Trenz Electronic GmbH operates as a provider of development services in the electronic industry since 1992. Our services include design-in support as well as turnkey designs which typically covers all steps from product specification, hardware and software design up to prototyping and production.

We are particularly specialized in the design of high-speed data acquisition, high-accuracy measurement and embedded digital signal processing systems based on FPGA and CPU architectures.

Many of our products are compatible with some widespread form factors. We also provide SoM products for Automotive industry and high-end applications.

In the event that an off-the-shelf FPGA board won’t fit the customers requirements, the design can be easily adapted by our comprehensive engineering design service.

Our in-house EMS and worldwide supply of FPGA and SoC modules complete the portfolio. All modules produced by Trenz Electronic GmbH are developed and manufactured in Germany.

Other assembly options of our modules for cost or performance optimization plus high volume prices are available on request. Also, cooling solutions and several carrier boards are available.

Hardware Design
- System architecture and design
- Hardware integration (Design-In)
- Ultrafast digital logic
- Analog and mixed signal
- Digital signal processing
- Schematic capture and PCB layout

HDL Design
- FPGA and System-On-Chip design
- System design and synthesis
- HDL design (VHDL, Verilog)
- Integration of soft-cores
- USB, PCI-Express, Gigabit Ethernet
- Ultrafast ADC/DAC interfaces

Software Development
- Device driver and application software development
- Software and Firmware development

- Extended device life cycle
- Rugged for industrial applications
- Automotive grade available
- Small and powerful
- Customizable
- Development and design service
- Rapid Prototyping
- Cooling solutions
- Carrier and testboards
- Free documentation and designs
- Sales worldwide
- In-house EMS
- Developed & produced in Germany

ISO 9001:2015 (quality management) certified
ISO 14001:2015 (environmental management) certified
several carrier boards are available. Also, cooling solutions and performance optimization plus high volume prices are available on request. Other assembly options of our modules for cost or adapt to the customers requirements, the design can be easily adapted by our comprehensive engineering design service.

In the event that an off-the-shelf FPGA board won't fit applications.

Many of our products are compatible with some based on FPGA and CPU architectures. We are particularly specialized in the design of high-speed data acquisition, high-accuracy measurement and embedded digital signal processing systems.

We offer a full range of services to the design up to prototyping and production.

Our in-house EMS and worldwide supply of FPGA and recent developments are strongly reflected in the portfolio.

Our products are featured in a wide range of applications from small to large scale projects and manufactured in Germany.

The Violet Series, including the Time Tagger, provides high-performance data acquisition solutions for scientific research and industrial applications.


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cronologic

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TE0803 Series
Xilinx Zynq UltraScale+, DDR4, Flash, 8 High Speed Serial Transceivers

Device list | Pin Package | Connectors | SDRAM max | Flash [MByte] | Total I/O | GBit Transceivers | Other Features
---|---|---|---|---|---|---|---
ZU2CG - ZU5CG, ZU2EG - ZU5EG, ZU4EV, ZU5EV | C784 | 4 x Samtec ST5 | 8192 MByte DDR4 | 128 | 156 + 65 MIO | 4 x PS GTR 4 x PL GTH (nur ZU4 + ZU5) | GPU/VCU depending on model, EEPROM MAC address, Programmable Clock Generator, Single Supply

TE0807 Series
Xilinx Zynq UltraScale+, DDR4, Flash, 20 High Speed Serial Transceivers

Device list | Pin Package | Connectors | SDRAM max | Flash [MByte] | Total I/O | GBit Transceivers | Other Features
---|---|---|---|---|---|---|---
ZU4CG - ZU7CG, ZU4EG - ZU7EG, ZU4EV - ZU7EV | B900 | 4 x Samtec ST5 | 8192 MByte DDR4 | 128 | 204 + 65 MIO | 4 x GTR, 16 x GTH | GPU and VCU, Programmable Clock Generator, Single Supply
TE0808 UltraSOM+ Series
Xilinx Zynq UltraScale+, DDR4, Flash, 20 High Speed Serial Transceivers

Device list | Pin Package | Connectors | SDRAM max | Flash [MByte] | Total I/O | GBit Transceivers | Other Features
---|---|---|---|---|---|---|---
ZU6CG, ZU9CG, ZU6EG, ZU9EG, ZU15EG | C900 | 4 x Samtec ST5 | 8192 MByte DDR4 | 128 | 204 + 65 MIO | 4 x GTR, 16 x GTH | GPU/VCU depending on model, Programmable Clock Generator, Single Supply

Device list | Pin Packages | Connectors | SDRAM max | Flash [MByte] | eMMC [GByte] | Ethernet PHY | USB PHY | Total I/O | GBit Transceiver | Other Features
---|---|---|---|---|---|---|---|---|---|---
ZU2CG - ZU5CG, ZU2EG - ZU5EG, ZU4EV, ZU5EV | 784 | 3 x Samtec LSHM | 4096 MByte DDR4 | 128 | 4 - 64 | 1 GBit | USB2.0 OTG | 132 + 14 MIO | 4 x PS GTR | GPU/VCU depending on model, Programmable Clock Generator, Single Supply

http://trenz.org/te0808-info

http://trenz.org/te0820-info
TEB0911 UltraRack+ Board
Xilinx Zynq UltraScale+, 6 FMC Slots, Gigabit Ethernet

Key Features

The TEB0911 UltraRack+ board is integrating a Xilinx Zynq UltraScale+ MPSoC with 4 GByte Flash memory for configuration and operation, DDR4-SDRAM SO-DIMM socket with 64-bit wide data bus, 22 MGT lanes and powerful switch-mode power supplies for all on-board voltages. The TEB0911 board exposes the pins of the Zynq MPSoC to accessible connectors and provides a whole range of on-board components to test and evaluate the Zynq UltraScale+ MPSoC and for developing purposes. The board is capable to be fitted to a enclosure, whereby on the enclosure's rear and front panel, I/O's, LVDS-pairs and MGT lanes are accessible through 6 on-board FMC connectors and other standard high-speed interfaces, namely USB3, SFP+, SSD, GbE, etc.

• Zynq UltraScale+ MPSoC
  - 1156 Pin Package
  - Assembly options: ZU6, ZU9, ZU15
  - 64-bit DDR4 SODIMM (PS connected)
  - M2 PCIe SSD (1-Lane)
  - eMMC (bootable)
  - Dual QSPI Flash (bootable)
  - System controller (LCMXO2-7000HC)
    - Power sequencing
    - IO expander
  - Configurable PLLs
    - GTH/GTP reference CLKs

• Front Panel
  - 4 x FMC
    - 4 GTH per FMC
    - 68 ZynqMP PL IO per FMC
  - DisplayPort (2-lanes)
  - RJ45 ETH + dual USB3 combo
  - Dual Stack SFP+
  - SD (bootable)
  - Status LEDs

• Back Panel
  - 2 x FMC
    - 4/2 GTH
    - 12 ZynqMP PL IO per FMC
  - 56 SC IO
  - USB JTAG/UART ZynqMP
  - USB JTAG/GPIO FMC
  - CAN FD (DB9 connector)
  - SMA (external CLK)
  - 5-pin 24V power connector

• Additional information
  - 406 mm x 234.30 mm board size
  - Other assembly options for cost or performance optimization plus high volume prices available on request.

http://trenz.org/teb0911-info
The TEB0911 UltraRack+ board is integrating a Xilinx Zynq UltraScale+ MPSoC with 4 GByte Flash memory for configuration and operation, DDR4-SDRAM SO-DIMM socket with 64-bit wide data bus, 22 MGT lanes and powerful switch-mode power supplies for all on-board voltages. The TEB0911 board exposes the pins of the Zynq MPSoC to accessible connectors and provides a whole range of on-board components to test and evaluate the Zynq UltraScale+ MPSoC and for developing purposes. The board is capable to be fitted to an enclosure, whereby on the enclosure’s rear and front panel, I/O’s, LVDS-pairs and MGT lanes are accessible through 6 on-board FMC connectors and other standard high-speed interfaces, namely USB3, SFP+, SSD, GbE, etc.

Zynq UltraScale+ MPSoC
- 1156 Pin Package
- Assembly options: ZU6, ZU9, ZU15

64-bit DDR4 SODIMM (PS connected)
M2 PCIe SSD (1-Lane)
eMMC (bootable)
Dual QSPI Flash (bootable)
System controller (LCMXO2-7000HC)
- Power sequencing
- IO expander
Conﬁgurable PLLs
GTH/GTP reference CLKs

Front Panel
- 4 x FMC
- 4 GTH per FMC
- 68 ZynqMP PL IO per FMC
- DisplayPort (2-lanes)
- RJ45 ETH + dual USB3 combo
- Dual Stack SFP+
- SD (bootable)
- Status LEDs

Back Panel
- 2 x FMC
- 4/2 GTH
- 12 ZynqMP PL IO per FMC
- 56 SC IO
- USB JTAG/UART ZynqMP
- USB JTAG/GPIO FMC
- CAN FD (DB9 connector)
- SMA (external CLK)
- 5-pin 24V power connector

Additional information
- 406 mm x 234.30 mm board size
- Other assembly options for cost or performance optimization plus high volume prices available on request.

