Short Description

- Fast readout control logic with ADC for digitization of the sensors’s analog video signal
- For CCD, InGaAs and NMOS PDAs
- Readout rate: 100, 500 or 1000 kpixels/second
- High resolution: 16 bits A/D conversion
- Dynamic range: up to > 15 bits (with PDA)
- On-board generation of stabilized ±5V for the sensors from a single supply voltage (5V ±1V)
- Input from device: Preamplifier with PDA or Spectral Sensor
- Output to device: tec5 Interface Electronics (PD-ETH01V1, PD-USB01V2 or PD-PCI01V1)
- PCB dimensions 87 mm x 67 mm (FEE standard)

General

The FEE-1M functions as a kind of adapter between the sensor module and the Interface Electronics. It generates the control signals for the photodiode array of the sensor module, preprocesses the analog video signal and performs analog / digital conversion. The digitized intensity values are provided as byte sequential data stream for the Interface Electronics.

The circuit board is connected either to the PCI bus Interface Electronics via a shielded 2 or 5m long multi-pin cable (PD-PCI01V1 version ‘Standard’, interface standard ‘Interface_40’) or directly plugged on top of the Ethernet- or USB Interface Electronics (PD-ETH01V1 or PD-USB01V2, version ‘Embedded’, interface standard ‘Interface_2*18’).

The sensor interface corresponds to specification ‘Sensor_Ux’. The sensor module is connected to the FEE using two flat ribbon cables (4 pin and 14 pin).

Basic Versions for CCD / InGaAs / NMOS

FEE-1M is available in three basic versions:
- FEE-1M /CCD-x for CCD - Spectral Sensors with tec5 Preamplifier Electronics DZA-S7030-4 (x=2) or DZA-S9840 (x=8)
- FEE-1M /NIR-x for InGaAs - Spectral Sensors with tec5 Preamplifier Electronics DZA-VVIR-LD (x=2) or DZA-VVIR-HM (x=4)
- FEE-1M /NMOS-x (x=1 or d1) for MCS with Preamplifier DZA-S3901-4 1M for Hamamatsu NMOS PDA types S3901 to S3904 or compatible, alternatively for Carl Zeiss MMS Spectral Sensor with Preamplifier DZA-MMS 1M

The extension ‘-x’ specifies the master clock frequency generated by FEE-1M for the Preamplifier Electronics.

Features / Specifications

Functional Properties

- Generation of supply voltages for sensors and preamplifiers (not used by self powered DZA-S7030-4 or DZA-S9840)
- PDA readout clock sequencing
- Analog video signal preprocessing, A/D conversion
- Data transfer to the Interface Electronics
- Local non-volatile memory, 256 Bytes capacity (e.g. for identification data of the sensor(s), calibration coefficients or customer specific information)

Specifications

- ADC 16 bits
- Conversion rate (100), 500 or 1000 kSps
- Electrical Non-linearity < ±2 counts
- Temperature drift < ±1.0 count / °C
- Offset adj. range approx. ±2000 counts

Basic Version | CCD-2 (S703x) | CCD-8 (S9840) | NIR-2 (InGaAs) | NMOS-1 | NMOS-D1
---|---|---|---|---|---
Input sensitivity [counts/V] approx. | 3.700 | 3.700 | 13.500 | 17.000 | 17.000
Standard deviation [counts] typically | 3.1 (cooled) | 15 | 4.0 | 4.0 | < 2.0
Pixel frequency [kHz] | 500 | 1000 | 500 (*) | 1000 | 100
Readout time [ms] | 1.9 or 2.9 | 2.3 | 1.1 | 0.52 | 5.2
Sensor (example) [number pixels] | 632 or 1044x64 | 2080 x20 | 512 | 512 | 512
Power consumption [mA] typically (@ +5V) | 140 | 200 | 310 | 320 | 250

(*) up to 1MHz for Hamamatsu G9212/14 (with /NIR-4)

Detailed technical data of the different configurations can be found in the FEE-1M Technical Documentation.

Interfaces

- Interface type ‘Sensor_Ux’ to sensor preamplifier (MICS4 connector for analog input signal only)
**Environmental conditions**

- **Temperature range operating**: 0 °C ... 60 °C
- **Temperature range storage**: -40 °C ... +70 °C
- **Humidity (at 25 °C, non condensing)**: 10 % ... 90 %

**Assembly Versions**

Assembly Version ’Standard' (extension /STD) with 40 pin Mini-Delta connector for cable connection to the tec5 PCI Interface Electronics. The 36 pin connector array CON602 may be assembled with socket contacts (not used).

Assembly Version ’Embedded' (extension /EMB) is prepared to be directly plugged on top of the Interface Electronics (typically Ethernet or USB Interface Electronics). The 36 pin connector array CON602 is assembled with pins on the solder side, the 40 pin Mini-Delta connector is not assembled.

Assembly Version ’Systems' (extension /SYS) is prepared for the module integration in systems. The 36 pin connector array CON602 is assembled with pin header contacts to link specific connector adapters (like the tec5 LKONV-40-37) via a flat-ribbon cable; the 40 pin Mini-Delta connector is not assembled.

**Interfaces**

Interface Electronics connector type / specs / pinout

<table>
<thead>
<tr>
<th>CON601: 40 pin 3M Mini Delta Ribbon (socket type) ‘Interface_40’ compatible</th>
<th>CON602: 36 pin socket connector array ‘Interface_2*18’ compatible</th>
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<tr>
<td>Pins</td>
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<td>S1/7</td>
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<tr>
<td>A14</td>
<td>S1/6</td>
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</tbody>
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**PCB Design**

![PCB Diagram](image)

**Trimming / Settings**

For offset compensation of the FEE, the optical sensor input has to be covered. Use a spectral data acquisition software to display raw pixel data in continuous acquisition / live display mode (e.g. tec5 AdminTool) with the following settings:

- Shortest integration time, without dark correction
- View-Option Y-scale: ADC — counts
- View-Zoom Y-scale: approx. 0…200 [counts]
- Continuous acquisition

The offset is adjusted by trimming potentiometer Po200 to result in a baseline between 80 and 120 counts for CCD and NMOS sensors.

**User Information**

**General**

The information in this data sheet has been checked carefully. However, no responsibility is assumed for inaccuracies. tec5 reserves the right to make changes to any portion of this document without notice. Each product is tested carefully before being shipped. If, however, problems should occur while initial operation or during later operation, please first check your specific settings and correct installation (connectors).

**Warranty**

The warranty period for this product is 12 months. The warranty begins on the day of delivery. Within the warranty period, tec5 will repair free of charge any faulty functioning of the product resulting from faulty design or defective material. All other claims are excluded, in particular consequential damage.

**Handling**

The electronics is partly constructed in CMOS technology and is thus sensitive against electrostatic discharge. Take appropriate precautions whenever handling the component. Please switch off the power before connecting or disconnecting the product.