cronologic

2025 catalogue

measurement technology

It's just about time...
www.cronologic.de

cronologic

cronologic offers custom-made data acquisition solutions for high-speed and high-precision signal processing and analysis. We provide a set of standard products focusing on high-precision timing measurements of digital signals and high-speed analog-signal transient recording.

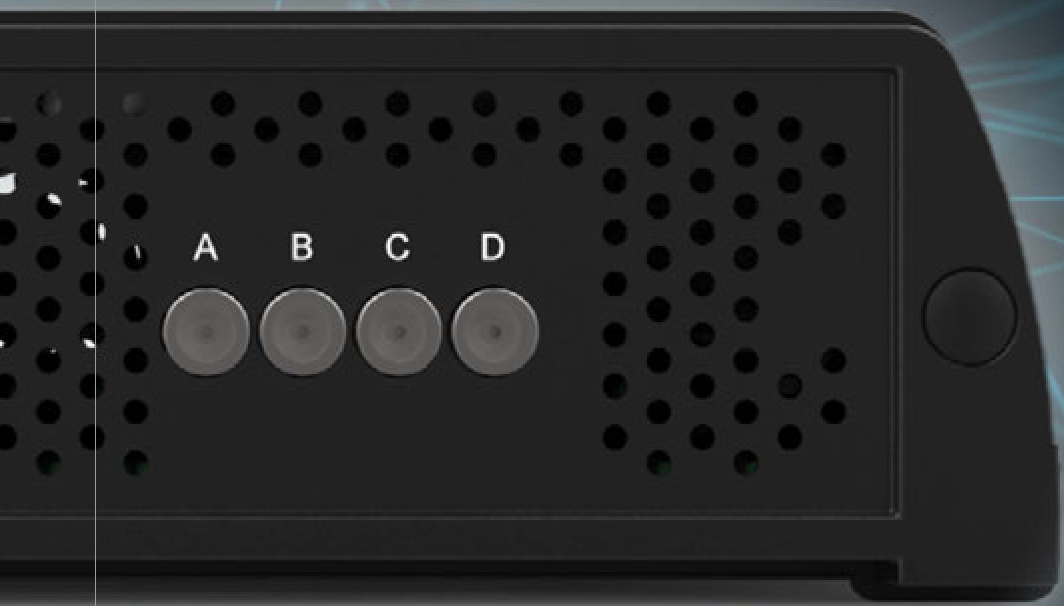
Our product portfolio comprises a range of versatile time-to-digital converters (TDC) and analog-to-digital converters (ADC). Many of our customers' applications rely on time-of-flight (TOF) measurements. Our PC boards are ideally suited for use in mass spectrometry (TOF-MS) and LIDAR Systems, Optical Coherence Tomography (OCT), Fluorescence Lifetime Imaging Microscopy (FLIM), Time Correlated Single Photon Counting (TCSPC), Near Infrared Spectroscopy (NIRS), Functional Near Infrared Spectroscopy (fNIRS) and others.

Our multi-hit capable TDCs perform measurements of pulse arrival times at highest precision.

Our ADCs provide additional analog pulse shape information, such as, for example, pulse height, width, and area, and allow for detailed pulse shape analysis to disentangle single-pulse contribution in scenarios of overlapping pulses. Many of our boards can be linked and synchronized for high-channel-count applications.

Our platform-based approach allows us to quickly customize products for OEM customers that need additional features for their systems.

measurement technology



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areas of application for our custom designed products

FLIM
fluorescence-lifetime imaging microscopy

The decay time of an electronically excited fluorophore is typically in the range of a few nanoseconds. In fluorescence lifetime imaging the exponential decay of a sample is determined requiring a timing resolution in the picosecond regime. Our sophisticated TDC and ADC solutions master this job with excellence.

Lidar
also known as: LIDAR, LiDAR, and LADAR, "light detection and ranging", "laser imaging, detection, and ranging", "3-D laser scanning", "LIDAR mapping"

LIDAR systems emit ultraviolet, visible, or near-infrared light to image objects and measuring the time-of-flight (TOF) of reflected photons. Such systems are used for object detection and tracking in many different fields, ranging from archaeology to agriculture, autonomous vehicles, and robots, etc. The high timing resolution of cronologic ADCs and TDCs is a key to reaching the highest ranging accuracy and our devices' high data throughput allows for targeting even complex measurement scenarios.

detectors for mass spectrometry
TOF- & MASS- spectroscopy detectors, TOFMS

In many TOFMS units, cronologic TDCs are used to measure precisely the arrival of single ions. From the arrival time, the ion's time-of-flight is deduced, from which the mass-to-charge ratio of the detected particle can be determined. A crucial factor for a successful measurement is the extremely low cycle-to-cycle jitter of our TDCs and their very low multiple-hit detection dead time.

phase shift measurements
frequency and phase shift measurements, phase-noise-analyzers

In phase measurements, the phase of an incident signal is compared to the phase of a device's response signal. With increasing frequency, such phase-shift measurements become more challenging. cronologic TDCs provide many features which help to address this difficult task.

photon counting
single-photon detectors (SPD), TCSPC, time-correlated single photon counting, detection of individual photons, photosensors

Whether in astrophysics, materials science, quantum information science, quantum encryption, medical imaging, DNA sequencing, or in fiber-optic communication: Single-photon detectors (SPD) provide a timing signal from which, for example, fluorescence lifetimes of excited matter can be deduced (FLIM). This is the perfect job for our TDCs and in some applications already our "entry-level"-device can be employed.

quantum cryptography
quantum information science, quantum encryption, quantum key distribution (QKD)

Quantum key distribution (QKD) enables the tap-proof encryption of data by exploiting the quantum properties of light. For transmission of encrypted data single-photon sources (SPS) can be used for optimal performance. Our fast TDCs facilitate the development of single-photon counting receiver modules which convert single-photon detection events into streams of time-tags - synchronized to the excitation-laser source.

applications

cronologic

The Ndigo6G-12 is a hybrid ADC/TDC solution for the acquisition of short pulses. It builds on the established platform of the Ndigo5G-10, but takes it to the next level in both, performance and flexibility.

The Ndigo6G-12 is particularly well-suited for time-of-flight applications like LIDAR or TOF mass spectrometry. Pulse arrival times can be measured with an accuracy down to 5 ps in combination with information on pulse shape such as area or amplitude.

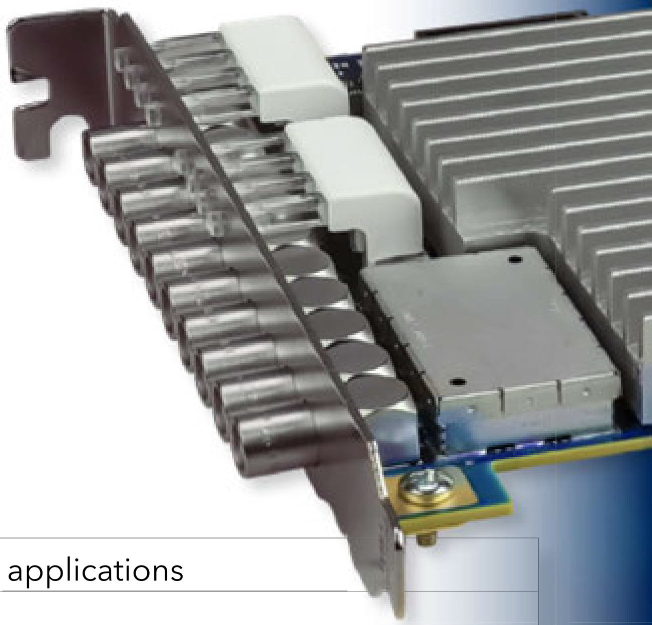
Four channels at 1.6 Gsps with 12 Bits resolution can be recorded independently or combined to two or one channel(s) with a higher dynamic range of up to 6.4 Gsps. The Ndigo6G-12 comprises, in addition, four TDC channels with a resolution of 13 ps.

cronologic will support you with drivers for Windows and Linux.