TE0802 MPSOC Development Board
Xilinx Zynq UltraScale+, LPDDR4, Flash, Ethernet, USB, Audio, VGA Display

TE0890 S7 Mini
Xilinx Spartan-7, Fully Open-Source Module with HyperRAM

Device list
- ZU2CG
  - 1024 MByte LPDDR4
  - Ethernet PHY: 32
  - USB: 1 GBit
  - User I/O: 2 Pmod connectors
  - Audio: 3.5 mm jack (PWM output)
  - Other Features: USB JTAG/UART MicroUSB, VGA Display, M2 SSD, Power: 5V Plug

Device list
- 7S25
  - Footprint compatible: 756, 7515, 7550 FTGB-196 devices
  - Config PROM: 64 MBit
  - HyperRAM DRAM: 64 MBit
  - Total I/O: Dual-Pinout DIP-40 or 50mil 80 pin for 32 or 64 FPGA 3.3V I/Os
  - Interface(s): Standard 1x6 FTDI cable serial
  - Supply: 5V input
  - Other Features: 23K Logic Cells, 29K Flops, 45 36Kb BRAMs, 80 mults., fully Open-Source
### TE0745 Series

**Xilinx Zynq-7000, DDR3, Flash, USB, Ethernet, 8 x GTX**

<table>
<thead>
<tr>
<th>Device list</th>
<th>Connectors</th>
<th>SDRAM max</th>
<th>Flash [MByte]</th>
<th>Ethernet PHY</th>
<th>USB PHY</th>
<th>Total I/O</th>
<th>GBit Transceivers</th>
<th>Other Features</th>
</tr>
</thead>
<tbody>
<tr>
<td>Z-7030, Z-7035, Z-7045</td>
<td>3 x Samtec ST5</td>
<td>1024 MByte DDR3L</td>
<td>64</td>
<td>1 GBit</td>
<td>USB2.0 OTG</td>
<td>250 + 6 MIO</td>
<td>8 x GTX</td>
<td>Real Time Clock, Single Supply</td>
</tr>
</tbody>
</table>

### TE0729 Series

**Xilinx Zynq-7000, DDR3, Flash, 3 x Ethernet, 3 x EEPROM, USB, eMMC**

<table>
<thead>
<tr>
<th>Device list</th>
<th>Connectors</th>
<th>SDRAM max</th>
<th>Flash [MByte]</th>
<th>e.MMC</th>
<th>Ethernet PHY</th>
<th>USB PHY</th>
<th>EEPROM</th>
<th>Total I/O</th>
<th>Other Features</th>
</tr>
</thead>
<tbody>
<tr>
<td>Z-7020</td>
<td>3 x Samtec LSHM</td>
<td>512 MByte DDR3</td>
<td>32</td>
<td>4 - 64 GByte</td>
<td>2 x 100 Mbit, 1 GBit</td>
<td>USB 2.0 OTG</td>
<td>2 x MAC address</td>
<td>136 + 14 MIO</td>
<td>Real Time Clock, Single Supply</td>
</tr>
</tbody>
</table>
TE0715 Series
Xilinx Zynq-7000, DDR3, Flash, Ethernet, USB, 4 High Speed Serial Transceivers

http://trenz.org/te0715-info

<table>
<thead>
<tr>
<th>Device list</th>
<th>Connectors</th>
<th>SDRAM max</th>
<th>Flash [MByte]</th>
<th>Ethernet PHY</th>
<th>USB PHY</th>
<th>Total I/O</th>
<th>GBit Transceivers</th>
<th>Other Features</th>
</tr>
</thead>
<tbody>
<tr>
<td>Z-7015, Z-7030, Z-7012S</td>
<td>3 x Samtec LSHM</td>
<td>1024 MByte</td>
<td>DDR3</td>
<td>32</td>
<td>1 GBit</td>
<td>USB 2.0</td>
<td>132 + 14 MIO</td>
<td>Z-7015: 4 x GTP Z-7030: 4 x GTX Programmable Clock Generator, Real Time Clock, Single Supply</td>
</tr>
</tbody>
</table>

TE0720 GigaZee Series
Xilinx Zynq-7000, DDR3, Flash, Ethernet, USB, eMMC

http://trenz.org/te0720-info

<table>
<thead>
<tr>
<th>Device list</th>
<th>Connectors</th>
<th>SDRAM max</th>
<th>Flash [MByte]</th>
<th>eMMC max.</th>
<th>Ethernet PHY</th>
<th>USB PHY</th>
<th>Total I/O</th>
<th>Other Features</th>
</tr>
</thead>
<tbody>
<tr>
<td>Z-7020, Z-7014S</td>
<td>3 x Samtec LSHM</td>
<td>1024 MByte</td>
<td>DDR3</td>
<td>32 GByte</td>
<td>1 GBit</td>
<td>USB 2.0</td>
<td>152 + 14 MIO</td>
<td>Real Time Clock, Single Supply, Automotive grade available</td>
</tr>
</tbody>
</table>
### TE0728 Series
**Xilinx Zynq-7000, DDR3, Flash, 2 x Ethernet, CAN, Automotive**

<table>
<thead>
<tr>
<th>Device list</th>
<th>Connectors</th>
<th>SDRAM max</th>
<th>Flash [MByte]</th>
<th>EEPROM</th>
<th>Ethernet PHY</th>
<th>Total I/O</th>
<th>Other Features</th>
</tr>
</thead>
<tbody>
<tr>
<td>XA7Z020</td>
<td>3 x Samtec SEM</td>
<td>512 MByte DDR3</td>
<td>16</td>
<td>8 KByte</td>
<td>2 x 100 MBit</td>
<td>124 + 30 MIO</td>
<td>Automotive, Real Time Clock, CAN, Single Supply</td>
</tr>
</tbody>
</table>

### TE0724 Series
**Xilinx Zynq-7000, DDR3L, Flash, Ethernet, EEPROM, CAN**

<table>
<thead>
<tr>
<th>Device list</th>
<th>Connectors</th>
<th>SDRAM max</th>
<th>Flash [MByte]</th>
<th>EEPROM</th>
<th>Ethernet PHY</th>
<th>Total I/O</th>
<th>Other Features</th>
</tr>
</thead>
<tbody>
<tr>
<td>Z-7010, Z-7020</td>
<td>1 x Samtec ST5</td>
<td>1024 MByte DDR3L</td>
<td>32</td>
<td>MAC Address</td>
<td>1 GBit</td>
<td>PL: 64 PS: 20</td>
<td>CAN, Single Supply</td>
</tr>
</tbody>
</table>
### TE0782 Series

**Xilinx Zynq-7000, DDR3, Flash, 2 x GBit Ethernet, 2 x USB, eMMC, 16 x Transceivers**

<table>
<thead>
<tr>
<th>Device list</th>
<th>Connectors</th>
<th>SDRAM max</th>
<th>Flash [MByte]</th>
<th>eMMC</th>
<th>Ethernet PHY</th>
<th>USB PHY</th>
<th>Total I/O</th>
<th>GBit Transceivers</th>
<th>Other Features</th>
</tr>
</thead>
<tbody>
<tr>
<td>Z-7035, Z-7045, Z-7100</td>
<td>3 x Samtec QTH</td>
<td>1024 MByte DDR3</td>
<td>32</td>
<td>4 - 64 GByte</td>
<td>2 x 1 GBit</td>
<td>2 x USB 2.0 OTG</td>
<td>230 + 2 MIO</td>
<td>16 x GTX</td>
<td>Programmable Clock Generator, Real Time Clock, Single Supply</td>
</tr>
</tbody>
</table>

### TE0783 Series

**Xilinx Zynq-7000, Memory on both PS and PL, Flash, Ethernet, USB, eMMC**

<table>
<thead>
<tr>
<th>Device list</th>
<th>Connectors</th>
<th>SDRAM max</th>
<th>Flash [MByte]</th>
<th>eMMC</th>
<th>Ethernet PHY</th>
<th>Total I/O</th>
<th>GBit Transceivers</th>
<th>Other Features</th>
</tr>
</thead>
<tbody>
<tr>
<td>Z-7035, Z-7045, Z-7100</td>
<td>3 x Samtec QTH</td>
<td>1 GByte DDR3L 32-bit connected to PS plus 2 GByte DDR3 64-bit connected to PL</td>
<td>32</td>
<td>4 max. 64</td>
<td>1 Gigabit</td>
<td>16 x GTX</td>
<td>4 x GT</td>
<td>USB2.0 OTG, Programmable Clock Generator, Real Time Clock, Single Supply</td>
</tr>
</tbody>
</table>

**Notes:**
- The Ethernet PHY supports 1 Gigabit, and the USB PHY supports OTG, and programmable clock generator.
- The TE0724 Series includes an EEPROM, CAN, and single supply features.
- The TE0782 Series and TE0783 Series have different configurations for SDRAM, Flash, and Ethernet PHY connections.

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**Images:**
- 8.5 x 8.5 cm form factor images for different series.

