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Figure shows xTDC4-PCIe.

Common Start TDCs

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The xTDC4-PCIe is based on a classic common-start architecture yielding high data throughput. In a common-start scenario, the arrival times of pulses on the "stop"-inputs are measured relative to a signal on the "start"-input.

The xTDC4-PCIe is ideally suited for a multitude of time-of-flight applications such as TOF mass spectrometry (TOF-MS), time-correlated single photon counting (TCSPC), and LIDAR.

The xTDC4-PCIe's four-stop channels allow, for example, to use segmented detectors or measure pulses from a single detector channel at multiple thresholds to obtain rudimentary pulse height information. Such features are beneficial in many TOF-MS applications and LIDAR light detection and ranging. Fluorescence lifetime imaging microscopes (FLIM) benefit strongly from the high timing resolution of the xTDC4-PCIe.

We provide drivers for Windows and Linux, including examples for the programming languages C and C++.
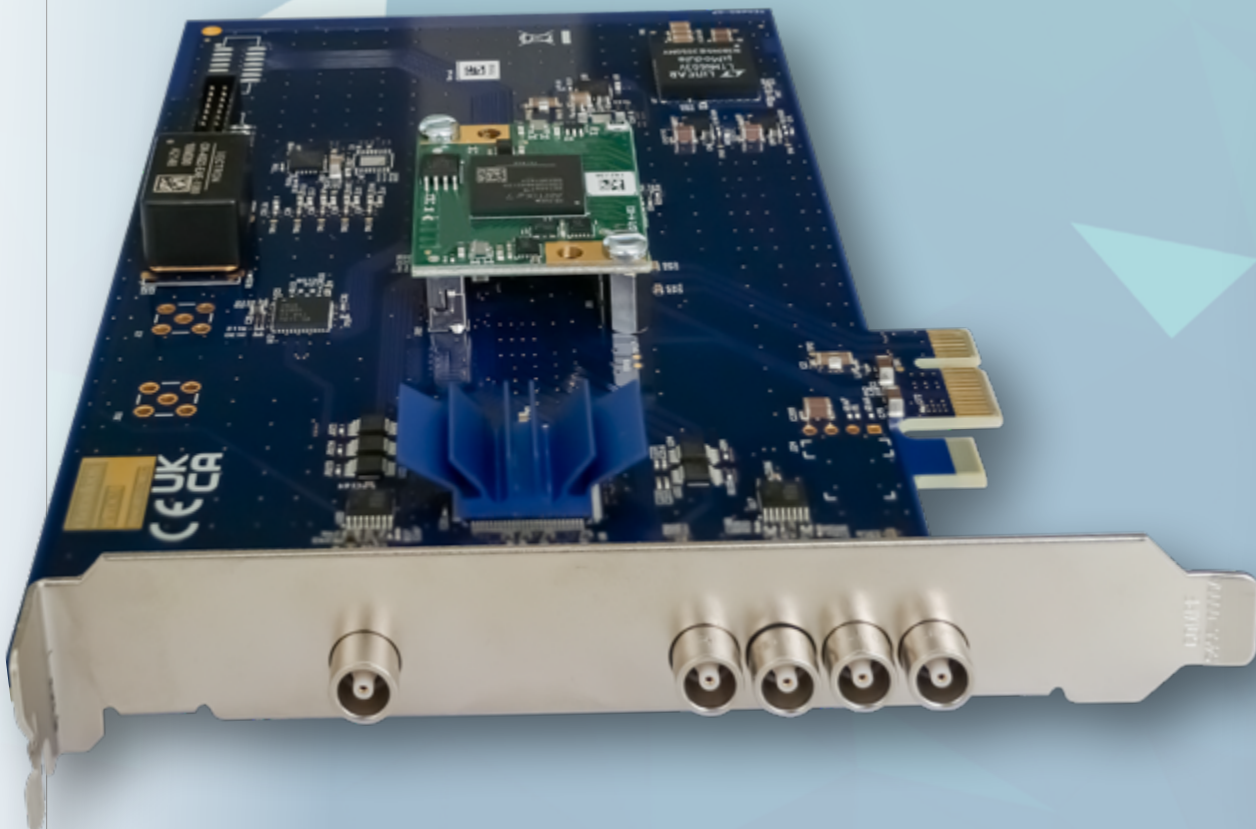

Figure shows xTDC4-PCIe board.

xTDC4-PCIe

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Record your data with tremendous precision.

