

Surface Concept Product Catalog 2014



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in the United States is**



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 Delayline Detectors

 MCP Detectors

 Time-to-Digital Converters

 Pulse Processing Electronics

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..... **CONCEPT**

Delayline Detectors

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Time-to-Digital Converters

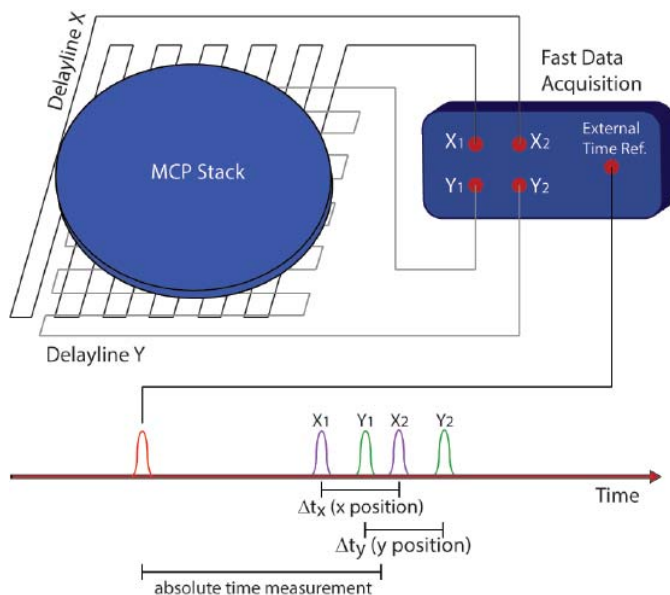
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Pulse Processing Electronics

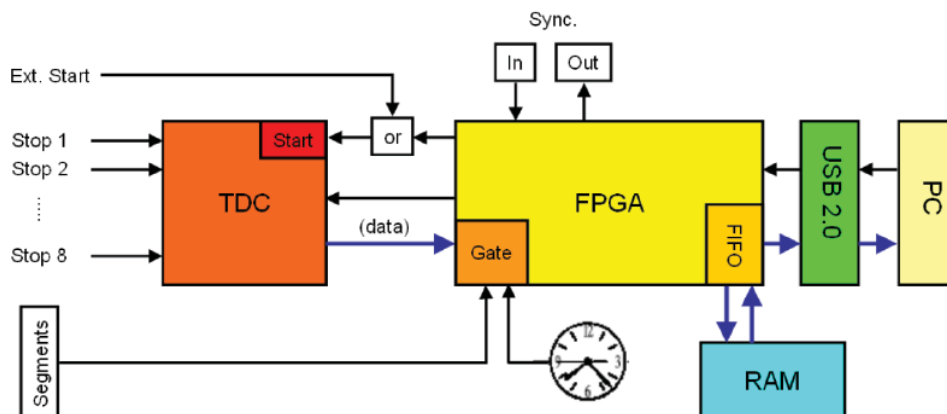
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Principle of Operation

The DLD anode consists basically of two flat serpentine-like wire arrangements (meanders); one below the other, rotated by 90°, in close proximity, but insulated. This unit is positioned behind a Chevron micro-channel plate stack for electron amplification. The electron cloud leaving the MCP stack output couples into the meanders where it induces electrical pulse groups traveling to the wire ends within a certain time that determines the impact position. Time measurement therefore allows reconstructing the position of the impact. The detector enables absolute time measurements with respect to an external start signal. This is derived from the average time at both coil ends in relation to an external repetitive clock signal.



Pulse readout is realized by a fast analog electronics and a time measurement unit (TDC = time-to-digital converter). A field programmable gate array (FPGA) within the TDC enables comfortable setups and a variable data stream handling from the TDC via USB 2.0. The main delayline detector and segment readout (optional device) functionality is permanently programmed. A complex FIFO design makes data losses almost impossible. The user DLL controls the data handling and streaming for the user.



Small area Delayline Detectors 2D(x,y), 3D(x,y,t)



DLD3636



DLD4040



Features

- 2D(x,y) / 3D(x,y,t) detector
- CF150 mounting flange
- typ. active areas¹: $\varnothing 30\text{mm}$ / $36 \times 36\text{mm}^2$ / $40 \times 40\text{mm}^2$
- active MCP area: $\varnothing 48\text{mm}$ (max.)
- typ. image sizes in pixels: 400×500 / 700×850 / 900×1100 (higher values possible as custom specific layouts)
- typ. time resolution: $\leq 240\text{ps}$ absolute, $\leq 100\text{ps}$ relative
- linear response due to single event counting²
- extremely low dark count rate: ≤ 5 cps (under UHV conditions)
- up to 8 million counts per second random hits in 2D/3D mode

¹The active area of a DLD is the intersection of the rectangular active area of the wire coils/ meander and the round active area of the MCP stack. Depending on these both areas, the active detector area can be round, rectangular or rectangular with rounded edges.

