Big things sometimes come in small pieces.

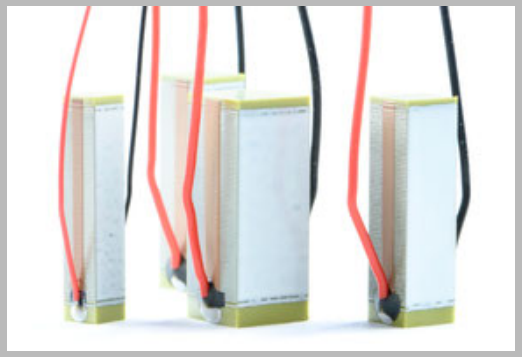
PIEZOTECHNICS

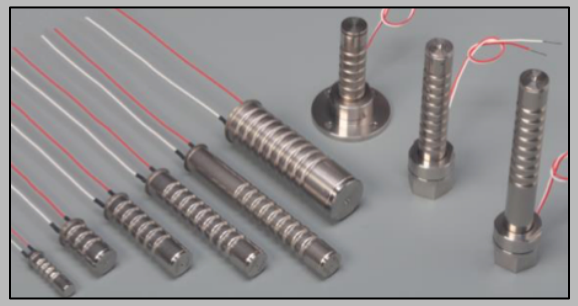
Content Multi-Channel Piezo Driver Boards

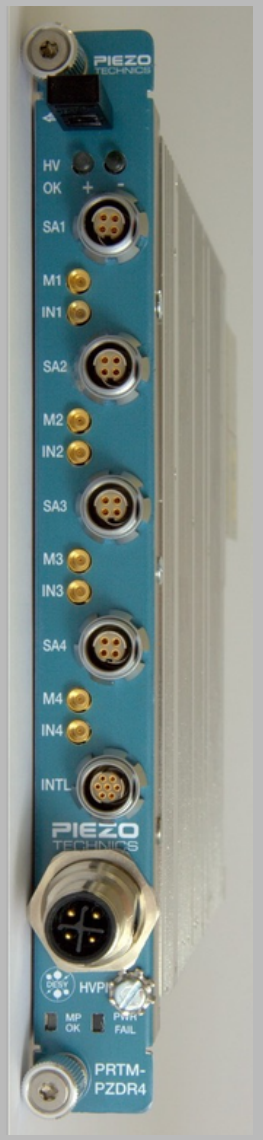
- Products & Services
- Short introduction of piezo technology
- PRTM-PZDR4 4-channel piezo driver
- Outlook 8-channel boards

Products & Services

- Piezos, Mechanics, and Piezo Electronics
- PZT4 4-Channel Piezodriver for MTCA under licence of DESY



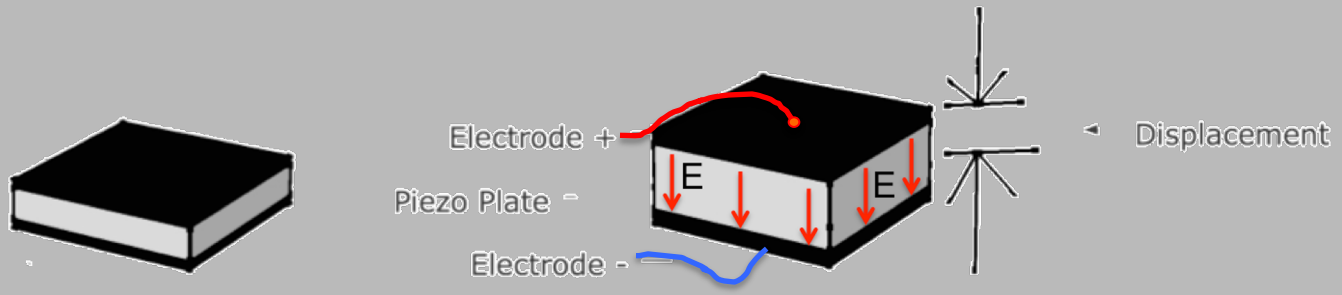




ACTuator – a technology of its own.

