



# TBX-04



## Picosecond photon counting made easy

The IBH TBX-04 is a miniature, fully-integrated, single-photon detection module containing all the electronics necessary to detect single photons with picosecond accuracy.

This groundbreaking new product contains a fast rise-time photomultiplier (PMT), wide bandwidth pre-amplifier, high-speed constant fraction discriminator (CFD) and high voltage supply, all in one compact package.

Each module is individually calibrated in our factory to achieve optimum performance and requires no user adjustment. All settings are stored in non-volatile memory and can be accessed and modified using the optional PC-interface kit.

For added flexibility, the PMT detector gain can be gated using an external switch or transistor (e.g. interfaced to the lid of your sample compartment). This useful feature protects the PMT if it is likely to be exposed to ambient light. Fast-NIM and TTL-compatible outputs are both provided. All **you** need to supply to start counting with the TBX-04 is some photons!

The TBX-04 features a typical timing jitter of less than 180ps FWHM (we guarantee a timing walk of 250ps or better). Such impressive performance is normally associated with fragile Microchannel Plate (MCP) PMTs costing many times more than the TBX-04.

The TBX-04's casing is machined from solid metal and gold-plated to achieve the highest level of RF shielding. Optical coupling is via a threaded tube which allows the focusing of incident light to be easily optimised while effecting a light-tight seal. This thread is compatible with the versatile Spindler & Hoyer Microbench system, and we can supply custom couplings to meet your requirements.

There are a number of different options and accessories available for the TBX-04, including cooled and uncooled red-sensitive versions. These are described overleaf.

The TBX-04 is unique product available only from the company with a Lifetime in Fluorescence.



- ▶ **<180ps typical timing jitter**
- ▶ **compact and easy to use**
- ▶ **Factory preset operation - apply power and start counting**
- ▶ **Fully integrated - no additional discriminators or HV required**
- ▶ **NIM & TTL compatible timing outputs**
- ▶ **Gold plated electromagnetic shielding**
- ▶ **External gate input and PC-interface option**

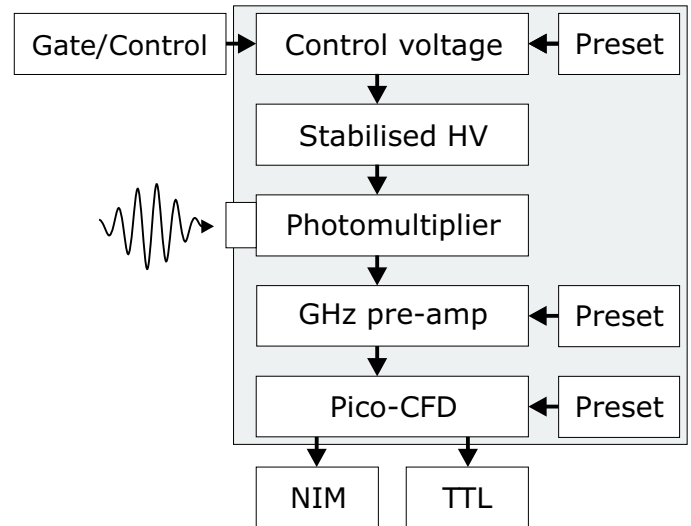
# How does it work?

Precision photon-counting systems for time-domain applications require a number of functional blocks including photomultiplier detector, high voltage (HV) power supply, pre-amplifier, and constant-fraction discriminator (CFD) with appropriate logic outputs. These functions are normally provided using discrete modules from a variety of manufacturers, requiring careful integration and optimisation.

The TBX-04 integrates all of these functions in one easy to use module which doesn't require any set-up at all to use. All internal components are mounted on a single PCB, maximising both timing performance and noise immunity.

The detector gain can be gated by applying an external signal to the Gate input, and the on-board settings can be re-programmed using the optional PC-interface kit.

Unlike photon-counting modules available elsewhere, the TBX-04 contains a GHz pre-amplifier and pico-CFD to obtain the lowest timing jitter available, and the incorporation of a high quality regulated HV source ensures stable operation even during lengthy measurements.



## Typical applications

- ✓ Time-resolved fluorescence detection
- ✓ Chemiluminescence and bioluminescence detection
- ✓ Photon correlation spectroscopy
- ✓ LIDAR
- ✓ Particle sizing
- ✓ Optical tomography of biological tissue
- ✓ Adaptive optics
- ✓ Microscopy
- ✓ General purpose photon counting and low light level detection

## Options and accessories

### TBX-04-A Single photon detection module (standard)

Timing walk	250ps FWHM or better (<180ps typical)
Spectral response	185nm to 650nm
Dark count rate	<80cps (<20cps typical)
Active area	9mm diameter
Power requirements	±15V (power supply available - see opposite)
Dimensions	73x107x38mm excluding thread coupling
Coupling thread	M35x0.5 (alternative couplings available)

### TBX-04-C Extended red version

Spectral response	300nm to 850nm (extended UV windows available on request)
Dark count rate	<500cps (<200cps typical)

### TBX-04-D Thermoelectrically cooled 850nm photocathode

Extended red option with thermoelectric cooling. Dark counts typically less than 20cps. Includes option -C extended red photocathode, internal thermoelectric device and sealed sapphire input window. This option requires an additional constant current power supply and therefore includes the TBX-PS universal power supply as standard (see below). The overall TBX-04 dimensions remain unchanged. Does not require recirculating water.

### TBX-04-E Fibre-optic coupling (e.g. SMA or FC) instead of window & thread

### TBX-PS Universal power supply

This compact module supplies the ±15V power for the TBX-04 and also the current for the optional thermoelectric cooler. The TBX-PS also allows convenient interlocking of the detector high voltage, so that the detector can be gated off when it is likely to be exposed to ambient or other strong illumination. For example, up to two sample chamber microswitches can be connected directly to the TBX-PS to protect the detector when the sample chamber lid is removed. The TBX-PS requires 100-250V AC and is supplied with an IEC mains power cable.



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