**Links:**
- [TE0728 Series](http://trenz.org/te0728-info)
- [TE0782 Series](http://trenz.org/te0782-info)
- [TE0783 Series](http://trenz.org/te0783-info)
### TE0722 DIPFORTy1 "Soft Propeller" Series

Xilinx Zynq-7000, Flash, fits on DIP40 Pinout, MEMS Oscillator

<table>
<thead>
<tr>
<th>Device list</th>
<th>Flash [MByte]</th>
<th>Total I/O</th>
<th>Other Features</th>
</tr>
</thead>
<tbody>
<tr>
<td>Z-7010, Z-7007S</td>
<td>16</td>
<td>46</td>
<td>33.333 MHz Clock (MEMS Oscillator), 3.3V Single Supply, Micro SD card socket, ambient light sensor</td>
</tr>
</tbody>
</table>

### ZYNQ

Form factor like Arduino Board

http://trenz.org/te0722-info

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### TE0723 "ArduZynq" Series

Xilinx Zynq-7000, DDR3L, Flash, USB OTG, On-board USB JTAG and UART

<table>
<thead>
<tr>
<th>Device list</th>
<th>Connectors</th>
<th>SDRAM max</th>
<th>Flash [MByte]</th>
<th>USB PHY</th>
<th>Total I/O</th>
<th>Other Features</th>
</tr>
</thead>
<tbody>
<tr>
<td>Z-7010, Z-7007S</td>
<td>Arduino Pmod headers</td>
<td>512 MByte DDR3L</td>
<td>16</td>
<td>Micro USB OTG, Micro USB, FT2232, JTAG/UART/FIFO</td>
<td>30</td>
<td>Micro SD, on-board USB JTAG and UART</td>
</tr>
</tbody>
</table>

### ZYNQ

Form factor like Arduino Board

http://trenz.org/te0723-info

---
### TE0726 "ZynqBerry" Series

Xilinx Zynq-7000, DDR3L, Flash, 100 MBit Ethernet RJ45, USB, HDMI

#### Device list

<table>
<thead>
<tr>
<th>Device list</th>
<th>Connectors</th>
<th>SDRAM max</th>
<th>Flash [MByte]</th>
<th>Ethernet PHY</th>
<th>USB PHY</th>
<th>Total I/O</th>
<th>Other Features</th>
</tr>
</thead>
<tbody>
<tr>
<td>Z-7010, Z-7007S</td>
<td>40-pin &quot;HAT&quot; headers</td>
<td>512 MByte DDR3L</td>
<td>16</td>
<td>100 MBit</td>
<td>4 x USB 2.0 Host</td>
<td>26</td>
<td>Form factor like a Raspberry Pi 2 Board, DSI display connector, CSI-2 camera connector, Micro SD card slot, 3.5 mm audio plug, HDMI type A</td>
</tr>
</tbody>
</table>

http://trenz.org/te0726-info

### TE0876 IceZero Series

Lattice ICE40HX, Raspberry Pi HAT compatible, SRAM, Flash, Open-Source

#### Device list

<table>
<thead>
<tr>
<th>Device list</th>
<th>Connectors</th>
<th>SDRAM max</th>
<th>Flash [MByte]</th>
<th>Other Features</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lattice ICE40</td>
<td>4 2x6-pin Pmod connectors (no default)</td>
<td>4 MBit external SRAM</td>
<td>8</td>
<td>100 MHz User Clock, 3 User LED, supported by fully open source FPGA toolchain, fast FPGA configuration from Raspberry Pi, full FPGA design flow on Raspberry Pi (all Open Source)</td>
</tr>
</tbody>
</table>

http://trenz.org/icezero-info
**TE0841 Series**  
Xilinx Kintex UltraScale, DDR4, Flash, 8 x GTH Transceiver Lanes

**http://trenz.org/te0841-info**

<table>
<thead>
<tr>
<th>Device list</th>
<th>Connectors</th>
<th>SDRAM [MByte] max</th>
<th>Flash [MByte]</th>
<th>Total I/O</th>
<th>GBit Transceivers</th>
<th>Other Features</th>
</tr>
</thead>
<tbody>
<tr>
<td>KU035, KU040</td>
<td>3 x Samtec LSHM</td>
<td>4096 DDR4</td>
<td>64</td>
<td>60 x HR I/Os</td>
<td>8 x GTH</td>
<td>Programmable Clock Generator, Single Supply</td>
</tr>
</tbody>
</table>

**TE0741 Series**  
Xilinx Kintex-7, Flash, 8 High Speed Serial Transceivers, 25 MHz Oscillator

**http://trenz.org/te0741-info**

<table>
<thead>
<tr>
<th>Device list</th>
<th>Connectors</th>
<th>Flash [MByte]</th>
<th>Total I/O</th>
<th>GBit Transceivers</th>
<th>Other Features</th>
</tr>
</thead>
<tbody>
<tr>
<td>70T, 160T, 325T, 410T</td>
<td>3 x Samtec LSHM</td>
<td>32</td>
<td>144 (94 for 70T variant)</td>
<td>8 x MGTs</td>
<td>Programmable Clock Generator, Single Supply</td>
</tr>
</tbody>
</table>
**TE0710 Series**  
Xilinx Artix-7, DDR3, Flash, 2 x 100 MBit Ethernet, EEPROM

Device list | Connectors | SDRAM max | Flash [MByte] | Ethernet PHY | Total I/O | Other Features
--- | --- | --- | --- | --- | --- | ---
35T, 50T, 75T, 100T | 2 x Samtec LSHM | 512 MByte DDR3 | 32 | 2 x 100 MBit | 112 (51 differential pairs + 10 single-ended) | JTAG, 100 MHz MEMS oscillator, User LED, Single Supply

**TE0711 Series**  
Xilinx Artix-7, Flash, USB, FTDI USB to UART/FIFO bridge, high pin count

Device list | Connectors | Flash [MByte] | MEMS Oscillator | USB PHY | Total I/O | Other Features
--- | --- | --- | --- | --- | --- | ---
35T, 50T, 75T, 100T | 3 x Samtec LSHM | 32 | 100 MHz | USB 2.0 UART/FIFO | 178 (84 differential pairs) | Four LEDs, Single Supply
### TE0712 Series
**Xilinx Artix-7, DDR3, Flash, 100 MBit Ethernet, 4 x GTP Transceiver**

![Diagram](http://trenz.org/te0712-info)

<table>
<thead>
<tr>
<th>Device list</th>
<th>Connectors</th>
<th>SDRAM [MByte] max</th>
<th>Flash [MByte]</th>
<th>EEPROM</th>
<th>Ethernet PHY</th>
<th>Total I/O</th>
<th>GBit Transceivers</th>
<th>Other Features</th>
</tr>
</thead>
<tbody>
<tr>
<td>35T, 50T, 75T, 100T, 200T</td>
<td>3 x Samtec LSHM</td>
<td>1024 DDR3</td>
<td>32</td>
<td>MAC Address</td>
<td>100 MBit</td>
<td>158</td>
<td>4 x GTP</td>
<td>Programmable Clock Generator, Single Supply</td>
</tr>
</tbody>
</table>

### TE0713 Series
**Xilinx Artix-7, DDR3L, Flash, USB 3.0 to FIFO Bridge, 4 x GTP Transceiver**

![Diagram](http://trenz.org/te0713-info)

<table>
<thead>
<tr>
<th>Device list</th>
<th>Connectors</th>
<th>SDRAM [MByte] max</th>
<th>Flash [MByte]</th>
<th>USB PHY</th>
<th>Total I/O</th>
<th>GBit Transceivers</th>
<th>Other Features</th>
</tr>
</thead>
<tbody>
<tr>
<td>15T - 200T</td>
<td>3 x Samtec LSHM</td>
<td>1024 DDR3L</td>
<td>32</td>
<td>USB 3.0</td>
<td>152</td>
<td>4 x GTP</td>
<td>Programmable Clock Generator, Single Supply</td>
</tr>
</tbody>
</table>
TE0714 Series
Xilinx Artix-7, Flash, 4 x GTP Transceiver, Form Factor 3 x 4 cm only

http://trenz.org/te0714-info

Device list | Connectors | Flash [MByte] | Total I/O | GBit Transceivers | Other Features
---|---|---|---|---|---
15T, 35T, 50T | 2 x Samtec LSHM | 16 | 138 + 5 (QSPI or user I/Os) | 4 x GTP | Differential MEMS oscillator for MGT clocking, XADC Analog Input, eFUSE bit-stream encryption (AES), Single Supply

---

TE0726 "ZynqBerry" Bundle

Package Content
- 1 x "ZynqBerry" TE0726 with Xilinx Zynq-7010, 512 MByte DDR3L, 16 MByte Flash, 4 x USB, 100 MBit Ethernet RJ45
- 1 x Xilinx SDSoc Development Voucher

Available in our online shop.
**TE0725 Series**

Xilinx Artix-7, Flash, HyperRAM, 2 x 50-pin Headers, 2.54 mm Pitch

**Device list**

<table>
<thead>
<tr>
<th>RAM [MByte] max</th>
<th>Flash [MByte]</th>
<th>EEPROM</th>
<th>Total I/O</th>
<th>Other Features</th>
</tr>
</thead>
<tbody>
<tr>
<td>15T, 35T, 50T, 75T, 100T</td>
<td>8 HyperRAM</td>
<td>32</td>
<td>16 KByte</td>
<td>Optional POF Fiber Optical Adapter (125/250 MBit/s), Single Supply</td>
</tr>
</tbody>
</table>

**TE0725LP Series**

Xilinx Artix-7, Flash, 3.3V or optional 1.8V VIN, 2 x 50-pin Headers, 2.54 mm Pitch

**Device list**

<table>
<thead>
<tr>
<th>RAM [MByte] max</th>
<th>Flash [MByte]</th>
<th>EEPROM</th>
<th>Vin</th>
<th>Total I/O</th>
<th>Other Features</th>
</tr>
</thead>
<tbody>
<tr>
<td>100T</td>
<td>32</td>
<td>16 KByte</td>
<td>3.3V or 1.8V depending on variant</td>
<td>95</td>
<td>JTAG/UART Connector, 25 MHz System Clock (up to 100 MHz on request), Single Supply</td>
</tr>
</tbody>
</table>
TEC0850 CompactPCI Serial Card
Xilinx Zynq UltraScale+, 3U Form Factor, DDR4 SODIMM, Flash, Ethernet

http://trenz.org/tec0850-info

<table>
<thead>
<tr>
<th>Device list</th>
<th>Form Factor</th>
<th>DDR4 SODIMM [GByte]</th>
<th>Flash [MByte]</th>
<th>USB</th>
<th>Total I/O</th>
<th>Ethernet</th>
<th>GBit Transceivers</th>
<th>Other Features</th>
</tr>
</thead>
<tbody>
<tr>
<td>ZU15EG, 1156 Pin Packages</td>
<td>3U</td>
<td>8 (32 max.)</td>
<td>512 max.</td>
<td>3.0</td>
<td>32 x differential pairs</td>
<td>1 Gigabit</td>
<td>24 on PL side</td>
<td>JTAG/UART via MicroUSB, 2 x EEPROM, Real Time Clock, Zynq MPSoC Cooling FAN Connector</td>
</tr>
</tbody>
</table>