²The linear response is accurately valid for small count rates. The detector response loses its linearity with increasing count rate due to typ. deadtimes between 20ns and 100ns, but can be restored by software corrections.

Large area Delayline Detectors 2D(x,y), 3D(x,y,t)



DLD6565



DLD8080



DLD120120



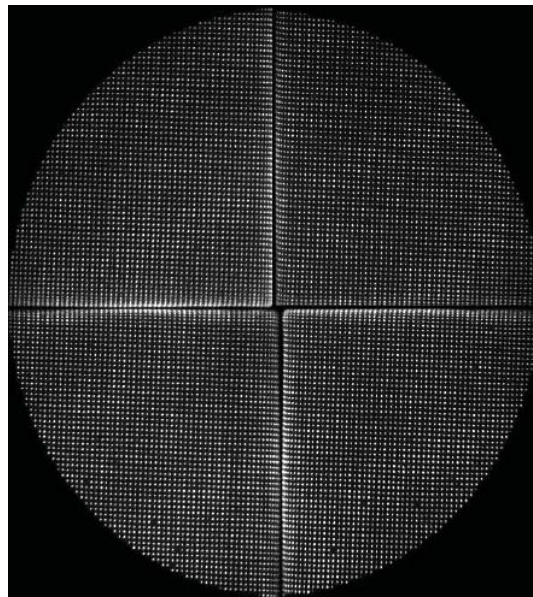
Features

- 2D(x,y) / 3D(x,y,t) detector
- CF150 mounting flange
- typ. active areas¹: 65x65mm² / 80x80mm² / 120x120mm²
- active MCP area: Ø 120mm (max.)
- typ. image sizes in pixels: 2000x2200 / 3000x34000 / 6000x7000
- typ. time resolution: ≤ 240ps absolute, ≤ 100ps relative
- linear response due to single event counting²
- extremely low dark count rate: ≤ 5 cps (under UHV conditions)
- up to 5 million counts per second random hits in 2D/3D mode

^{1,2} see page 3 for details.

4 Quadrant Delayline Detectors DLD3030-4Q / DLD4040-4Q

- Renewed realization of Surface Concept's patented multi-anode DLD layout
- Multi-hit 4 fold detector optimized for fast burst recognition above 100 MCPS equiv.
- Large detection area up to 60 mm x 60 mm (60 mm x 30 mm used in PHOIBOS 225)
- Real parallel detection of 4 hits without any dead time due to the fourfold design
- Multi hits on single quadrants (all 10 ns possible) are always unambiguous, no data redundancy problems due to the short single delays of about 9 ns.



Features

- multi-hit 2D/3D 4-fold Delayline Detector
- up to 4 multi-hits with zero dead time
- up to 400 multi-hits per 1 μ s
- Burst rates above 100 Mcps equivalent rate
- 60 x 60 mm² (alternatively 80 x 80 mm²) active area¹ of DLD and \varnothing 82 mm active MCP area
- down to 30 μ m pixel size
- < 250ps overall time resolution
- linear response due to single event counting²
- extremely low dark count rate: ≤ 2 cps/cm² (under UHV conditions)
- up to 40 Mcps permanent random count rate in 2D/3D mode

^{1,2} see page 3 for details.

Interchangeable-in-UHV Delayline Detectors 2D(x,y), 3D(x,y,t)



Features

- 2D(x,y) / 3D(x,y,t) Delayline Detector
- CF63 mounting flange
- Interchangeable system for in-situ change of DLD position, e.g. for electron / ion optics front-ends
- typ. active areas¹: \varnothing 18 mm - \varnothing 40 mm
- active MCP area: \varnothing 46 mm (max.)
- typ. image sizes in pixels: 200 x 250 - 900 x 1100
- typ. time resolution: ≤ 240 ps absolute, ≤ 100 ps relative
- linear response due to single event counting²
- extremely low dark count rate: ≤ 5 cps (under UHV conditions)
- up to 8 million counts per second random hits in 2D/3D mode

^{1,2} see page 3 for details.