ADC

Ndig6G-12

cronologic



Ndigo6G-12
Technical Data

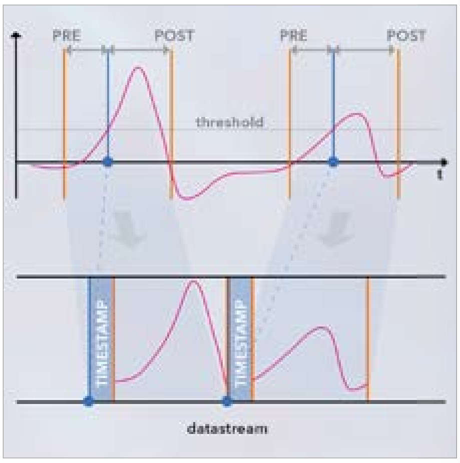
Optimized for	TOF applications
ADC channels	4
TDC channels	4
Gating channels	2
Digital Control Channels	10x LEMO 00
Sample rate single channel	6400 Msps
Sample rate multi channel	1600 Msps
Resolution	12 bits
TDC Double pulse resolution	typically 5ns
TDC bin size	13 ps
Multihit	unlimited
Dead time between Groups	none
TDC readout rate	30 MHits/s total; 11,6 MHits/s
ADC readout rate	5200 MByte/s
Timestamp range	106 d
Common start/stop	yes / yes
Readout interface	PCIe3 x8
Time base	50 ppb on board or external 10 MHz clock
On-board calibration data storage	✓
Adjustable trigger windows	✓
Continuous ADC recording without dead time	✓
Easy to use Windows C API	✓
Linux support available	✓
In-system firmware update	✓

ADC

Ndig6G-12

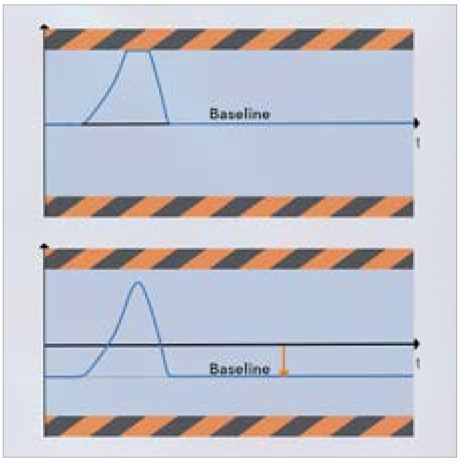
Features

Zero suppression



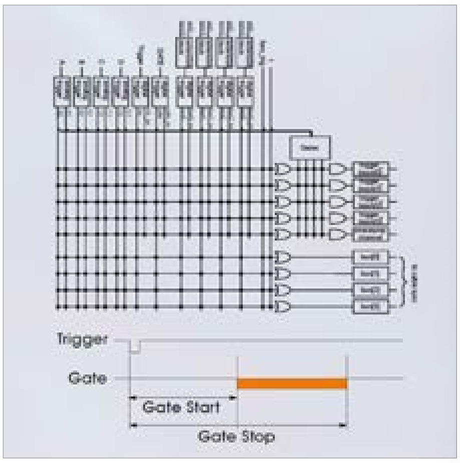
Detect pulses above a certain threshold and only acquire the relevant data to massively reduce the amount of data that needs to be copied and transferred to the host PC.

Configurable DC Offset



When acquiring unipolar pulses, shift the baseline to the edge of the ADC range to double your dynamic range.

Flexible Utility Functions



A multitude of useful details help you to create a highly integrated setup with a minimum of external components. Using the integrated TiGer timing pattern generator can provide digital pulse patterns to control your experiment or internal triggers. Use gate and veto functions with our gating logic. This also works across channels or from the additional control inputs with a flexible trigger matrix.

Streaming Architecture

Don't pay for expensive memory upgrades!

The buffers of the Ndigo6G-12 are only limited by the size of your main memory.

Data is streamed at a rate of 5.2 GByte/s concurrently with data acquisition.

There is no dead time and latency is minimized.

Ndigo6G-12

The Ndigo5G is a flash-ADC board for the acquisition of short pulses.

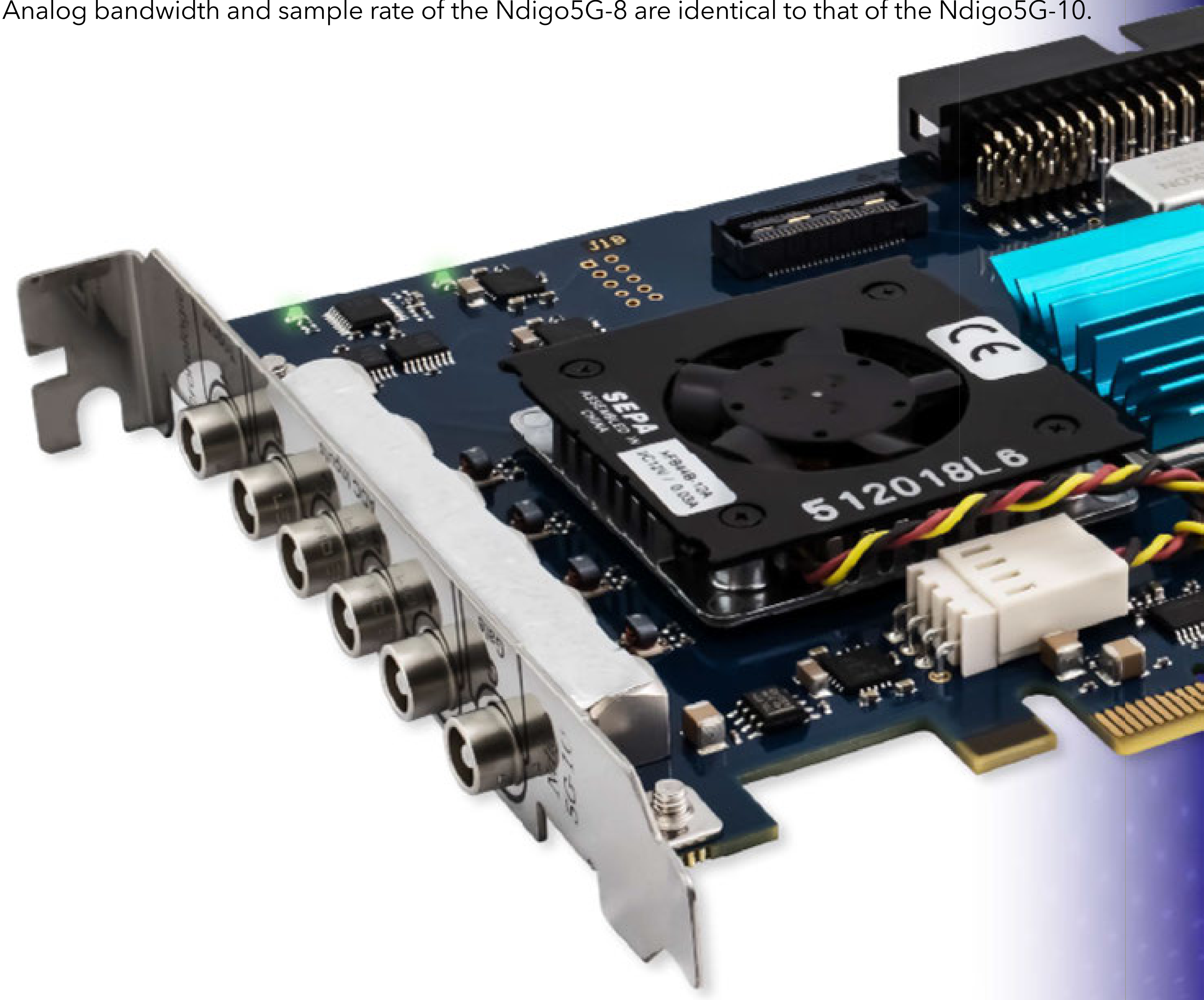
It was specifically designed for time-of-flight applications like LIDAR or TOF mass spectrometry. Pulse arrival times can be measured with an accuracy down to 5 ps together with information on pulse shape such as area or amplitude.

The unit supports onboard zero supression for pulse extraction of the input data stream. Extracted pulse data is streamed directly to the main memory at 800 MB/s for the lowest latency and largest buffer size.

Four channels with 1.25 Gsps can be acquired independently or combined to two channels or one channel with a higher dynamic range or up to 5 Gsps sample rate.

