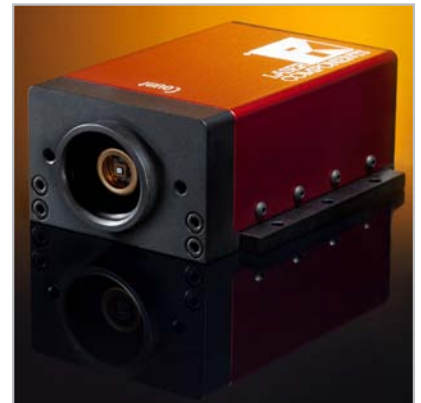


Single Photon Counting Module

Description

Laser Components' COUNT series of Single Photon Counting Modules has been developed to offer a unique combination of high quantum efficiency, wide dynamic range and ease of use for photon counting applications. Combining LASER COMPONENTS' ultra-low-noise VLoK silicon avalanche photodiode with specially developed quenching and signal processing electronics from PicoQuant GmbH, the module offers everything needed for single photon detection from 400 – 1000 nm. Incoming photons generate corresponding electrical pulses which may be conveniently read out at the TTL output. The gating function allows the module to be disabled between measurements to provide protection against accidental overload. The optional FC connector provides a convenient method for connecting the module to the sample using a multimode optical fiber. As an additional option, modules optimised for timing resolution are also offered (data sheet is available upon request).



Features

- Extremely low dark count rates
- Detection efficiency > 70%
- Optional FC fiber connector
- Single 12 V DC supply operation
- Stable count rate (no bi-stability)

Applications

- Confocal microscopy
- Particle sizing
- Fluorescence analysis
- LIDAR
- Astronomy



Technical Specifications for COUNT Module

Parameter	Min.	Typ.	Max.	Unit
Spectral range	400		1000	nm
Dark count rate COUNT-20C COUNT-50C COUNT-100C COUNT-250C			20 50 100 250	Counts/s Counts/s Counts/s Counts/s
Photon detection efficiency Pd ¹ at: 405 nm 670 nm 810 nm	5 60 40	15 70 50		% % %
Pd variation at constant temperature		TBC		%
Active area diameter (nominal) ²		100		µm
Timing resolution ³		800		ps
Afterpulsing probability ⁴		0.5	1	%
Dead time	47	55		ns
Gating input voltage Gating on (= disable module) Gating off (= enable module)		TTL low (<0.5) TTL high (>2.4)		V V
Gating input response time Gating on (= disable module) Gating off (= enable module)		20 85	40 100	ns ns
TTL output pulse length		25		ns
TTL output pulse amplitude (into 50 Ohm)		3		V
Delay between photon impact and TTL pulse		50		ns
Supply voltage	11.5	12.0	12.5	V
Supply current (switch on)		1.5		A
Supply current (operation at 1 Mcps)		0.2		A

¹ Specifications valid for modules without FC-connector

² The active area of the integrated Si-APD is larger than 100 µm.

The FC-version is optimised for optical fibers with core diameter <105 µm. The pre-aligned GRIN lens focuses the light onto a spot of <70 µm diameter in the centre of the detector. Please also see Fig. 2 and 3.

³ Timing resolution depends on count rate and wavelength. Modules specifically optimised for timing resolution are also available

⁴ Defined for a time interval of 4 µs

Absolute Maximum Ratings

	Min.	Typ.	Max.	Unit
Supply voltage	11.5	12.0	12.5	V
Operating temperature	10		40	°C
Storage temperature	-20		70	°C
Count rate			5	MCOUNTS/s

Fiber Connection Option

The COUNTXX-FC has a FC-style fiber-optic receptacle pre-aligned to the optical detector surface. The standard GRIN lens used in this assembly is optimized and AR-coated for the range 400 – 700 nm. Please contact LASER COMPONENTS or its authorised distributor if your application requires optimisation for a longer wavelength.

Optical Fiber Shielding

To avoid stray light impinging on the detector and affecting the count rate, any optical fiber assembly attached to the FC connector must be completely opaque. LASER COMPONENTS offers suitably shielded optical fiber assemblies, please contact us for details.

Gating Function

The COUNT module features a gating input provided as standard. This can be used for viewing a signal that occurs only in a small timeframe window, or in applications with very weak signals and higher background. The output of the module is disabled when a TTL low level is applied to the gate input. Applying a TTL high level will enable the module and permit photon detection. If the gate input is left unconnected, the module is enabled by default.