TEC0871 RF SoC
Xilinx Zynq UltraScale+ RF SoC, DDR4, Flash, Ethernet, USB, EEPROM

http://trenz.org/tec0871-info

<table>
<thead>
<tr>
<th>Device list</th>
<th>Pin Packages</th>
<th>Connectors</th>
<th>SDRAM [GByte DDR4]</th>
<th>Flash [MByte]</th>
<th>Ethernet PHY</th>
<th>Other Features</th>
</tr>
</thead>
<tbody>
<tr>
<td>XCZU28DR-2FFVE1156C</td>
<td>1156</td>
<td>2 x Samtec ST5</td>
<td>4</td>
<td>128</td>
<td>1 Gigabit</td>
<td>High Speed USB2 Transceiver OTG, MAC Address Serial EEPROM, RTC</td>
</tr>
</tbody>
</table>
## TEC0330 PCIe FMC Carrier
*Xilinx Virtex-7, FMC HPC, 8 lane PCIe GEN2 card, DDR3 SODIMM Socket*

<table>
<thead>
<tr>
<th>Device list</th>
<th>Flash [MByte]</th>
<th>SDRAM</th>
<th>Total I/O</th>
<th>GBit Transceivers</th>
<th>GBit Transceivers Transmission Rate</th>
<th>Other Features</th>
</tr>
</thead>
<tbody>
<tr>
<td>XC7VX330T</td>
<td>32</td>
<td>DDR3 SODIMM Socket</td>
<td>up to 202 FPGA I/O pins on FMC connector</td>
<td>10 on FMC 8 on PCIe lanes</td>
<td>13.1 GBit/s</td>
<td>FMC High Pin Count (HPC) Connector, Programmable Clock Generator</td>
</tr>
</tbody>
</table>

## TEF1001 PCIe FMC Carrier
*Xilinx Kintex-7, FMC HPC, 4 lane PCIe GEN2 card, DDR3 SODIMM Socket*

<table>
<thead>
<tr>
<th>Device list</th>
<th>Flash [MByte]</th>
<th>SDRAM</th>
<th>Total I/O</th>
<th>GBit Transceivers</th>
<th>Other Features</th>
</tr>
</thead>
<tbody>
<tr>
<td>XC7K160T</td>
<td>32</td>
<td>DDR3 SODIMM Socket</td>
<td>160 on FMC connector</td>
<td>4 on FMC 4 on PCIe lanes</td>
<td>Vita 57.1 FMC HPC Slot, Programmable Clock Generator, 200 MHz Low-Jitter LVDS Oscillator</td>
</tr>
</tbody>
</table>
TEF0007 Series
FMC Card with DisplayPort input and output

<table>
<thead>
<tr>
<th>Device list</th>
<th>Connector(s)</th>
<th>Flash [MByte]</th>
<th>Total I/O</th>
<th>GBit Transceiver(s)</th>
<th>Other Features</th>
</tr>
</thead>
<tbody>
<tr>
<td>Xilinx Kintex-7 160T</td>
<td>HPC FMC</td>
<td>32</td>
<td>34 differential (68 single ended)</td>
<td>4 x GTP</td>
<td>Data Rates up to 5.4 Gbps, Sink + Source DP Connector, 50 MHz Oscillator, Configurable PLL</td>
</tr>
</tbody>
</table>

http://trenz.org/tef0007-info

TEF0008 Series
FMC Card with four SFP+ 10 GBit Ports based on VITA 57.1 FMC HPC Standard

http://trenz.org/tef0008-info

It is intended for use on a FMC HPC carrier and cannot be used stand-alone.

<table>
<thead>
<tr>
<th>Device list</th>
<th>Connector(s)</th>
<th>Dimension</th>
<th>SFP+</th>
<th>Other Features</th>
</tr>
</thead>
<tbody>
<tr>
<td>Intel MAX 10 10M08SAU169C8G</td>
<td>HPC FMC</td>
<td>69 x 84 mm, SFP+ connector excluded (+ 5.5 mm)</td>
<td>4 SFP+ 10 GBit ports for fiber optical SFP modules</td>
<td>Low-Jitter Programmable Clock Generator, 3.3V to 1.8V DCDC Converter, 128 KBit EEPROM, Status LED (green)</td>
</tr>
</tbody>
</table>
The EDDP Kit enables rapid, simplified development and evaluation of three-phase motor control applications by providing software, documentation, binary images, editable source code to run on a Xilinx Zynq®-7000 All Programmable SoC along with associated hardware. For the first time ever, the highly parallel and deterministic benefits of FPGA-based motor control, offering up to 30-40x more responsiveness than traditional embedded approaches, is available in a C/C++ development environment. Furthermore, scalability with minimal CPU burden is increasingly differentiating for developers of such systems given the industry rise in demand for multi-axis motion control.

The three main hardware components included in the EDDP Kit are the development board, TEC0053, from Trenz Electronic as the motor driver board, the Arty Z7-10 from Digilent Inc. as the reference controller board, and a three-phase permanent magnet synchronous motor from Anaheim Automation as the reference motor. The main software components are the field oriented motor control algorithm implemented with the Xilinx Vivado® Design Suite and the Web UI. To edit the included design or replace with proprietary C/C++ code, users must have access to either a fully licensed seat of Vivado HLx Edition or the no-charge WebPACK Edition. Also required is the SDSoC™ tool, part of the SDx™ Development Environment, available for purchase or no cost evaluation from Xilinx. All other resources are available for free download from http://trenz.org/EDDP/.

### Key Features
- Development and evaluation of three-phase motor control applications
- Speed and flexibility provided by FPGA-fabric in Xilinx Zynq®-7000 All Programmable SoC
- Implementation of a Field Oriented Control Algorithm with Vivado® SDSoC™, offloading from processor to embedded
- Available motor control modes consist of speed control and stator current control
- Internet connectivity provided by the Linux operating system running on an ARM processor
- Web UI and Network API for the control of the motor over internet
- Runs on 12V DC power
- Optionally, the power stage can be run from a separate 5V ... 48V DC power supply

Other assembly options for cost or performance optimization plus high volume prices available on request.

### Resources
- http://trenz.org/EDDP/- including a Quick Start Guide, an User Manual for the EDDP Kit and the EDPS motor driver board, block diagram, design database and technical specifications

### Support
- A support forum especially for this product is accessible at http://trenz.org/EDDPsupport.
The DesignWare® ARC® EM Software Development Platform is a flexible platform for rapid software development on ARC EM processors and subsystems. It is intended to accelerate software development and debug of ARC EM processor-based systems for a wide range of ultra-low power embedded applications such as IoT, sensor fusion, and voice applications. It includes an FPGA-based hardware board with commonly used peripherals and interfaces for extensibility. Downloadable platform packages containing different hardware configurations enable the board to be programmed with different ARC EM processors and subsystems. The packages also contain the necessary software configuration information for the toolchain and embARC Open Software Platform.

The development platform is supported by Synopsys' MetaWare Development Tool Kit, which includes a compiler, debugger and libraries optimized for maximum performance with minimal code size. The embARC Open Software Platform (OSP), available online from embarc.org, gives developers online access to device drivers, FreeRTOS, middleware and examples that enables them to quickly start software development for their ARC-based embedded systems.

Each hardware configuration includes an ARC EM processor and subsystem with access to 16MB of PSRAM, 16MB of SPI Flash and a wide range of peripherals such Audio Line In/Out, UART, SPI, I2C, and ADC. An on-board module providing Wi-Fi/Bluetooth functionality and a 9-D motion sensor enable fast development of IoT applications. Two digital MEMs microphones can also be used for the development of voice applications. The hardware is extensible using the popular Arduino® interface and extension is also possible with Digilent® Pmod™ Interfaces, mikroBUS™ headers and a 50-pin header. Debug and trace are handled with USB/JTAG interfaces and a NEXUS interface for ARC Real-Time Trace (RTT). The board includes a micro-SD card slot for loading application software.

Key Features
- Xilinx Kintex-7 XC7K325T-2FBG676C
- 32 MByte Quad-SPI Flash memory (for configuration and operation)
- USB-JTAG bridge FT2232H
- FPGA configuration through Jtag and SPI Flash memory
- SPI Flash configuration through JTAG and USB
- Connectors
  - Arduino compatible pin headers
  - MicroBUS compatible pin headers
  - 3 x Pmod compatible pin headers
  - 50 pin header 2.54mm (40 single-ended IO, 20 differential lanes, variable VCCIO)
  - MiCTor Debug connector
  - 10 pin Debug connector 2mm
- 2 x 8 MByte PSRAM
- 32 MByte User Quad-SPI Flash memory
- Micro SDCard Socket
- Wireless module RS9113-NBZ-D1C (Wi-Fi/BT/BLE)
- 3-axis gyroscope, 3-axis accelerometer, 3-axis magnetometer ICM-20948
- Stereo Audio Codec MAX9880A
- 2 x PDM Microphones SPK0641HT4H-1
- 2 x 3.5mm RCA audio jacks (input/output)
- 100MHz User Clock Oscillator ST8008
- Status LEDs, Power LED
- 12V Power Supply (separately included in the scope of delivery)
- 12V Fan

http://trenz-electronic.de/DesignWare_ARC_EM
The carrier boards are base-boards for 4 x 5 SoMs, which exposes the modules B2B-connector-pins to accessible connectors and provides a whole range of on-board components to test and evaluate Trenz Electronic 4 x 5 SoMs.