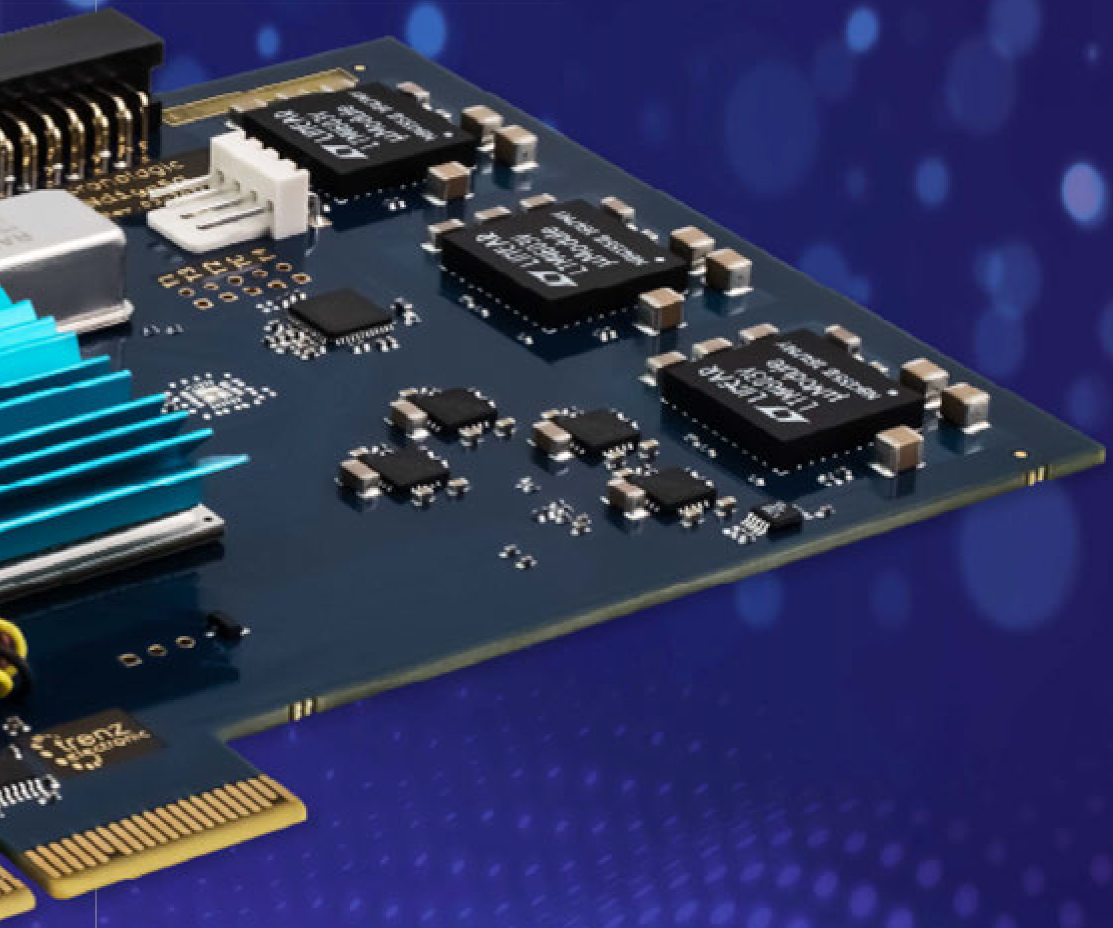
The Ndigo5G-10 offers 10 bits of vertical resolution.

Analog bandwidth and sample rate of the Ndigo5G-8 are identical to that of the Ndigo5G-10.



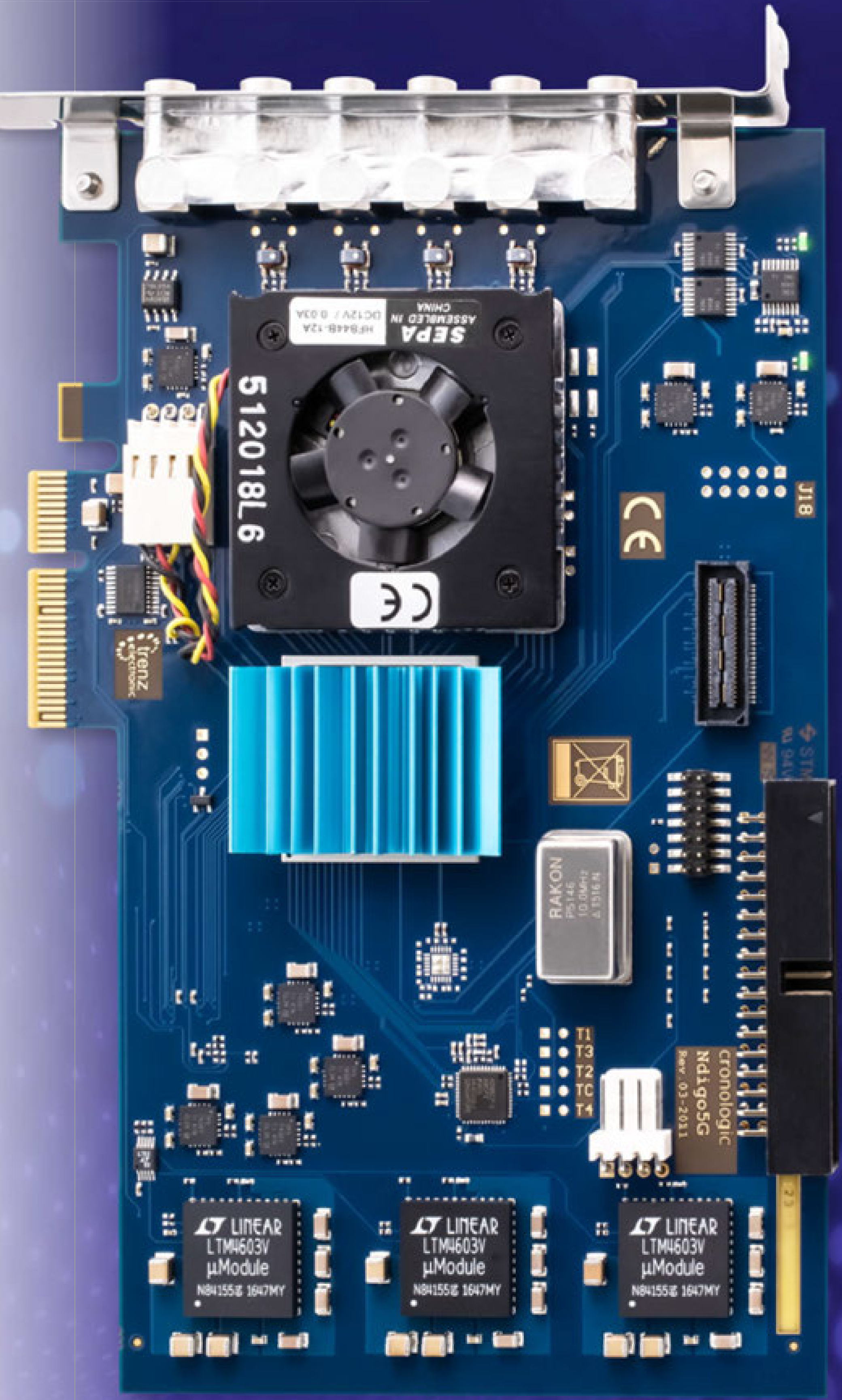
ADC

Ndigo5G-10



Ndigo5G-10
Technical Data

Optimized for	TOF applications
ADC channels	4
TDC channels	1
Gating channels	1
Connectors	6x LEMO 00
Sample rate single channel	5.0 Gsps
Sample rate multi channel	1.25 Gsps
ADC channel resolution	10 bits
TDC Double pulse resolution	typically 4ns
Maximum bandwith	950 Mhz
TDC bin Size	40 ps
Multihit	unlimited
Dead time between groups	none
TDC Readout rate	20 MHits/s
ADC Readout rate	800 MBytes/s
Timestamp range	106 d
Common start / stop	yes / yes
Number of boards that can be event-synchronized	8
Readout interface	PCIe x4
Time base	50 ppb on board or external 10 MHz clock
On-board calibration data storage	✓
Adjustable trigger windows	✓
Continuous ADC recording without dead time	✓
Easy to use Windows C API	✓
Linux support available	✓
In-system firmware update	✓

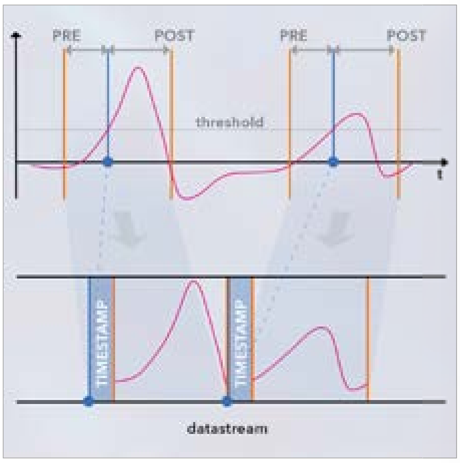


Ndigo5G-10

Features

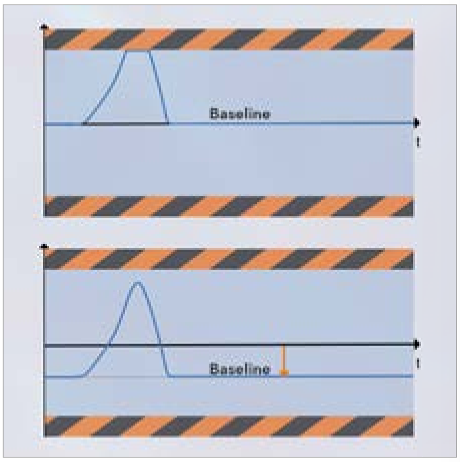
Zero suppression

Detect pulses above a certain threshold and only acquire the relevant data to massively reduce the amount of data that needs to be copied and analysed.



