MTCA.4™
MicroTCA™
AdvancedMC™

Catalogue 2019

powerBridge Computer
## powerBridge Computer

powerBridge Computer supplies computer systems and computer boards from leading manufacturers since 1993. We design and integrate industrial computers, communication systems and boards according to our customers requirements.

You benefit from our experience in hundreds of industrial applications in automation, research, medical technology, telecommunications, transportation, aero space and defense engineering for more than 20 years. We offer system solutions which comply perfectly with your requirements for performance, reliability, stability, costs and product durability.

Our product range covers boards, chassis, systems and HA solutions based on industrial standards like AdvancedTCA, CompactPCI, VMEbus, VPX, MicroTCA, AMC, FMC, PMC and IndustryPack mezzanine modules. In addition to system integration and OEM solutions we offer development systems, drivers, protocols and protocol integration. We support our offer with Windows, Linux and Real-Time operating systems.

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That’s MicroTCA!
MicroTCA defines backplane-based computer systems based on AdvancedMC (AMC) modules. MicroTCA systems are used in industry, research, medical technology, vehicle engineering, defence engineering, telecommunications and network engineering.

Highly Scalable Systems
The MicroTCA specification defines highly scalable systems – from simple low-cost systems to high-available carrier grade computer architectures. Depending on its configuration, one chassis can hold up to 12 AMC modules. Several chassis can be easily linked together. Modules with any function can be used in each slot. It goes without saying that any operating system and processor architecture can be used. In addition to the AMC modules, a MicroTCA system has at least one MicroTCA carrier hub (MCH) as well as at least one power module (PM). Originally intended only for telecommunication applications, MicroTCA systems have now been introduced in many areas.

AMC modules communicate with each other by way of switched fabrics. Ethernet (1GbE, 10GbE, 40GbE), PCI Express, RapidIO, SATA and SAS are defined as possible protocols. AMC modules are available in various front panel widths and also optionally in double board size.

MicroTCA Carrier Hub
The MCH defines the connections, monitors the whole system and generates the system clocks. It also monitors and manages the AMC modules, up to 4 power modules (PM) and 2 cooling units (CU). It provides the required switching functionality.

The MCH has the form of an AMC module, but consists of several PCBs and has a dedicated system slot. For fail-safe systems, two MCHs can be used redundantly in one system. In addition, the MCH provides an Ethernet interface as management interface with extensive options.


MTCA.4
The MTCA 4 specification describes the enhancements of the MTCA standard required by scientists in high energy physics for their applications. Along with establishing a unified board format (double mid-size), so-called rear transition modules (µRTM) have also been defined. In this way the conversion and signal conditioning part can be uncoupled from the data processing area. The larger board surface also allows more complex card designs to be implemented for high performance analogue/digital converters. An additional backplane allows high performance FPGA modules to communicate with each other without latency.

Of course, AMC.0-compatible modules can also be used in MTCA.4 systems and there is a corresponding splitter kit for this purpose. This modularity and the larger board sizes allow these systems to also be used in a wide range of other fields of application outside of research where they are used with success.
MTCA-6P
2U 19" 6 Slot Starter Kit, special Clock Module, PCIe Gen 3

2U 19" 6 slot MTCA.4 crate, 6 double mid size AMC slots, 4 µRTM slots for Rear I/O, MCH & PM slots, NAT-MCH-PHYS, AM G64/47i, 256GB SSD, 600W AC PSU

Ordering Information
MTCA-6P-PH2a 6 Slot 2U 19" MTCA.4 Starter Kit, front to left air flow, NAT-PM-AC600D
MTCA-6P-PH4d 6 Slot 2U 19" MTCA.4 Starter Kit, right to left air flow, NAT-PM-AC600D

MTCA-12S
9U 19" 12 Slot Starter Kit, special Clock Module, PCIe Gen 3

9U 19" 12 slot MTCA.4 crate, 12 double mid size AMC slots, 2 MCH & 4 PM slots, NAT-MCH-PHYS, AM G64/47i, 256GB SSD, 1000W AC PSU

Ordering Information
MTCA-12S-PH2a 12 Slot 9U 19" MTCA.4 Starter Kit, W-IE-NE-R 1000W

MTCA-12P
9U 19" 12 Slot LLRF Starter Kit, special Clock Module, PCIe Gen 3

9U 19" 12 slot MTCA.4 LLRF crate, 12 double mid size AMC slots, 2 MCH & 4 PM slots, NAT-MCH-PHYS, AM G64/47i, 256GB SSD, 1000W AC PSU, prepared for a RF backplane

Ordering Information
MTCA-12P-PH3b 12 Slot 9U 19" MTCA.4 LLRF Starter Kit, W-IE-NE-R 1000W

More Starter Kits upon request

Fig.: Fully functional timing/LLRF control system based on MTCA.4 installed in FLASH (Free electron Laser in Hamburg). Generation of ultra-short laser pulses (4.1 nm).

The European XFEL is a 3.4 km long particle accelerator whose control needs to be synchronised along its entire length. To do this DESY requires very reliable, high-performance technology with long-term availability that is also available for the planned 15-year duration of the project. In the same way, management capability, such as the start-up in the ongoing operation, and extremely short latency are further requirements for this experiment.

Only one type of technology can be considered under these conditions: MicroTCA!

High channel densities, redundancies, the monitoring of every component in the system and high-speed links are brought together in this industry standard.
MicroTCA Chassis

**10849-005**
6U 9 Slot MicroTCA System

9 full size AMC slots, 2 power module slots, 2 MCH slots

**Ordering Information**
10849-005 9 Slot MicroTCA System

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**11850-016**
1U 2 Slot MicroTCA System with eMCH

2 single full size or mid size AMC slots, integrated eMCH, integrated 150W AC power supply with wide range AC input and DC output

**Ordering Information**
11850-016 2 Slot MicroTCA System

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**11850-025**
1U 6 Slot MicroTCA System

6 single mid size AMC slots, 1 single full size MCH slot, 250W AC power supply, PCIe on ports 4–7

**Ordering Information**
11850-025 6 Slot MicroTCA System

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**NATIVE-C1**
1U 6 Slot MicroTCA System with JSM Slot

6 single mid size AMC slots, 1 power module slot, 1 single full size MCH slot, 1 JTAG switch module (JSM) slot, 2 hot swapp cooling units, point-to-point SATA/SAS port 2 & 3, replaceable backplane

