

## Redefining Measurement

# ID Qube Series - NIR Free-Running version

Asynchronous Single-Photon Detection at Telecom Wavelengths

### COMPACT & COST-EFFECTIVE

The ID Qube NIR Free-Running brings a major breakthrough for single-photon detection in free-running mode at telecom wavelengths.

It provides a cost-effective solution for applications in which asynchronous photon detection is essential such as photon correlation or time of flight measurements. Moreover it is especially suited for applications such as Lidar where compactness is strongly required.

The detector offers a gate input port connector dedicated to avoid saturation or undesired detections. The cooled InGaAs/InP avalanche photodiode and associated electronics have been specially designed to achieve low dark count and afterpulsing rates in free-running mode.

The device is available in free-space or fibre-coupled version (MMF62.5) compatible with both SMF and MMF62.5 fibre.



### Applications



Quantum communication



Quantum physics and optics



Time of flight measurement  
(OTDR, LIDAR)



Fluorescence Lifetime measurements

### Key Benefits



Compact & cost-effective



Optimised for free-running operations



Ultra low noise (800 cps at 10%)



Low jitter (150 ps)

## Free-running mode at telecom wavelengths

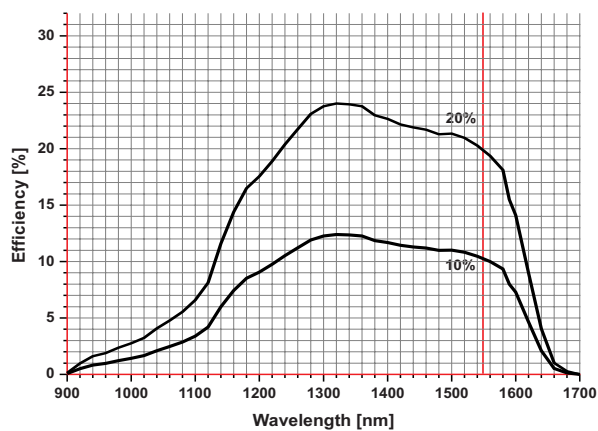
The ID Qube has been especially designed to achieve low dark count and afterpulsing rates in free-running mode.

The ID Qube NIR Free-Running can operate at three detection probability levels of 10%, 15% and 20% with a deadtime between 1  $\mu$ s and 25  $\mu$ s. The arrival time of photons is reflected by a 100 ns LVTTTL pulse available at the SMA connector with a timing resolution as low as 150 ps at 20% efficiency. A simple USB interface allows the user to set the efficiency level and the deadtime.

### EFFICIENCY

The calibration is carefully made in house using equipment calibrated by the swiss metrology institute (METAS).

Efficiency versus wavelength

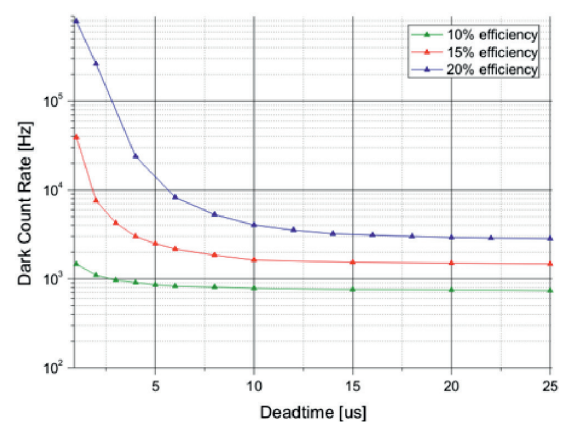


### DARK COUNT RATE

The dark count rate strongly depends 2 settings: efficiency and deadtime. By playing with the 2 settings, it is possible to optimize efficiency, afterpulsing and dark count rate for each dedicated experiment.

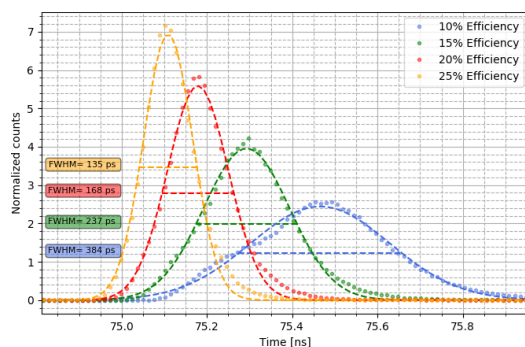
Dark count versus deadtime

(for illustration only)



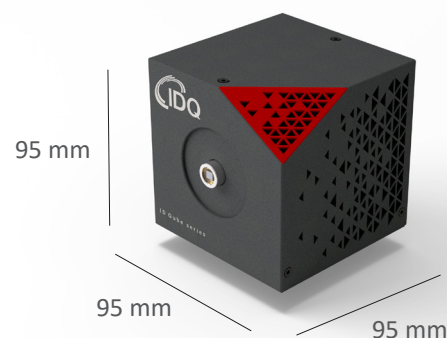
### LOW JITTER

The jitter of a SPAD strongly improves with its quantum efficiency as shown on the curve below. The ID Qube NIR Free-Running offers a best-in-class jitter of 150 ps at 20% efficiency at 1550 nm. The here below represented jitter figures may vary from diode to diodes. Note that the 25% efficiency setting is only available with the ID Qube NIR Gated version.