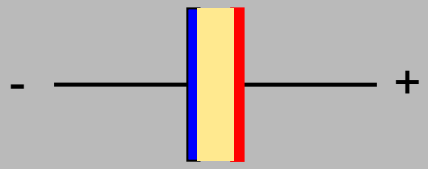
The idea of piezo actuators is as **simple** as it is **effective**:

- A piece of piezo material deforms under the influence of electric field .
- It changes its length directly with the applied voltage
- and can run at very high power setting movements of loads.

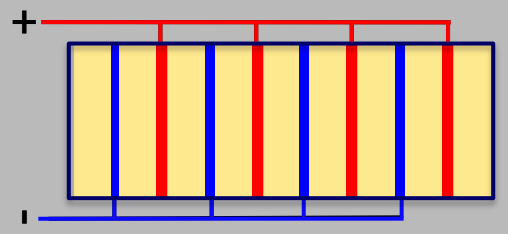


Vice versa, a piezo generates an electrical voltage under the presence of mechanical pressure

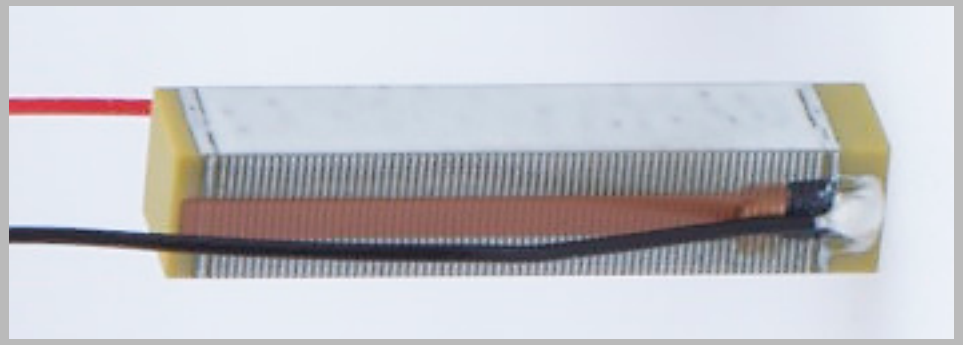
ACTuator – a technology of its own.



