

Terminator Multimode Encoder Signal Filters

The encoder, in rotary or linear form, is a motion/position control staple and these filters complement, safeguard, maintain and extend their capabilities and performance.

The filters remove all types of electrical noise (common and differential mode, dV/dt transients, ground loop generated etc.) in the encoder signal lines as well as the corrupting effects of mechanical noise and vibration (phantom movement, dither etc.).



Terminator Multimode Filter in Cast Al IP65 Enclosure

The filters reconstruct the encoder signals to reflect the correct encoder position and speed signaling.

Performance is safeguarded and problems such as:

- Motion system position drift,
 - Home reference loss,
 - False triggering of the receiving inputs, and
 - Receiving input saturation, latch-up or failure
- are eliminated.

Their design is characterized by typical industrial application considerations: low ownership costs, standard interfacing, fool-proof installation, transparent operation, results-oriented and all-inclusive design. The filters feature the following operational characteristics:

- **They are wired in-line** between the encoder and the processing equipment. This minimizes and simplifies wiring, usually one of the most significant costs in an installation,
- **They interface in a standard way** with the encoder outputs and the processing equipment inputs. This enables installation by a non-specialist as well as widening equipment choice,
- **They have no special installation requirements**, have small physical dimensions and are transparent in operation, and
- **They are readily recyclable** and made with lead-free materials for minimal impact to the environment.

The Terminator line of multimode filters are all-in-one, value-for-money products, each device addressing all and any combination of known encoder application issues. They process digital quadrature encoder signals with the following features:

- **Dual voltage 115/230 VAC twin isolated supply.** The twin supply powers the two internally isolated, input and output, filter sections. It can power the monitored encoder with regulated 5 VDC or unregulated 10/15 VDC,
- **Galvanically isolated input and output stages** to interrupt unavoidable system ground loops, eliminate related noise as well as protect the input stage of the driven controller from high voltage transients (the galvanic barrier features 5 V/ns dV/dt immunity),
- **Four selectable modes of digital processing**
 1. Unfiltered: the outputs are buffered replicas of the inputs,
 2. Filtered: the encoder inputs are processed for electronic noise only,
 3. Recovered x1: the encoder inputs are processed for electronic noise and analyzed for mechanical position to recover corrupted motion sequences. The outputs are in quadrature format and the mark (or index) channel is processed for electrical noise.
 4. Recovered x4: Same as the Recovered x1 mode, but with output resolution quadrupling. The output signals are a clock/direction pair at four times the input frequency instead of the quadrature format.
- **Test mode.** Depending on the chosen mode and sampling frequency, the filter outputs simulate the function of a 1024 ppr encoder,
- **Direction reversal.** One of the encoder channels can be complemented to effect a direction reversal, thus saving the rewiring/reconnection of the encoder signals,
- **Supply, signal and worn/faulty encoder indication.** Five LEDs indicate the status of the power supply, the three encoder channels and the presence of out-of-sequence signaling, typically caused by a worn or faulty encoder,
- **DIP switch selectable options.** All operational parameters and functions are set/reset via DIP switches,
- **Selectable sampling frequency.** The encoder signals are DSP processed at selectable frequencies to interface to slower equipment or tune out problem noise sources in particularly difficult applications,
- **Three types of EIA(RS)422 input termination:** standard DC, AC and none, and
- **Cast aluminum enclosure** of IP65 protection and high noise immunity. Its dimensions are 171 x 121 x 55 mm (approximately 6.7 x 4.7 x 2.2 inches).



Detail showing the function DIP switches and status LEDs.

