

Beckhoff EtherCAT Hardware with LabVIEW

1 What is EtherCAT?

EtherCAT is a fieldbus for automation based on Ethernet with realtime characteristics. The usage of Ethernet connection technology allows a cost-efficient system with high data throughput of the bus. The technology is supported and powered by the EtherCAT Technology Group, which is an international community of users and vendors, which more than 1500 members already joined. This great acceptance lead to the availability of a broad range of products by different vendors.

2 Why EtherCAT with LabVIEW?

A lot of tasks for LabVIEW applications from the field of measurement and automation can be effectively solved with EtherCAT based hardware. There is a wide variety of hardware for Input and output signals as well as drive systems. All components can be controlled over the same bus. When using different vendors, there is no need to master different drivers and hardware interfaces in the software.

Another advantage is the possibility to create decentralized stations of input and output signals. The conversion to or from digital can be carried out near to the sensor or actor. Using boxed modules, there is even no necessity to create extra electrical enclosures or control cabinets.

With our EtherCAT Library for LabVIEW, EtherCAT components can be easily controlled directly from LabVIEW. The Beckhoff driver libraries provide an own set of VIs for most terminal types, that represent the functionality and make the integration an easy experience.

3 Beckhoff EtherCAT Hardware for Measurement and Automation Applications

Beckhoff provides a very flexible and cost-efficient bus terminal system. Terminals for different inputs and outputs can be plugged together as needed. Additionally boxed EtherCAT modules can be used in rough environments near to sensors and actors.

Additionally there are components for drive control as well as drives available.

3.1 Bus Terminal System

The bus terminal system provides a great variety of modules for inputs and outputs as well as drive control. Terminals can be easily stacked up as needed. For different sensor measurements there are modules with high accuracy and oversampling technology allows to sample faster than the bus cycle rate.



Digital Inputs

- Digital signals with levels of 5V, 12V, 24V, 48V, 120V and 230V
- Scanrate of max 1 MSample/s at 5V and 24V with oversampling
- Counter modules for measurements of frequencies, positions, flows, etc. at 5V and 24V

Digital Outputs

- Digital output levels of 5V and 24V
- Relay modules for switching levels of up to 230V directly in the terminal
- Output rate of max 1 MSample/s at 24V
- Modules for PWM and Pulse Train

Analog Inputs

- Voltage inputs of up to 30V and current inputs up to 20mA in 12 and 16 bit resolution
- With oversampling up to 100 kSamples/s scanrate
- 24 bit resolution for accurate measurements of voltage ranges down to +/- 75 mV
- Thermolement measurements
- Measurement of resistance sensors like RTDs
- Measurements of resistor bridge sensors for strain gauges or load cells
- Digital multimeter terminal for currents up to 10A and voltages up to 300V
- Terminals for power measurements and power monitoring
- Inputs for accelerometers for vibration measurement

Analog Outputs

- Voltage outputs up to 10V and current outputs up to 20mA in 12 and 16 bit resolution
- With Oversampling output rates up to 100 kSamples/s

Position Measurements

- SSI encoder interface
- SinCos-encoder-interface
- Incremental-encoder interface
- EnDat-interface

Motion Control

- Stepper motors up to 5A, 50V
- DC motors up to 3,5A, 50V
- Servo motors up to 4,5A, 50V
- Position control and velocity control

- Positioning tasks interface

Communication

- Serial RS-232, RS-422, RS-485
- AS-Interface
- Profinet, Profibus
- Ethernet/IP
- CANopen
- DeviceNet
- EtherCAT Master bridge for data exchange with other EtherCAT Systems

3.2 Box Modules

Box modules allow the use directly at the machine or measurement location and don't require electrical enclosures or control cabinets. The boxes come in protection class IP 65, IP 66 and IP 67. They are fully casted and therefore ideal for wet, dirty and dusty working environments. For extreme, harsh or corrosive industrial environments, modules in stainless steel housing in IP 69K protection are available.



Digital Inputs

- Digital signals 24V
- Counter modules for 24V level

Digital Outputs

- Digital output level 24V
- Relay modules for switching up to 30V

Analog Inputs

- Voltage inputs of up to 10 V and current inputs up to 20mA in 12 and 16 bit resolution
- Thermocouple measurement
- Measurement of resistance sensors like RTDs
- Measurements of resistor bridge sensors for strain gauges or load cells
- Measurements of absolute and differential pressure

Analog Outputs

- Voltage output up to 10V and current outputs up to 20 mA at 16 bit resolution

Position Measurements

- Incremental-encoder interface

Motion Control

- Stepper motors up to 5A, 50V
- DC motors up to 3,5A, 50V
- Position control and velocity control
- Positioning tasks interface

Communication

- Serial RS-232, RS-422, RS-485