powerful 32-bit microcontroller executes the complete FOC algorithm in software, minimizing hardware complexity while providing maximum application flexibility. Space Vector Modulation (SVM) ensures optimal power stage control, while field-weakening operation extends the motor's maximum speed range.
The discrete MOSFET power stage achieves an efficiency of up to 98.5%. Maximum motor phase current is 14 A RMS, with current regulation performed entirely in software.

The unit operates from 12 to 48 VDC. Four 24 V control inputs are provided for Direction, Enable, Emergency Stop, and STO (Safe Torque Off). Speed setpoint control is accomplished via a 0–10 V analog input.
Four open-drain outputs are available: one frequency output for speed monitoring, two status outputs, and one freely configurable output. In addition, PWM outputs are provided for brake control and external fan control.
Communication is provided via a CAN interface supporting the CANopen protocol. All parameters and settings can be configured using the Windows-based commissioning software.

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H60– Technical Specifications



Operating Modes:	• Sensorless Field-Oriented Control (FOC) with Field-Weakening Operation • Space Vector Modulation (SVM) • Speed Control • Torque Control • Positioning Operation with Magnetic Rotary Encoder • Sinusoidal Commutation
Motor Type:	EC-motors
Rotor Types:	• Surface-mounted permanent magnet (SPM) rotors • Interior permanent magnet (IPM) rotors
Rotor Position Detection:	• Sensorless operation based on a mathematical motor model • Sensorless rotor position detection at standstill • Optional magnetic rotary encoder with SSI interface
Power Supply:	12 to 48 VDC, unregulated
Maximum Motor Current per Phase: Maximum Peak Current:	14 A_{rms} 30 A
Connections: • Supply Voltage: • Motor Phases: • I/Os: • Fan, Brake, and Motor Temperature: • SSI Interface:	 2 × 4.8 mm quick-connect tab terminals (+UB, GND) 3 × 4.8 mm quick-connect tab terminals (PHA, PHB, PHC) 12-pin Molex Pico-Clasp connector 8-pin Molex Pico-Clasp connector 6-pin Molex Pico-Clasp connector
Interfaces:	CAN (Protokoll = CANOpen)
Outputs: • Open-Drain Outputs (max. 50 mA): • PWM Outputs (max. 0.5 A):	 • Frequency output for speed monitoring • Error output • Ready output • 1 freely configurable output • Motor brake • External fan
Inputs: • 24 V Inputs: • Analog Inputs: • Encoder Interface:	 4 × inputs (Enable, Direction, Emergency Stop, STO) 0–10 V speed reference input (12-bit resolution) Encoder with SSI interface
Dimensions:	55 mm x 20 mm
Operating Temperature Range:	0 ... +60 °C