

ICC-1C Industrial Current Controller – 1 Channel



Main features:

- Industrial current controller with robust casing and a DIN rail adapter
- 1 channel output for driving Optotune tunable lens (current up to +/-500 mA)
- High output current stability in the whole temperature range
- Communication and other interfaces:
 - USB, I2C, UART, Ethernet with PoE+ capability
 - Analog input (0 – 10 V)
 - Trigger Input/Output signals
 - 2x Status LEDs (Red/Green/Orange)
- Power supply options:
 - Barrel connector
 - PoE (RJ-45 connector)
 - USB-C Power Delivery
- Graphical user interface *Optotune Cockpit* for control via USB, UART¹ or Ethernet
- Software SDKs for Python and C# are available
- RoHS, REACH and CE certified

Mechanical specifications

Dimensions (L x W x H)	64 x 105 x 28.7	mm
Weight	240	g
USB connector	USB-C	-
Max. USB cable length ²	2	m
Max. lens cable length (Hirose) ³	5	m
Accepted DC Barrel Plug	2.1 I.D. x 5.5 O.D. x 10.0	mm
Output connector	Hirose HR10G-7R-6SB(73)	
Auxiliary output connector	Standard rectangular header, 100" (2.54mm) pitch	10 pins
I/O connector	Standard rectangular header, 100" (2.54mm) pitch	14 pins
Mounting	T-slots for standard M4 nut	

Thermal specifications

Operating temperature	0 to 45 (+/- 500 mA) 0 to 65 (+/- 300 mA)	°C
Storage temperature	-40 to 85	°C

Electrical specifications

Supply voltage range typical	5 to 48	VDC
Supply voltage range absolute limits	4.75 to 57	VDC
PoE specification	PoE (802.3af or higher)	
USB-C power delivery requirement (min)	15	W
Total power consumption (max)	15	W

¹ The Cockpit software supports UART which is available on the I/O connector. A compatible CP210X USB to UART Bridge must be used.

² Maximum tested cable length in lab conditions, actual performance may depend on electromagnetic environment. Longer lengths are possible using active USB cables.

³ Maximum tested cable length in lab conditions. Maximum cable length may depend on electromagnetic environment.

Driver outputs

Maximum output current	±500	mA
Minimum output current step	65	µA
Resolution	14	bits
Output current thermal stability	0.5	mA
Front-end voltage ⁴ (configurable)	6 – 15 (factory default = 12)	V
Output voltage limit	6 – 15	V
Output stage topology	Full bridge, filtered PWM (load not grounded)	
Digital communication with lens	Dedicated I2C bus, 400kHz max.	
I2C logic level (pullups implemented)	3.3	V
Power supply for I2C (output channel)	3.3	V
Power for logics, max. current	typ. 100	mA
Status LED (main + output channel)	Red, Green, Orange LED	

Driver inputs

Analog input level	0 – 10	V
Analog input resolution	16	Bits
Analog input BW	10	kHz
Analog input impedance	743	kΩ
Digital inputs	GPIO, I2C, UART	
Digital inputs logic level	3.3 (NOT 5 V tolerant)	V

Standard products

ICC-1C	ICC-1C Controller with a DIN rail adapter	
ICC-1C Controller Kit	<ul style="list-style-type: none"> • ICC-1C • DIN rail adapter • ICC-1C Extension Board for lenses with FPC flex cable • AC/DC Power supply to 24V/1A • USB-A to USB-C cable, 1 m 	
ICC-1C PCBA Controller	ICC-1C PCB only (OEM) version	



Figure 1: ICC-1C Controller Kit

⁴ The front-end voltage supplies the output stage. The output voltage is slightly lower than the front-end voltage.