1D Delayline Detectors 18 / 43 / 43-2 / 64 / 64-2



1D-DLD43



1D-DLD64

Features

- 1D(x) / 2D(x,t) Delayline Detector
- CF150 mounting flange
- typ. active detection lengths¹: 18mm / 43mm / 64mm
- detection width (nonresolving): 15mm / 20mm / 20mm
- typ. no. of lines: 40 / 215 / 320 (higher values up to 2000 channels in custom specific layout)
- typ. time resolution: $\leq 240\text{ps}$ absolute, $\leq 100\text{ps}$ relative
- linear response due to single event counting²
- extremely low dark count rate: ≤ 5 cps (under UHV conditions)
- up to 6 million counts per second random hits (1D-DLD43, 1D-DLD64)
- up to 15 million counts per second random hits (1D-DLD64-2)

^{1,2} see page 3 for details.

Optional Packages for Delayline Detectors

In addition, we offer for all Delayline Detectors optional setup packages for extended time measurement ranges, improved time resolution, and multi-hit recognition. A virtual segmentation readout is possible for spectroscopy applications, which enables improved countrates. The high voltage option enables floating operation of the detector head up to 20kV.

Custom Designed Delayline Detectors

Surface Concept is an expert in designing customized delayline detectors. We produce all DLD components (active areas, housings, mounting flanges) adapted to the customer's application. A selection of our most recent customized designs:

DLD4040-4Q mounted on x,y and rotational piezo drives



- High Voltage (HV)DLD
- base potential of up to -20kV



- HV DLD/ MircoMott Detector Combination
- HV DLD combined with a micromott detector
- base potential up to -12kV

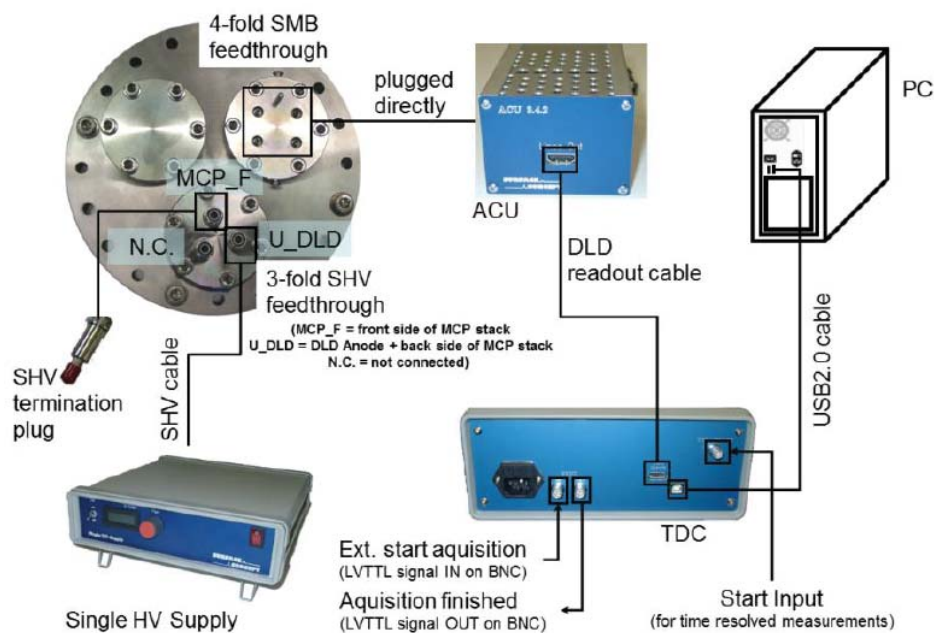


- Encapsulated X-Ray DLDs and EUV DLDs



Typical delivery package

- DLD with MCP stack mounted in housing on conflat flange
- Pulse processing unit with preamplifiers and constant fraction discriminators (CFD) tuned individually for the delivered detector
- Time to Digital Converter (TDC) with free programmable gate array logic (FPGA) and USB 2.0 interface tuned up for the delivered detector
- High voltage power supply
- All required connection cables
- Windows® DLL with interface discription
- Stand alone image acquisition software for monitoring and histogramming
- Transport vacuum-housing for delivery and storage of UHV part



Non-imaging MCP Detectors



Non-imaging MCP detectors are available in a large variety of layouts including single and multi-anodes, with or without center hole, signal readout, dimensions and active areas.

Superior signal-to-noise ratio due to true counting readout.

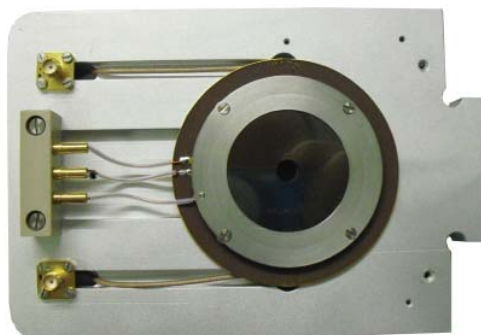
Roughly position sensitive due to multi-anode readout.