The occurring cycle to cycle jitter of the xTDC4-PCIe is way below the bin size of 13 ps. Therefore you can expect an RMS error below 7 ps for your measurements.

Only 5 ns have to be between consecutive hits on the same input channel in order for them to be reliably recognized. The xTDC4 records events at a readout rate of approx. 48 MHits/s.
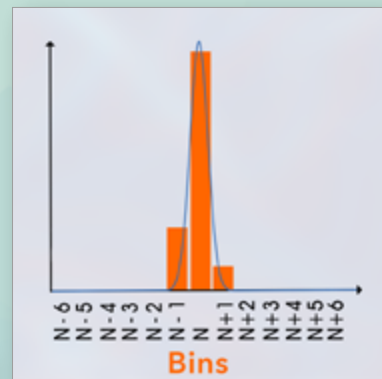
Compatible with a wide variety of detectors.

Bipolar threshold: When developing the device, our focus was on flexibility in use. Fully software-configurable positive or negative input thresholds comply with a multitude of single-ended signaling standards.

This allows you to use the xTDC4-PCIe with a wide range of detectors or constant fraction discriminators (CFD).
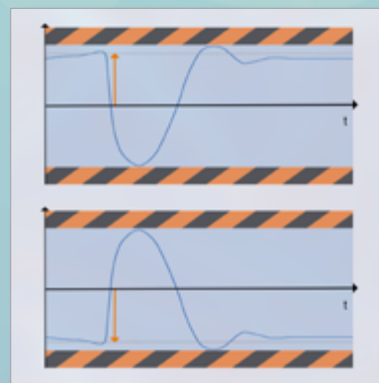
Make use of your individual TiGer Timing Generator setup.

All LEMO-00 inputs can also be used to output AC-coupled periodic pulse patterns to control external devices in your experimental setup.

The exact timing of these patterns is measured by the TDC. For more flexibility and different applications, each TiGer block can be triggered by an arbitrary combination of inputs, including the auto-trigger.

By the way: In BIDI and BIPOLAR mode, pulses can be provided while still using the corresponding connector as an input.

As a result, channels are not wasted in order to generate control pulses.

xTDC4-PCIe

xTDC4-PCIe - Technical Data

Optimized for	common start
TDC channels @ bin size	1 AC-coupled start channel 4 AC-coupled stop channels
Connectors	5x LEMO 00
Bin size	13 ps
Double pulse resolution	5 ns
TDC timing resolution	8 ps
Multihit	15
Dead time between groups	parameter dependent
Readout rate	30 MHits/s total; 11,6 MHits/s per channel
Range	218 µs default, 14 ms extended
Common start/stop	yes / no
Max. start frequency	4 Mhz
L0 FIFO	16 words/channel
L2 FIFO	10000 words
Number of boards that can be synced	no sync possible
Readout interface	PCIe2 x1 @ 400MB/s
Time base	50 ppb on board

Please note:

Both the xTDC4 and our TimeTaggers are also available as desktop devices which allow data transfer via USB4 using conventional Thunderbolt cables.

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With the TimeTaggers cronologic presents an exciting series of low-cost, mid-resolution, high-bandwidth, common start time-to-digital converters.

These data acquisition boards are based on our high-performance xTDC4 platform and offer 500ps to 1ns single-shot resolution with a high readout bandwidth.

TimeTaggers are ideal for applications that do not require the highest single-shot timing resolution, but rather high data acquisition rates and the lowest possible dead time on multiple hits.

These include certain types of mass spectroscopy (TOF-MS), time-correlated single-photon counting (TCSPC), phase shift measurement, quantum sensing and cryptography, plus frequency counting applications.

The timestamps of leading or trailing edges of digital pulses are recorded from the TimeTaggers with the following quantization (bin size):

- TimeTagger4-1.25G: 800 ps
- TimeTagger4-2.5G: 400 ps
- TimeTagger4-5G: 200 ps
- TimeTagger4-10G: 100 ps

