

High Precision Polarization Controller-USB/RS232

Rotating 3 waveplates, 400-2600nm, turn-key module



DATASHEET

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Features

- Rotation of half wave plates, quarter waveplates
- Rotation of polarizers
- 0.03 degree precision control
- Built-in encoder for closed loop operation
- USB computer control
- User-friendly intuitive GUIs
- SM, PM, MM fiber option
- Free space operation option

Applications

- Automation of multi-polarization state analysis
- Quantum state tomography
- Polarization calibration
- Polarization state analyzer and controller
- Polarized fiber optic source
- Polarization extinction ratio controller
- PM fiber axes conversion
- Optical Interferometric systems
- Laser to fiber coupling and coherent detection

The POLU is a turn-key module, providing precise polarization control with three independently step-motor-driven rotatable waveplates, adaptable for both fiber-coupled and free-space applications across a wide range of operating wavelengths and high optical powers. The POLU is designed to convert incoming light with any polarization state into a specific polarization state on the Poincaré sphere, working together with a polarimeter. With a single or dual rotator configuration using polarizer plates, polarizer prisms, or polarization beam splitters, the POLU functions as a polarizer with sub-degree directional resolution. A high-precision driver with a built-in encoder allows adjustments with accuracy better than 0.03 degrees, managed through an intuitive GUI accessible via USB or RS232. This plug-and-play unit includes a wall-pluggable DC power supply. High-power optics and connectorized fibers are available, and the software and GUI can be customized upon request, with a Python command list also available.

For full-range polarization control on the Poincaré sphere, a typical setup involves placing a $\lambda/2$ plate, $\lambda/4$ plate, and another $\lambda/2$ plate in series. Each plate's orientation determines the polarization transformation: First Half-Wave Plate: Rotates the initial polarization angle. Quarter-Wave Plate: Converts linearly polarized light into elliptical or circular polarization. Second Half-Wave Plate: Further rotates the polarization angle to achieve the desired output state.

This module has two fiber cables extrude out with FC/APC connectors as the default selection.

Specifications

Parameter	Min	Typical	Max	Unit
Wavelength	400		2650	nm
Insertion Loss ^[1]		1	1.5	dB
Rotating	0		360	°
Homing Repeatability	0.05			°
Repeatability	0.1			°
Encode Resolution	0.001			°
Minimum Incremental Motion	0.05			°
Return Loss	50			dB
Response Time			300	ms
Operating Optical Power		0.5	1	W
Operation Frequency	DC		5	Hz
Power Consumption			0.5	W
Power Input	4.5	5	5.5	DCV
Operating Temperature		-5 ~ 60		°C
Storage Temperature		-40 ~ 85		°C

Notes:

- [1]. Excluding connectors. Connectors add 0.3dB.
- [2]. @1550nm

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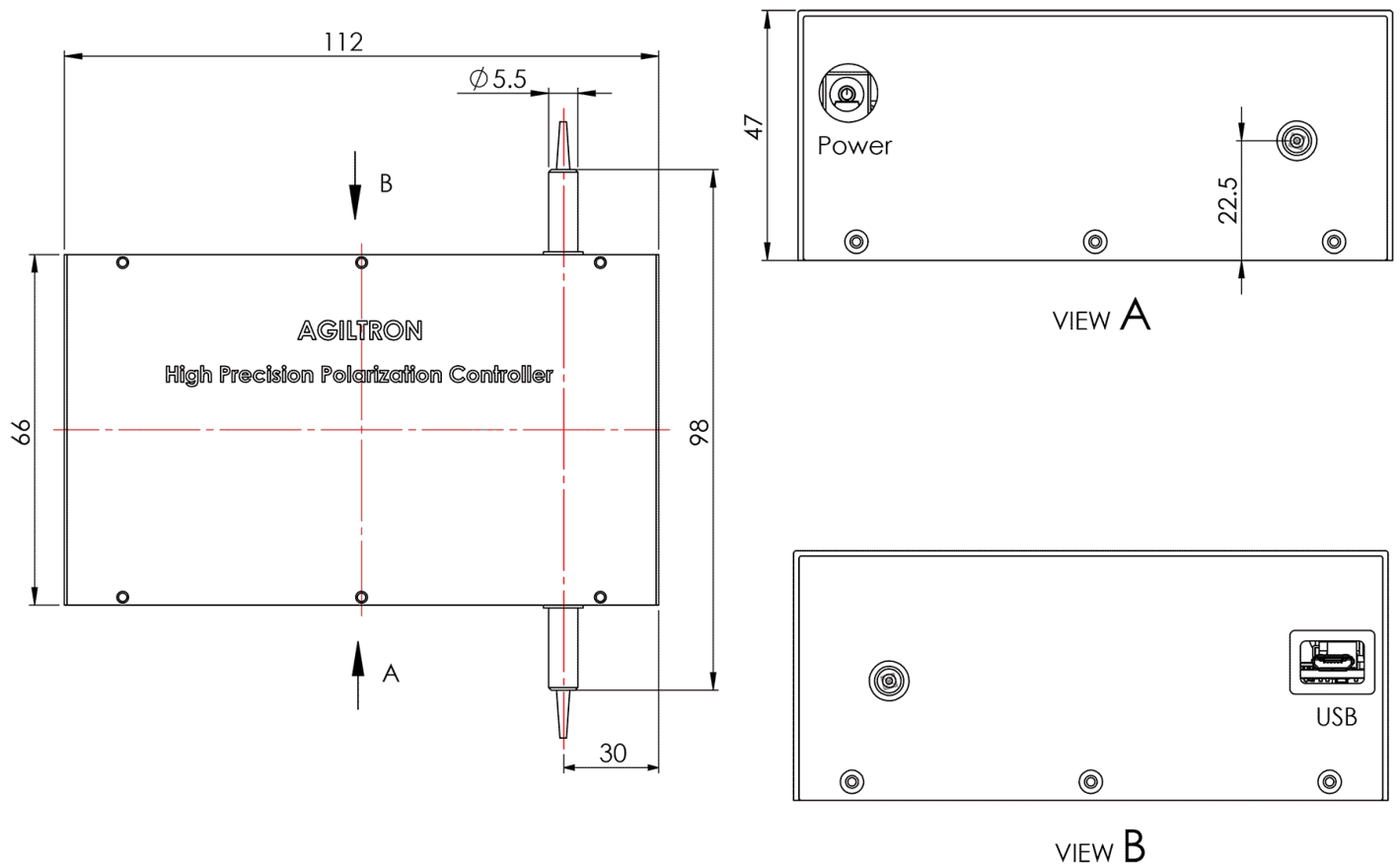
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Mechanical Dimensions (mm)