Parallel multi-hit capability due to multi-anode concept.

High count rates, small dead times, compact design.

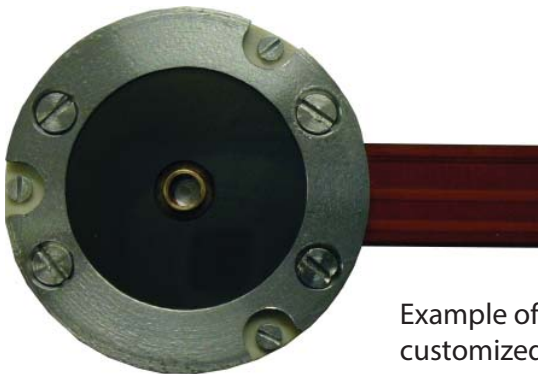
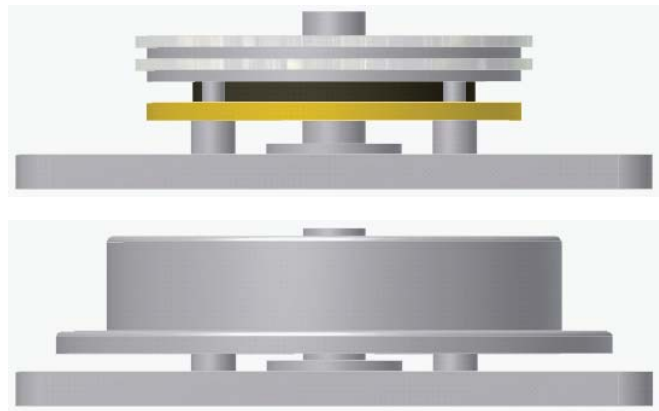
Time resolution down to below 150 ps for each anode segment.

Typical applications: time resolving detection of particles (electrons, ions, UV-photons, X-rays) under different emission angles, time-of-flight electron spectroscopy, time-of-flight mass / ion spectrometry.



Backscattered Electron Detectors for SEM

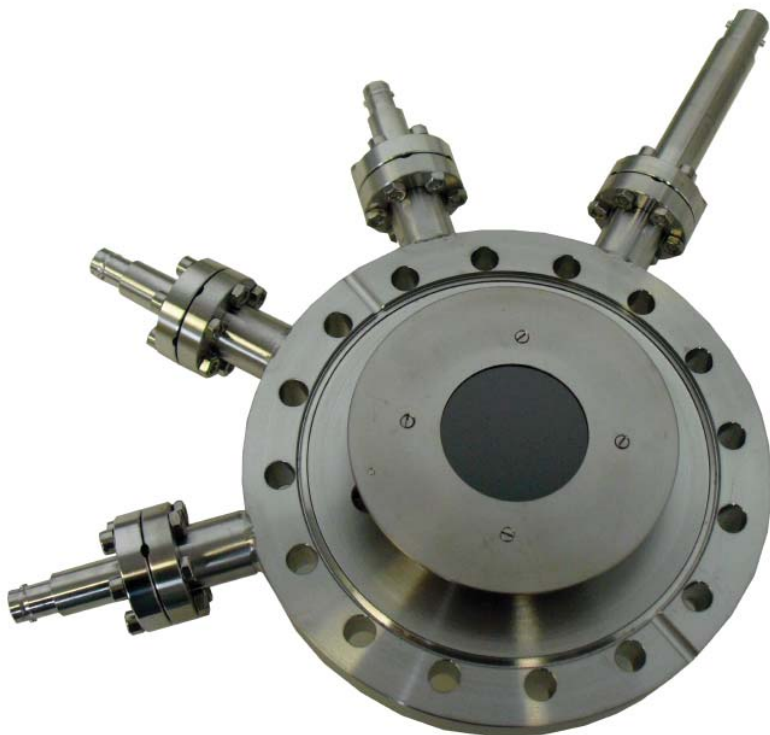
For the detection of backscattered electrons in scanning electron microscopy a four-segment MCP detector with center hole is available. The mechanical layout and dimensions can be adapted to the frame conditions of the SEM type.



Example of extremely thin
customized design
(thickness only 2.5mm)

MCP-based Image Intensifiers

MCP / Phosphor screen based image intensifiers are available in a wide range of possible layouts. Mechanical design, active areas, Phosphor screen types, number of MCPs and dimensions can be adapted to the special needs of the application.



