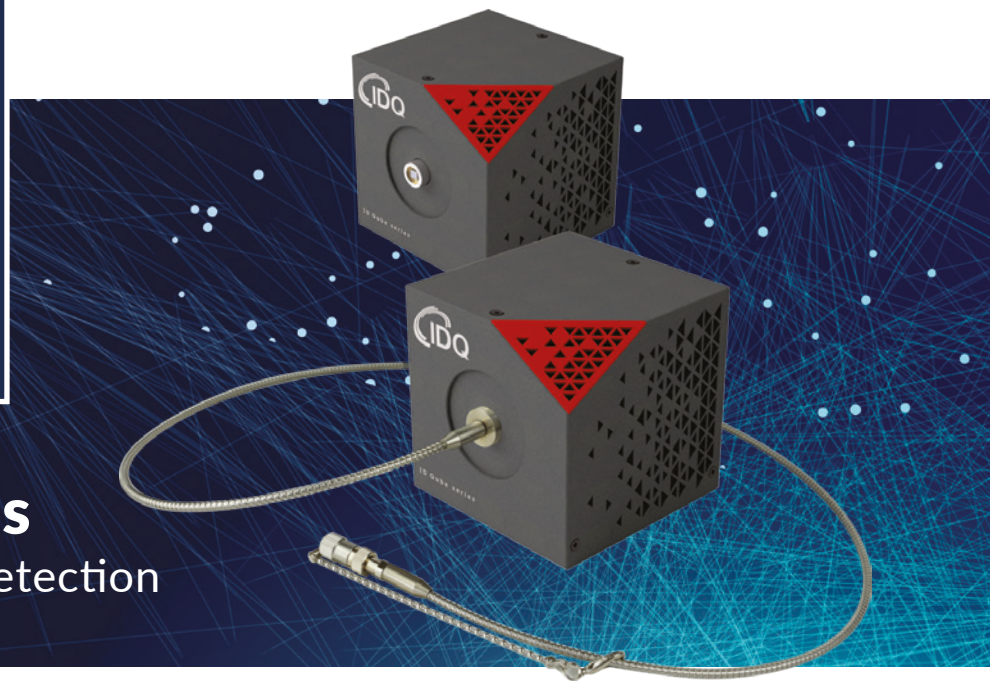
Make every photon count



ID Qube Series

NIR Single Photon Detection

Synchronous and Asynchronous
Single-Photon Detection at Telecom Wavelengths

The ID Qube is a cost effective solution delivering precise and reliable single photon detection, with high detection efficiency, precise timing jitter and low detector noise. Available in two models:

- **The ID Qube NIR Free-Running** model, for applications in which asynchronous photon detection is essential, such as photon correlation or time of flight measurements.
- **The ID Qube NIR Gated** model, for applications in which synchronous photon detection is essential, such as quantum communication and QKD.

All models offer a gate input port connector, dedicated to avoiding saturation or undesired detections. The cooled InGaAs/InP avalanche photodiode and associated electronics have been designed to achieve especially low afterpulsing and dark count rates.

Get the best out of your photonic experiments and applications with the ID Qube NIR Series today.

KEY FEATURES

- **Compact, cost effective and dependable performance**
- **Fast gated** (up to 100 MHz) and **free-running**
- **Ultra-low noise** (<800 cps at 10%)
- **Low jitter** (<200 ps, typically <150 ps)
- **Free space or Fibre-coupled optical input**
- **Broadband detection** (900–1700 nm)

APPLICATIONS

- QKD and quantum communication
- Quantum optics and computing
- Single-photon source characterisation
- Fluorescence lifetime imaging
- Failure analysis of integrated circuits
- VIS, NIR and MIR spectroscopy

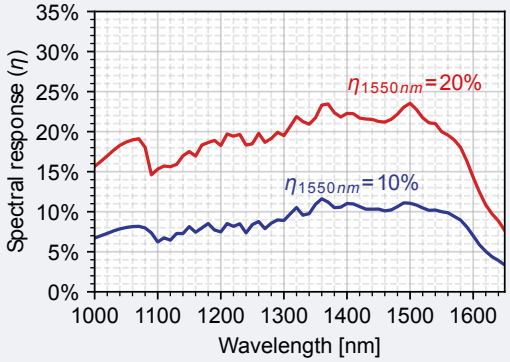
AVAILABLE IN EIGHT COMBINATIONS

ID Qube-NIR-*XX*-*YY*-*ZZ*

- ***XX*** : **GAT** *(Gated model)* or **FR** *(Free running model)*
- ***YY*** : **FS** *(Freespace model)* or **MMF** *(Fibre coupled model, compatible with SMF and MMF FC/PC couplers)*
- ***ZZ*** : **STD** *(Standard noise model)* or **LN** *(Low noise model)*