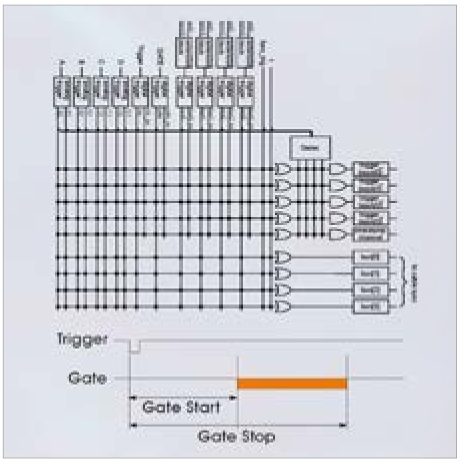
Configurable DC Offset

When acquiring unipolar pulses, shift the baseline to the edge of the ADC range to double your dynamic range.

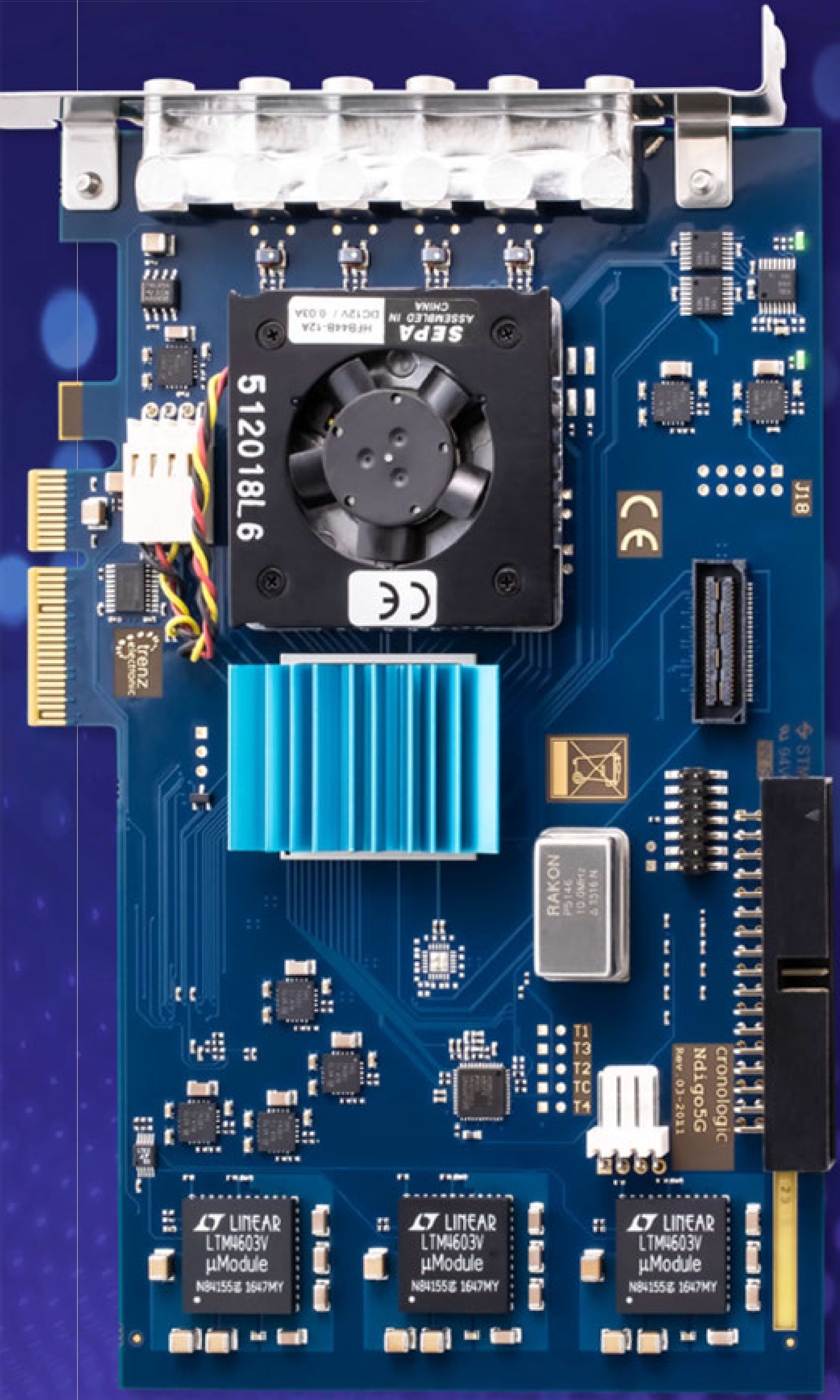


Flexible Utility Functions

A multitude of useful details help you to create a highly integrated setup with a minimum of external components. Using the integrated TiGer timing pattern generator can provide digital pulse patterns to control your experiment or internal triggers. Use gate and veto functions with our gating logic. This also works across channels or from the additional digital input with a flexible trigger matrix.



Ndigo5G-10


SEPA
ASSEMBLED IN CHINA
512018L6
RAKON
cronologic
Ndigo5G
LINEAR
LTM4603V
µModule

cronologic

The xHPTDC8 is our most versatile TDC. This is the ideal time-to-digital converter for an infinite stream of time stamps.

Don't let yourself be restricted to common-start configurations!

With the xHPTDC8 time interval analyzer, you can easily set up custom trigger scenarios. The device provides an infinite stream of timestamps - one for each input pulse. You may filter the stream in your own DAQ-software - or make use of the trigger and grouping features provided by xHPTDC8.

Like the xTDC4-PCIe, the xHPTDC8-PCIe provides very high precision measurements with almost no cycle-to-cycle jitter. You can expect an RMS error very close to the quantization error. The linearity is also practically perfect.

The PCIe bus master writes into a ring buffer that is fully controlled by hardware, ensuring low CPU load at high throughput.

Our TiGer timing generator allows you to create digital output pulse patterns on all connectors to control the timing of your experiment.

The newly added 18-bit ADC can monitor an analog voltage in your system in sync with the data acquisition or controlled by an external trigger.

cronologic will support you with drivers for Windows and Linux.

TDC

xHPTDC8

cronologic

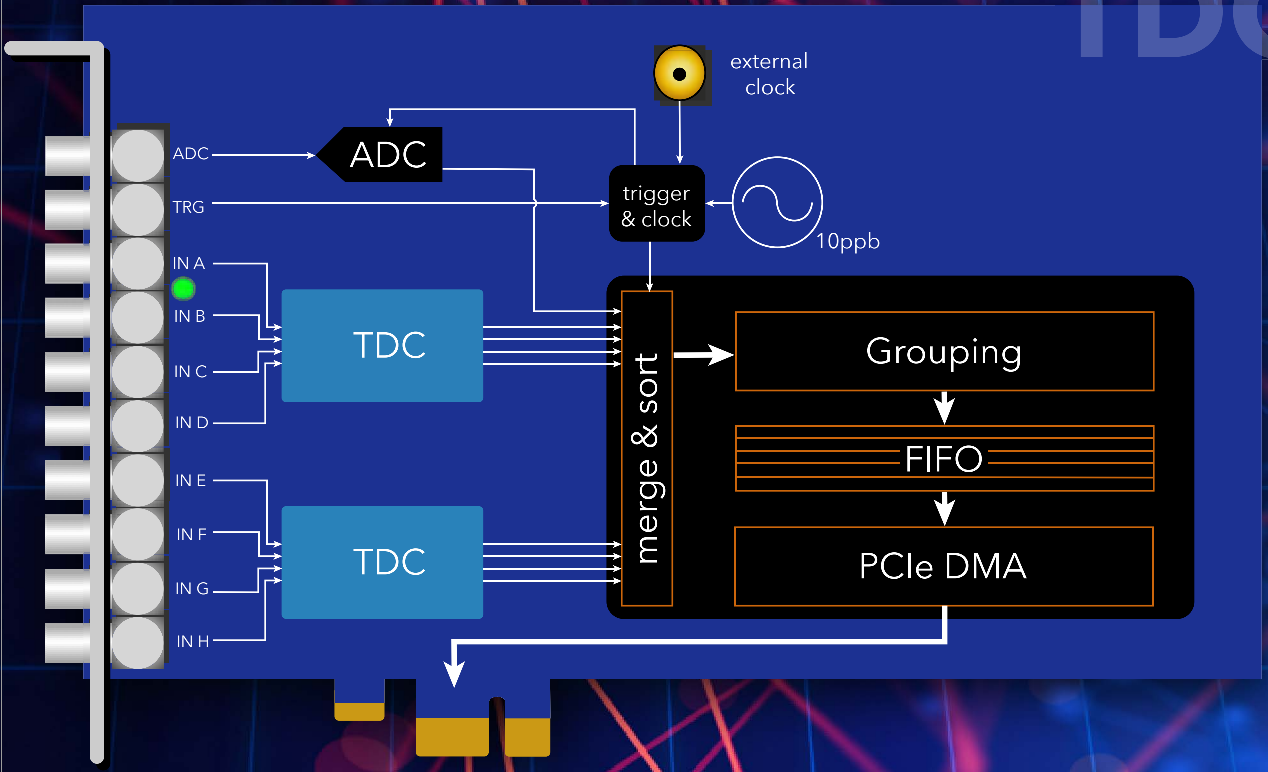
xHPTDC8 Technical Data

Optimized for	flexibility + performance
TDC channels	8
Additional inputs	event triggered ADC
Connectors	10x LEMO-00
Bin-size	13 ps
Double pulse resolution	5 ns
Multihit	unlimited
Dead time between groups	none
Readout rate	30 MHits/s total; 11.6 MHits/s per channel
Timestamp range	unlimited
Common start / stop	yes / yes
Number of boards that can be synced	6
Readout interface	PCIe x1 @ 200 MB/s (or connects to TBT)
Time base	10 ppb on board