**Ordering Information**
NATIVE-C1 6 Slot MicroTCA System

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**11850-011**
3U 6 Slot MicroTCA System

4 double and 2 single full size AMC slots, 2 Power Module slots, 2 MCH slots

**Ordering Information**
11850-011 6 Slot MicroTCA System

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**11850-023**
1U 2 Slot AdvancedMC System

2 single full size AMC slots, 150W AC power supply, direct connection of all ports between both AMCs, data transfer rates up to 10 Gbps per port

**Ordering Information**
11850-023 2 Slot AdvancedMC System

---

**Bluleco**
5 Slot MicroTCA Developmentsystem

3 mid size and two full size slots, MCH slot, IPMI power distribution module integrated on the backplane, plug-in AS PSU 300W 12V output voltage, cooling unit with IPMI support on the backplane, direct SATA / SAS connections, single star topology, optimized high-speed routing

**Ordering Information**
Bluleco 5 Slot MicroTCA System
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<th>Description</th>
<th>Ordering Information</th>
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</thead>
<tbody>
<tr>
<td>RackPak/M4–2</td>
<td>2U 6 Slot MTCA.4 Crate</td>
<td>6 Slot 19” MTCA.4 Crate, front to left air flow</td>
</tr>
<tr>
<td></td>
<td>2U 19” 6 slot MTCA.4 Crate, 6 double mid size AMC slots, 4 µRTM slots for</td>
<td>6 Slot 19” MTCA.4 Crate, right to left air flow</td>
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<tr>
<td></td>
<td>Rear I/O, MCH &amp; PM slots</td>
<td></td>
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<tr>
<td>MTCA–125–RF2</td>
<td>9U 19” 12 Slot LLRF MTCA.4 Crate</td>
<td>12 Slot 9U 19” MTCA.4 LLRF Crate</td>
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<tr>
<td></td>
<td>9U 19” 12 slot MTCA.4 LLRF Crate, 12 double mid size AMC slots, 2 MCH + 4</td>
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<td></td>
<td>PM slots, ready for an LLRF backplane</td>
<td></td>
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<tr>
<td>11850–026 and</td>
<td>9U 19” 12 Slot MTCA.4 Crate with opt. JSM Slot</td>
<td>12 Slot 9U 19” MTCA.4 Crate with JSM slot</td>
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<tr>
<td>11850–027</td>
<td>9U 19” 12 Slot MTCA.4 Crate</td>
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<tr>
<td>11890–152</td>
<td>7U 19” 12 Slot MTCA.4 Crate with JSM Slot</td>
<td>12 Slot 7U 19” MTCA.4 Crate</td>
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<tr>
<td>11890–170</td>
<td>9U 19” 12 Slot MTCA.4 Crate with JSM Slot</td>
<td>12 Slot 9U 19” MTCA.4 Crate with JSM slot</td>
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<tr>
<td>11890–152</td>
<td>7U 19” 12 Slot MTCA.4 Crate with JSM Slot</td>
<td>12 Slot 7U 19” MTCA.4 Crate</td>
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<tr>
<td>11890–170</td>
<td>9U 19” 12 Slot MTCA.4 Crate with JSM Slot</td>
<td>12 Slot 9U 19” MTCA.4 Crate with JSM slot</td>
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**RackPak/M5–1**

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<th>Ordering Information</th>
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<tr>
<td></td>
<td>2U 6 Slot MTCA.4 Crate with JSM Slot</td>
<td>6 Slot 19” MTCA.4 Crate, front to left air flow</td>
</tr>
<tr>
<td></td>
<td>2U 19” 6 slot MTCA.4 Crate, 5 double mid size and 1 double full size AMC</td>
<td>6 Slot 19” MTCA.4 Crate, right to left air flow</td>
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<tr>
<td></td>
<td>slots, 5 µRTM slots for Rear I/O, MCH with RTM slot, JSM &amp; PM slot, opt.</td>
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<td>White Rabbit</td>
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<tr>
<td>11850–021</td>
<td>5U 7 Slot MTCA.4 Crate</td>
<td>7 Slot 5U 42HP MTCA.4 Crate</td>
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<tr>
<td>11850–029</td>
<td>1U 4 Slot MTCA.4 System with eMCH</td>
<td>4 Slot 1U MTCA.4 System with eMCH</td>
</tr>
<tr>
<td>11890–152</td>
<td>9U 12 Slot MTCA.4 System with eMCH</td>
<td>12 Slot 9U 19” MTCA.4 System with JSM slot</td>
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MicroTCA Carrier Hubs

**NAT-MCH**

GbE, PCIe, SerialRapid IO, 10GbE MCH

MicroTCA Carrier Hub, 200 MHz Freescale ColdFire 547x CPU with 64MB SDRAM and 32 MB flash, management for up to 12 AMCs, 2 cooling units and 1-4 power units, GbE switch, one Fast Ethernet management port, one GbE port and one clock I/O on BNC port in the front panel

Ordering Information

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<tr>
<td>NAT-MCH-202201</td>
<td>NAT-MCH-Base12-GbE-SSCH-PCIx48-FP1D</td>
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<tr>
<td>NAT-MCH-200004</td>
<td>NAT-MCH-Base12-GbE-FP0S</td>
</tr>
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**NAT-MCH-PHYS**

GbE, PCIe MCH

MicroTCA Carrier Hub, management for 12 AMCs, 2 cooling units and 1-4 power units, 16 port GbE switch, 48 port PCIe Gen 3 switch, two GbE ports, USB, RS-232 in the front panel, 128 GB 2,5” SSD or two 1,25” SSD (RAID)

Ordering Information

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<td>NAT-MCH-PHYS</td>
<td>NAT-MCH, 16 GbE, PCIe x4, low jitter Clock Module, double full size</td>
</tr>
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**NAT-MCH-PHYS80**

GbE, PCIe MCH

MicroTCA Carrier Hub, management for 12 AMCs, 4 cooling units, 4 power units, and 2 rear power units, 16 Port GbE switch, 80 port PCIe Gen 3 switch, two GbE ports, USB, RS-232 in the front panel, front panel optical uplink for PCIe (Gen 3) with 16 lanes, 128 GB 2,5” SSD or two 1,25” SSD (RAID)