TE0701
- Overvoltage-, undervoltage- and reversed- supply-voltage-protection
- Barrel jack for 12 V power supply
- Carrier Board System-Controller CPLD
- Mini CameraLink connector
- RJ45 Gigabit Ethernet MagJack
- FPGA Mezzanine Card (FMC-LPC) connector
- USB JTAG- and UART interface with Mini-USB connector
- HDMI transmitter with HDMI connector
- 8 x user LEDs, 2 x user push buttons, 2 x DIP switch
- Pmod connectors, Micro SD card socket and Micro-USB interface

TE0703
- 2 x VG96 connectors (mounting holes and solder pads)
- SDIO port expander with voltage-level translation
- Micro SD card socket
- 4 x user LEDs, 1 x user-push button, 2 x user configurable DIP switches
- Mini USB connector (USB JTAG and UART interface)
- RJ45 Gigabit Ethernet socket with 4 integrated LED’s.
- USB host connector
- Barrel jack for 5 V power supply input
- DC-DC step-down converter for 3.3 V power supply
- USB JTAG and UART interface

TE0705
TE0705 is a “downgraded” version of TE0701. As little as possible has been changed in functionality except the functionality that was removed.
Changes from TE0701
- Pmod connectors changed to IDC headers
- HDMI removed
- CL connector removed
- USB connector position changed
- 5 pin header support added on both USB interfaces
- 12 V DC power input connector changed to different type
- FMC connector removed and replaced by two dual row 100 mil pin headers

TE0706
- VG96 connector and 50-pin IDC male connector socket
- SDIO port expander with voltage-level translation
- Micro SD card socket and a USB type A connector
- 1 x user push button, user configurable DIP switch
- 2 x RJ45 Gigabit Ethernet MagJack
- 1 x Ethernet PHY
- Barrel jack for 5 V power supply input
- DC-DC step-down converter for 3.3 V power supply
- JTAG pins on 12-pin header
- 3 x VCCIO selection jumper

TEBA0841
Mainly for the use with TE0841 and TE0741 modules.
- XMOD (TE0790) pin header
- SFP connector
- Micro USB
- 1 x pin header 16 pol. (JTAG, MGT-CLK, boot mode, RST, IOs)
- 1 x pin header 10 pol. (SD IOs)
- 2 x pin headers 50 pol. (FPGA bank IOs and power)
- 1 x pin header for FPGA bank power VCCIOA and 1 x for VCCIOD
- LDO voltage regulator 3.3 V to 2.5 V
- 2 x user LEDs (Red/Green)

http://trenz.org/te-baseboards
Trenz Electronic Carrier Boards
for modules with different form factors

Following carrier boards are base boards for specific Trenz Electronic SoMs, which exposes the module’s B2B-connector-pins to accessible connectors and provides a whole range of on-board components to test and evaluate Trenz Electronic SoMs.

TEBF0808
- Mini-ITX form factor
- ATX power supply connector (12 V only supply required)
- Optional 12 V standard power plug
- USB 3.0 with USB 3.0 HUB
- FMC HPC slot (1.8 V max VCCID)
- MicroSD Card (bootable) and eMMC (bootable)
- PCIe slot - one PCIe lane (16 Lane connector)
- Fan connectors, PC enclosure, FMC fan
- Intel front panel- and HDA audio-connector
- CAN FD transceiver (10 pin IDC connector)
- Displayport Single Lane
- One SATA Connector
- Dual SFP+
- Gigabit Ethernet RJ45
- One Samtec FireFly (4 GT lanes bidir.)
- One Samtec FireFly connector for reverse loopback
- 20 pins ARM JTAG connector (PS JTAG0)

TEB0728
- Trenz TE0728 module socket (3 x Samtec SEM connectors 80 pins)
- 2 x RJ45 Ethernet
- SD card slot
- Power supply with DC jack
- 3 x user LEDs (red/yellow/green)
- User push button

TEB0729
- Trenz TE0729 module socket (2 x Samtec BTE/BSE connectors 120 pins)
- 5 V board supply via DC jack
- 3 x RJ45 Ethernet
- 1 x MicroUSB and 1 x SD card connector
- 1 x 128K I2C CMOS Serial EEPROM
- 1 x 2K I2C Serial EEPROM
- XMOD (TE0790) pin header
- 2 x pin header FPGA bank power supply
- 1 x VBat pin header and 2 x VG96 pin header
- 1 x user push button, 1 x LED (red), user switch FPGA boot mode

TEB0745
- Trenz TE0745 module socket (3 x Samtec ST5 connectors 160 pins)
- 24 V power supply over ARK2950/2 connecting terminal
- XMOD (TE0790) Pin Header (JTAG / UART)
- 1 x EMI Network Filter
- microSD connector
- RJ45 Ethernet connector
- USB Host connector
- 8 x SFP connector
- 6 x pin header 50 pol. (FPGA bank I/O and power)
- 6 x pin header 12 pol. (FPGA bank I/O and power)

TEBA0714
- Trenz TE0714 module socket (2 x Samtec LSHM connectors 100 pins)
- XMOD (TE0790) pin header
- 1 x pin header 16 pol. (JTAG, MGT-CLK, boot mode, XADC, I/O’s)
- 1 x pin header 10 pol. (I/O)
- SFP connector
- LDO voltage regulator 3.3 V to 2.5 V
- 2 x user LEDs (red/green) and 1 x LED (red)
- 2 x pin headers 50 pol. (FPGA bank I/O and power)
- 1 x pin header for FPGA bank power VCCIO34 (1.8 VOUT, 2.5 V, 3.3 VOUT)
- 1 x pin header for FPGA bank power V_CFG (1.8 VOUT, 2.5 V, 3.3 VOUT)

http://trenz.org/te-baseboards
MKR Compatible Footprint
Arduino MKR Standard 2.5 x 6.15 cm

Resources http://trenz.org/max1000-info

**MAX1000** IoT/Maker board, TEI0001 series, Intel MAX 10 10M08SAU169C8G or 10M16SAU169C8G) FPGA, 8/16 kLE, 8 - 32 MByte SDRAM (max. 64 MByte), 8 MByte Flash, USB-Programmer on-board, JTAG and UART over Micro USB2 connector, ADC 8 x 12 Bit, 12 MHz oscillator, optional MEMS oscillator, optional Pmod headers, supply USB/pins, 2 switches, 8 configurable and 2 status LEDs, power can be supplied as 5V from the USB port or via a separate pin

Resources http://trenz.org/cyc1000-info

**CYC1000.** TEI0003 series, Intel Cyclone 10CL025YU256 C8G FPGA, 25 kLE, optional 10CL006, 10CL010, 10CL016, 8 MByte SDRAM, 2 MByte Flash, 21 I/O Arduino MKR compatible headers, JTAG and UART over Micro USB2 connector, LIS3DH 3-axis accelero-meter, 2 x 14-pin headers providing 23 GPIOs, 1 x 3-pin header providing 2 GPIOs, Pmod: 2 x 6-pin support, 8 configurable and 2 status LEDs, user push button, 5.0V single power supply with on-board voltage regulators

Resources http://trenz.org/smf2000-info

**SMF2000.** TEM0001 series, Microsemi SmartFusion2 M2S010-VFG400 FPGA, 8 MByte SDRAM, 8 MByte Flash, 25 MHz system clock and 32.768 KHz auxiliary clock, JTAG and UART over Micro USB2 connector, 1 x 3-pin header for Live Probes, 1 x Pmod header providing 8 I/O, 2 x 14-pin header (2.54 mm pitch) providing 23 I/O, 9 User LEDs, 1 user push button

Resources http://trenz.org/xo2000-info

**LXO2000.** TEL0001 series, Lattice X02-4000 FPGA, 22 I/O on MKR header, 2 I/O on additional header, optional Pmod header (+ 8 I/O), on-board USB/JTAG, on-board USB/serial, 100 MHz MEMS clock oscillator, 2 push buttons, 8 LEDs, supply: USB or 5V from pin header, RC-networks
### TEI0006 Series

**Intel Cyclone 10 GX SoM, DDR3, Flash, Ethernet, Baseboard available**

- **Cyclone 10 GX**
  - 10CX220YF7801G
  - 3 x Samtec ST5
  - 2 DDR3
  - 256 MByte
  - 1 Gbps Ethernet
  - Intel MAX 10 as Power Sequencer, EEPROM, 4 LEDs, 5V Input Voltage

### TEI0009 C10LP RefKit Development Board

**Intel Cyclone 10 LP, Integrated USB Programmer2, 2 x 10/100 Ethernet, USB2.0**

- **Cyclone 10 LP**
  - 10CL055YU484C8G
  - 55 kLE in 484-pin QSE (for LVDS), Pmod, Arduino, SMA
  - 64 MBit HyperRAM
  - 64 MBit Flash
  - 2 x 10/100 Ethernet
  - 2.0 USB
  - Integrated USB Programmer2
TEM0002 SmartBerry Series
Microsemi M2S010, DDR3, Ethernet PHY with RJ45 MagJack

http://trenz.org/smartberry-info

<table>
<thead>
<tr>
<th>Device list</th>
<th>SDRAM</th>
<th>Ethernet</th>
<th>Total I/O</th>
<th>Connectors</th>
<th>on-board</th>
<th>Other Features</th>
</tr>
</thead>
<tbody>
<tr>
<td>Microsemi</td>
<td>1 GBit DDR3</td>
<td>1 GBit Ethernet PHY</td>
<td>Raspberry Pi compatible</td>
<td>MicroSD Card socket,</td>
<td>USB/JTAG</td>
<td>2 Push Buttons</td>
</tr>
<tr>
<td>M2S010-VFG400</td>
<td></td>
<td>with RJ45 MagJack</td>
<td>header with 26 I/O + I2C</td>
<td>USB/serial</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

