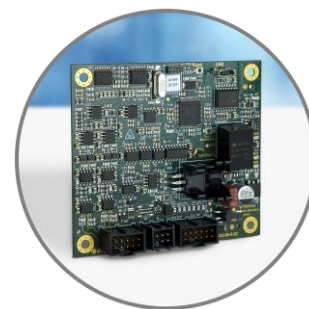


Control Electronics EL-E-OF-A

The EL-E-OF-A enables the control of the EL-10-42-OF lens via an analog input signal. Several digital signals are available for status verification. The electronics essentially provides an analog-to-digital stage to read the control and set voltage signal, digital processing with an implemented PID-loop and current sources to drive the lens and the heater unit. The board is optimized for OEM-integration in laser marking systems and therefore comes without housing. The main features are:



- Analog control voltage from 0 to 5 V (ADC resolution 16 bit)
- Sampling rate 1.1 kHz
- Lens driving current ranging from 0 to 300 mA
- Integrated optical feedback (OF) control
- JTAG or USB interface for firmware updates

Mechanical specifications

| | | |
|----------------------------|--|----|
| Dimensions (L x W x H) | 85 x 75 x 30 (height with connector plugged) | mm |
| Weight | 40 | g |
| Interface connector P4 | Male header dual row (6 x 2 pins), 2.54 mm pitch | |
| Connectors to lens P2, P3 | Male header dual row (5 x 2) and (3 x 2 pins), 2.54 mm pitch | |
| Connector for power supply | Male header 2 pin, 2.54 mm pitch | |

Electrical specifications

| | | |
|---------------------------------|-----|----|
| Supply voltage Vcc | 24 | V |
| Max power output for the lens | 3 | W |
| Max current output for the lens | 350 | mA |
| Max heater power consumption | 22 | W |
| Total max power consumption | 30 | W |
| Total max heat dissipation | 1.5 | W |

Thermal specifications

| | | |
|----------------------------|------------|----|
| Operating temperature | +10 to +50 | °C |
| Storage temperature | -40 to +85 | °C |
| Total max heat dissipation | 1.5 | W |

Electrical connections

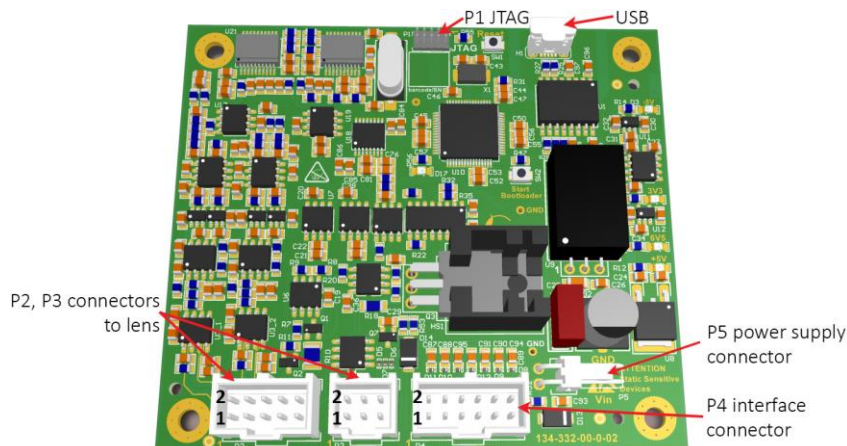


Figure 1: Control electronics EL-E-OF-A. The pin header P1 allows to flash new software versions onto the micro-processor through JTAG interface. The connectors P2, P3 are the interface connectors to the lens module EL-10-42-OF. Connector P4 constitutes the interface to external signals. The power supply is connected to P5.

| Connector P2 | | | |
|--------------|---------------|----------------|---|
| Pin | Signal | Value | Function |
| 1 | PD anode ref | 0..100 μ A | Current signal of reference photo diode |
| 2 | PD cathode | - | |
| 3 | LED - cathode | - | |
| 4 | PD anode sig | 0..100 μ A | Current signal of signal photo diode |
| 5 | LED + anode | 30 mA @ 1.5V | Driving current for LED |
| 6 | GND | - | GND is connected to shielding of cable |
| 7 | n.c. | n.c. | |
| 8 | n.c. | n.c. | |
| 9 | Current + | 0..300 mA | Lens control current |
| 10 | Current - | - | Lens control current |

| Connector P3 | | | |
|--------------|---------|---------|--|
| Pin | Signal | Value | Function |
| 1 | GND | - | |
| 2 | Heat + | 0..1 A | Current to supply heater unit of EL-10-42-OF |
| 3 | Heat - | - | |
| 4 | I2C SDA | digital | Signal of temperature sensor readout |
| 5 | I2C SCL | digital | Clock signal of temperature sensor |
| 6 | Vcc | 3.3V | Voltage supply for temperature sensor |