Please note:

The xHPTDC8-PCIe is also available as a desktop device that allows data transfer to any Thunderbolt port and offers several mounting options.
Please make use of the model designation xHPTDC8-TBT.

xHPTDC8


external clock
ADC
TRG
IN A
IN B
IN C
IN D
IN E
IN F
IN G
IN H
ADC
trigger & clock
10ppb
TDC
TDC
merge & sort
Grouping
FIFO
PCIe DMA

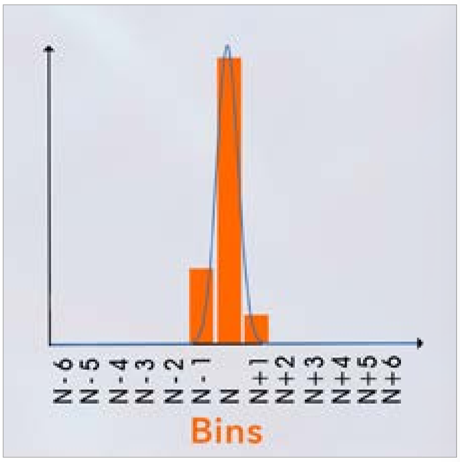
Features

Forget about data anomalies - and record your data with tremendous precision.

The occurring cycle-to-cycle jitter of the xHPTDC8 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.

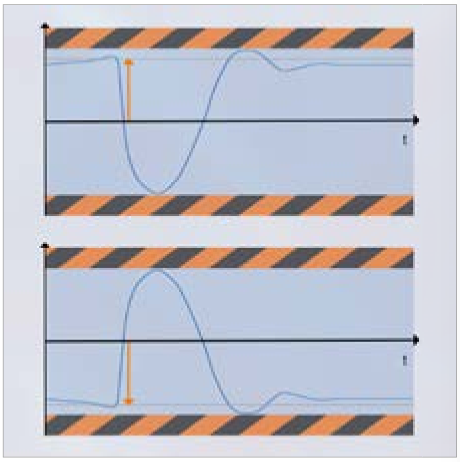


Bipolar threshold: Make use of a wide range of detectors.

When developing the device, our focus was on flexibility in use.

The threshold discriminators can use positive or negative thresholds with configurable voltage.

This allows you to use the xHPTDC8 with a wide range of detectors or constant fraction discriminators (CFD).



Make use of your individual TiGer Timing Generator setup.

The LEMO-00 inputs of Channels A-H and TRG can be used to output periodic pulse patterns to control 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.

xHPTDC8

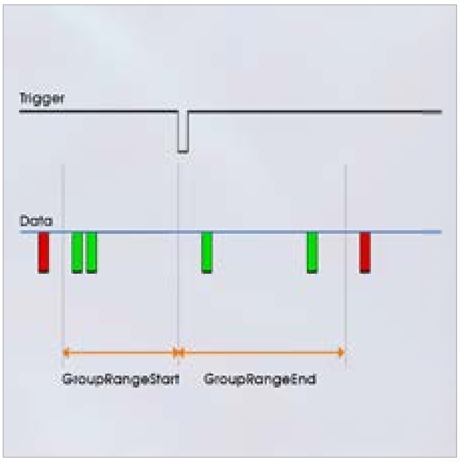
Features

Group data with versatile trigger windows.

There is no limit in range of time measurement for this TDC. It will output an infinite stream of timestamps for all incoming pulses.

In case you prefer common-start or common-stop the device can output structured data that mimic these modes.

The grouping function of the xHPTDC8 enables the user to define any channel as a trigger channel. Only hits arriving within a configurable time window around the trigger will be recorded.



Reduce buffer requirements and CPU load by setting veto or gate inputs.

With the xHPTDC8 you can block inputs from being measured for a certain period of time relative to an input pulse.

You can decide for yourself whether the exact definition of the recording or the blocking timespan is more suitable for your application.

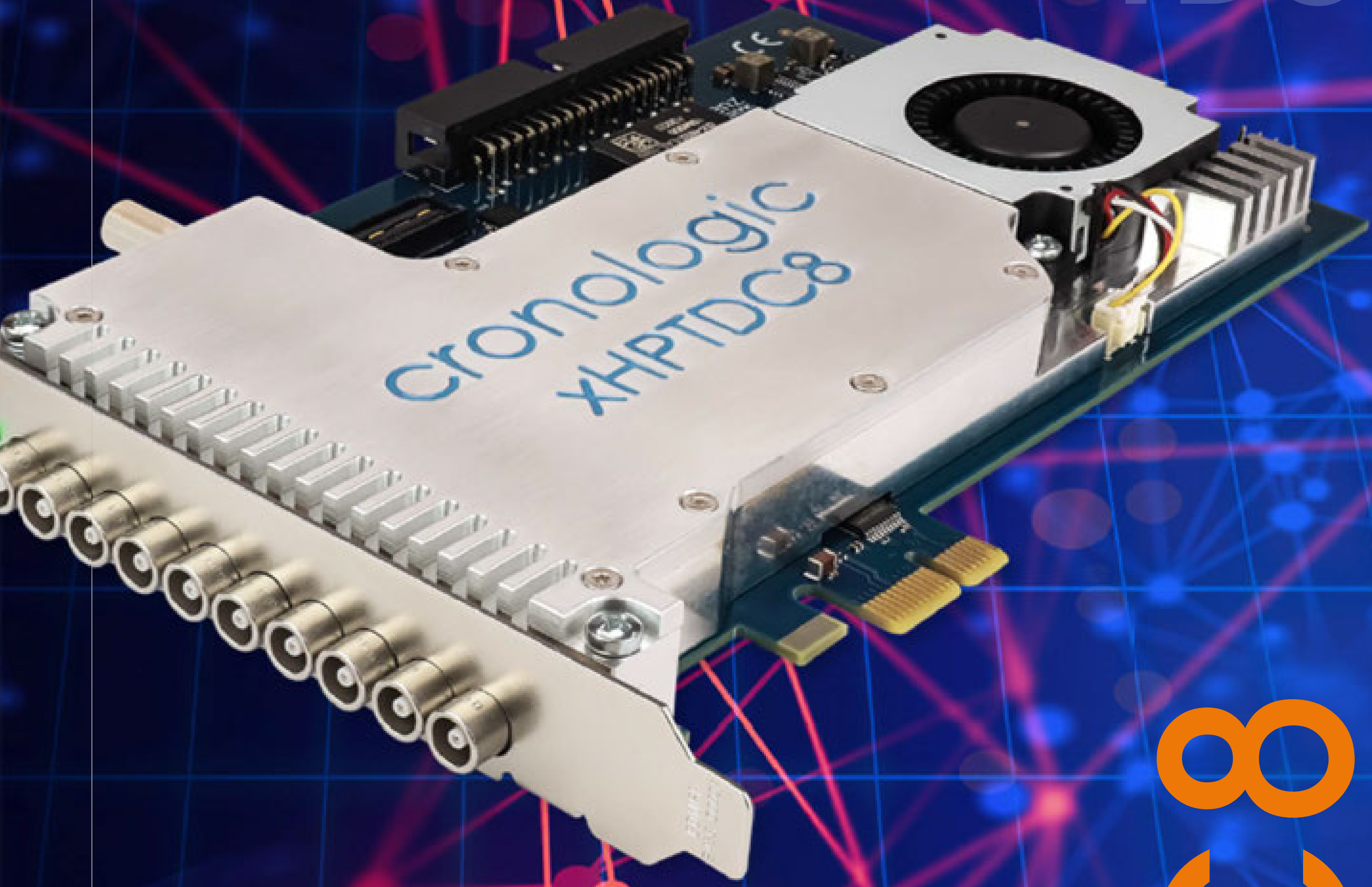
Such a configuration of the gating block can reduce the bandwidth and buffer usage significantly. This is a useful feature in setups where the trigger creates a lot of noise.