TE0790 XMOD FTDI JTAG Adapter
XMOD Form Factor, FT2232H, Lattice X02-256 CPLD

http://trenz.org/te0790-info

<table>
<thead>
<tr>
<th>Device</th>
<th>Form Factor</th>
<th>FT2232H</th>
<th>Total I/O</th>
<th>Other Features</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lattice X02-256 CPLD</td>
<td>Xmod, M3 mounting hole</td>
<td>Mini USB connector, channel B</td>
<td>8 universal I/O pins</td>
<td>Step down DC DC Converter for optional Power Supply</td>
</tr>
<tr>
<td></td>
<td></td>
<td>RX/TX LED’s, EEPROM</td>
<td></td>
<td>via USB-Power, 4 Position DIP Switch</td>
</tr>
</tbody>
</table>
**TEI0004 ARROW USB Programmer2**
For Development with Intel FPGAs, 2.54 mm Header

![Image of ARROW USB Programmer2](http://trenz.org/tei0004-info)

1.35 x 2.2 cm form factor

http://trenz.org/tei0004-info

<table>
<thead>
<tr>
<th>Supported by</th>
<th>JTAG Connector</th>
<th>USB</th>
<th>Voltage levels</th>
<th>Other Features</th>
</tr>
</thead>
<tbody>
<tr>
<td>Intel Quartus program</td>
<td>Standard 2 x 5-pin header</td>
<td>MicroUSB connector</td>
<td>1.8V - 3.3V</td>
<td>Additional support for UART, red activity LED, green power-on LED</td>
</tr>
</tbody>
</table>

**TEI0005 FPGA Programmer2 Module**
FT2232H based JTAG Programmer, Surface-Mount module

![Image of FPGA Programmer2 Module](http://trenz.org/usbprogrammer2)

1.7 x 1.7 cm form factor

http://trenz.org/usbprogrammer2

<table>
<thead>
<tr>
<th>Device list</th>
<th>Supported</th>
<th>Powered</th>
<th>Compatible</th>
<th>Other Features</th>
</tr>
</thead>
<tbody>
<tr>
<td>FTDI FT2232H USB2 Interface</td>
<td>by Intel Quartus (JTAG mode only)</td>
<td>via USB</td>
<td>SMT Pick and Place Assembly Process</td>
<td>Additional UART Channel available, Activity LED's, UART Interface available, two I/O pins reserved for future use</td>
</tr>
</tbody>
</table>
Trenz Electronic Starter Kits
Including Accessories

Trenz Electronic Starter Kits consists in general of a Trenz Electronic micromodule mounted on a Trenz Electronic base board including a pre-assembled heatsink, some of them are built in a black Core V1 Mini-ITX Enclosure. All this provided with a matching power supply including different adapters, a micro SD card, an USB cable plus screws and bolts.

<table>
<thead>
<tr>
<th></th>
<th>Starter Kit 720</th>
<th>Starter Kit 729</th>
<th>Starter Kit 803</th>
<th>Starter Kit 808</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Module</strong></td>
<td>TE0720</td>
<td>TE0729</td>
<td>TE0803</td>
<td>TE0808</td>
</tr>
<tr>
<td><strong>FPGA</strong></td>
<td>Xilinx Zynq-7020</td>
<td>Xilinx Zynq-7020</td>
<td>Xilinx Zynq UltraScale + ZU3EG</td>
<td>Xilinx Zynq UltraScale + ZU9EG</td>
</tr>
<tr>
<td><strong>Baseboard</strong></td>
<td>TE0703</td>
<td>TEB0729</td>
<td>TEBF0808</td>
<td>TEBF0808</td>
</tr>
<tr>
<td><strong>Enclosure</strong></td>
<td>-</td>
<td>-</td>
<td>Core V1 Mini-ITX</td>
<td>Core V1 Mini-ITX</td>
</tr>
<tr>
<td><strong>Power Supply</strong></td>
<td>Universal power supply unit</td>
<td>Universal power supply unit</td>
<td>Be Quiet! 400W ATX Power Supply</td>
<td>Be Quiet! 400W ATX Power Supply</td>
</tr>
<tr>
<td><strong>Heat sink</strong></td>
<td>Heat sink for TE0720, spring-loaded embedded</td>
<td>KK0729-02TE custom built</td>
<td>BGA Heat sink</td>
<td>BGA Heat sink</td>
</tr>
<tr>
<td><strong>USB cable</strong></td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td><strong>MicroSD card</strong></td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td><strong>Screws &amp; bolts</strong></td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
</tbody>
</table>

Photo shows similar product.
Cooling Solutions for Trenz Electronic Modules

We are offering different customized cooling solutions for a selection of modules. Please ask for special solutions at sales@trenz-electronic.de.

Available cooling solutions

<table>
<thead>
<tr>
<th>Article Number</th>
<th>TE600</th>
<th>TE0710</th>
<th>TE0712</th>
<th>TE0714</th>
<th>TE0715</th>
<th>TE0720</th>
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</thead>
<tbody>
<tr>
<td>Trenz Electronic</td>
<td>26920</td>
<td>26925</td>
<td>26924</td>
<td>KK0714-02</td>
<td>26923</td>
<td>26922</td>
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<table>
<thead>
<tr>
<th>Article Number</th>
<th>TE0729</th>
<th>TE0741</th>
<th>TE0745</th>
<th>TE0808</th>
<th>TE0820</th>
</tr>
</thead>
<tbody>
<tr>
<td>Trenz Electronic</td>
<td>KK0729-02TE</td>
<td>26921</td>
<td>KK0745-02</td>
<td>KK0808-03</td>
<td>28606</td>
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</table>
# Module series comparison table

For Trenz Electronic Modules

<table>
<thead>
<tr>
<th>Device family</th>
<th>TE0710</th>
<th>TE0711</th>
<th>TE0712</th>
<th>TE0713</th>
<th>TE0714</th>
</tr>
</thead>
<tbody>
<tr>
<td>TE0710</td>
<td>Artix-7</td>
<td>Artix-7</td>
<td>Artix-7</td>
<td>Artix-7</td>
<td>Artix-7</td>
</tr>
<tr>
<td>TE0711</td>
<td>35T, 50T, 75T, 100T</td>
<td>35T, 50T, 75T, 100T</td>
<td>35T, 50T, 75T, 100T, 200T</td>
<td>15T - 200T</td>
<td>15T, 35T, 50T</td>
</tr>
<tr>
<td>Artix-7</td>
<td>4 x 5</td>
<td>4 x 5</td>
<td>4 x 5</td>
<td>4 x 5</td>
<td>4 x 3</td>
</tr>
<tr>
<td>Connectors</td>
<td>2 x Samtec LSHM</td>
<td>2 x Samtec LSHM</td>
<td>3 x Samtec LSHM</td>
<td>3 x Samtec LSHM</td>
<td>2 x Samtec LSHM</td>
</tr>
<tr>
<td>Artix-7</td>
<td>MicroBlaze</td>
<td>MicroBlaze</td>
<td>MicroBlaze</td>
<td>MicroBlaze</td>
<td>MicroBlaze</td>
</tr>
<tr>
<td>Processing system</td>
<td>2 x 100 MBit</td>
<td>2 x 100 MBit</td>
<td>100 MBit</td>
<td>100 MBit</td>
<td>100 MBit</td>
</tr>
<tr>
<td>SDRAM [MByte] max</td>
<td>512 DDR3</td>
<td>-</td>
<td>1024 DDR3</td>
<td>1024 DDR3L</td>
<td>-</td>
</tr>
<tr>
<td>Flash [MByte]</td>
<td>32</td>
<td>32</td>
<td>32</td>
<td>32</td>
<td>16</td>
</tr>
<tr>
<td>EEPROM</td>
<td>-</td>
<td>MAC Address</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>eMMC</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Ethernet PHY</td>
<td>2 x USB2.0 OTG</td>
<td>2 x USB2.0 OTG</td>
<td>-</td>
<td>USB3.0</td>
<td>-</td>
</tr>
<tr>
<td>USB PHY</td>
<td>-</td>
<td>USB2 UART/FIFO</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Total I/O</td>
<td>112</td>
<td>178</td>
<td>158</td>
<td>152</td>
<td>144</td>
</tr>
<tr>
<td>GBit transceiver</td>
<td>-</td>
<td>-</td>
<td>4 x GTP</td>
<td>4 x GTP</td>
<td>4 x GTP</td>
</tr>
<tr>
<td>Other features</td>
<td>Single Supply</td>
<td>Single Supply</td>
<td>Programmable Clock Generator, Single Supply</td>
<td>Programmable Clock Generator, Single Supply</td>
<td>Single Supply, Differential MEMS Oscillator for GT clocking, GT Reference Clock input</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Device family</th>
<th>TE0745</th>
<th>TE0782</th>
<th>TE0783</th>
<th>TE0803</th>
</tr>
</thead>
<tbody>
<tr>
<td>TE0745</td>
<td>Zynq-7000</td>
<td>Zynq-7000</td>
<td>Zynq-7000</td>
<td>Zynq UltraScale+</td>
</tr>
<tr>
<td>TE0782</td>
<td>Z-7035, Z-7035, Z-7045</td>
<td>Z-7035, Z-7045, Z-1000</td>
<td>Z-7035, Z-7045, Z-1000</td>
<td>ZU2CG-ZU5CG, ZU2EG-ZU5EG, ZU4EV-ZU5EV</td>
</tr>
<tr>
<td>Form factor/size [cm]</td>
<td>5.2 x 7.6</td>
<td>8.5 x 8.5</td>
<td>8.5 x 8.5</td>
<td>5.2 x 7.6</td>
</tr>
<tr>
<td>Connectors</td>
<td>3 x Samtec ST5</td>
<td>3 x Samtec QTH</td>
<td>3 x Samtec QTH</td>
<td>3 x Samtec ST5</td>
</tr>
<tr>
<td>Programmable logic family</td>
<td>Kintex-7</td>
<td>Kintex-7</td>
<td>Kintex-7</td>
<td>UltraScale+</td>
</tr>
<tr>
<td>Processing system</td>
<td>2 x Cortex A9</td>
<td>2 x Cortex A9</td>
<td>2 x Cortex A9</td>
<td>Up to 4 x Cortex A53+ + 2 x Cortex R5</td>
</tr>
<tr>
<td>SDRAM [MByte] max</td>
<td>1024 DDR3/L</td>
<td>1024 DDR3</td>
<td>1024 DDR3</td>
<td>1 GByte DDR3 connected to PS 2 GByte DDR3 connected to PL*</td>
</tr>
<tr>
<td>Flash [MByte]</td>
<td>64</td>
<td>32</td>
<td>32</td>
<td>128</td>
</tr>
<tr>
<td>EEPROM</td>
<td>MAC Address</td>
<td>2 x MAC + 16 KByte</td>
<td>1 x MAC + 16 KByte</td>
<td>-</td>
</tr>
<tr>
<td>eMMC</td>
<td>-</td>
<td>4 - 64 GByte</td>
<td>4 - 64 GByte</td>
<td>-</td>
</tr>
<tr>
<td>Ethernet PHY</td>
<td>1 GBit</td>
<td>2 x 1 GBit</td>
<td>1 GBit</td>
<td>-</td>
</tr>
<tr>
<td>USB PHY</td>
<td>USB2.0 OTG</td>
<td>USB2.0 OTG</td>
<td>USB2.0 OTG</td>
<td>-</td>
</tr>
<tr>
<td>Total I/O</td>
<td>250 + 6 MIO</td>
<td>250 + 2 MIO</td>
<td>166 + 12 MIO + 40 CPLD mixed IO</td>
<td>156 + 65 MIO</td>
</tr>
<tr>
<td>GBit transceiver</td>
<td>8 x GTX</td>
<td>16 x GTX</td>
<td>16 x GTX</td>
<td>PS GTR 4</td>
</tr>
<tr>
<td>Other features</td>
<td>RTC, Single Supply</td>
<td>Programmable Clock Generator, RTC, Single Supply</td>
<td>* 32-bit and 64-bit wide DDR3, Programmable Clock Generator, RTC, Single Supply</td>
<td>Programmable Clock Generator, Single Supply</td>
</tr>
</tbody>
</table>