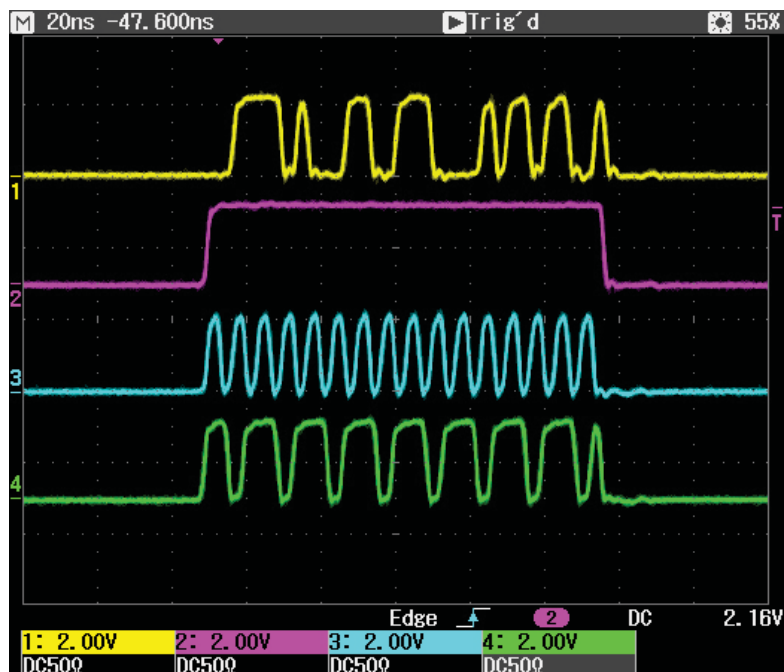
Pulse Pattern Generator

The Surface Concept Pulse Pattern Generator is a stand-alone device that is capable of creating complex patterns and bursts of pulses. The adjustments are carried out with two menu knobs below the display or via PC interface software. The connection between the Pulse Pattern Generator and the PC is established via USB 2.0. The module is equipped with four output channels (BNC type connectors) that operate independently.



4 LVTTTL outputs for independent patterns down to pulse widths of 3.3ns
retriggerable and external clock capability for synchronization
maximum frequency of 150 MHz

Exemplary pulse patterns



Time-to-Digital Converters

The Surface Concept Time-to-Digital Converters (TDCs) are compact time measurement systems. These systems are available in a variety of layouts and performance characteristics. All devices are equipped with multiple synchronization capabilities and with a high-speed USB 2.0 interface that enables measurement rates up to 8 million results per second. The delivery package contains flexible software.



SC-TDC-1000/16 S



SC-TDC-1000/02 D

SC-TDC-1000/08 S and SC-TDC-1000/16 S

ultrafast time measurements with a time bin resolution of 82.2ps on 8 or 16 channels

SC-TDC-1000/02 D and SC-TDC-1000/04 D

ultrafast time measurements with a time bin resolution of 27.4ps on 2 or 4 channels



Also available as customized NIM unit device.

TDCs can be customized with time bin widths of 82ps or 27ps and up to 128 channels. Sophisticated triggering capabilities, USB 2.0 and USB 3.0, PCIe and Ethernet interface possible.

Programmable integrated start dividers available.

Constant Fraction Discriminator (CFD)



Versions with 2, 4 or 6 channels available
Gated operation possible
Constant fraction discrimination with walks below 20ps
Minimum pulse distances of 7ns
Available as NIM module or stand-alone unit



Fast Signal Level Translation and Distribution



Level translators between TTL, LVTTTL, ECL, PECL, LVPECL, NIM and LVDS, up to 8 channels

Signal Fan-Outs for all signal families, also combinable with level translators

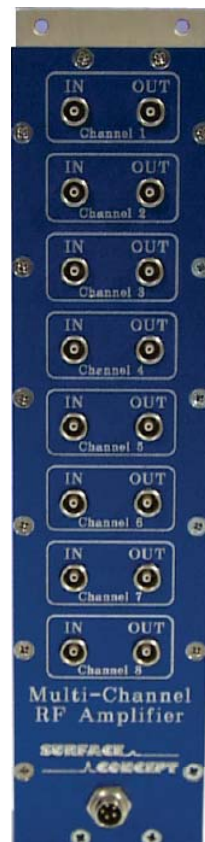
Frequencies up to 1 GHz, pulse width recognition below 1ns (depending on signal family)

available as NIM module or stand-alone device

Ultrafast Pulse Amplification



Pulse amplifiers in different configurations with up to 8 channels
Amplification levels from 12dB up to 48dB
Different connectors available, SMA or LEMO
Bandwidths depending on configuration from 500 MHz to 6 GHz
Available as NIM module or stand-alone device



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**For further information or to discuss your application,
please contact our technical support team.**

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