

Key features and benefits

- 3 functions in a single mainframe:
laser diode controller, three-channel counter and twin single-photon detection module
- Stand-alone unit in a 19" rack system with flexible architecture allowing user-specified configuration
- Used with qutools quED entanglement demonstrator or your home-built photon pair sources
- Simple-to-use device with intuitive front panel controls and easy-to-read graphics displays



The quCR is a stand-alone control and read-out unit for photon pair sources such as qutools' quED. It features a laser diode controller, a counter module and a twin avalanche photodiode detection module.

The laser diode controller combines a low-noise current source with the precise thermoelectric driver. Multiple safety measures including slow turn-on sequence, independent current limit or laser-off short circuit, ensure the safe operation of laser diodes.

The counter with integrated coincidence logic circuit provides direct detection-event frequency counting on two input channels and the analysis of the coincidences on these channels within a given

time window. The three output counting rates are shown in continuous or single-shot operation mode on an easy-to-read LED graphics display or can be monitored via USB connection. A variety of pre-programmed functions are available such as averaging, coincidence-to-single ratio, integration and coincidence time step adjust.

The twin detection module is a self-contained compact unit containing two avalanche detectors operated in Geiger mode for single-photon sensitivity. Based on silicon reach-through photodiode technology the wide spectral responsivity range of 450-1050 nm and high peak detection efficiency of typ. 40% is achieved. The photodiodes are multimode fiber coupled with standard FC/PC optical connectors. The thermoelectric cooling together with the integrated temperature micro-controller ensure stable operation of the detection module despite ambient temperature changes.

Applications

- Laser diode control and frequency counting
- Educational instrument for quantum mechanics lab experiments
- Scientific experiments (coincidence correlation, quantum physics)
- Commercial applications (cryptography, metrology, optical sensing, weak-signal fluorescence)
- General purpose laboratory instrument

Specifications

Laser Diode Controller	
Laser Diode Current Range	0 - 200 mA
Laser Diode Setpoint Current Resolution	1 mA
Max. Output Power	1 W
Temperature Control Range	10 - 30 °C
Temperature Adjustment Accuracy	0.1 °C
TEC Current/ Voltage	3A/ ± 5 V
Supported Temperature Sensor	NTC Thermistor 10 kΩ
Three-channel Counter	
Max. Count Rate (per channel)	1 MHz (LED Display) 10 MHz (USB)
Integration Time Range	0.1 - 10 s
Coincidence Gate Time Range	8 - 32 ns
Logic Input/ Output Pulse	TTL and NIM
Remote Counter Interface	USB (Control and Read-out)
Twin Detection Module	
Spectral Range	450 - 1050 nm
Peak Detection Efficiency (@ 800 nm)	30 % (typ. 40 %)
Dark Count Rate (per channel)	1500 (typ. 500) cps
Dead Time	approx. 1 μs
Supply Voltage/ Max. Current	12 V/ 1.5 A
Output Pulse Width	40 ns
Fiber Type	Multimode Graded Index 62.5 μm
General Characteristics	
Power Requirements	90 to 264 VAC; 47 - 63 Hz
Dimensions (H x W x D)	135 x 450 x 344 mm