Broadband performance

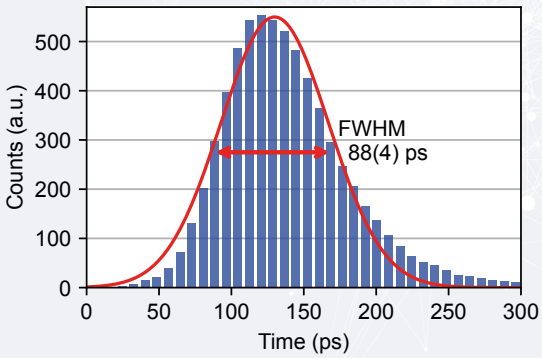
High system detection efficiency (SDE) across a broad range, characterized with equipment carefully calibrated by METAS.



(Above) Spectral response measurement for a typical ID Qube NIR device.

High precision

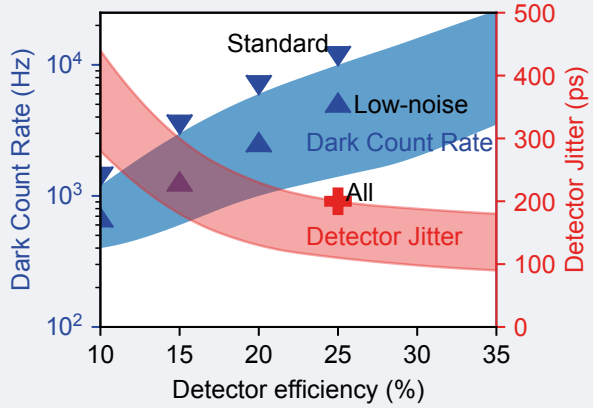
See the best timing resolution with the lowest detection timing jitter.



(Above) Timing jitter measurement of an ID Qube NIR detector at 30% SDE, including all other instrument jitter contributions, recorded with an ID1000 Time Controller.

Low noise

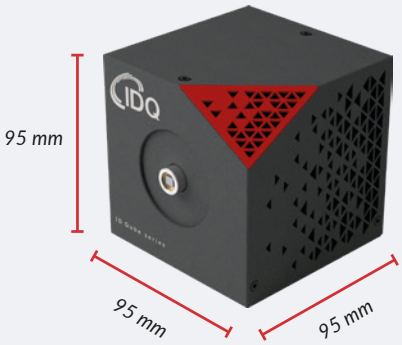
Always few dark counts with our Standard Qube models, and even better with the Low Noise model.



(Above) Dependence of detector noise and timing jitter with SDE. Users have the ability to balance the SDE, noise and precision to best fit their needs.

Compact

The ID Qube's small and compact form factor fits well into your experiments, and ideally suited for applications such as LiDAR, where compactness is key for system integration.