The available Terminator models are offered in a range of options which also allow them to be used as interfaces between different encoder and PLC/drive input card signal types. Model options are characterized by input/output type and speed capability:

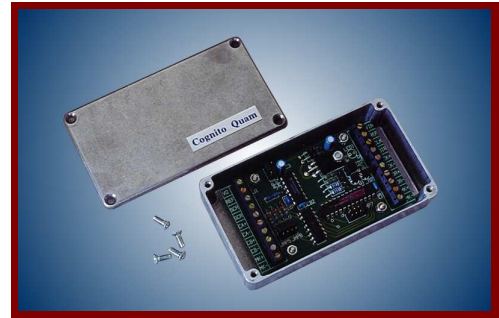
Terminator Multimode Encoder Filter Model Selection Table					
Model	Input types	Output types	Available speed grades	Encoder supply	Filter supply
EFDO	Differential EIA422 only	Differential EIA422 only	Standard, High	5 VDC regulated or 10 VDC unregulated	115/230 VAC
EFU5	Differential: EIA422. Single ended: all 5 V, 5-30 V NPN and Push-Pull only	Differential EIA422 and all single ended 5 V	Standard, High	5 VDC regulated or 10 VDC unregulated	115/230 VAC
EFSO	Differential: EIA422. Single ended: all 5 V, 5-30 V NPN and Push-Pull only	Single ended 5-30 V PNP and Push-Pull only	Low	5 VDC regulated or 10 VDC unregulated	115/230 VAC and 5-30 VDC
EF24	All 10-28 V	All 5-30 V	Low	15 VDC unregulated	115/230 VAC and 5-30 VDC

The speed grade specifies the maximum quadrature input frequency which can be processed. The limit is different for each filter mode:

Maximum Quadrature Input Frequency Capability per Filtering Mode				
Speed Grade	Unfiltered	Filtered	Recovered x1	Recovered x4
Low	300 kHz	250 kHz	200 kHz	62.5 kHz
Standard	10 MHz	1.5 MHz	1.2 MHz	375 kHz
High	10 MHz	3.0 MHz	2.4 MHz	1.5 MHz

Terminator Multimode Encoder Filter and Accessories Ordering Information	
Model	Description
EF2402-ALU-L	Low speed Terminator Multimode encoder signal filter, Universal 10-28 V inputs and Universal 5-30 V outputs.
EFDO02-ALU-H	High speed Terminator Multimode encoder signal filter, EIA422 inputs and Universal 5 V outputs.
EFDO02-ALU-S	Standard speed Terminator Multimode encoder signal filter, EIA422 inputs and Universal 5 V outputs.
EFSO02-ALU-L	Low speed Terminator Multimode encoder signal filter, Universal 5 V inputs and 5-30 V PNP/Push-Pull single ended type outputs.
EFU502-ALU-H	High speed Terminator Multimode encoder signal filter, Universal 5 V inputs and Universal 5 V outputs.
EFU502-ALU-S	Standard speed Terminator Multimode encoder signal filter, Universal 5 V inputs and Universal 5 V outputs.
XFR400230	Control Voltage Supply Transformer, 90VA, 400/230 VAC (accessory to provide power from 3x400 VAC lines).

The technology is also available in custom versions for OEMs (Original Equipment Manufacturers).



Cognito Quam Profile

Cognito Quam Electrotechnologies Ltd. (established in 1990) is a privately held engineering and commercial company specializing in industrial electronics and their application. The company expertise covers all aspects of applications for the factory environment namely measurement (transducers and sensors), data processing and communication, control and actuation, automation and robotics and power and energy electronics.

Cognito Quam has contributed and been involved in the design and development of the following technologies, machinery and devices:

- Motor voltage and frequency inverters and converters,
- Thermal load control and management,
- Robotic interfaces and protocol converters,
- Adaptive panel controllers,
- Robotics controllers,
- Variable speed drives,
- Olive oil processing rejects control equipment (FAIR contract),
- Low Voltage and EMC CE marking compliance devices and equipment for production lines,
- Portable dioxine-furan instrumentation (SMT contract),
- Three-phase programmable soft-starters,
- Hard real time job scheduling systems,
- Hard real time industrial distributed data systems (Brite-EuRam subcontract),
- Calibration rig and supplies for power meters,
- Electrical utility Hall effect energy and power meters,
- Industrial data networks,
- Battery chargers and UPS inverters,
- Solar power air conditioning telemetry and control systems (Thermie subcontract)
- Small switching power supplies,
- Multi-port communication PC cards,
- Ship oily water separators, and
- Modem controllers.

Cognito Quam also offers its research and development services in integrating its products in larger industrial systems products as well as in the design of new and challenging devices and equipment. As such the company cooperates closely and supports its customers in their efforts for a better product.