Make use of the internal ADC to monitor your control voltage at intervals or triggers.

The xHPTDC8 is equipped with an ADC that can be triggered in three ways:

- Whenever there is an edge on the ADC trigger connector, the voltage on the ADC input connector is sampled.
- By using the TiGer and the internal auto-trigger, so that you can sample an analog signal in defined intervals or in random periods.
- By using the TiGer with triggers relative to a TDC input

A typical application would be to sample some slow control voltage once per start signal.



xHPTDC8

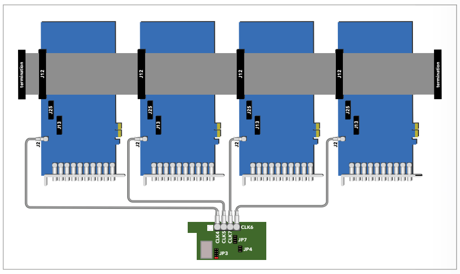
Features

Synchronize multiple xHPTDC8 boards for measuring more channels.

In measurement setups that require more than eight TDC inputs, up to six boards can be synchronized within a system.

Such setups will be managed automatically by the xHPTDC8 API.

Tip: For synchronizing up to four boards, cronologic offers the ClockBox product that conveniently makes four clock signals available inside the PC enclosure.

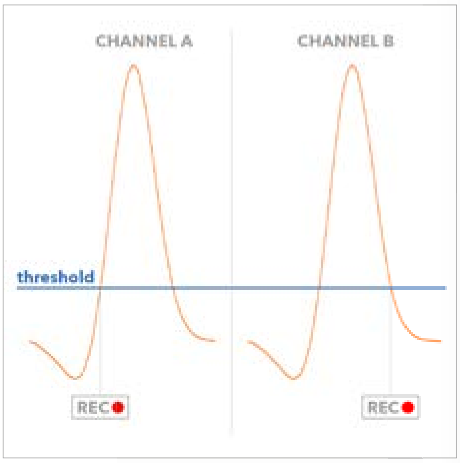


Rising or falling edge - you decide what is recorded.

Depending on your application, for a more convenient evaluation it is useful that it can be determined in advance whether the rising or falling edge should be recorded.

However, there are also users who would like to individually define one of these two measurement methods for each measurement channel.

With the xHPTDC8 this is no problem, as you can select the type of recording individually for each channel.



xHPTDC8

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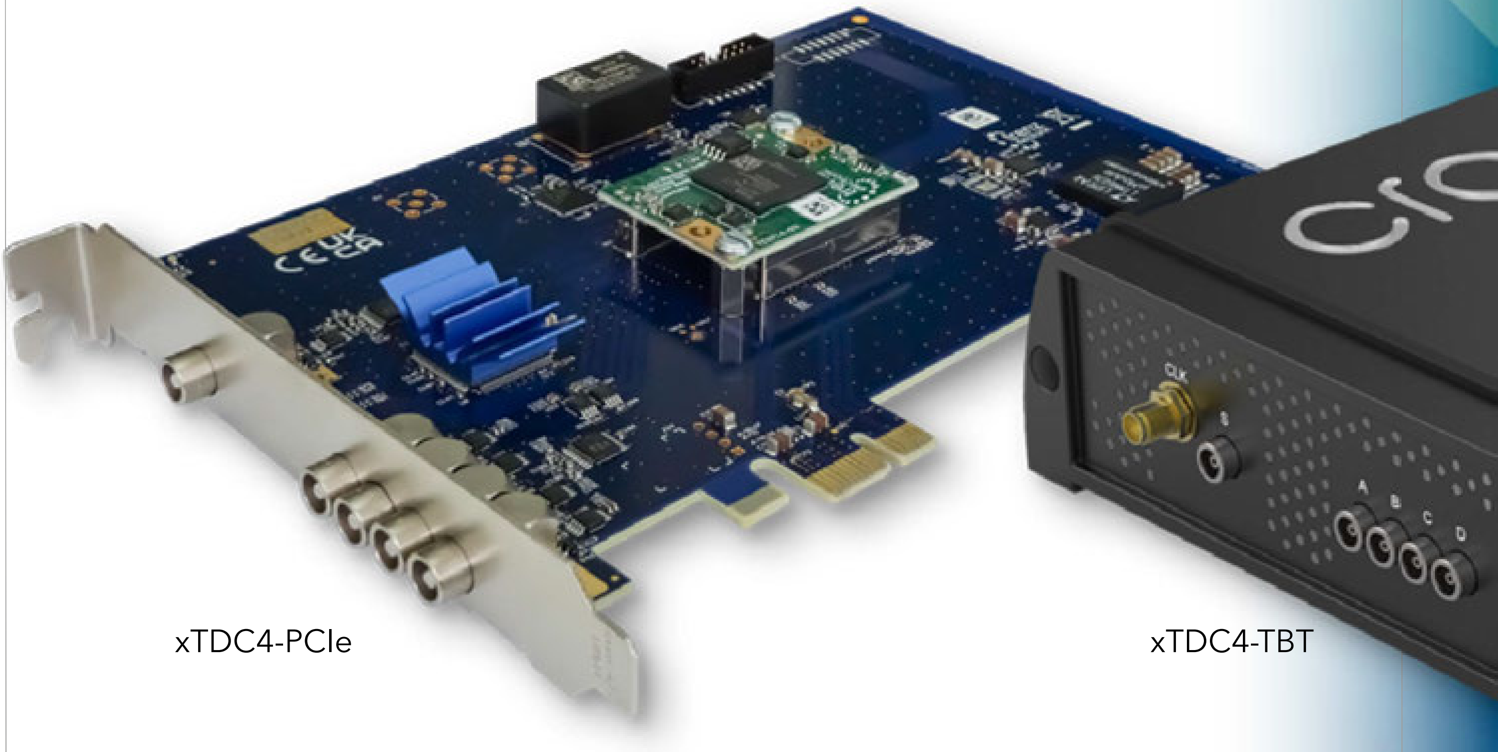
The xTDC4 is based on a classic common-start architecture yielding high data throughput. In a common-start scenario, the arrival times of pulses on the "stop"-inputs are measured relative to a signal on the "start"-input. The xTDC4 is ideally suited for a multitude of time-of-flight applications such as TOF mass spectrometry (TOF-MS), time-correlated single photon counting (TCSPC), and LIDAR.

The xTDC4'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.

The integration of an xTC4 in applications your data acquisition application is easy. The board provides a stream of simple data structures, containing a list of relative time stamps for all stop events.



xTDC4-PCIe

xTDC4-TBT

Please note:

The xTDC4 is also available as a desktop device that allows data transfer to any Thunderbolt port and offers several mounting options.

xTDC4

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xTDC4
Technical Data

Optimized for	common start
TDC channels	1 AC-coupled start channel 4 AC-coupled stop channels
Connectors	5x LEMO 00
Bin size	13 ps
Double pulse resolution	5 ns
Multihit	8000x per start event
Dead time between groups	parameter dependent
Readout rate	30 MHits/s total; 11.6 MHits/s per channel
Timestamp range	218 µs default, 14 ms extended
Common start/stop	yes / no
number of boards that can be synced	no sync possible
Readout interface	PCIe2 x1 @ 400 MB/s (or connects to TBT)
Time base	10 ppb on board
Linux support available	yes

xTDC4

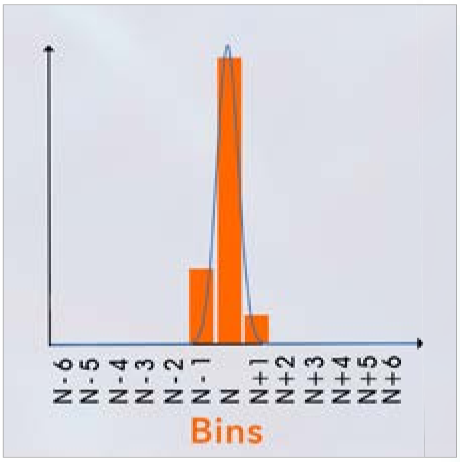
Features

Forget about data anomalies - and 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 for them to be reliably recognized.

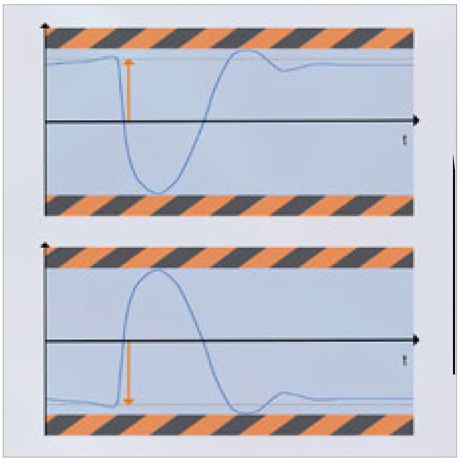


Bipolar threshold: Make use of a wide range of detectors.