Mechanical layout

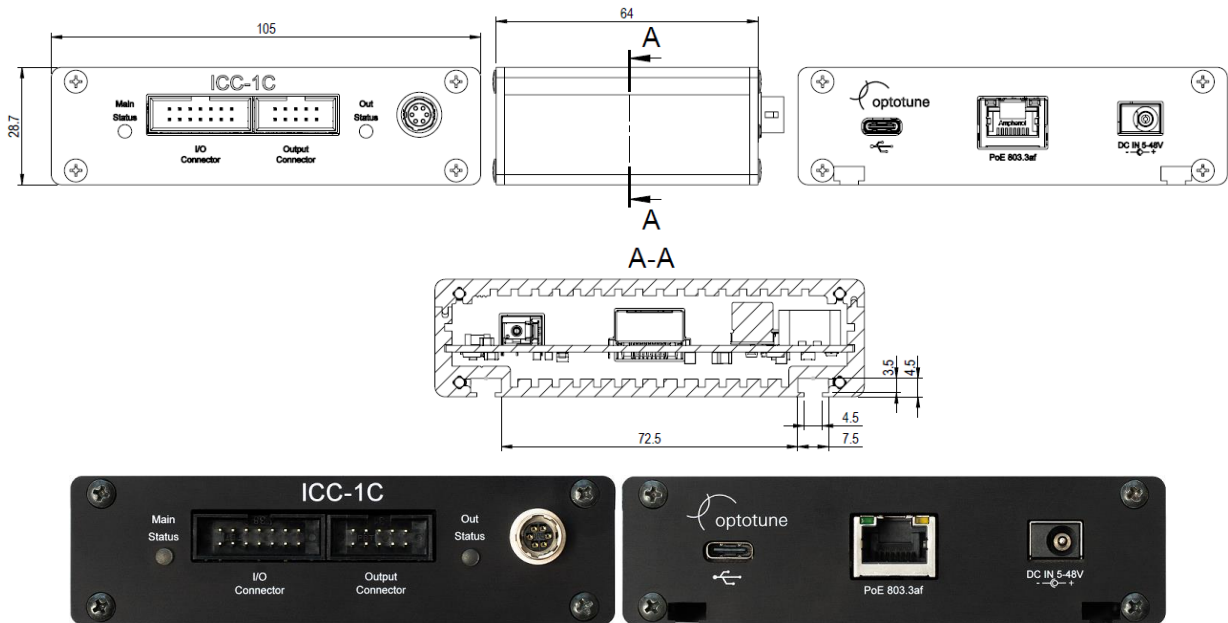


Figure 2: Mechanical dimensions, front and back panel overview of the ICC-1C

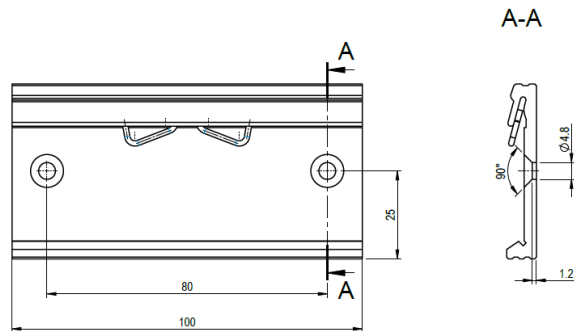


Figure 3: DIN rail adapter

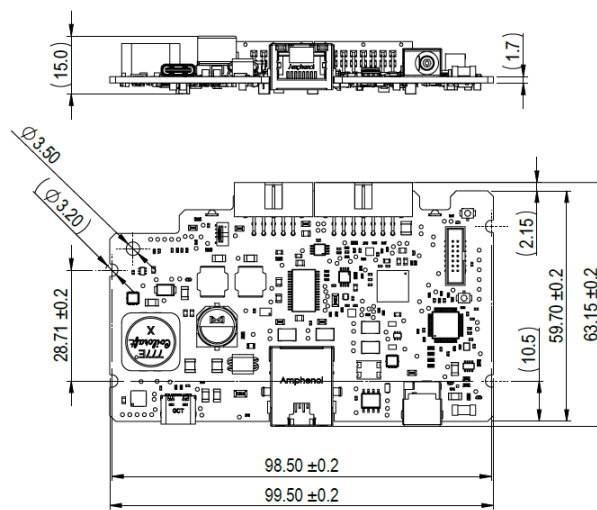
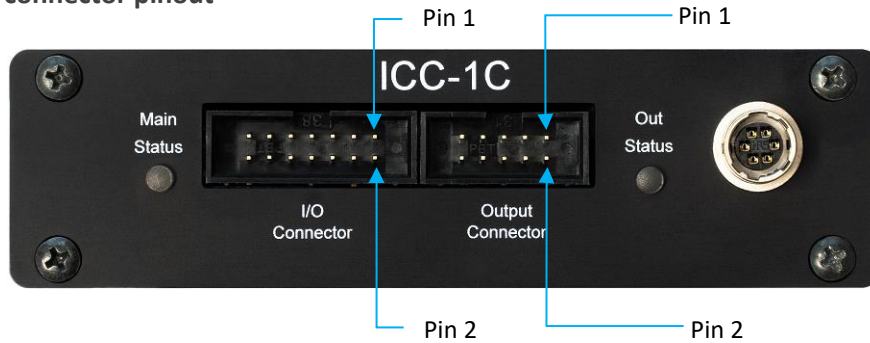


Figure 4: ICC-1C PCBA Controller

Input/Output connector pinout



I/O connector pinout (14-pin)		
Position	Function	Description
1	External VCC pin Enable	Enable signal for using the External power supply pin (connect to External GND to activate)
2	Analog In	Analog Input Voltage
3	Signal GND	Digital and analog ground
4	Signal GND	Digital and analog ground
5	UART TX/ I2C SCL	Serial interface transmitter line / I2C clock line ¹
6	GPIO1	General purpose digital IO #1, Trigger Input/Output ²
7	UART RX/ I2C SDA	Serial interface receiver line / I2C data line ¹
8	GPIO0	General purpose digital IO #0, Trigger Input/Output ²
9	-	Reserved
10	-	Reserved
11	-	Reserved
12	-	Reserved
13	External VCC	External power supply input (alternative to the barrel connector)
14	External GND	External power supply input - ground

¹ configurable external serial interface UART or I2C
² configurable input/output

Output connector pinout (10-pin)		
Position	Function	Description
1	NC	Not connected
2	NC	Not connected
3	VCC	3.3 V supply to the lens or the Extension Board
4	I2C SDA	I2C data line (dedicated to the lens only)
5	GND	Ground for the lens or the Extension Board
6	I2C SCL	I2C clock line (dedicated to the lens only)
7	Device Detect	Lens connected detection signal
8	nWrite CTRL	Lens EEPROM Write control signal
9	Lens (+ pole)	Lens current control – positive polarity
10	Lens (- pole)	Lens current control – negative polarity

Lens connectors pinout



FPC Molex connector		Hirose connector	
Pin	Function	Pin	Function
1	GND	1	Lens (+ pole)
2	Lens (- pole)	2	Lens (- pole)
3	Lens (+ pole)	3	GND
4	I2C SDA	4	VCC (3.3V)
5	I2C SCL	5	I2C SCL
6	VCC (3.3V)	6	I2C SDA