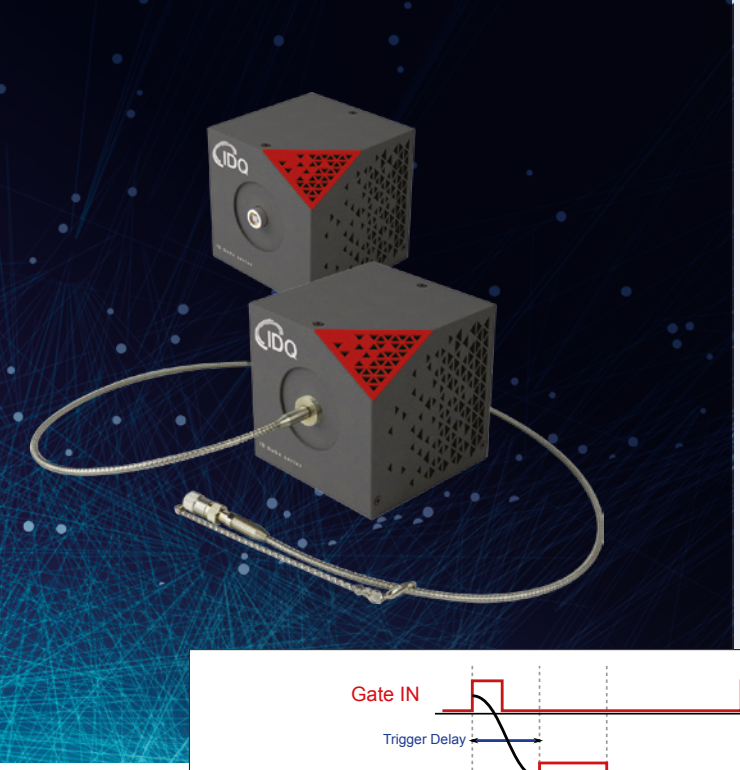


GATED AND FREE-RUNNING DETECTION AT TELECOM WAVELENGTHS

The ID Qube has been specially designed to achieve low dark count and afterpulsing rates.

The ID Qube NIR can operate at six detection efficiency levels[1][2] of 10%, 15%, 20%, 25%, 30% and 35% with a deadtime between 100 ns and 80 µs. In gated mode it accepts gates as short as 3 ns (500 ns for the Freerunning model) with a maximum repetition frequency of 100 MHz (1 MHz for the Free-running model).

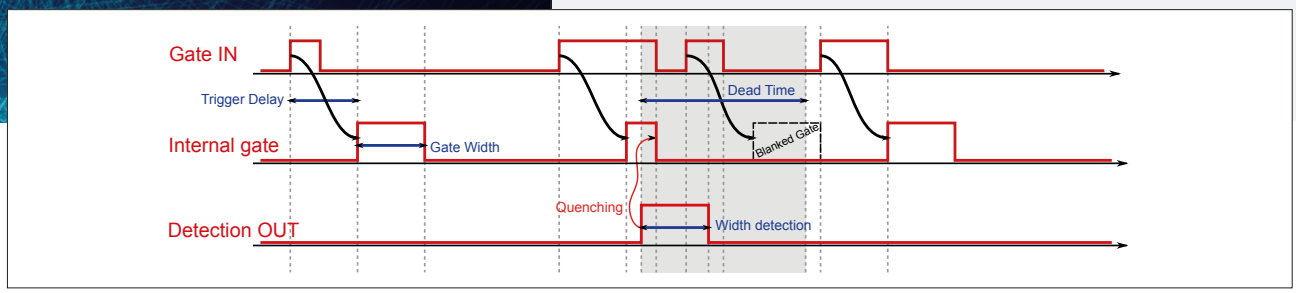
The arrival time of photons is reflected by a 10 ns LVTTL/NIM (user-selectable) pulse available at the SMA connector with a timing resolution typically as low as 150 ps at 25% efficiency. A simple USB interface allows the user to set the efficiency level and the deadtime.



GATED OPERATION

Detector gating — fast switching of the detector response — is achieved through an external electrical pulse source, such as an ID1000 Time Controller. Both models of the ID Qube NIR can be gated, with slow (maximum 1 MHz) gating of the ID Qube Free-running vs the fast (maximum 100 MHz) gating with the ID Qube Gated model.

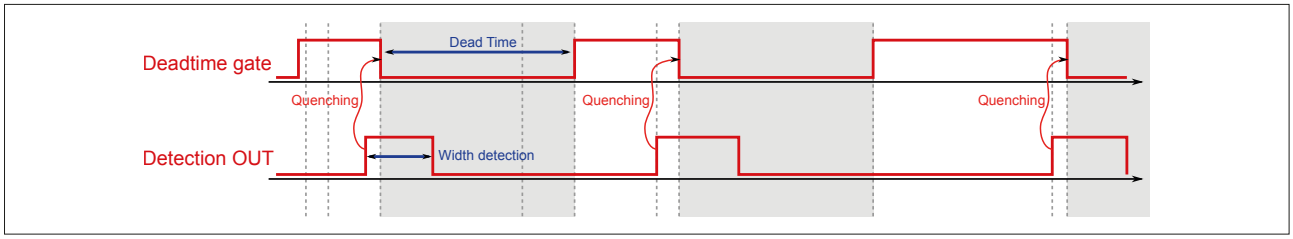
The ID Qube NIR Gated allows for high-speed synchronisation with external signals, such as in a fluorescence microscopy setup, while the slower gating of the ID Qube Free-running still proves useful for mitigating background noise.