Ordering Information

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<td>NAT-MCH-PHYS80</td>
<td>NAT-MCH, 16 GbE, PCIe x8, 80 PCIe Links, low jitter Clock Module, double full size</td>
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<tr>
<td>NAT-MCH-PHYS80UPLNK</td>
<td>NAT-MCH, 16 GbE, PCIe x8, 80 PCIe Links, 16 optical PCIe Lanes, low jitter Clock Module, double full size</td>
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**NAT-MCH-RTM**

RTM for MTCA.4 Systems and COM Express Carrier

MicroTCA Carrier Hub, 200 MHz Freescale ColdFire 547x CPU with 64MB SDRAM and 32 MB flash, management for up to 12 AMCs, 2 cooling units, up to 4 power units, and 2 rear power units, GbE switch, and PCIe Gen 3 switch, two GbE ports, USB, RS-232 in the front panel, 128 GB 2,5” SSD or two 1,25” SSD (RAID)

Ordering Information

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<td>NAT-MCH-RTM</td>
<td>RTM and COM Express carrier type 6 (PCIe x16 Gen 3) carrier for MTCA.4, 1 µRTM backplane and LLRF backplane control, 2 DisplayPorts, 4 USB 3.0 and GbE port on the rear panel, zone 3 connector, optional quad core 2.0 GHz Intel Xeon E3-1505LV5, up to 16GB DDR3 RAM</td>
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**MicroTCA System Block Diagram**

MicroTCA brings together serial high-speed links, system monitoring, efficient cooling and redundancy strategies in one industry standard.

This standard contains a backplane-based system with a central monitoring unit, MicroTCA Carrier Hub (MCH), 1-2 fan units (CU), up to 4 power supply units (PM) and a maximum of 12 AdvancedMC Modules (AMC).

The PM, CU and MCH power up when the system is switched on. After the MCH has booted up it takes over the control of the PM, controls the CUs and checks the AMC modules in place.

Provided the AMC module information is correct, it operates the high-speed links between the modules (fat pipe). If sufficient power is available in the system the MCH switches on the payload power for the individual AMC modules.
**AM G6x/msd**
Intel Xeon E3–1505M v6/Core i3 Gen. 7 CPU

Processor AMC with Intel Xeon E3–1505M v6 or Intel Core i3–7102E CPU, Intel CM238 chipset, up to 32 GB DDR4 RAM, DisplayPort, GbE, SATA, M.2 SSD, RS–232, USB, AMC.1 type 8 or type 4, AMC.2 E2 (2x GbE) and AMC.3 S2 (SATA), TCLKA clock input, audio, opt. 10 GbE, opt. FIN-S software, ~25°C .. +70°C operating temperature

**Ordering Information**

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<th>Configuration</th>
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<td>AM G6x/msd</td>
<td>4 Core Intel Xeon E3–1505M v6 AMC CPU, double mid size</td>
</tr>
<tr>
<td>AM G6x/msd</td>
<td>4 Core Intel Xeon E3–1505M v6 AMC CPU, double full size</td>
</tr>
<tr>
<td>AM G6x/msd</td>
<td>2 Core Intel Core i3–7102E AMC CPU, double mid size</td>
</tr>
<tr>
<td>AM G6x/msd</td>
<td>2 Core Intel Core i3–7102E AMC CPU, double full size</td>
</tr>
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**AM Ctx/msd**
Intel Core i7 4 Generation CPU with Serial RapidIO Fabric

Processor AMC with Intel Core i7 CPU, Intel QM87 chipset, up to 16 GB RAM, GbE, SATA, RS–232, AMC.2 E2 (2x GbE), AMC.3 S2 (SATA) and AMC.4 type 5 and 10 (one or two x4 Serial RapidIO), TCLKA clock input

**Ordering Information**

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<th>Model</th>
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<tr>
<td>AM Ctx/msd</td>
<td>2 Core, Core i5–4440E, 4 GB RAM, full size</td>
</tr>
<tr>
<td>AM Ctx/msd</td>
<td>2 Core, Core i5–4440E, 4 GB RAM, mid size</td>
</tr>
<tr>
<td>AM Ctx/msd</td>
<td>4 Core, Core i7–4700EQ, 4 GB RAM, full size</td>
</tr>
<tr>
<td>AM Ctx/msd</td>
<td>4 Core, Core i7–4700EQ, 4 GB RAM, mid size</td>
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**AM F5x/msd**
Intel Xeon E3–1500 v5 CPU with PCIe Fabric

Processor AMC with Intel Xeon E5–1500 v5 CPU, Intel CM236 chipset, 16 GB RAM, 10GbE, DisplayPort, GbE, SATA, RS–232, USB, AMC.1 type 8 or type 4, AMC.2 E2 (2x GbE) and AMC.3 S2 (SATA), TCLKA clock input

**Ordering Information**

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<tr>
<td>AM F51/msd</td>
<td>4 Core, 2.8 GHz E3–1515M v5, 16 GB RAM, mid size</td>
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<tr>
<td>AM F52/msd</td>
<td>4 Core, 2.8 GHz E3–1505M v5, 16 GB RAM, mid size</td>
</tr>
<tr>
<td>AM F53/msd</td>
<td>4 Core, 2.8 GHz E3–1505L v5, 16 GB RAM, mid size</td>
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AdvancedMC CPU Modules PowerPC

NAMC-8569-CPU
PowerPC MPC8569 PowerQUICC III CPU

Processor AMC with MPC8569 PowerQUICC III PowerPC CPU, Lattice ECP3 FPGA, up to 1 GB RAM, 2 GB flash, 512 KB MRAM, MicroSD slot, GbE, SATA, RS-232, iTDM, opt. H.110 alike TSI interface, sub module slot for customized IO, AMC.1 type 4 or AMC.1 type 1, AMC.2 type E2 and AMC.4 SRIO

Ordering Information
NAMC-QorIQ-P40-F 8 Core, 1.5 GHz P4080 PowerPC, full size
NAMC-QorIQ-P40-M 8 Core, 1.5 GHz P4080 PowerPC, mid size
NAMC-QorIQ-P50-F 2 Core, 2.2 GHz P5020 PowerPC, full size
NAMC-QorIQ-P50-M 2 Core, 2.2 GHz P5020 PowerPC, mid size

NAMC-QorIQ-P204x
QorIQ P204x CPU

Processor AMC with P2040/P2041 QorIQ CPU, Lattice ECP3 FPGA, up to 4 GB RAM, up to 1 GB flash, 512 KB MRAM, MicroSD slot, 10GbE, GbE, SATA, AMC.1 type 4, AMC.2 type E2 and AMC.4 SRIO