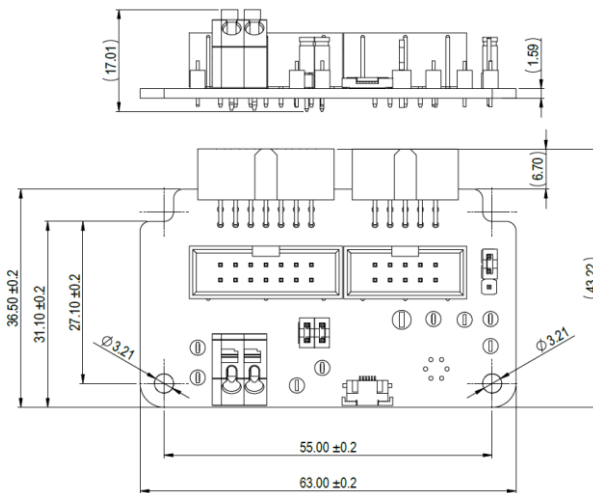


Figure 5: ICC-1C Extension Board

Main status and Out status LEDs

LED	Color	Legend
Main Status	Red	Power on, no connection
	Orange ¹	Operation OK (possible error)
	Green	Operation OK
Out Status	Red	Lens error
	Green	Lens detected; operation OK

¹ mixed from red and green LEDs. Depending on the viewing angle, one color might be more dominant.

Control via analog input

The ICC-1C can be controlled via a dedicated 0-10 V analog input signal. The resolution of the ADC is 16 bits. A specific analog input voltage can be mapped to a specific Current or Focal power (if applicable) of the connected lens. Both linear and non-linear mapping are possible.

For additional information on how to set up the analog mapping, please refer to the detailed ICC-1C Manual or use the Optotune Cockpit software.

Trigger input and output

The ICC-1C has two configurable trigger input/output pins, that can be set up to synchronize with or start the built-in signal generator (Sinusoidal, Triangular, Square, Sawtooth, Pulse, Staircase or Fast autofocus waveforms) or any custom vector.

By default, the trigger signals are configured as outputs. The trigger signal goes HIGH (3.3V, max. 5 mA) at phase 0° of the selected waveform and goes LOW in the middle of the period. For pulse patterns, the trigger signal reflects the duty cycle.

When configured as inputs, the trigger signals can be used to start the built-in signal generator or a preconfigured custom vector. When the trigger input signal goes HIGH (max 3.3V), the selected waveform starts off at phase 0°.

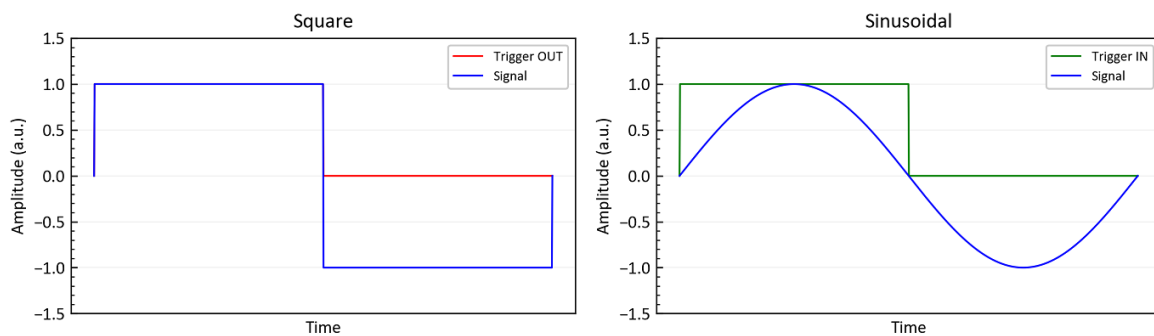


Figure 6: Trigger output and trigger input signal examples

For additional information on how to set up the trigger signals, please refer to the detailed ICC-1C Manual or use the Optotune Cockpit software.

Interface options

The ICC-1C provides multiple options to communicate with a PC or other host systems. To communicate with the controller, a simple ASCII-based communication is available that can be used to control the device via a Serial Terminal, such as Termit or Putty (Baud rate: auto-detected, Data bits: 8, Stop bits: 1, Parity: N), or alternatively via a Telnet Client, if the Ethernet communication is selected and configured. This communication mode provides a simple set of ASCII characters commands and answers to interact with the ICC-1Cs most simple features. The list of the available commands can be found in the detailed ICC-1C Manual (in the UART Communication section).

