CL190 / CL191 Embedded Industrial Lens Controllers
Compatible with Optotune focus tunable lenses

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Precision, embedded controller for Optotune lenses

Easy to drop into user PCB design files or available as miniature hardware, ready for installation

Compatible with the most common communication protocols for embedded devices

- One channel output
- Include constant current lens drive and lens EEPROM data communications
- -250mA to +250mA in 0.07mA steps
- Compatible with Optotune EL-10-30-Ci, EL-3-10 and EL-16-40-TC lenses
- Full current calibration with lens temperature compensation (pre-calibrated lenses only)

Gardasoft Embedded Industrial Lens Controllers

Gardasoft has extended its existing product capability for industrial lens control by offering an embedded version within the range. The embedded version is available as either the CL190, which is a design module that can be cut and pasted into the user's PCB design files, or as the CL191 compact PCB lens controller, which is supplied as completed, tested, enclosure-free, miniature hardware that can be fitted into the user's equipment.

The CL190 and CL191 controllers include constant current Lens drive and Lens EEPROM data communications that are compatible with lenses that have calibration data in their internal EEPROMs such as the Optotune EL-10-30-Ci and EL-16-40-TC. Where a tunable lens does not have an internal EEPROM, such as the Optotune EL-3-10, the CL190/CL191 itself can hold calibration data for the lens.

With a fast focus change (6ms), the CL190/CL191 offer dynamic lens control in Machine Vision applications which deal with varying height objects – Postal identification for example.

Microscopy and Life Sciences are other key market sectors for tunable lens control, addressing applications such as Z slices, Light sheet imaging, In vivo (live tissue) imaging, and many types of automated imaging.

The CL190/CL191 can be communicated with using I2C, UART or USB and so cover the most commonly used interface protocols for embedded equipment. This communication can be used for:

> Changing the configuration of the lens
> Setting the optical power
> Checking the status of the lens
> Detecting errors, such as a disconnected lens

For additional ease of use, it is not necessary for the user to configure the CL191 as Gardasoft is able to pre-configure it to the user's requirements prior to shipping. Also, the CL190/CL191 have a non-volatile memory and so configuration and calibration retention during power outages is automatic.

The CL190/191 is designed specifically for high-volume, OEM applications. For lower volume applications please refer to the CL180 Industrial Lens Controller.

Optotune lenses

Optotune's focus tunable lenses provide a versatile and compact solution to adjust the focus within milliseconds. As no translational mechanics are involved such systems are robust and achieve billions of cycles.

The technology of Optotune's shape-changing lenses is based on a combination of optical fluids and a polymer membrane. To tune the lens, fluid is pressed into the center of the lens by a current controlled voice coil thus changing the curvature of the membrane and with that the focal length of the lens.

The waveform can be continuously output or can be output once for each application of an external trigger signal. The repetition period of the sequence can be set from 5ms (200Hz) to 30 seconds. For other focus profiles, the lens optical power can also be controlled by an analog input voltage and the mapping of analog voltage conversion to optical power can be configured by the user and stored in the CL190/CL191 memory. Again, Gardasoft can install this configuration prior to shipping the CL191.

Applications

In many applications, the tunable lens will be required to cycle through a repetitive focus profile. The CL190/CL191 accommodate this by featuring built-in focus sequences as follows:

Square wave	Sawtooth
Sine	Staircase
Triangle	User configurable

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EL-16-40-TC

EL-3-10

EL-10-30-Ci

SPECIFICATIONS	
Parameter	**CL190 / CL191 specifications**
Output channel	One channel, including constant current lens drive and lens EEPROM data communications. Automatically reads data from EEPROM inside lens which calibrates the controller response. The performance of the controller is therefore automatically tailored to each individual lens.
Lens compatibility	Compatible with following Optotune lens ranges EL-10-30-Ci; EL-16-40-TC; EL-3-10 Full current calibration with lens temperature compensation
Operating modes	Three operating modes: 1. Single configurable optical power 2. Two optical powers, selected by digital input 3. Optical power set by analog input 4. Configurable single-shot or continuous waveforms 0.03Hz to 200Hz
Input	Accepts digital or analog input. Active voltage can be customised from 1V to 24V. 12-bit analog measurement
Refocus latency	Nominal 6ms including lens response
Output current	-250mA to +250mA in 0.07mA steps
Output voltage	Up to 3V
User interface command and configuration interface options	IIC at up to 1MHz. TTL UART up to 115200 baud. USB 2.0
Power input	Optional 3.3V or 5V at up to 300mA. Regulated.
Operating temperature	-20ºC to +65ºC
Humidity	Up to 95% non-condensing
Dimensions	CL191: 50mm x 20mm CL190: 20mm x 15mm (reduced size available on request)
Standards	REACH, RoHS
Connections (CL190)	Power input (x2), IIC, UART or USB communications (x2), trigger input (x2), lens drive output (x6)
Connections (CL191)	Power input solder pads (x2), IIC or UART communications solder pads (x2), trigger input solder pads (x2), lens drive output solder pads (x2) lens flexi-cable connector (6-way, standard Optotune pinout)