Saturation

The photon count rate rolls off at high incoming light levels. The count rate at which the output starts to decrease is called the saturation point. The control electronics feature a built-in current limiter designed to prevent damage to the APD when exposed to high light levels. Precautions should however be taken to avoid prolonged exposure excessive light levels that may damage the COUNT module.

Warranty

A standard 12-month warranty following shipment applies. Any warranty is null and void if the module case has been opened. Warranty is void if the module input exceeds 12.5 V.

ESD Information

Modules should only be handled at an ESD-safe work station.

Individual Module Test Data

Each module is supplied with test data indicating the module's actual dark count, dead time, photon detection efficiency @ 405 nm, 670 nm and 810 nm and afterpulsing probability.

Safety

The COUNT-Series contains a high voltage power supply. Users may be injured if the case is opened. All internal settings are pre-set; there are no user adjustments.

Units that appear defective or have suffered mechanical damage should not be used because of possible electrical shorting of the high voltage power supply. Opening the case may damage sensitive components and expose the user to the risk of electrical shock. Please contact factory for repairs.



RoHS Compliance

The COUNT-Series is designed and built to be fully compliant with the European Union Directive 2002/95/EC.

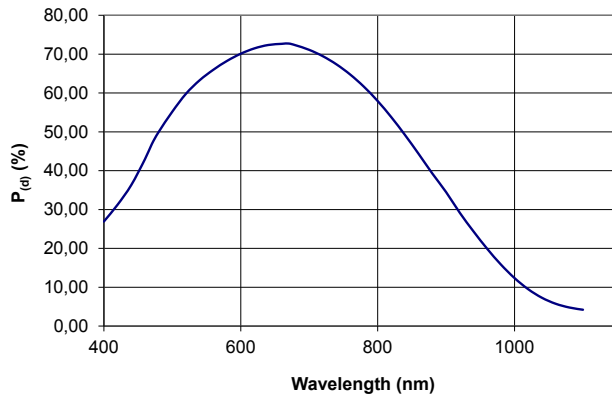


Fig. 1: Typical Photon Detection Efficiency (P_d) vs. Wavelength

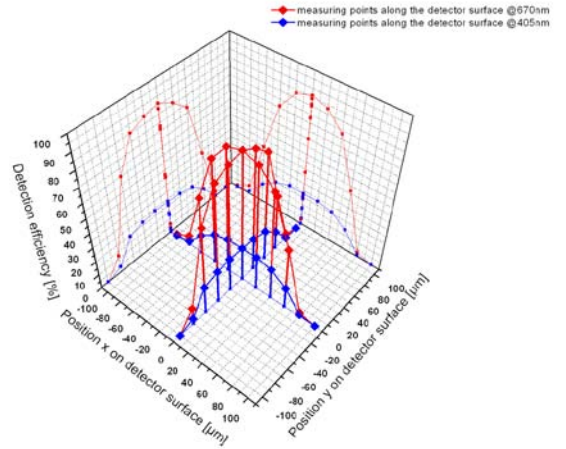


Fig. 2: Typical P_d scan

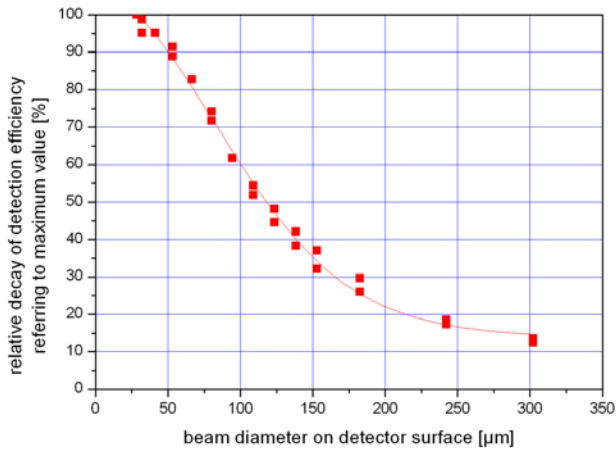
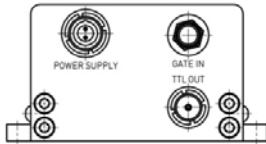


Fig. 3: Beam diameter on detector surface vs. relative intensity of P_d referring to maximum value