Ordering Information
NAMC-QorIQ-P2040-F 4 Core, 1.5 GHz P2040 PowerPC, full size
NAMC-QorIQ-P2040-M 4 Core, 1.5 GHz P2040 PowerPC, mid size
NAMC-QorIQ-P2041-F 4 Core, 1.5 GHz P2041 PowerPC, full size
NAMC-QorIQ-P2041-M 4 Core, 1.5 GHz P2041 PowerPC, mid size

NAMC-QorIQ-P3041
QorIQ P3041 CPU

Processor AMC with P3041 QorIQ CPU, Lattice ECP3 FPGA, up to 4 GB RAM, up to 2 GB flash, 10GbE, GbE, SATA, iTDM, opt. H.110 alike TSI interface, AMC.1 type 4, AMC.2 type E2 and AMC.3 S2 (SATA)

Ordering Information
NAMC-QorIQ-P3041-F 4 Core, 1.5 GHz P3041 PowerPC, full size
NAMC-QorIQ-P3041-M 4 Core, 1.5 GHz P3041 PowerPC, mid size

NAMC-QorIQ-P5020
QorIQ P5020 CPU

Processor AMC with P5020 QorIQ CPU, Lattice ECP3 or Xilinx Virtex-6 FPGA, up to 8 GB RAM, 2 GB flash, 10GbE, GbE, SATA, iTDM, opt. H.110 alike TSI interface, AMC.1 type 4, AMC.2 type E2, AMC.3 S2 (SATA) and AMC.4 SRIO

Ordering Information
NAMC-QorIQ-P40-F 8 Core, 1.5 GHz P4080 PowerPC, full size
NAMC-QorIQ-P40-M 8 Core, 1.5 GHz P4080 PowerPC, mid size
NAMC-QorIQ-P50-F 2 Core, 2.0 GHz P5020 PowerPC, full size
NAMC-QorIQ-P50-M 2 Core, 2.0 GHz P5020 PowerPC, mid size

NAMC-QorIQ-P4080
QorIQ P4080 CPU

Processor AMC with P4080 QorIQ CPU, Lattice ECP3 FPGA, up to 4 GB RAM, 2 GB flash, 10GbE, GbE, SATA, iTDM, opt. H.110 alike TSI interface, AMC.1 type 4, AMC.2 type E2, AMC.3 S2 (SATA) and AMC.4 SRIO

Ordering Information
NAMC-QorIQ-P4080-F 8 Core, 1.5 GHz P4080 PowerPC, full size
NAMC-QorIQ-P4080-M 8 Core, 1.5 GHz P4080 PowerPC, mid size
NAMC-QorIQ-P4080-V6-F 8 Core, 1.5 GHz P4080 PowerPC, Virtex6, full size
NAMC-QorIQ-P4080-V6-M 8 Core, 1.5 GHz P4080 PowerPC, Virtex6, mid size
AdvancedMC I/O Modules – Field Bus

**BU-65590A**
MIL-STD-1553 and ARINC 429 Controller

2 or 4 channel MIL-STD-1553 interface, redundant channels, BC, RT, MT or RT/MT, ARINC 429 interface with 8 receive and 4 transmit channels, 2 RS-232 channels, 2 RS-422/485 channels, 6 prog. digital I/Os, 1 MB RAM per MIL-STD-1553 channel, IRIG-B time code input, 6-kbit/s time stamp, DMA engine, front Micro-D connector, AMC.1 type 4, opt. Conformal Coating

**Ordering Information**

<table>
<thead>
<tr>
<th>Order Code</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>BU-65590A0</td>
<td>MIL-STD-1553, ARINC 429 Controller, mid size</td>
</tr>
<tr>
<td>BU-65590A1</td>
<td>MIL-STD-1553, ARINC 429 Controller, full size</td>
</tr>
</tbody>
</table>

**CAN-4**
4 Channel CAN Interface

4 high-speed CAN interfaces, 11bit and 29bit CAN IDs, Spartan-3e FPGA, up to 1 Mbit/s bit rate, receive buffer, prog. error warning limit, listen only mode, aut. bit rate detection, interfaces potential isolated against each other, 4 front RJ45 connectors, 11898-1 (CAN 2.0A/B) compliant, AMC.1 type 1

**Ordering Information**

<table>
<thead>
<tr>
<th>Order Code</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>CAN-4f</td>
<td>4 Channel CAN Interface, full size</td>
</tr>
<tr>
<td>CAN-4m</td>
<td>4 Channel CAN Interface, mid size</td>
</tr>
<tr>
<td>AMC-CAN4-DSUB-Adapter</td>
<td>RJ45-to-9-pin DSUB Adapter cable, 1,5m</td>
</tr>
</tbody>
</table>

**NAMC-ECAT**
EtherCAT Slave Module

EtherCAT Slave module, 3 front RJ45 connectors, ETH100 slave controller, AMC.1 type 1

**Ordering Information**

<table>
<thead>
<tr>
<th>Order Code</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>NAMC-ECAT</td>
<td>EtherCAT Slave Module, full size</td>
</tr>
<tr>
<td>NAMC-ECATm</td>
<td>EtherCAT Slave Module, mid size</td>
</tr>
</tbody>
</table>

**EPS-9905**
EtherCAT Solution

EtherCAT Chassis with 5 slots, slave module status monitoring, IP31, 50G shock resistance, 6.6W power consumption, small dimensions 130 x 110 x 105 mm, -20°C .. +60°C operating temperature range

**Ordering Information**

<table>
<thead>
<tr>
<th>Order Code</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>EPS-9905</td>
<td>EtherCAT chassis for Slave Modules</td>
</tr>
<tr>
<td>EPS-6000</td>
<td>EtherCAT Bus Coupler</td>
</tr>
</tbody>
</table>