### COMPACT

The ID Qube is very small and suited for applications such as LiDAR where compactness is strongly required.

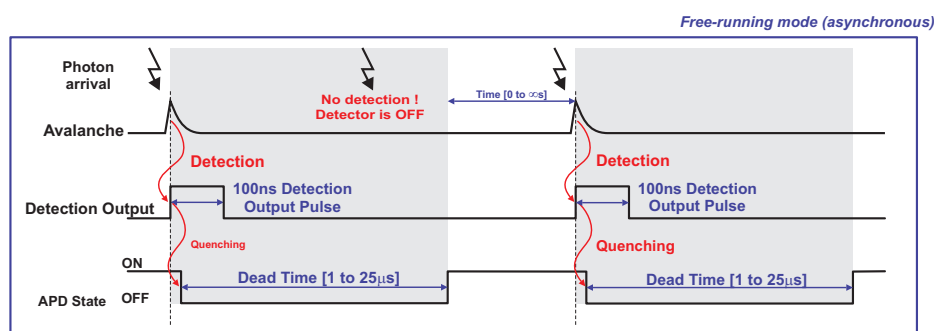


## Compact

The ID Qube is specially suited for applications such as Lidar where compactness is strongly required.

## PRINCIPLE OF OPERATIONS

In contrast with usual gated operations of detectors based on InGaAs/InP avalanche photodiodes (APDs), the ID Qube-NIR-FR operates in free-running (asynchronous) mode. The APD is biased above its breakdown voltage in the so-called Geiger mode. Upon photon absorption, the photon arrival time is reflected by the rising edge of a 100 ns width LVTTTL pulse at the output. The ID Qube NIR Free-Running has been designed to provide a fast avalanche quenching, thus limiting the afterpulsing rate. This allows the operation at reasonably short deadtimes of values that can be optimized depending on the applications and the efficiency level.



## USER FRIENDLY SOFTWARE

The ID Qube NIR Free-Running comes with an intuitive software that allows the user to set the efficiency level and the deadtime through a simple USB interface.

The module can also operate disconnected from the PC. The settings are reloaded upon each power up.

## BUNDLE ID900 TIME CONTROLLER

Take your experiment a step further. Operate the ID Qube with the ID900 Time Controller, IDQ's central platform which combines the functionalities of a time-tagger, delay and pattern generator.

It is even possible to generate conditional pulses thanks to the unique computing capabilities of the Time Controller.



The ID Qube Series exists in 2 versions: ID Qube NIR Free-running and ID Qube NIR Gated  
More info: [www.idquantique.com](http://www.idquantique.com)



# ID Qube NIR Free-Running

## PRELIMINARY SPECIFICATIONS

Parameter				Units
Wavelength range		900 - 1700		nm
Deadtime range		0.1 - 100		μs
Deadtime step		100		ns
Output pulse voltage		LVTTTL / NIM		
Output pulse width		100		ns
Optical fibre coupling		MMF62.5 or free-space		
Efficiency range calibrated at λ=1.55 μm		10, 15 or 20		%
Timing resolution (FWHM) at 20% efficiency		150		ps
Dark count rate at (efficiency)	10	15	20	%
STD	1.2	3	6	kHz
LN	0.8	1.5	3	kHz
Gate-in max frequency		TBD		
Gate-in min pulse duration		1		ns
Gate-in voltage range		-2 to 2		V
Gate-in coupling		DC		
Gate-in threshold voltage range		-2 to 2		V
Gate-in threshold voltage resolution (steps)		1		mV
Output connector		SMA		
Optical connector		FC/PC pigtail		
Operating Temperature		+10 to +35		°C
Dimensions		95 x 95 x 95		mm
Weight		1		kg
Cooling time		5		min
Power supply				
Input voltage		90~264VAC - 135~370VDC		
Frequency range		47~63		Hz
AC current		1.4A / 115VAC 1A / 230VAC		

Supplied Accessories
60W AC/DC +12 V green power adapter
Power cable
1.8 m USB cable
Optical fibre cleaner
User guide on USB key

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