(Above) Detector operation in Gated mode. Outside of a gate pulse, the ID Qube is insensitive to photon arrivals. In the case of small gate widths, the Gate IN signal can be used to trigger an internal adjustable-width gate. Whichever mode chosen, a photon-induced avalanche event inside a gate generates an electrical pulse, sent to the Detection OUT connector as a user's photon detection event signal. The quenching electronics then close the gate, halting the avalanche, while a user-adjustable deadtime is applied.

FREE-RUNNING OPERATION

All ID Qube NIR models can also be operated in free-running (asynchronous) mode. The APD is biased above its breakdown voltage in the so-called Geiger mode. Upon a photon absorption of a photon and the associated avalanche, the photon arrival time is reflected by the rising edge of a 10 ns-wide LVTTL/NIM pulse at the Detection OUT connector.



Both ID Qube Gated and ID Qube Free-running models are designed for fast avalanche quenching, strongly limiting after-pulsing (where additional 'false' detections are triggered by the tail of a 'real' detection pulse). This allows for even shorter deadtimes, increasing the maximum count rate without sacrificing performance.

TIME CONTROLLER SERIES BUNDLE

Take your experiment to the next level. Use the ID1000 Time Controller to register single-photon pulses and control the gates of up to five ID Qube detectors, within a combined time-tagger, pulse generator, delay generator package. All with advanced on-board logic for real-time four-fold coincidence measurements.

SPECIFICATIONS

ID Qube NIR Series				
Wavelength range	900 nm to 1700 nm			
Deadtime range	100 ns to 80 µs, in 100 ns steps			
Output pulse format	LVTTL or NIM			
Output pulse width	10 ns			
Optical coupling	Free space or optical fibre (MMF62.5)			
Efficiency range [1] calibrated at λ = 1550 nm	10%, 15%, 20%, 25%			
Extended efficiency range [2]	30%, 35%			
Timing jitter @ 25% efficiency level	Maximum 200 ps (150 ps typical)			
Noise performance @ efficiency level [3]	10%	15%	20%	25%
STD model (Max. dark count rate)	1.2 kHz	3 kHz	6 kHz	10 kHz
LN model (Max. dark count rate)	0.8 kHz	1.5 kHz	3 kHz	6 kHz
Gate-in max frequency	100 MHz (Gated model) / 1 MHz (Free-running model)			
Gate-in min pulse duration	3 ns (Gated model) / 500 ns (Free-running model)			
Gate-in voltage range	-2 V to 3 V			
Gate-in coupling	50 Ω DC			
Gate-in threshold voltage range	-2 V to 2 V, in 1 mV steps			
Output connector	SMA			
Operating temperature	+10°C to +35°C, max. 60% humidity			
Dimensions (W x H x L)	95 mm x 95 mm x 95 mm			
Weight	1 kg			
Cooling time @ power-on	< 3 minutes			
Power supply	100-240 VAC ; 1.4 A ; 50-60 Hz			
Storage temperature	+5°C to +50°C, max. 60% humidity			

Supplied Accessories:

- +12V, 60 W, AC/DC power adapter, with AC power cord
- Region adapted power cord
- 1.8 m USB cable
- Optical fibre cleaner (fibre-coupled model)
- C-mount adapter (free space model)
- Optical table mechanical adapter (M4 taps)
- 4 x Adhesive rubber feet

Notes:

(1) Additional efficiency levels can be calibrated on demand.

(2) The extended detection range is provided without guarantees of the device's noise performance. Above 25% efficiency, ID Qube devices start exhibiting non negligible afterpulsing, and detector dark counts can rise significantly. However, detector timing jitter has also been observed to improve with increasing detection efficiency.

(3) Dark count rate measured in free running mode with a 50 µs deadtime.

Applicable Standards

Safety US: UL 61010-1:2012 (3rd Ed.), AMD1
Safety CAN: C22.2 No 61010-1:2012 + U1:2015 + U2:2016 AMD1:2018

CE **Safety:** EN 61010-1:2010, AMD1:2016
EMC: EN 55032:2015, EN 55035:2017, EN 61326-1:2013

FC Title 47 Part 15:2019 Subpart B as a Class B device

IDQ

WORLD HEADQUARTERS

ID QUANTIQUE SA
Rue Eugène-Marziano 25
1227 Acacias/Geneva
Switzerland

www.idquantique.com | info@idquantique.com

SALES OFFICES AND ENGINEERING LABS

Switzerland Geneva | **USA** Boston, MA | **South Korea** SungNam-si