**EtherCAT Slave Modules Overview for EPS-9905**

<table>
<thead>
<tr>
<th>Model Code</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>EPS-1032</td>
<td>32 Channel Sourcing Type Digital Input</td>
</tr>
<tr>
<td>EPS-1132</td>
<td>32 Channel Sinking Type Digital Input</td>
</tr>
<tr>
<td>EPS-2032</td>
<td>32 Channel Sourcing Type Digital Output</td>
</tr>
<tr>
<td>EPS-2132</td>
<td>32 Channel Sinking Type Digital Output</td>
</tr>
<tr>
<td>EPS-2308</td>
<td>8 Channel Relay Output</td>
</tr>
<tr>
<td>EPS-3032</td>
<td>32 Channel ±10V Analog Input</td>
</tr>
<tr>
<td>EPS-3216</td>
<td>16 Channel 0-20mA Analog Input</td>
</tr>
<tr>
<td>EPS-3504</td>
<td>4 Channel RTD Thermal Input</td>
</tr>
<tr>
<td>EPS-4008</td>
<td>8 Channel +/-10V Analog Output</td>
</tr>
<tr>
<td>EPS-7002</td>
<td>2 Channel Pulse-Train Motion Control</td>
</tr>
</tbody>
</table>
TAMC100
AMC Module with one IndustryPack Slot

AMC carrier module for one IndustryPack module, front I/O via 50-pol.
SCSI-2 connector, routing all IP interrupts on PCIe INTA/MSI, local interrupt status register, self healing fuses and RF-filtering for the power supply of the IndustryPack slot, AMC.1 type 1, -40°C .. +85°C operating temperature range

Ordering Information
TAMC100-10R AMC Carrier for 1 IndustryPack Module, mid size
TAMC100-11R AMC Carrier for 1 IndustryPack Module, full size

TAMC200
AMC Module with three IndustryPack Slots

AMC carrier module for three IndustryPack modules, front I/O via 68-pol.
SCSI-2 connector, routing all IP interrupts on PCIe INTA/MSI, local interrupt status register, self healing fuses and RF-filtering for the power supply of the IndustryPack slots, AMC.1 type 1, -40°C .. +85°C operating temperature range

Ordering Information
TAMC200-10R AMC Carrier Module for 3 IndustryPack Modules, double mid size
TAMC200-11R AMC Carrier Module for 3 IndustryPack Modules, double full size

TAMC220 and TAMC002
AMC Module with three IndustryPack Slots for MTCA.4

AMC carrier module for three IndustryPack modules, Rear I/O via AirmaxVS connector, e.g. TAMC002-TM, routing all IP interrupts on PCIe INTA/MSI, local interrupt status register, self healing fuses and RF-filtering for the power supply of the IndustryPack slots, AMC.1 type 1, -40°C .. +85°C operating temperature range

Ordering Information
TAMC220-10R AMC Carrier Module for 3 IndustryPack Modules, double mid size
TAMC220-11R AMC Carrier Module for 3 IndustryPack Modules, double full size
TAMC002-TM-10R MTCA.4 µRTM for TAMC220, mid size
TAMC002-TM-11R MTCA.4 µRTM for TAMC220, full size

IndustryPack Modules Overview

| Analogue I/O | TIP865 | 16 Channel 12bit ADC |
| TIP866 | 16 Channel iso. 16bit ADC |
| TIP867 | 4 Channel iso. 16bit ADC |
| TIP870 | 4 Channel iso. 16bit DAC |
| TIP890 | 8 Channel sync. 12/16bit ADC |
| TIP895 | 4 Channel 14bit ADC |
| TIP896 | 16 Channel 12bit ADC, 4 DAC |

| Digital I/O | TIP600 | 16 iso. 24V inputs |
| TIP605 | 16 iso. 24V inputs |
| TIP606 | 16 iso. Diff. inputs |
| TIP610 | 20 TTL I/Os |
| TIP620 | 48 TTL I/Os, 68230 T/C |
| TIP670 | 4/8 Channel iso. 4/8bit ADC |
| TIP671 | 24 Channel 12/16bit ADC |
| TIP675 | 48 TriState TTL I/Os |
| TIP676 | 8 Channel 12bit ADC |
| TIP678 | 8 Channel 16bit ADC |
| TIP830 | 8 Channel 12 or 16bit ADC |
| TIP903 | 3 Channel Ext. CAN |

| Memory | TIP250 | 8 MB Flash |
| TIP255 | 2 MB SRAM with battery |

| Field Bus Controller | TIP810 | Basic CAN |
| TIP815 | ARCNET |
| TIP816 | Extended CAN |
| TIP903 | 3 Channel ext. CAN |

| Motor Control | TIP812 | 2 Channel Servo, ADC |
| TIP811 | 2 Channel Servo, SSI |
| TIP814 | 10 Channel SSI Encoder |
| TIP815 | 5 Channel SSI Encoder |
| TIP816 | 4 Channel Quad Encoder |
| TIP819 | 6 Channel Quad Encoder |
| TIP820 | 2 Channel Synchro/Resolver |

| More information about IndustryPack Modules: | www.powerbridge.de |
### AdvancedMC I/O Modules – PMC Carrier

**TAMC260**
AMC Module with one PMC Slot

AMC carrier module for one PMC module, front and P14 I/O via 68-pol. SCSI–V connector, AMC.1 type 1, -40°C .. +85°C operating temperature range

**Ordering Information**
- TAMC260-10R AMC Carrier for 1 PMC Module, 5V, double full size
- TAMC260-11R AMC Carrier for 1 PMC Module, 3.3V, double full size
- TAMC260-20R AMC Carrier for 1 PMC Module, 5V, double mid size
- TAMC260-21R AMC Carrier for 1 PMC Module, 3.3V, double mid size

**NAMC-PMC**
AMC Module with one PMC Slot

AMC carrier module for one PMC module, front I/O, AMC.1 type 1, 0°C .. +55°C operating temperature range

**Ordering Information**
- NAMC-PMC AMC Carrier Module for 1 PMC Module, mid size

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### AdvancedMC I/O Modules – Ethernet / Serial

**TAMC261 and TAMCO20**
AMC Module with one PMC Slot and MTCA.4 µRTM

AMC carrier module for one PMC module with MTCA.4 Rear I/O, front and P14 I/O, AMC.1 type 1, -40°C .. +85°C operating temperature range

**Ordering Information**
- TAMC261-10R AMC Carrier Module for 1 PMC Module with MTCA.4 Rear I/O, double mid size
- TAMC261-11R AMC Carrier Module for 1 PMC Module, with MTCA.4 Rear I/O, double full size
- TAMC261-20R AMC Carrier Module for 1 PMC Module, with MTCA.4 Rear I/O, M-LVDS, double mid size
- TAMC261-21R AMC Carrier Module for 1 PMC Module, with MTCA.4 Rear I/O, M-LVDS, double full size
- TAMC020-TM-10R MTCA.4 µRTM for Rear I/O access to the PMC back I/O lines, double mid size, PIM I/O
- TAMC020-TM-11R MTCA.4 µRTM for Rear I/O access to the PMC back I/O lines, double full size, PIM I/O