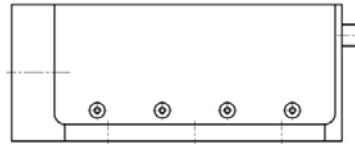
Package Drawings

Window Version

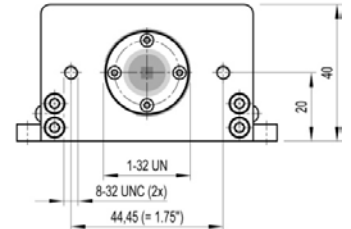
Rear



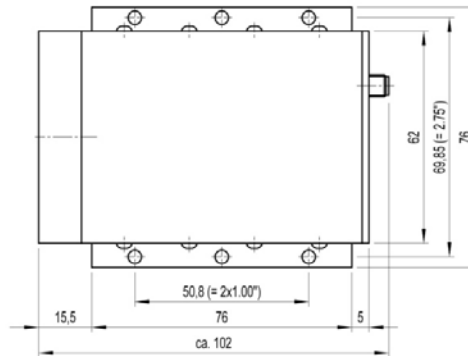
Side view



Front



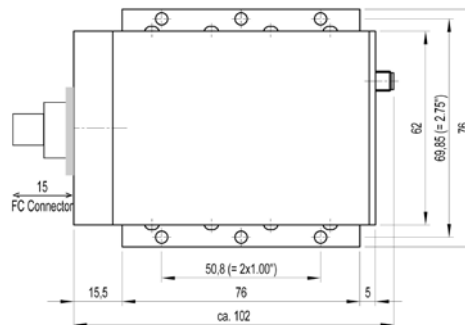
Top view



Optical distance from top of window to active area plane: typ. 1.35 mm
 Dimensions in mm

Fiber Connector Version

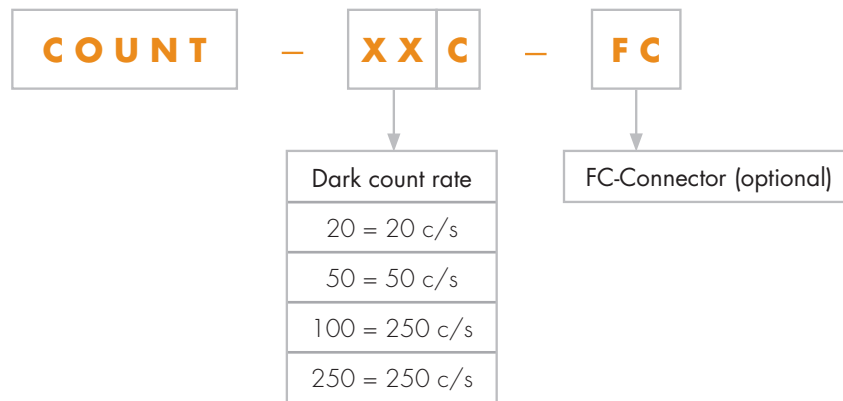
Top view



Interface Information

- Power Supply: LEMO connector, item number FGG.OB.302.CLAD42 (optional COUNT power supply is available upon request).
- Gate input: SMA connector
- TTL output: LEMO connector, compatible with LEMO/BNC adapter ABF.00.250.CTCE31. An optional cable with the appropriate LEMO connector at one end and BNC connector at the other is available upon request.
- Optical input (FC connector version): compatible with standard FC/PC-connector, suitable for fiber core diameters up to 105 μm .

Product Number Designations



Fiber Number Designations

Part number	Fiber Type	Connector Type	Diameter			Numerical Aperture
			Core	Cladding	Outer	
COUNTFP-050-FC-FC-2	Multimode	FC/PC // FC/PC	50 μm	125 μm	1.8 mm	0.20
COUNTFP-050-FC-SMA-2	Multimode	FC/PC // SMA	50 μm	125 μm	1.8 mm	0.20
COUNTFP-062-FC-FC-2	Multimode	FC/PC // FC/PC	62.5 μm	125 μm	1.8 mm	0.275
COUNTFP-062-FC-SMA-2	Multimode	FC/PC // SMA	62.5 μm	125 μm	1.8 mm	0.275
COUNTFP-100-FC-FC-2	Multimode	FC/PC // FC/PC	100 μm	140 μm	1.8 mm	0.29
COUNTFP-100-FC-SMA-2	Multimode	FC/PC // SMA	100 μm	140 μm	1.8 mm	0.29

Product Changes

LASER COMPONENTS reserves the right to make changes to the product(s) or information contained herein without notice. No liability is assumed as a result to their use or application.

Ordering Information

Products can be ordered directly from LASER COMPONENTS or its representatives. For a complete listing of representatives, visit our website at www.lasercomponents.com

Custom designed products are available on request.