For all these TDCs, cronologic will support you with drivers for Windows and Linux.
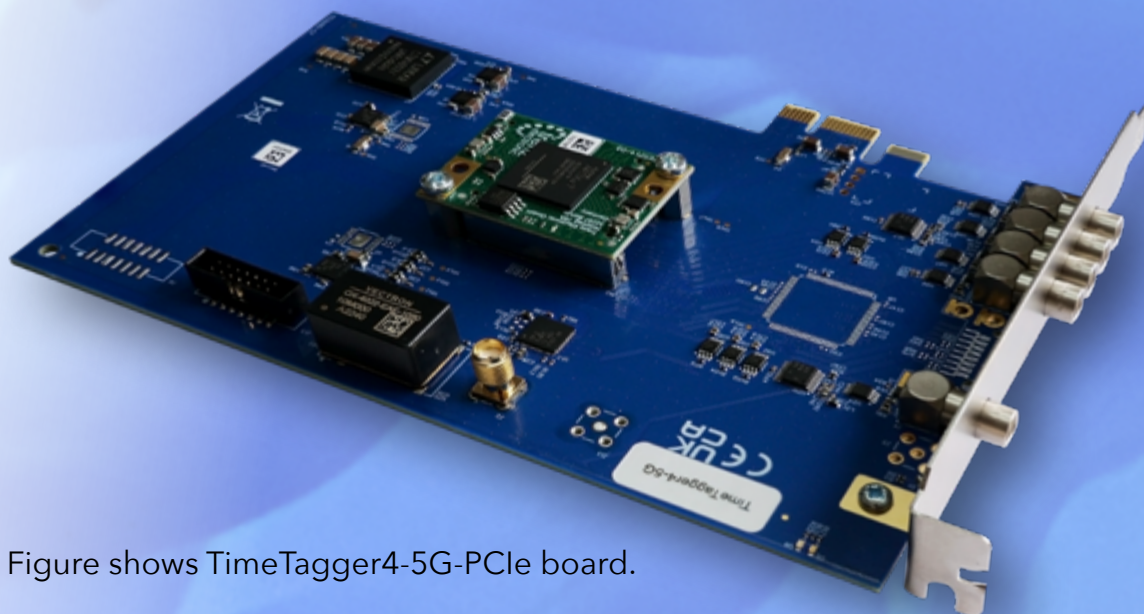

Figure shows TimeTagger4-5G-PCIe board.

Please note: "TimeTagger" is a registered trademark of cronologic.

TimeTaggers

cronologic

Capture your data with high precision at low cost.

The TimeTagger4 is available at the lowest cost, yet offering picosecond resolution.

For example, the TimeTagger4-5G has a bin size of 200 ps, while its little brother the TimeTagger4-10G has a bin size of 100ps. There is no dead time between measurements: The double pulse resolution is two bins for both boards.

Compatible with a wide variety of detectors.

Bipolar threshold: When developing the device, our focus was on flexibility in use. Fully software-configurable positive or negative input thresholds comply with a multitude of single-ended signaling standards.

This allows you to use TimeTaggers with a wide range of detectors or constant fraction discriminators (CFD).
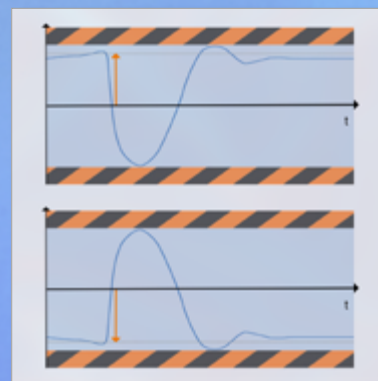
Make use of your individual TiGer Timing Generator setup.

All LEMO-00 inputs can also be used to output AC-coupled periodic pulse patterns to control external devices in your experimental setup.

The exact timing of these patterns is measured by the TDC. For more flexibility and different applications, each TiGer block can be triggered by an arbitrary combination of inputs, including the auto-trigger.

By the way: In BIDI and BIPOLAR mode, pulses can be provided while still using the corresponding connector as an input.

As a result, channels are not wasted in order to generate control pulses.