**On our website [www.powerbridge.de](http://www.powerbridge.de) you can find more than 300 PMC Modules**

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### AdvancedMC I/O Modules – Ethernet

**SB-AMC-58**
2 Channel 10GbE Ethernet Controller

Two 10GbE SFP+ interfaces, AMC.1 type 8, IEEE 802.3ap (auto negotiation), IEEE 802.1Q (VLAN), IEEE 802.3ad (link aggregation), I/O virtualization ready, TCP and UDP checksum offload, jumbo frame support (9 kB or 15 kB), iSCSI remote boot support, FCoE hardware acceleration

**Ordering Information**
- SB-AMC-58 2 Port 10GbE Ethernet Controller

**TAMC863**
4 Channel high-speed syn. Serial Interface

4 channel serial controller, EIA-232, EIA-422, EIA-429, EIA-530, EIA-530A, V.35, V.36 and X.21, AMC.1 type 1, interface is software selectable per channel, HDLC, asynchronous, isochronous and synchronous protocol support, transfer rates up to 10 Mbit/s synchronous, 2 Mbit/s asynchronous and 75.2 kbit/s with RS-232, front panel I/O via HD68 connector, 512 32-bit word FIFO per channel, 4 KV ESD protection

**Ordering Information**
- TAMC863-10R Quad High-Speed Serial Interface, Front I/O, mid size
- TAMC863-11R Quad High-Speed Serial Interface, Front I/O, full size

**SB-AMC-59**
4 Port Gigabit Ethernet Interface

4 GbE interfaces, AMC.1 type 4, auto negotiation, 9 KB jumbo frames, link aggregation, TCP segmentation, IPv4 and IPv6 support, TCP and UDP checksum offload, PXE boot, iSCSI remote boot support

**Ordering Information**
- SB-AMC-59F 4 Port GbE Ethernet Module, full size
- SB-AMC-59M 4 Port GbE Ethernet Module, mid size

**TAMC890**
16 Port GbE Switch

16 port 10/100/1000T Ethernet switch AMC, AMC.2 type E3 and type 4, 4 front panel ports, RI–45, unmanaged L2 switch, Broadcom 5396 switch chip set, auto sensing, MDI/MDIX crossover, nonblocking, auto negotiating, automatic MAC management, 9KB jumbo frames, 4k VLAN

**Ordering Information**
- TAMC890-10R Ethernet Switch AMC, mid size
- TAMC890-11R Ethernet Switch AMC, full size
AdvancedMC I/O Modules – FPGA

TAMC641
Virtex-5 FPGA Module with FMC Slot

Xilinx Virtex-5 FPGA, 512 MB DDR2 SDRAM, 4 MB QDR-II SRAM, FMC slot for flexible I/O, VITA 57, AMC.1 type 8, AMC.2 type 6, AMC.3 (SATA), AMC.4 (SRIO x8)

Ordering Information
TAMC641-10R FPGA Virtex-5 AMC Module, XC6SLX25T, mid size
TAMC641-11R FPGA Virtex-5 AMC Module, XC6SLX25T, full size
TAMC641-12R FPGA Virtex-5 AMC Module, XC6SLX75T, mid size
TAMC641-13R FPGA Virtex-5 AMC Module, XC6SLX75T, full size
TAMC641-14R FPGA Virtex-5 AMC Module, XC6SLX150T, mid size
TAMC641-15R FPGA Virtex-5 AMC Module, XC6SLX150T, full size
TAMC641-16R FPGA Virtex-5 AMC Module, XC6SLX500T, mid size
TAMC641-17R FPGA Virtex-5 AMC Module, XC6SLX500T, full size
TA900-10R Program and Debug Box
TFMC900-10R Test FMC Mezzanine Module

Faster FPGA speed grades on request

MFMC
Xilinx Artix-7 FPGA Module for MTCA.4 Rear I/O with 2 FMC slots

Xilinx Artix-7 FPGA, MTCA.4 Rear I/O, two FMC slots, VITA 57.1, 16 GB DDR3 RAM, 256 MB quad flash, front SMB, MicroUSB, PCIe x4, GbE

Ordering Information
MFMC-16G1 Dual FMC Carrier Module, Artix-7 XC7A200T-1, 16 GB RAM, double mid size
MFMC-16G2 Dual FMC Carrier Module, Artix-7 XC7A200T-2, 16 GB RAM, double mid size
MFMC-4G2 Dual FMC Carrier Module, Artix-7 XC7A200T-2, 4 GB RAM, double mid size

FMC Modules Overview

FMC-4SFP+ Quad SFP/SFP+ Ports
FMC-CAMERALINK High-performance 2-fach CameraLink Interface
FMC-CL High-performance 2-fach CameraLink Interface
FMC-Pico-1M4 Quad 16/20-bit 1 MSPS Pico-Ammeter
IC-ADC-FMCa Quad 16-bit ADC, 135 MSPS
IC-ADC-FMCb Quad 14-bit ADC, 400 MSPS
IC-ADC-FMcc Quad 12-bit ADC, 1.6 GSPS
IC-DAC-FMCa Quad 16-bit DAC, 1 GSPS
IC-QSFP-FMCa Dual QSFP 10GBe
IC-SFP-FMCa Dual SFP+ GbE
TFMC684 32 diff. M-LVDS
TFMC900 Test Module, Spartan-6 FPGA

IC-ADC-FMcc 4 Channel ADC, 1.6 GSPS
TFMC684 32 diff. M-LVDS

TAMC631
Spartan-6 FPGA Module with FMC Slot

Xilinx Spartan-6 FPGA, 256 MB DDR3 SDRAM, FMC slots for flexible I/O, VITA 57, AMC.1 type 1