To access the more advanced features of the ICC-1C, it is possible to use the Pro (binary) mode communication protocol, which provides direct access to the ICC-1Cs register map. This mode of communication is used by the Optotune Cockpit software, by the C# and Python SDKs, and it's also possible to implement it into a microcontroller for direct access through the dedicated UART pins. Additionally, I2C access is also available in this mode. Additional information and examples for each of these communication methods is available in the ICC-1C Manual.

Thermal Safe Operating Area

The ICC-1C can be operated with input voltages between 5 – 48 V and output currents up to 0.5 A, or 0.3 A respectively across the whole ambient temperature range, sufficient to drive any of Optotune’s liquid lens.

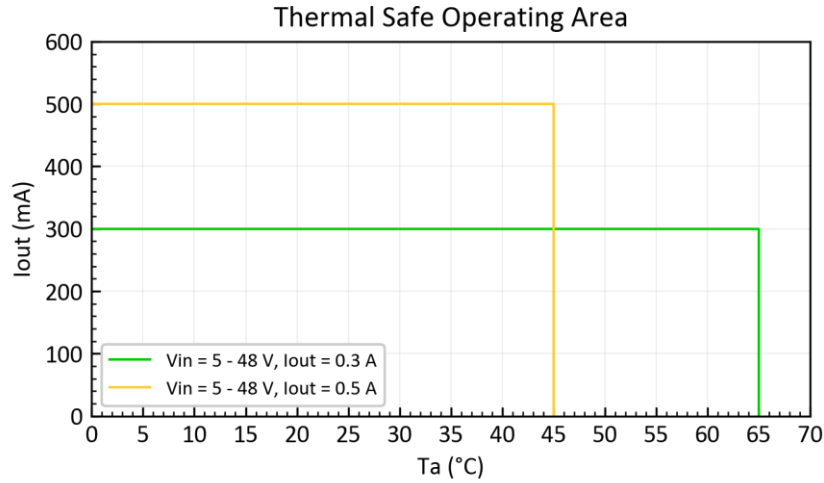


Figure 7: Safe Operating Area of the ICC-1C

Output current thermal stability

The ICC-1C offers output current stability below 0.5 mA across the entire temperature and output current range.

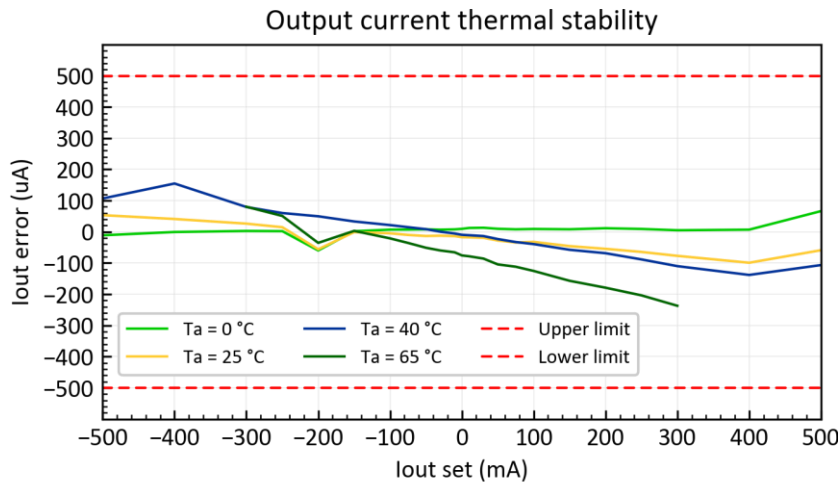


Figure 8: Typical output current thermal stability

Safety and compliance

The product fulfils the RoHS, REACH and CE compliance standards. The customer is solely responsible for complying with all relevant safety regulations for integration and operation.

For more information, please contact sales@optotune.com.

Supporting documentation

- ICC-1C Manual