TimeTaggers

TimeTagger - Technical Data

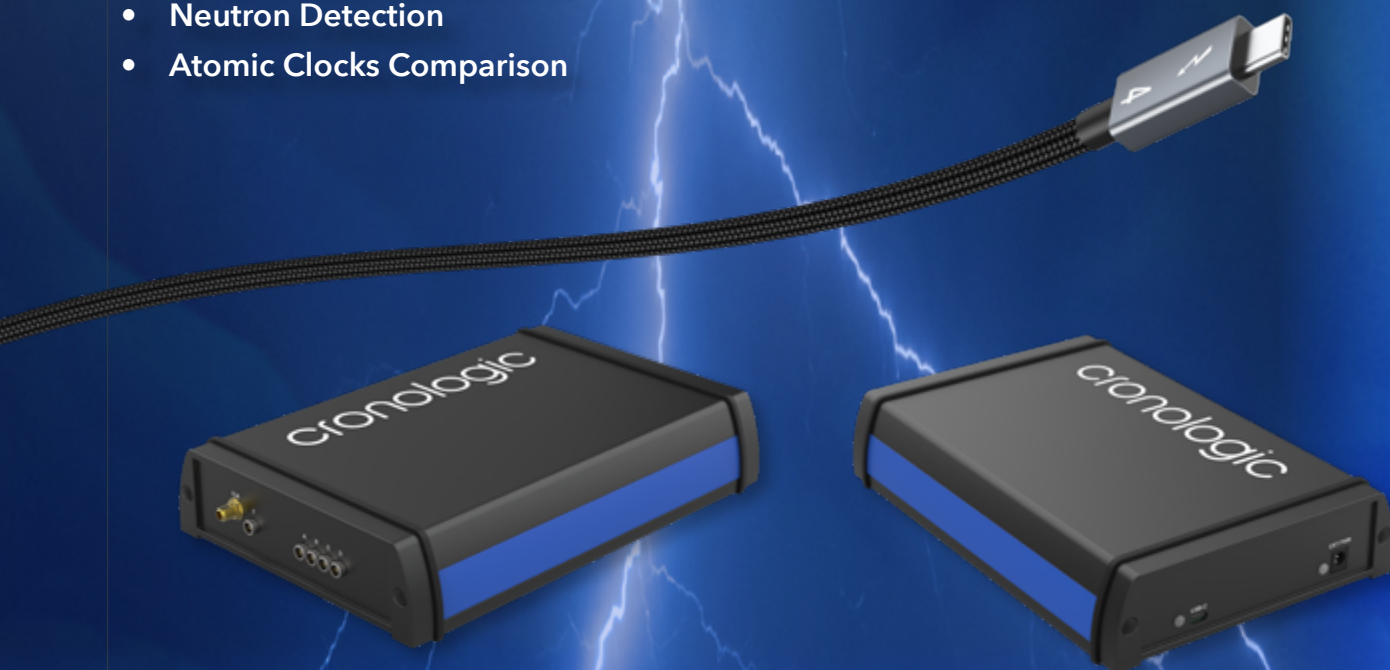| Technical Data	Time Tagger4 - **1,25G** - **2,5G** - **5G** - **10G**	
Optimized for	low cost	
TDC channels	1 AC-coupled start channel 4 AC-coupled stop channels	
Connectors	5x LEMO 00	
Bin size (quantization, version-dependent)	**800** / **400** / **200** / **100** ps	
Double pulse resolution	2 bins	
Dead time between groups	none	
Start rate (version-dependent)	**0.625** / **1.25** / **2.5** / **5** GHz burst, 18 MHz sustained	
Stops (version-dependent)	**0.625** / **1.25** / **2.5** / **5** GHits/s per channel for bursts of up to 3900 stops	
Readout Rate	40 MHits/s per channel sustained	
	60 MHits/s over all channels sustained	
Range	1.6 ms, 430 ms extended	
measuring mode	common start or continuous	
Maximum hits per packet	≈8000 hits	
synchronisation of multiple boards	external clock input only	
Readout interface	PCIe2 x1 @ 400MB/s	

In case your development project should focus on a space-saving integration, we can offer an extremely interesting possibility with our TimeTaggers.

All TimeTagger variants are also available for this purpose as 30 mm x 40 mm TDC modules and can be installed via board-to-board connectors with minimal hardware effort.
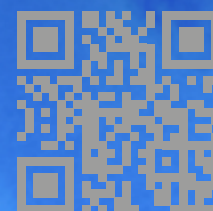
TimeTaggers

Applications

- **TOF Mass Spectrometry**
- **Time-Correlated Single-Photon Counting**
- **Low Energy Nuclear Physics**
- **Fluorescence Lifetime Correlation Spectroscopy and Imaging**
- **Quantum Research**
- **Quantum Sensing**
- **Quantum Key Distribution**
- **LIDAR**
- **Time Domain Reflectrometry & OTDR**
- **Spectral Imaging**
- **Phase Shift Measurements**
- **Neutron Detection**
- **Atomic Clocks Comparison**

Both the xTDC4 and our TimeTaggers are also available as desktop devices which allow data transfer via USB4 using conventional Thunderbolt cables.

www.cronologic.de