Ordering Information
TAMC631-10R FPGA Spartan-6 AMC Module, XC6SLX25T, mid size
TAMC631-11R FPGA Spartan-6 AMC Module, XC6SLX25T, full size
TAMC631-12R FPGA Spartan-6 AMC Module, XC6SLX75T, mid size
TAMC631-13R FPGA Spartan-6 AMC Module, XC6SLX75T, full size
TAMC631-14R FPGA Spartan-6 AMC Module, XC6SLX150T, mid size
TAMC631-15R FPGA Spartan-6 AMC Module, XC6SLX150T, full size
TAMC631-16R FPGA Spartan-6 AMC Module, XC6SLX500T, mid size
TAMC631-17R FPGA Spartan-6 AMC Module, XC6SLX500T, full size
TA900-10R Program and Debug Box
TFMC900-10R Test FMC Mezzanine Module

Faster FPGA speed grades on request

TAMC651
Spartan-6 FPGA Module for MTCA.4 Rear I/O

Xilinx Spartan-6 FPGA, MTCA.4 Rear I/O, 128 MB DDR3 SDRAM, AMC.1 type 1, SFP GbE front panel port, point-to-point (AMC ports 12-15) and multi-drop (AMC ports 17-20) connections, 46 differential FPGA I/O lines or single-ended I/O lines, 2 differential reference clock lines (LVDS) and 2 Spartan-6 GTP transceiver I/O signals on MTCA.4 zone 3

Ordering Information
TAMC651-10R FPGA Spartan-6 AMC Module, XC6SLX65T-2, double mid size
TAMC651-11R FPGA Spartan-6 AMC Module, XC6SLX65T-2, double full size
TAMC651-12R FPGA Spartan-6 AMC Module, XC6SLX100T-2, double mid size
TAMC651-13R FPGA Spartan-6 AMC Module, XC6SLX100T-2, double full size
TA900-10R Program and Debug Box
TFMC900-10R Test FMC Mezzanine Module

Faster FPGA speed grades on request

TFMC684 32 diff. M-LVDS
### AdvancedMC I/O Modules – FPGA / ADC / DAQ

#### TAMC532
32 port 12/14bit 75/50 MSPS ADC

- **Kintex-7 FPGA, MTCA.4 Rear I/O, ±1V diff. input, 6 GB DDR3 RAM, AMC.1 type 4, AMC.2 type E1, 2 front SFP+, M-LVDS on AMC ports 17-20**, double mid size and double full size form factor

**Ordering Information**
- TAMC532-10R 32 Channel 12bit 75 MSPS ADC, 512 MB RAM, Kintex-7 70T
- TAMC532-11R 32 Channel 14bit 50 MSPS ADC, 512 MB RAM, Kintex-7 70T
- TAMC532-TM-10R µRTM for TAMC532
- TA900-10R Program and Debug Box

Kintex-7 160T/325T/410T and other RAM versions on request

#### TAMC900
8 Channel A0 Converter AMC

- 8 differential 14bit 105 MSPS A0 inputs, 1-105 MSPS sampling rate, Virtex-5 FPGA, 4 MB QDR-II SRAM, AMC.1 type 4, mid size and full size form factor

**Ordering Information**
- TAMC900-10R 8 Channel 105 MSPS, 14bit LX30T ADC AMC
- TAMC900-25R 8 Channel 105 MSPS, 14bit LX30T ADC AMC
- TAMC900-A1-10R Signal Conditioning Adapter, Gain = 1, mid size
- TAMC900-A1-11R Signal Conditioning Adapter, Gain = 1, full size
- TA900-10R Program and Debug Box

#### ADQ412
2 or 4 Channel 12bit Digitizer Module

12bit resolution, 2 or 4 analog input channels, 1 to 4 GSPS sampling rate per channel, AC-coupling with up to 2.0 GHz analog bandwidth, time stamp for real-time operation, 700 MSPS data memory, Xilinx Kintex-7 K325T FPGA, GbE, MTCA.4, 1GB DRAM, PCIe x4 Gen2, Mini-USB 2.0, double mid size form factor

**Ordering Information**
- ADQ412-AC 12bit Digitizer Module, AC-coupled, double mid size
- ADQ412-DC 12bit Digitizer Module, DC-coupled, double mid size

#### ADQ7
14bit Digitizer Module

14bit resolution, 1 or 2 analog channels, 5 to 10 GSPS sample rate per channel, DC-coupled with up to 2.5GHz analog BW optimized for low noise, AC-coupled with up to 2.5GHz analog BW optimized for wide band linearity, programmable DC-offset, Multi-unit synchronization, time-stamp for real-time operation, 4GB data memory, 6.8 Gbytes/s with PCIe x8 Gen3, optical 10GbE, GbE, USB 3.0, MTCA.4, double mid size form factor

**Ordering Information**
- ADQ7-7 14bit Digitizer Module, double mid size

#### ADQ14
1 to 4 Channel 14bit Digitizer Module

14bit resolution, 1 to 4 analog input channels, 500 MSPS to 2 GSPS sample rate per channel, DC-coupling with up to 1.2 GHz analog bandwidth, AC-coupling with up to 1.2 GHz analog bandwidth, time stamp for real-time operation, internal and external trigger, trigger output, Xilinx Kintex-7 K325T FPGA, GbE, MTCA.4, 2GB data memory, programmable DC-offset, multi-channel synchronization, PCIe x4 Gen2, SRIO x4, double mid size form factor

**Ordering Information**
- ADQ14-AC 14bit Digitizer Module, AC-coupled, double mid size
- ADQ14-DC 14bit Digitizer Module, DC-coupled, double mid size

#### ADQ412
2 or 4 Channel 12bit Digitizer Module

12bit resolution, 2 or 4 analog input channels, 1 to 4 GSPS sampling rate per channel, AC-coupling with up to 2.0 GHz analog bandwidth, time stamp, 5 GPIOs for real-time communication, external trigger input and output, 700 MSPS data memory, Xilinx Virtex-6 LX240T FPGA, front panel 10GbE SFP+ and GbE SFP ports, opt. DC-bias for unipolar pulse capture, MTCA.4, 1GB DRAM, PCIe x4 Gen2, Mini-USB 2.0, double mid size form factor

**Ordering Information**
- ADQ412-MTCA-1G2 12bit Digitizer, 2 channel, 2GSPS, 1.3GHz, double mid size
- ADQ412-MTCA-1G4 12bit Digitizer, 4 channel, 1GSPS, 2GHz, double mid size
- ADQ412-MTCA-3G2 12bit Digitizer, 2 channel, 3.6GSPS, 1.3GHz, double mid size
- ADQ412-MTCA-3G4 12bit Digitizer, 4 channel, 1.8GSPS, 2GHz, double mid size
- ADQ412-MTCA-4G2 12bit Digitizer, 2 channel, 4GSPS, 1.3GHz, double mid size
- ADQ412-MTCA-4G4 12bit Digitizer, 4 channel, 2GSPS, 2GHz, double mid size
- PB Option Positive bias for negative pulses
- NB Option Negative bias for positive pulses
AMC-ADIO24-HD50
24 Channel Analogue–Digital–I/O AMC Module