* 32-bit and 64-bit wide DDR3, Programmable Clock Generator, RTC, Single Supply

Cooling solutions and carrier boards are available. Other assembly options for cost or performance optimization available on request.

RTC, Single Supply
### Module Series Comparison Table

<table>
<thead>
<tr>
<th>TE0715</th>
<th>TE0720</th>
<th>TE0724</th>
<th>TE0728</th>
<th>TE0729</th>
<th>TE0741</th>
</tr>
</thead>
<tbody>
<tr>
<td>Zynq-7000</td>
<td>Zynq-7000</td>
<td>Zynq-7000</td>
<td>Zynq-7000</td>
<td>Zynq-7000</td>
<td>Kintex-7</td>
</tr>
<tr>
<td>4 x 5</td>
<td>4 x 5</td>
<td>6 x 4</td>
<td>6 x 6</td>
<td>5.2 x 7.6</td>
<td>4 x 5</td>
</tr>
<tr>
<td>3 x Samtec LSHM</td>
<td>3 x Samtec LSHM</td>
<td>1 x Samtec STS</td>
<td>3 x Samtec SEM</td>
<td>2 x Samtec BTE</td>
<td>3 x Samtec LSHM</td>
</tr>
<tr>
<td>Z-7015: Artix-7, Z-7030: Kintex-7</td>
<td>Artix-7</td>
<td>Artix-7</td>
<td>Artix-7</td>
<td>Artix-7</td>
<td>Kintex-7</td>
</tr>
<tr>
<td>2 x Cortex A9</td>
<td>2 x Cortex A9</td>
<td>2 x Cortex A9</td>
<td>2 x Cortex A9</td>
<td>MicroBlaze</td>
<td></td>
</tr>
<tr>
<td>1024 DDR3</td>
<td>1024 DDR3</td>
<td>1024 DDR3</td>
<td>512 DDR3</td>
<td>512 DDR3</td>
<td>-</td>
</tr>
<tr>
<td>32</td>
<td>32</td>
<td>32</td>
<td>16</td>
<td>32</td>
<td>32</td>
</tr>
<tr>
<td>MAC Address</td>
<td>MAC Address</td>
<td>MAC Address</td>
<td>8 KByte</td>
<td>3 x MAC Address</td>
<td>-</td>
</tr>
<tr>
<td>-</td>
<td>-</td>
<td>-</td>
<td>4 - 64 GByte</td>
<td>4 - 64 GByte</td>
<td>-</td>
</tr>
<tr>
<td>1 GBit</td>
<td>1 GBit</td>
<td>1 GBit</td>
<td>2 x 100 MBit</td>
<td>2 x 100 MBit, 1 GBit</td>
<td>-</td>
</tr>
<tr>
<td>USB2.0 OTG</td>
<td>USB2.0 OTG</td>
<td>-</td>
<td>-</td>
<td>USB2.0 OTG</td>
<td>-</td>
</tr>
<tr>
<td>132 + 14 MIO</td>
<td>152 + 14 MIO</td>
<td>PL: 64 Ps: 20</td>
<td>124 + 34 MIO</td>
<td>136 + 14 MIO</td>
<td>144</td>
</tr>
<tr>
<td>3 x Samtec LSHM</td>
<td>3 x Samtec LSHM</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>8 x GTX</td>
</tr>
<tr>
<td>Programmable Clock Generator, RTC, Single Supply</td>
<td>RTC, Single Supply</td>
<td>CAN, Single Supply</td>
<td>Automotive, RTC, CAN, Single Supply</td>
<td>RTC, Single Supply</td>
<td>Programmable Clock Generator, Single Supply</td>
</tr>
</tbody>
</table>

### Additional Details

- Cooling solutions and carrier boards are available.
- Other assembly options for cost or performance optimization available on request.
PC/104 OneBank Carrier for SoC Modules

Providing the base for all of our PC/104 integrated systems the EMC²-SoM is a PCIe/104 OneBank® Carrier for a Trenz compatible 40mm x 50mm SoC Module.

The EMC²-SoM also provides expansion for a VITA57.1 FMC™ LPC I/O board.

The PCIe/104 OneBank® design enables the EMC²-SoM to be added to robust and rugged installations for various commercial, medical, industrial and military uses.

USING THE EMC² TO PROVIDE REAL-TIME ON-BOARD OBSTACLE AVOIDANCE FOR UAVS BASED ON EMBEDDED STEREO VISION.

The increase in the use of UAVs requires an improvement of their usability and safety. UAVs are equipped with multiple sensors to monitor their surroundings for imaging purposes and also for obstacle avoidance. Using stereo cameras to calculate the distance to surrounding objects offers a more cost effective solution than using distance sensors.
The VCS-1 system is an EMC² and FM191 combination which features:

- High performance and low power consumption (24V @ 1.1A)
- Compatible with a wide range of commercially available sensors and actuators
- Raspberry Pi and Arduino compatible
- 4x USB3.0 ports for interfacing with multiple sensors
- MQTT and OpenCV compatible
- ROS compatible, ROS2 ready and HIPPEROS ready
- Will be fully compatible with the Xilinx reVision stack.

Connectivity:

**FM191-R; FMC-LPC to:**

- 15x Digital I/Os [DB9]
- 12x Analogue Inputs [DB9]
- 8x Analogue Outputs [DB9]
- 1x Expansion [SEIC]

**FM191-U; SEIC to:**

- 4x USB3.0 [USB-C]
- 28x GPIO [40-pin GPIO]

**FM191-A1; 40-pin GPIO**

- 28x GPIO [DB9]

**EMC² stackable ruggedised box.**

Sundance Multiprocessor Technology Ltd.
Chiltern House, Waterside, Chesham,
Buckinghamshire, HP5 1PS.
United Kingdom.

Phone: +44 (0) 1494 793 167
Email: sales@sundance.com
cronologic offers a family of high-resolution high-throughput PCIe analog-to-digital converters (ADCs):

- Up to 4 analog input channels
- Additional digital trigger and/or gating inputs
- PCIe x4 or x8 half-size boards
- Gross DMA-bandwidth up to 8 GByte/s
- Arbitrary board combinations can be synchronized
- LEMO 00 series input connectors (adapter cables to SMA connector available)
- The DC-offset can be shifted to make optimal use of the ADC range for either positive or negative pulses

**Ndigo Series**

It has been designed to acquire trains of pulses at high repetition rates. Employing an onboard zero suppression, the pulse data is recorded with pre- and post-cursors, omitting the data in between to reduce the requirements on bandwidth and pulse processing or averaging. There is no deadtime between samples as long as the sustained rate is lower than the available PCIe bandwidth. The first available instances of this series provide 5 Gsps at 10-bit resolution and 250 Msps at 14-bit resolution.