When developing the device, our focus was on flexibility in use.

Any positive or negative thresholds with a configurable voltage can therefore be adjusted to comply with a multitude of single-ended signaling standards.

This allows you to use the xTDC4 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 DC-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

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If a time resolution in a range of a few 100 ps is sufficient for your application, the TimeTagger4 can replace our high-end TDCs at a lower cost.

With the first TimeTaggers, cronologic has coined a name for an entire generic brand. Today, this exciting series represents our cost-effective, mid-resolution time-to-digital converters. These time-interval analyzer boards feature a three-digit picosecond-range bin size at a high readout bandwidth.

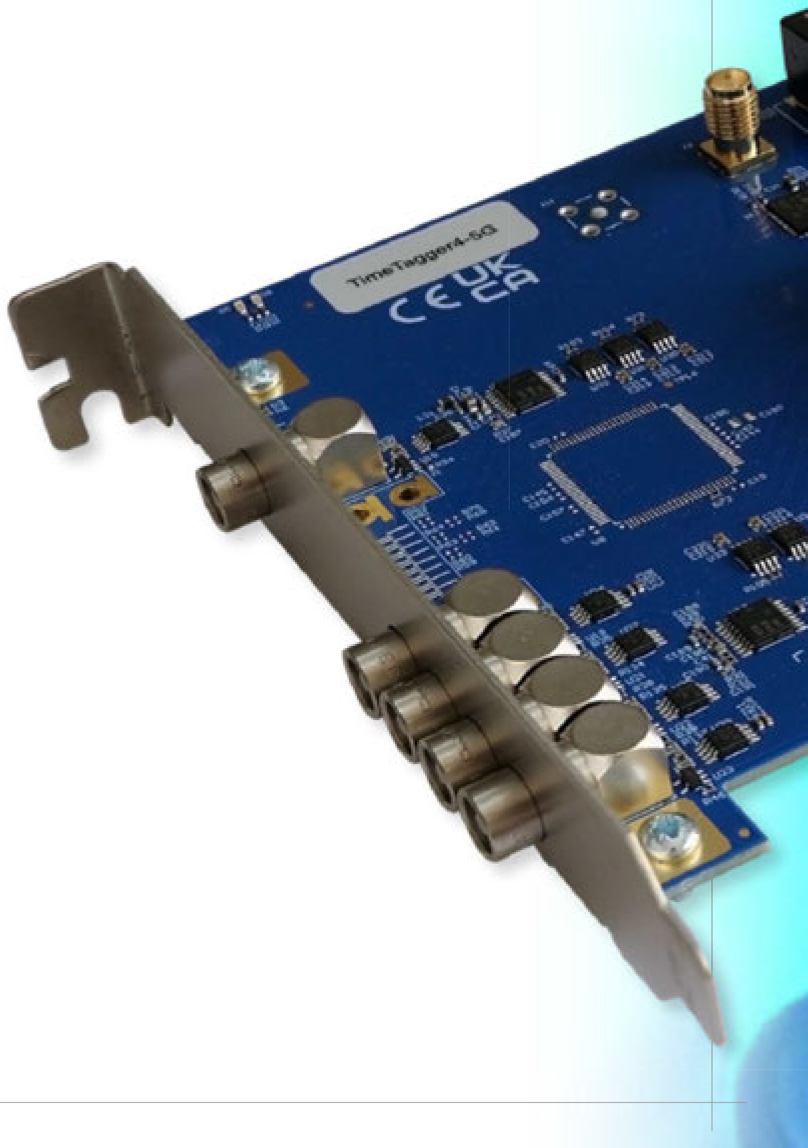
TimeTaggers are ideally suitable in applications that do not require the highest resolution, but high data acquisition rates and the lowest multiple-hit dead time. These include certain types of mass spectroscopy (TOF-MS), time-correlated single photon counting (TCSPC), and frequency counting applications.

TimeTaggers are high-bandwidth, low-cost, common-start time-to-digital converters.
As an alternative to the usual differential time measurement, our TimeTaggers can also be operated in continuous mode so that stop signals are recorded continuously, even if no start signal is connected.

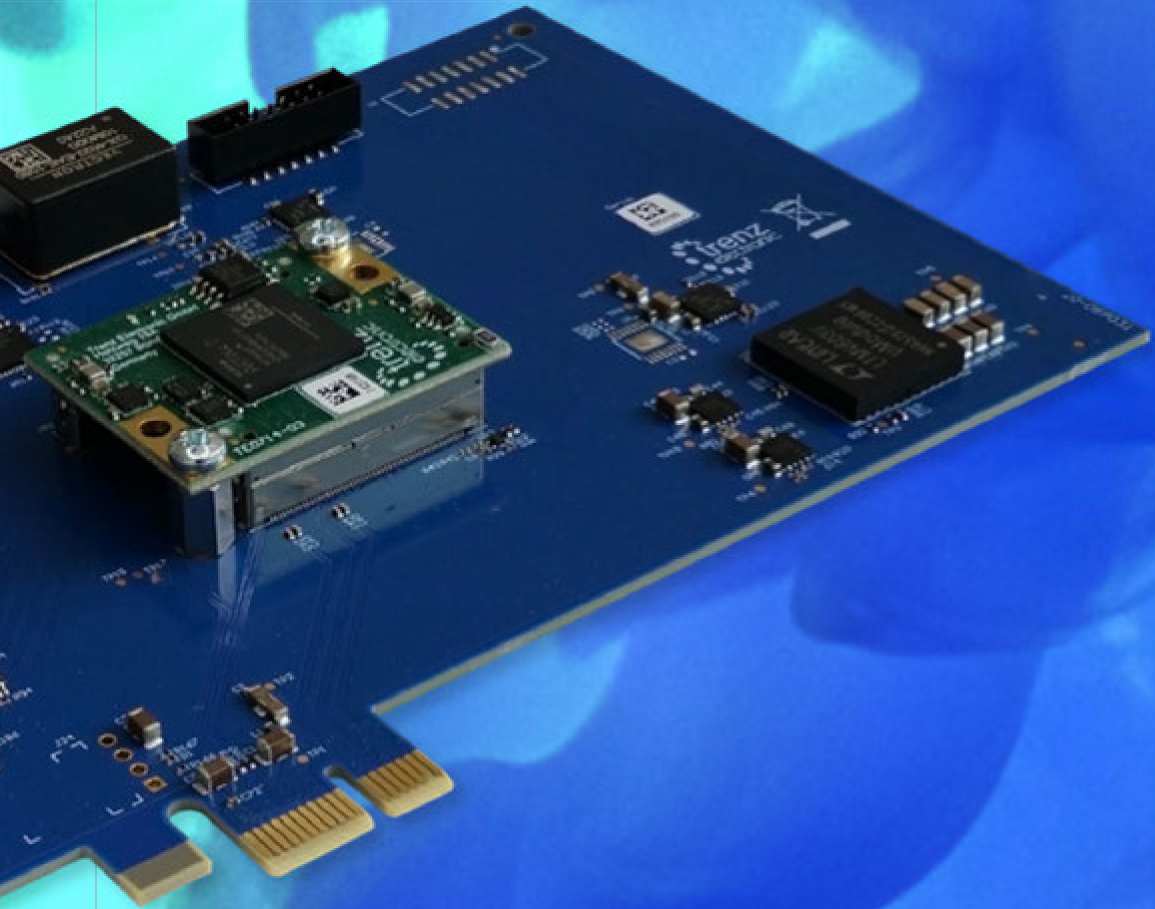
The timestamps of leading or trailing edges of digital pulses are recorded from the TimeTaggers with the following quantization (bin size):

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

For all these time interval meters, cronologic will support you with drivers for Windows and Linux.