Single Piezo Plate E = 2kV/mm



Stacked Piezo Plates U = 0 to +150V



Sintered multilayer piezo stack actuator

Stack Assembly

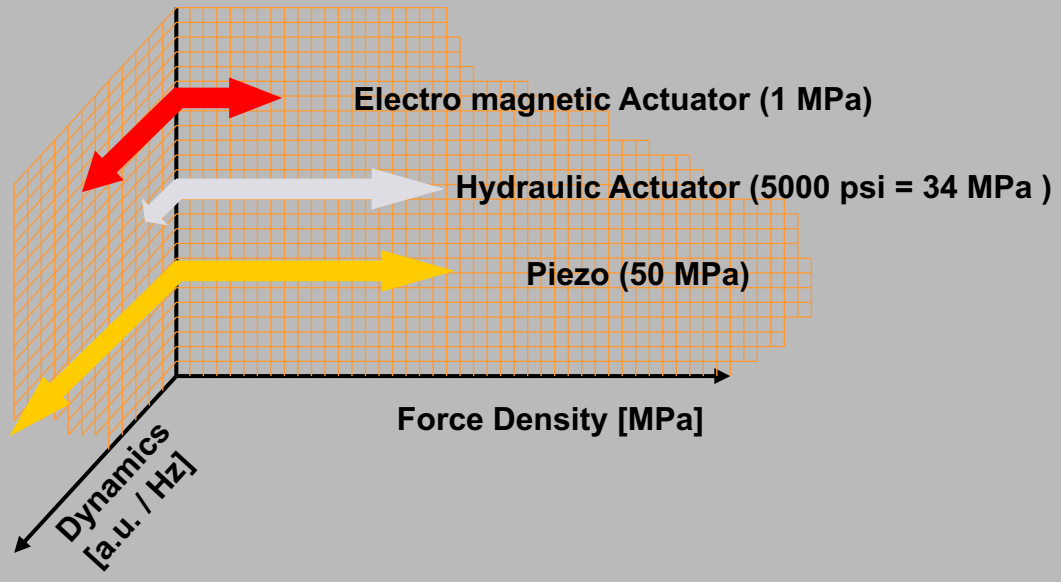
PIEZOTECHNICS

ACTuator – a technology of its own.

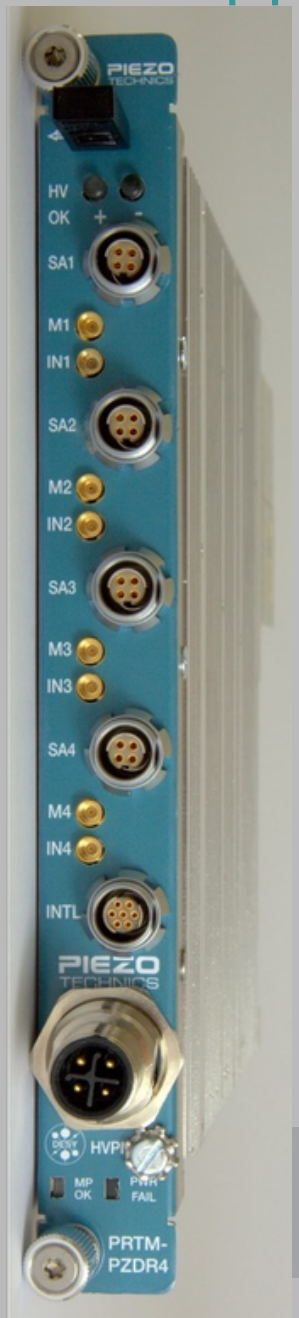
Pros of Piezo

- **Strong.**
- **Faster.**
- **True**.

Con of Piezos – **small displacement**



PRTM-PZDR4 4-Channel Piezo Driver for MTCA



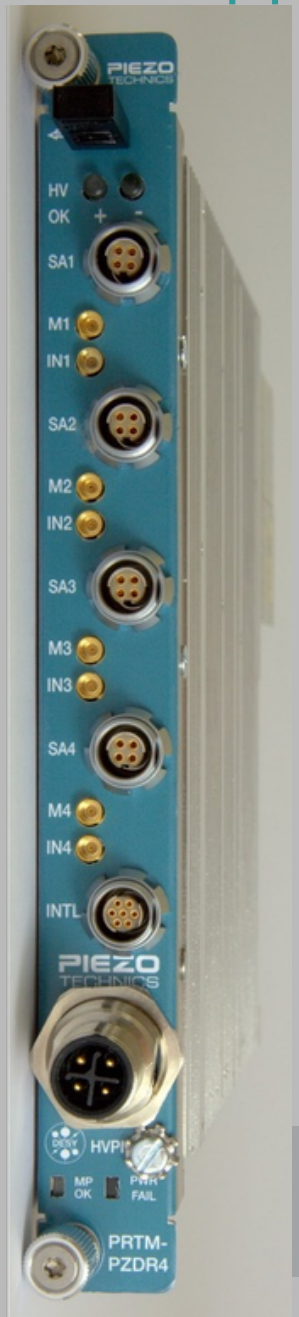
HIGHLIGHTS
Supports 4 actuators and sensors
Unipolar and bipolar operation
Digital voltage and current readout
Encapsulated in metal housing
Internal high-voltage source/ and external high-voltage option

FEATURES
MicroTCA.4 Rear-Transition Module (RTM)
Typical bandwidth of 50 kHz with 0.1 µF piezos
Digital output sampling with 200 kSPS
Switchable actuator and sensor functionality