These boards are ideally suited for applications like:

- Mass Spectrometry
- Photon Counting
- Lidar
- NMR

*preliminary data*
cronologic offers a family of high-resolution high-throughput PCIe analog-to-digital converters (ADCs)

- Up to 4 analog input channels
- Additional digital trigger and/or gating inputs
- PCIe x4 or x8 half-size boards
- Gross DMA-bandwidth up to 8 GByte/s
- Arbitrary board combinations can be synchronized
- LEMO 00 series input connectors (adapter cables to SMA connector available)
- The DC-offset can be shifted to make optimal use of the ADC range for either positive or negative pulses

<table>
<thead>
<tr>
<th></th>
<th>Ndigo2G-14</th>
<th>Ndigo5G-10</th>
<th>Ndigo5G-8</th>
<th>Ndigo250M-14</th>
<th>Violet125M-14</th>
<th>Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Analog channels</td>
<td>2</td>
<td>4</td>
<td>2</td>
<td>1</td>
<td>4</td>
<td>4</td>
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<tr>
<td>ADC resolution</td>
<td>14</td>
<td>10</td>
<td>8</td>
<td>14</td>
<td>14</td>
<td>Bits</td>
</tr>
<tr>
<td>Max. sampling rate</td>
<td>2248</td>
<td>1250</td>
<td>2500</td>
<td>2500</td>
<td>2500</td>
<td>250</td>
</tr>
<tr>
<td>Max. bandwidth</td>
<td>1000</td>
<td>1000</td>
<td>1000</td>
<td>120 or 700</td>
<td>60 or 450</td>
<td>MHz</td>
</tr>
<tr>
<td>Max. individual sample length</td>
<td>58</td>
<td>26</td>
<td>26</td>
<td>32</td>
<td>6</td>
<td>hours</td>
</tr>
<tr>
<td>THD</td>
<td>70*</td>
<td>58</td>
<td>58</td>
<td>73</td>
<td>86</td>
<td>dBc</td>
</tr>
<tr>
<td>SNR</td>
<td>60*</td>
<td>51</td>
<td>50</td>
<td>45</td>
<td>64</td>
<td>dBc</td>
</tr>
<tr>
<td>SFDR incl.</td>
<td>72*</td>
<td>61</td>
<td>60</td>
<td>60</td>
<td>58</td>
<td>dBc</td>
</tr>
<tr>
<td>SFDR excl.</td>
<td>84*</td>
<td>74</td>
<td>64</td>
<td>63</td>
<td>76</td>
<td>TBD</td>
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<tr>
<td>SINAD</td>
<td>60*</td>
<td>50</td>
<td>48</td>
<td>48</td>
<td>64</td>
<td>dBc</td>
</tr>
<tr>
<td>ENOB</td>
<td>9.8*</td>
<td>8.0</td>
<td>7.7</td>
<td>7.7</td>
<td>10.3</td>
<td>11.0</td>
</tr>
<tr>
<td>Input type and coupling</td>
<td>AC single ended</td>
<td>AC single ended</td>
<td>AC single ended</td>
<td>DC single ended</td>
<td>DC single ended</td>
<td>-</td>
</tr>
<tr>
<td>PCIe lanes</td>
<td>8</td>
<td>4</td>
<td>4</td>
<td>8</td>
<td>8</td>
<td>-</td>
</tr>
<tr>
<td>PCIe bandwidth</td>
<td>5000</td>
<td>800</td>
<td>800</td>
<td>1400</td>
<td>1400</td>
<td>MB/s</td>
</tr>
</tbody>
</table>

*preliminary data

Ndigo Series

It has been designed to acquire trains of pulses at high repetition rates. Employing an onboard zero suppression, the pulse data is recorded with pre- and post-cursors, omitting the data in between to reduce the requirements on bandwidth and pulse processing or averaging. There is no deadtime between samples as long as the sustained rate is lower than the available PCIe bandwidth. The first available instances of this series provide 5 Gsps at 10-bit resolution and 250 Msps at 14-bit resolution.

These boards are ideally suited for applications like

- Mass Spectrometry
- Photon Counting
- Lidar
- NMR
With the Ndigo Crate it is possible to use up to 8 PCIe boards with a PC. The connection of the external chassis to the PC happens over PCIe 2 x 16 for a full duplex bandwidth of 2x 8GByte/s.

The enclosure was specifically designed to operate multiple synchronized cronologic digitizer boards to create a high speed data acquisition system. It can also be used to house other DAQ cards, GPUs for high performance computing, storage adapters or networking equipment.

The extension is fully transparent. The operating system can’t distinguish between boards in the PCIe expansion box and boards inside the PC itself. No drivers are required.

The slot covers are on the front side of the enclosure to easily see status information and plug in cables during operation.

The crate is delivered as a set with cable and PC link board.

**Facts**

<table>
<thead>
<tr>
<th>Crate</th>
<th>Connection to Host</th>
<th>Bandwidth to Host</th>
<th>Performance relative to 10Gbps</th>
<th>PCIe3 16x slots with 8 lanes</th>
<th>PCIe3 16x slots with 4 lanes</th>
<th>PCIe2 16x slots with 4 lanes</th>
<th>PCI slots 5V, 32 Bit, 33MHz</th>
<th>PCI slots 3V, 32 Bit, 66MHz</th>
<th>Availability</th>
<th>Cable and link boards</th>
<th>Cable Length</th>
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<tr>
<td>Crate</td>
<td>PCIe 2.0 x 16</td>
<td>8 GByte/s</td>
<td>Thunderbolt link</td>
<td>8x</td>
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<td>3 meters</td>
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<td>Crate-3</td>
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<td>2</td>
<td>3</td>
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<td>now</td>
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<td>Crate-5</td>
<td>PCIe 2.0 x 16</td>
<td>8 GByte/s</td>
<td>8x</td>
<td>2</td>
<td>3</td>
<td>-</td>
<td>2</td>
<td>-</td>
<td>now</td>
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<td>3 meters</td>
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</table>

**Violet Series**

It has been designed to continuously stream samples data to host computer main memory at full rate. These boards are ideal for any applications that require unusually long samples at rates up to 250 Msp/s at a resolution of 14 bits.

For example
- Software Defined Radio High Precision FFT Spectrum Analyzers

**Time Tagger**

Cronologic presents a new series of low cost, mid resolution time-to-digital converters.

Two new boards are available featuring 500ps to 1ns single shot resolution at highest data bandwidths.

Time Taggers are ideally suitable in applications that do not require highest single shot timing resolution, but high data acquisition rates and lowest multiple hit deadtime. These include certain types of mass spectroscopy, time correlated single photon counting (TCSPC) and frequency counting applications.
Ndigo Crate

With the Ndigo Crate it is possible to use up to 8 PCIe boards with a PC. The connection of the external chassis to the PC happens over PCIe 2 x16 for a full duplex bandwidth of 2x 8GByte/s.

The enclosure was specifically designed to operate multiple synchronized cronologic digitizer boards to create a high speed data acquisition system. It can also be used to house other DAQ cards, GPUs for high performance computing, storage adapters or networking equipment.

The extension is fully transparent. The operating system can’t distinguish between boards in the PCIe expansion box and boards inside the PC itself. No drivers are required.

The slot covers are on the front side of the enclosure to easily see status information and plug in cables during operation.

The crate is delivered as a set with cable and PC link board.

<table>
<thead>
<tr>
<th>Facts</th>
<th>Crate</th>
<th>Crate-3</th>
<th>Crate-5</th>
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<tr>
<td>Connection to Host</td>
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<td>PCIe 2.0 x 16</td>
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<td>Bandwidth to Host</td>
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<td>8 GByte/s</td>
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<td>Performance relative to 10Gbps Thunderbolt link</td>
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<td>PCIe3 16x slots with 8 lanes</td>
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<td>PCIe3 16x slots with 4 lanes</td>
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<td>PCIe2 16x slots with 4 lanes</td>
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<td>PCI slots 3V, 32 Bit, 66MHz</td>
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<td>Availability</td>
<td>now</td>
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<td>Cable and link boards</td>
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<td>included</td>
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<tr>
<td>Cable Length</td>
<td>3 meters (1m, 2m and 5m upon request)</td>
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## Distributor List

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<td>Bulgaria</td>
<td>Metrisys Ltd.</td>
<td><a href="http://www.metrisys.com">www.metrisys.com</a></td>
<td><a href="mailto:bulgaria@metrisys.com">bulgaria@metrisys.com</a></td>
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<tr>
<td>China &amp; Taiwan</td>
<td>Future Linking Solution Tech Co. Ltd</td>
<td><a href="http://www.fulso.com">www.fulso.com</a></td>
<td><a href="mailto:liu@fulso.com">liu@fulso.com</a></td>
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<td>Czech Republic</td>
<td>DFC Design, s.r.o.</td>
<td><a href="http://www.dfcdesign.cz">www.dfcdesign.cz</a></td>
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<td><a href="http://www.lextronic.fr">www.lextronic.fr</a></td>
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<td>China &amp; Taiwan</td>
<td>SITRE S.a.r.l.</td>
<td><a href="http://www.sitre.fr">www.sitre.fr</a></td>
<td><a href="mailto:sales@sitre.fr">sales@sitre.fr</a></td>
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<tr>
<td>Germany</td>
<td>ARIES Embedded GmbH</td>
<td><a href="http://www.aries-embedded.de">www.aries-embedded.de</a></td>
<td><a href="mailto:info@aries-embedded.de">info@aries-embedded.de</a></td>
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<td>Greece</td>
<td>A. Katzagiannakis G. Milolidakis O.E.</td>
<td><a href="http://www.kernel.gr">www.kernel.gr</a></td>
<td><a href="mailto:info@kernel.gr">info@kernel.gr</a></td>
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<td><a href="mailto:info@chipcad.hu">info@chipcad.hu</a></td>
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<td>Innovate Software Solutions Pvt. Ltd</td>
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<td><a href="mailto:sales@innovatesolutions.net">sales@innovatesolutions.net</a></td>
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<td>E-mail: <a href="mailto:trenz@concurrenteda.com">trenz@concurrenteda.com</a></td>
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<td><a href="mailto:rs-gmbh@rsonline.de">rs-gmbh@rsonline.de</a></td>
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