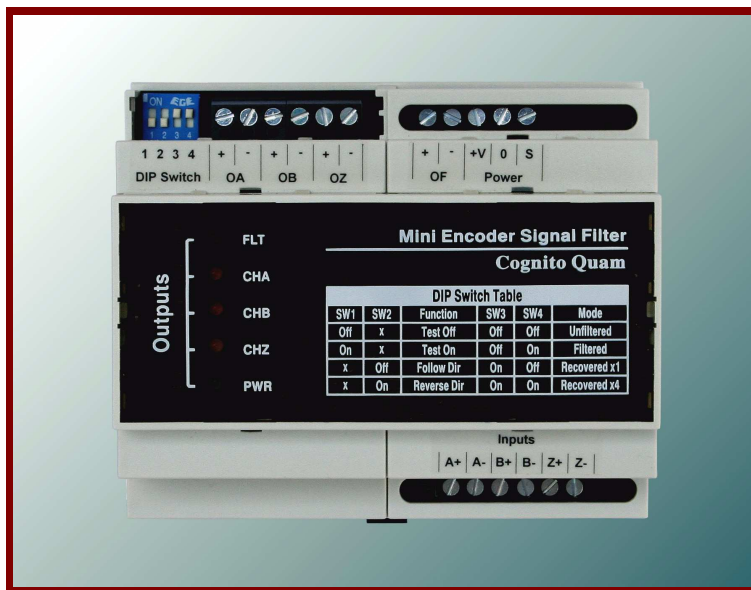


Mini Multimode Encoder Signal Filters

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.).



Mini multimode filter in DIN rail IP40 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

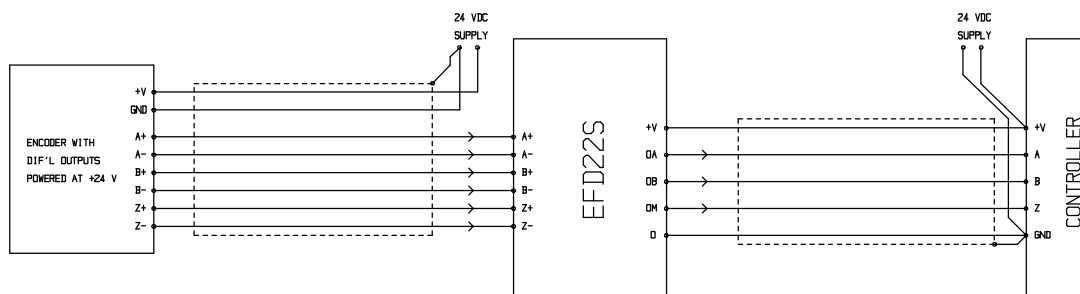
are eliminated.

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 Mini 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:

- **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 0.1 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 or an up/down pair at four times the input frequency instead of the quadrature format.
- **Test mode.** 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,
- **Independent, galvanically isolated fault output.** The fault, out-of-sequence state activates this uncommitted optotransistor output interfacing to external systems,
- **DIP switch selectable options.** All operational parameters and functions are set/reset via DIP switches,
- **Two types of EIA(RS)422 input termination:** standard DC and none, and
- **Small DIN rail mountable plastic enclosure** of IP40 protection. Its dimensions are 105 x 90 x 58 mm (approximately 4.1 x 3.5 x 2.3 inches).



Typical application of an EFD22S filter powering a physically remote encoder (connected via long cables), processing its differential output signals and interfacing them to a 24 V single input controller. The two 24 VDC supplies must be isolated from each other to maintain the galvanic barrier between the filter input and output stages.

The available Mini 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. These are:

| Mini Multimode Encoder Filter Model Selection Table | | | | | |
|---|--------------------------|--------------------------|--------------------------------|---------------------------|--|
| Model | Single ended input types | Differential input types | Single ended output types | Differential output types | Power supply |
| EFD44 | | EIA422 | | EIA422 | 5 VDC (input) and 5 VDC (output) |
| EFD42S | | EIA422 | 10-28 V PNP and Push-Pull only | | 5 VDC (input) and 10-28 VDC (output) |
| EFD42D | | EIA422 | All 10-28 V | 10-28 V | 5 VDC (input) and 10-28 VDC (output) |
| EFD24 | All 10-28 V | All 10-28 V | | EIA422 | 10-28 VDC (input) and 5 VDC (output) |
| EFD22S | All 10-28 V | All 10-28 V | 10-28 V PNP and Push-Pull only | | 10-28 VDC (input) and 10-28 VDC (output) |
| EFD22D | All 10-28 V | All 10-28 V | All 10-28 V | 10-28 V | 10-28 VDC (input) and 10-28 VDC (output) |

The maximum quadrature input frequency which can be processed by the filters depends on the selected function mode as follows:

| Maximum Quadrature Input Frequency Capability per Filtering Mode | | | | |
|--|------------|----------|--------------|--------------|
| Speed Grade | Unfiltered | Filtered | Recovered x1 | Recovered x4 |
| Basic | 300 kHz | 125 kHz | 100 kHz | 31.3 kHz |

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



| Mini Multimode Encoder Filter Ordering Information | | |
|--|--------------------------|---|
| Model | | Description |
| Clock/direction x4 output | Up/down x4 output | Mini multimode encoder signal filter, DIN rail enclosure, with .. |
| EFD44-DIN-B | EFD44U-DIN-B | EIA422 in, EIA422 out. |
| EFD42S-DIN-B | EFD42SU-DIN-B | EIA422 in, single ended 10-28 V PNP/Push-Pull out. |
| EFD42D-DIN-B | EFD42DU-DIN-B | EIA422 in, Universal 10-28 V out. |
| EFD24-DIN-B | EFD24U-DIN-B | Universal 10-28 V in, EIA422 out. |
| EFD22S-DIN-B | EFD22SU-DIN-B | Universal 10-28 V in, single ended 10-28 V PNP/Push-Pull out. |
| EFD22D-DIN-B | EFD22DU-DIN-B | Universal 10-28 V in, Universal 10-28 V out. |

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:

- Power factor controllers,
- 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.