OPERATION
Internal power supply: : ±80 V, 100 mARMS (sum 4 channels)
External power supply: : ± 120V, 500 mARMS (sum channels)
Interlock signal support via Zone 3 or front panel
Analog low-voltage monitor outputs on front panel

PIEZOTECHNICS

PRTM-PZDR4 4-Channel Piezo Driver for MTCA



APPLICATIONS

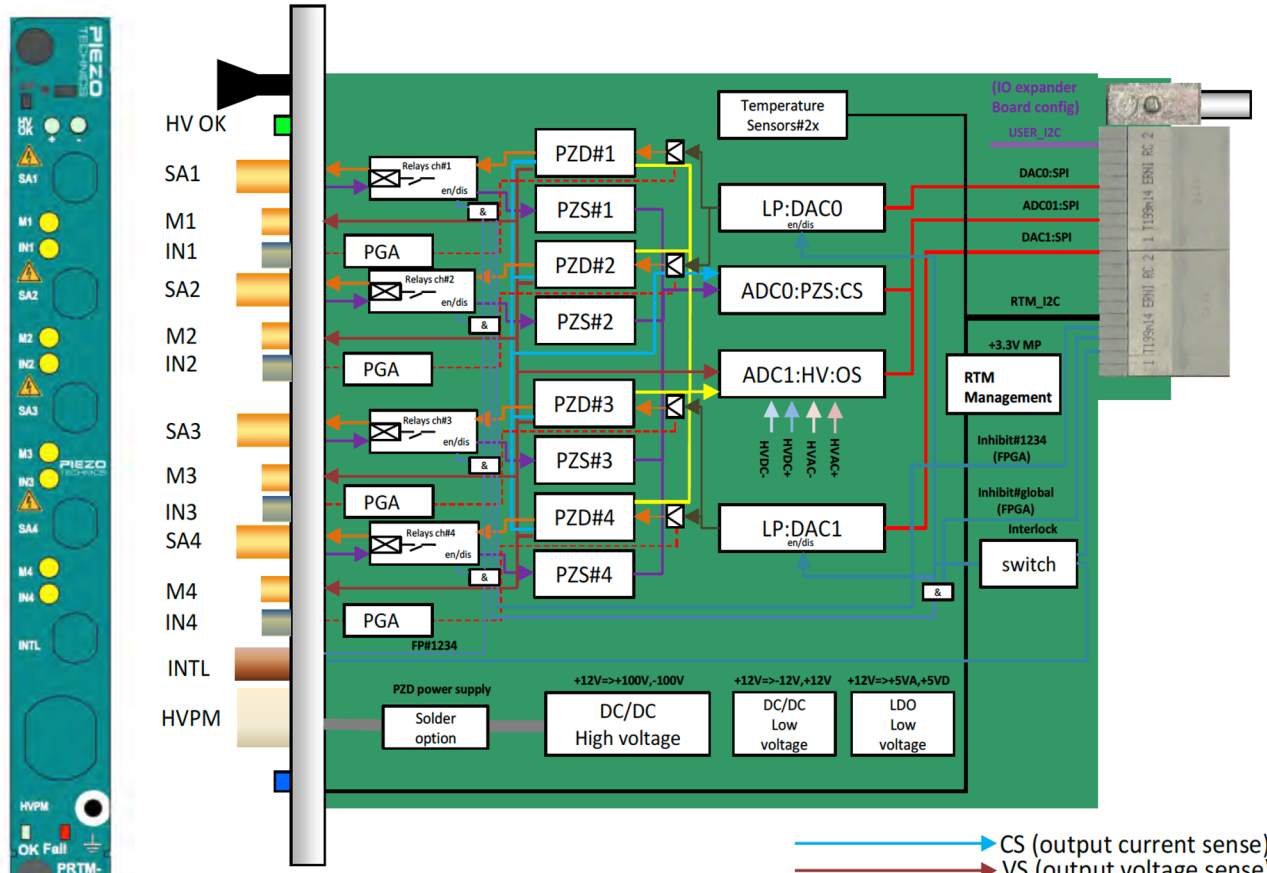
Particle and optical beam control
Particle accelerator: RF Cavity frequency control
Laser optics: Stretcher and switcher for optical fiber
Control, mirror steering,
synchronization of pulsed lasers, fiber link stabilization etc.