*Product dimensions may change without notice. This is sometimes required for non-standard specifications.

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Operation Instruction

- Plug in the accompanied power supply
- Connect an input light and output
- Connect to a computer using the accompanied cable
- Load the accompany software (in a memory disk)
- Run the GUI
- Adjust the Wave Plates to Achieve the Desired Polarization State with $\lambda/2$ plate, $\lambda/4$ plate, and $\lambda/2$ plate in series.
 - Initial Setup: Align the wave plates such that the first half-wave plate is at 0° , the quarter-wave plate is at 45° , and the second half-wave plate is at 0° .
 - Fine-Tuning: Rotate each wave plate individually to adjust the polarization state at the output. Rotate the first $\lambda/2$ plate to set the initial linear polarization angle. Rotate the $\lambda/4$ plate to introduce elliptical or circular polarization. Rotate the second $\lambda/2$ plate to achieve the final desired linear polarization angle.

Ordering Information (Part Number) System

Prefix	Wavelength	Stage 1*	Stage 2*	Stage 3*	Interface	Input Fiber	Output Fiber	Fiber Cover	Fiber Length	Connector ^[1]
POLU-	1550nm = 5 1310nm = 3 1060nm = 1 980nm = 9 850nm = 8 Special = 0	1/2 waveplate = 2 1/4 waveplate = 4 Plate polarizer = 5 Glan-Thompson = 6 Special = 0	1/4 waveplate = 4 1/2 waveplate = 2 Plate polarizer = 5 Glan-Thompson = 6 Special = 0	1/2 waveplate = 2 1/4 waveplate = 4 Plate polarizer = 5 Glan-Thompson = 6 Special = 0	USB = 1 RS232 = 2	SMF-28 = 1 Hi1060 = 2 SM980 = 9 SM850 = 8 780HP = 3 SM1950 = 4 Free Space = S 50/125 = M Special = 0	SMF-28 = 1 Hi1060 = 2 SM980 = 9 SM850 = 8 780HP = 3 SM1950 = 4 Free Space = S PM1550 = 5 PM1310 = 3 PM980 = A PM850 = B PM780 = C PM1950 = D 50/125 = M Special = 0	Bare fiber = 1 0.9mm tube = 3 Special = 0	0.5m = 2 1.0 m = 3 Special = 0	None = 1 FC/PC = 2 FC/APC = 3 LC/PC = L Special = 0

* To control polarization in a full range on the Poincaré sphere: select $\lambda/2$ waveplate, $\lambda/4$ waveplate, and $\lambda/2$ waveplate

[1]. The default connector configuration uses fiber with 0.9 mm buffer protection. The connector cannot be installed directly onto bare fiber because the bare fiber is prone to damage during shipping. However, the connector can be assembled on bare fiber if a 3 cm protective loose tube is added for reinforcement. The customer may remove this protective tube after testing. The optical power handling of a standard connector is less than 0.5 W for SMF-28 fiber and decreases further for smaller-core fibers.

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GUI

The screenshot displays the AGILTRON software interface. At the top left is the AGILTRON INC logo. Below it, a section titled 'Connect To Device' contains a dropdown menu currently showing '-Select--', and three buttons: 'Refresh', 'Connect', and 'Read Settings'. A larger section titled 'Motor' contains four rows, each with a label ('Rotator 1' through 'Rotator 4') and a numeric input field set to '0'. Each input field has small up and down arrow buttons on its right side. At the bottom of the 'Motor' section are two buttons: 'Reset' and 'Set'.

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