TimeTagger



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TimeTagger
Technical Data

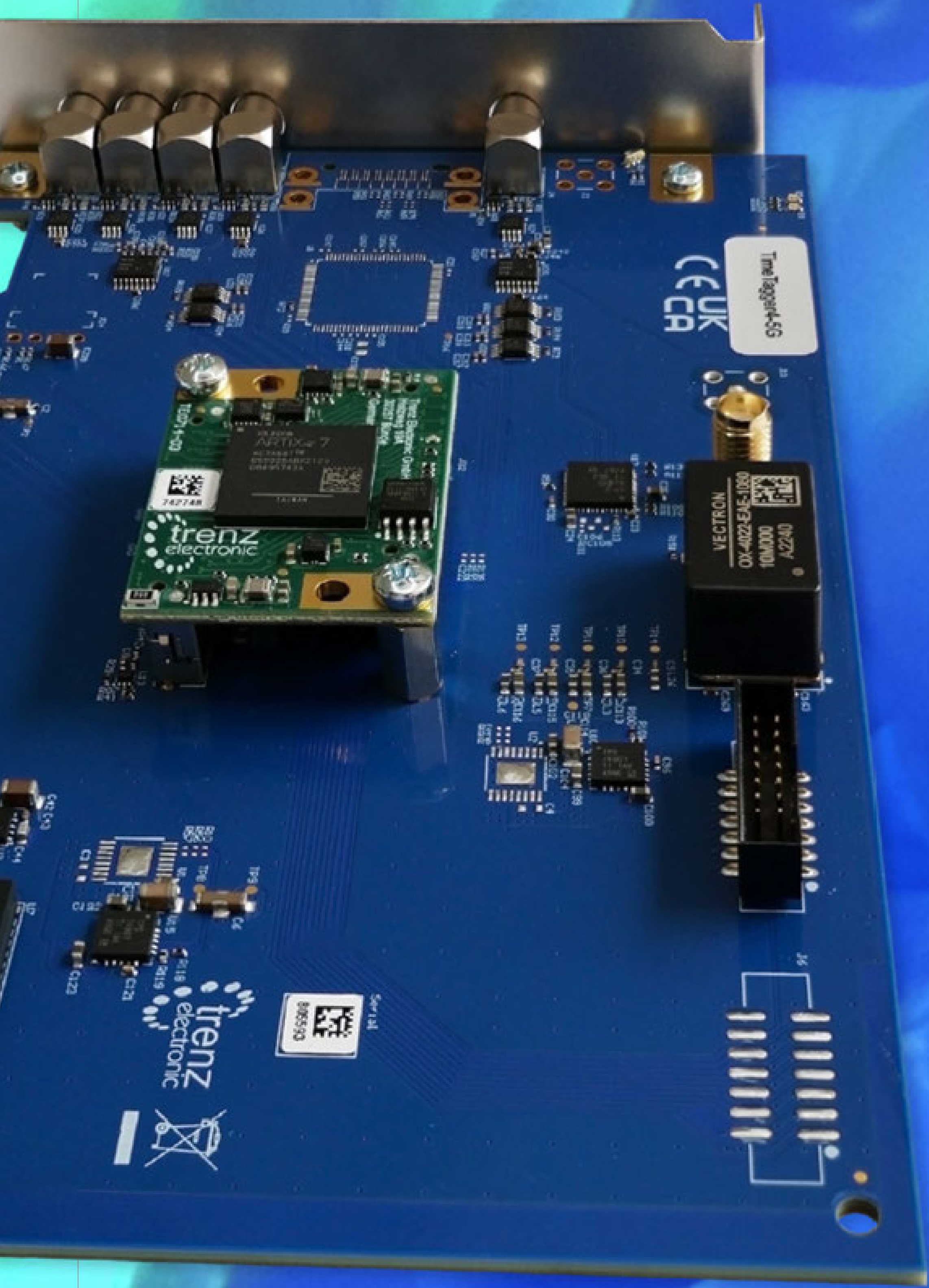
Optimized for	low cost
TDC channels	1 AC-coupled start channel 4 AC-coupled stop channels
Connectors	5x LEMO 00
Bin size	800 / 400 / 200 / 100 ps
Double pulse resolution	2 bins
Multihit	8000x per start event
Dead time between groups	none
Readout rate	60 MHits/s total; 40 MHits/s per channel
Timestamp range	1.67 ms / 430 ms extended
Common start/stop	yes / no
number of boards that can be synced	no sync possible
Readout interface	PCIe2 x1 @ 400MB/s (or connects to TBT)
Time base	250 ppb on board
Linux support available	yes

Please note:

All TimeTagger - PCVIe versions are also available as a desktop device that allows data transfer to any Thunderbolt port and offers several mounting options. Please make use of the model designation TimeTager4-xxxG-TBT.

TDC

TimeTagger



Features

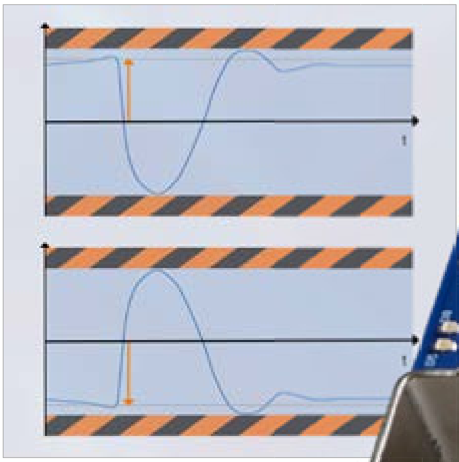
Low cost.

The TimeTagger4 is available at the lowest cost, while still providing picosecond resolution.

Bipolar threshold: Make use of a wide range of detectors.

The threshold discriminators can use positive or negative thresholds with configurable voltage.

This allows you to use the TimeTagger with a wide range of detectors or constant fraction discriminators (CFD).



Make use of your individual TiGer Timing Generator setup.

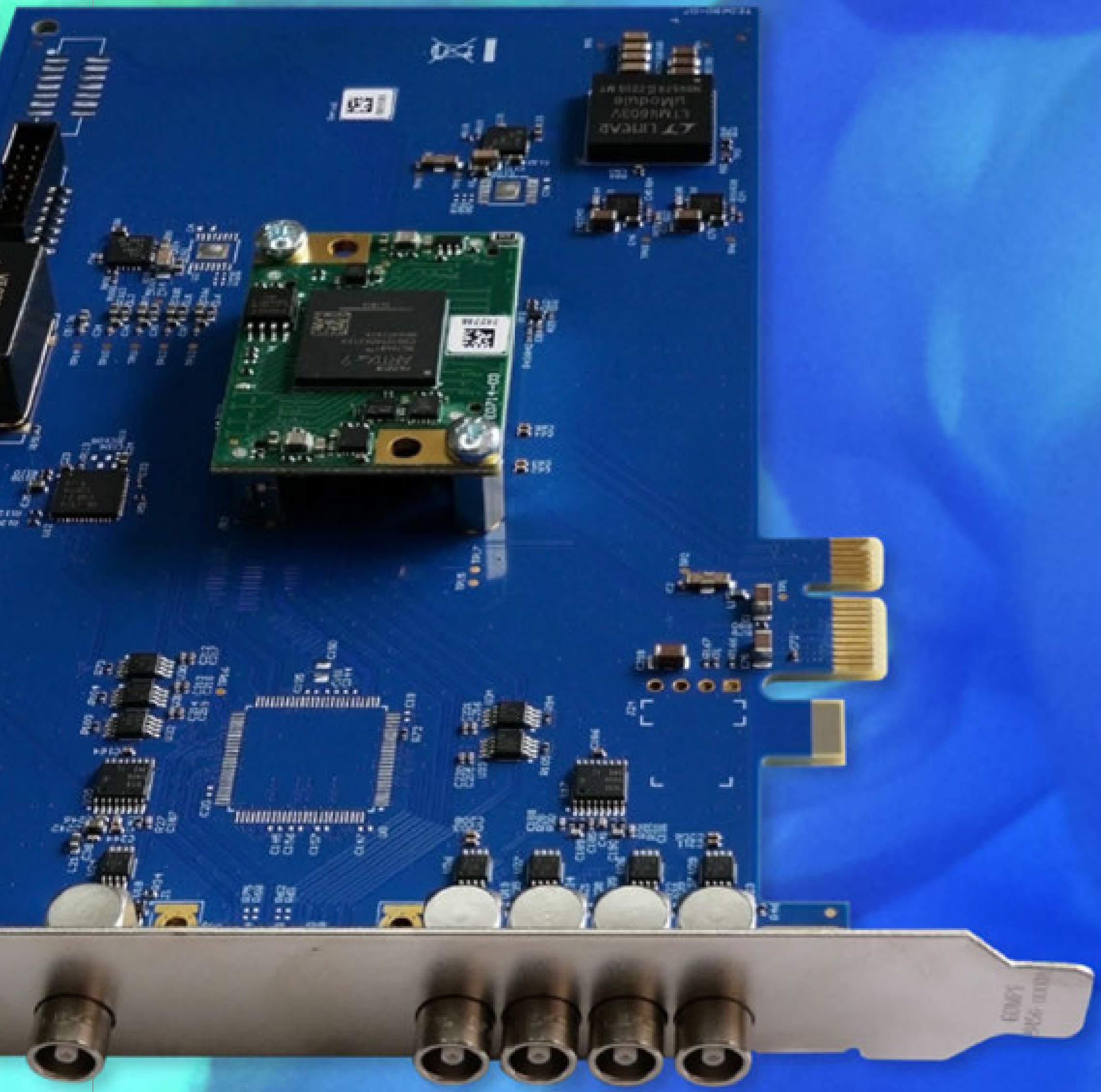
All LEMO-00 inputs can also be used to output DC-coupled periodic pulse patterns to control external devices in your experimental setup.

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.

TDC



TimeTagger

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