INDUSTRIALIZATION

by PIEZOTechnics under licence of DESY
In series production since 2019:
2019 67 pcs.
2020 25 pcs.

PIEZOTECHNICS

FUNCTIONAL BLOCK DIAGRAM



HVDC-(high voltage negative:dc component)
HVDC+(high voltage positive:dc component)
HVAC-(high voltage negative:ac component)
HVAC+(high voltage positive:ac component)

CS (output current sense)
VS (output voltage sense)
PZDO (piezo driver output)
PZS (piezo sensor input)
DAC output
external input

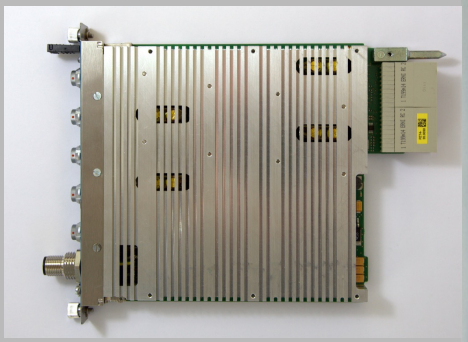
LP(programmable analog low pass)
Relays ch#(Relay ACT/SENS, Relay load disconnection)
PGA(Programmable gain amplifier with protection)

PIEZOTECHNICS

PRTM-PZDR4 Applications I

Commercial offer of PRTM-PZDR4

- **proven DESY technology**
- **four channels for piezo** (actuators or sensors)
- **fast**: small signal bandwidth 80 kHz (for 1 µF)



Applications at DESY FLASH/XFEL

- 1.3 GHz Superconducting RF Cavity Tuning
- Laser Cavity Tuning
- Fiber Link Stabilization
- and more

References to
Matthias Felber: Laser Synchronisation
Konrad Przygoda: Single Cavity Piezo
Michael Fenner: Piezo Driver Improvem.

PRTM-PZDR4 Applications II

MTCA.4 based synchronization for the EOD laser

System now fully integrated in 19”:

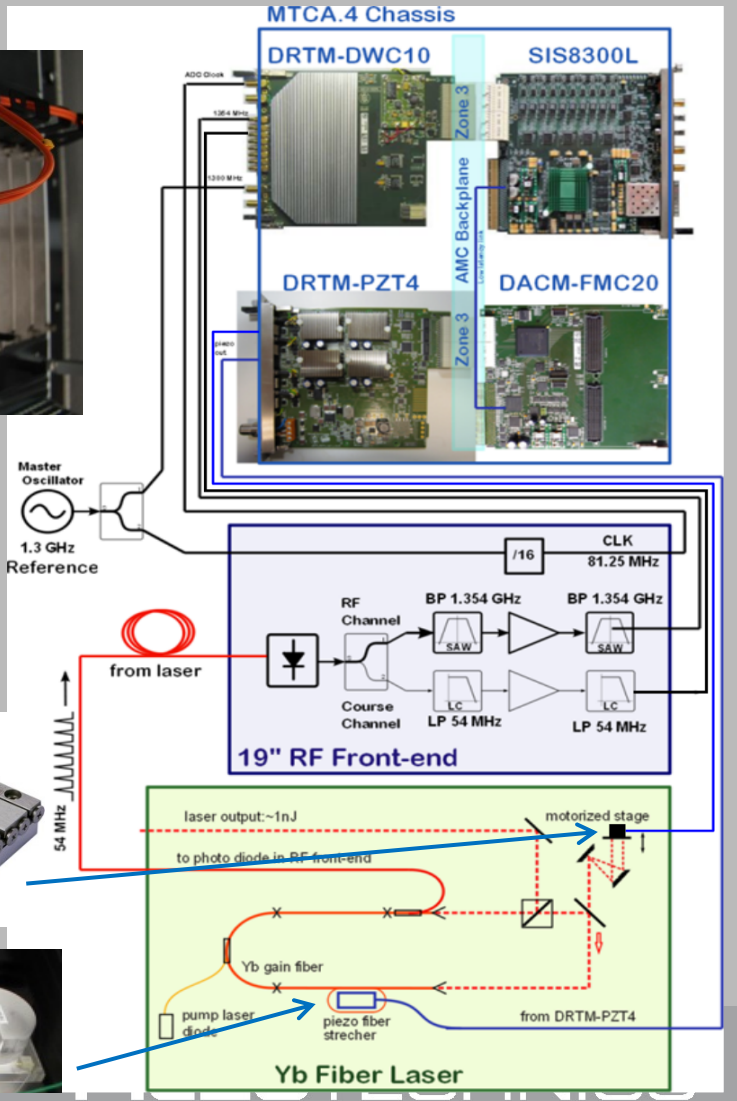
- MTCA.4 system for:
  - Detection and controls:

    Struck ADC + downconverter RTM
  - **Piezo driver: MTCA-RTM PZT4**

    for fiber stretcher and linear piezo stage
- RF-front-end: temperature stabilized in Special Diagnostics Module chassis (SDM, together with LDDs and laser temperature control)
- Yb fiber laser and amplifier

SmarAct SLC-1730 piezo stepper for coarse tuning

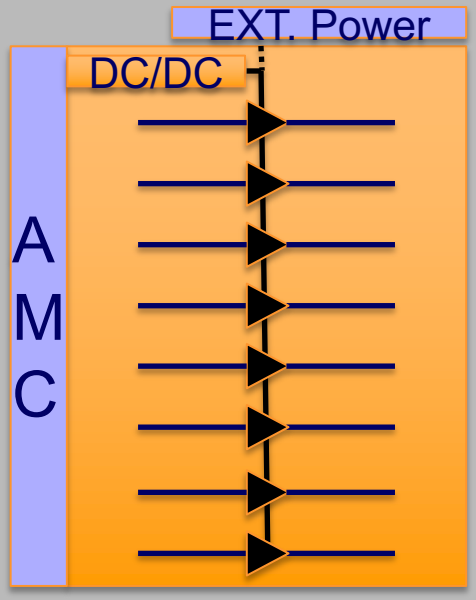
Evanescent Optics fiber stretcher 915B for fast synchronization

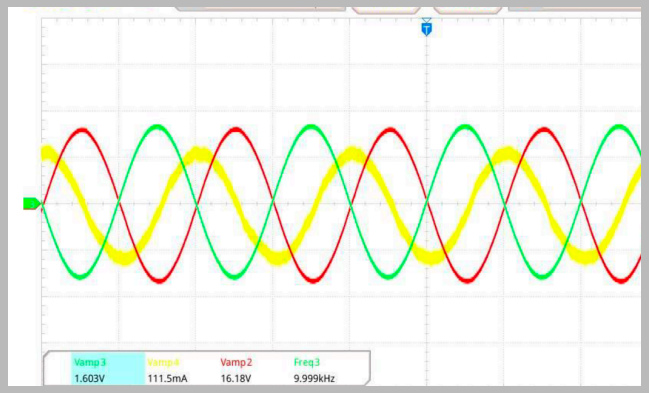


Outlook 8-Channel Board under Development

- **SPECIFICATION**

  - Standalone or MTCA Crate operation 0-150 or +/-150 V
  - Internal (30 W by MMC) or external power supply (150 W)
  - Noise figure 20mV RMS
  - Small signal bandwidth 100 kHz
  - Dimensions 170 x 170 mm^2





First Testing at 10 kHz

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THANK YOU!

QUESTIONS??