| Connector P4 | | | |
|--------------|------------------------------|---------------|--|
| Pin | Signal | Value | Function |
| 1 | n.c. | n.c. | |
| 2 | Temperature control in range | 3.3 V TTL out | High: Temperature within set temperature +3°C / -1.5°C The middle LED on the board is turned on when TTL reaches high |
| 3 | n.c. | n.c. | |
| 4 | Lens control in range | 3.3 V TTL out | High: Lens with EEPROM reaches the set signal |
| 5 | Temperature indication | 3.3 V TTL out | High: Temperature below (set temperature – 1°C) |
| 6 | AGND | - | Analog ground |

| | | | |
|----|-----------|------------------|--|
| 7 | GPIO5 | digital | Laser On/Off state |
| 8 | Analog In | 0..5 V (< 50 µA) | Analog set signal to control the focal length of EL-10-42-OF |
| 9 | n.c. | n.c. | |
| 10 | AGND | - | Analog ground |
| 11 | GPIO4 | digital | If actively pulling it low, linearizing focal powers versus applied voltages |
| 12 | Error | 3.3 V TTL out | High: no EEPROM, no lens connected |

Connection kit: In order to connect the EL-E-OF-A to the tunable lens EL-10-42-OF, a cable (length 50 cm) is delivered together with the electronics.

Power supply of EL-E-OF-A: Most of the power is used during the initial heating phase until the EL-10-42-OF reaches its operation temperature. Afterwards, the power consumption of about 5 W is mainly due to the lens current. In order to provide enough power under all conditions, the EL-E-OF-A must be supplied by a DC-voltage of 24V (with 30 W). The peak-to-peak voltage ripple (full load) needs to be ≤ 200 mV.

Ground connection: In order to avoid electronic noise due to possible ground loops, it must be assured that the electronics connected to the EL-E-OF-A board are on the same ground level (AGND).

Suggestions for connectors:

- P4 connector: Digi-key no. WM8038-ND in combination with no. WM2558-ND. For prototyping, assembled jumper cables are also useful (e.g., no. 1706, www.pololu.com)
- P5 connector: Digi-key no. WM2613-ND in combination with no. WM2624-ND. For prototyping, assembled cables are also useful (e.g., no. 741637 – 62, www.conrad.com)

Usable laser repetition rates

The EL-E-OF-A electronics is especially developed to control the EL-10-42-OF laser processing lens. In laser processing applications, pulsed and high-power laser beams are used, posing considerable challenges on the precision of the optical feedback (OF) control. Although optical filters and the mechanical design are optimized, tiny amounts of stray light introduce an offset on the OF, shifting the actual set value. The remaining shift is canceled electronically, implemented on the EL-E-OF-A board. However, for efficient OF control, laser repetition rates ≥ 20 kHz are recommended.

Mechanical layout

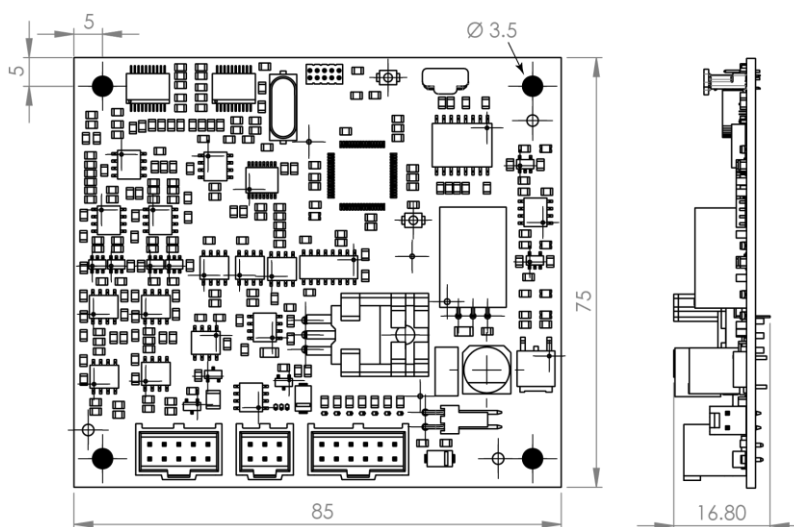


Figure 2: Mechanical dimensions of the EL-E-OF-A control electronics.

Safety and compliance

The product fulfills the RoHS and REACH compliance standards. The product is delivered without housing. The customer is solely responsible for complying with all relevant safety regulations for integration and operation.

For more information on optical, mechanical and electrical parameters, please contact sales@optotune.com.