Ordering Information
AMC-ADIO24-HD50t 24 Channel Analogue–Digital–I/O AMC, full size
AMC-ADIO24-HD50m 24 Channel Analogue–Digital–I/O AMC, mid size

SIS8000
Histogramming Scaler/Multiscaler/Counter AMC Module with MTCA.4 Rear I/O

Ordering Information
SIS8000EFT Histogramming Scaler/Multiscaler/Counter, ECL and flat cable TTL, double mid size
SIS8000NLT Histogramming Scaler/Multiscaler/Counter, NIM and LEMO TTL, double mid size

SIS8325
10 Channel 250 MSPS Digital–Analogue–I/O AMC Module for MTCA.4 Rear I/O

Ordering Information
SIS8325 10 Channel 16bit ADC, double mid size

SIS8325-L
10 Channel 250 MSPS Digital–Analogue–I/O AMC Module for MTCA.4 Rear I/O

Ordering Information
SIS8325-L 10 Channel 16bit ADC, double mid size

SIS8325-KU
10 Channel 250 MSPS Digital–Analogue–I/O AMC Module for MTCA.4 Rear I/O

Ordering Information
SIS8325-KU 10 Channel 16bit ADC, double mid size

SIS8300-L
10 Channel 125 MSPS Digital–Analogue–I/O AMC Module for MTCA.4 Rear I/O

Ordering Information
SIS8300-L 10 Channel 125 MSPS 16bit ADC, MTCA.4 Rear I/O, 10 – 125 MSPS sampling rate, 2 16bit DACs, 2 front SFP, 2GB DDR3 RAM, Xilinx Kintex Ultrascale XCKU040–1FFVA1156C FPGA, 1 GSample memory, dual boot, in-field firmware upgrade support, Zone3 Class A1.1CO compatible, White Rabbit option

Ordering Information
SIS8300-L10AC 10 Channel 16bit AC ADC, DAC to front panel, double mid size
SIS8300-L10DC 10 Channel 16bit DC ADC, DAC to front panel, double mid size
SIS8300-L8AC2DCDFP 8 Channel 16bit AC ADC and 2 Channel 16bit DC ADC, DAC to front panel, double mid size
SIS8300-L8AC2DCDZ3 8 Channel 16bit AC ADC and 2 Channel 16bit DC ADC, DAC to Zone3, double mid size
SIS8300-L8AC2DCWR 8 Channel 16bit AC ADC and 2 Channel 16bit DC ADC, DAC to Zone3, White Rabbit, double mid size

SIS8300-KU
10 Channel 125 MSPS Digital–Analogue–I/O AMC Module for MTCA.4 Rear I/O

Ordering Information
SIS8300-KU 10 Channel 125 MSPS 16bit ADC, MTCA.4 Rear I/O, 10 – 125 MSPS sampling rate, 2 16bit DACs, 2 front SFP, 2GB DDR3 RAM, Virtex-6 FPGA, 1 GSample memory, dual boot, in-field firmware upgrade support

Ordering Information
SIS8300-KU10AC 10 Channel 16bit AC ADC, DAC to front panel, double mid size
SIS8300-KU10DC 10 Channel 16bit DC ADC, DAC to front panel, double mid size
SIS8300-KU8AC2DCDFP 8 Channel 16bit AC ADC and 2 Channel 16bit DC ADC, DAC to front panel, double mid size
SIS8300-KU8AC2DCDZ3 8 Channel 16bit AC ADC and 2 Channel 16bit DC ADC, DAC to Zone3, double mid size
SIS8300-KU8AC2DCWR 8 Channel 16bit AC ADC and 2 Channel 16bit DC ADC, DAC to Zone3, White Rabbit, double mid size

RTM Overview for SIS8300-L and SIS8300-KU

SIS83900 Single ended input card
RTM7001 4 channel signal modulator
DWC3900 10 channel downconverter
BPM Interleaved sampling for BPM readout
APD Dual channel signal stretcher
DWC8VM1 8 channel downconverter, 1 channel VM
DS8VM1 8 channel analogue input, 1 channel VM
Fast ADC RTM LLRF ADC frontend

Ordering Information
SIS83900 10 Channel 16bit ADC, double mid size
SIS8300-L 10 Channel 125 MSPS 16bit ADC, MTCA.4 Rear I/O, 10 – 125 MSPS sampling rate, 2 16bit DACs, 2 front SFP, 2GB DDR3 RAM, Virtex-6 FPGA, 1 GSample memory, dual boot, in-field firmware upgrade support

Ordering Information
SIS8300-KU 10 Channel 125 MSPS 16bit ADC, MTCA.4 Rear I/O, 10 – 125 MSPS sampling rate, 2 16bit DACs, 2 front SFP, 2GB DDR3 RAM, Virtex-6 FPGA, 1 GSample memory, dual boot, in-field firmware upgrade support

Ordering Information
SIS8300-L10AC 10 Channel 16bit AC ADC, DAC to front panel, double mid size
SIS8300-L10DC 10 Channel 16bit DC ADC, DAC to front panel, double mid size
SIS8300-L8AC2DCDFP 8 Channel 16bit AC ADC and 2 Channel 16bit DC ADC, DAC to front panel, double mid size
SIS8300-L8AC2DCDZ3 8 Channel 16bit AC ADC and 2 Channel 16bit DC ADC, DAC to Zone3, double mid size
SIS8300-L8AC2DCWR 8 Channel 16bit AC ADC and 2 Channel 16bit DC ADC, DAC to Zone3, White Rabbit, double mid size

SIS8800
Histogramming Scaler/Multiscaler/Counter AMC Module with MTCA.4 Rear I/O

Ordering Information
SIS8800EFT Histogramming Scaler/Multiscaler/Counter, ECL and flat cable TTL, double mid size
SIS8800NLT Histogramming Scaler/Multiscaler/Counter, NIM and LEMO TTL, double mid size
AdvancedMC I/O Modules – FPGA / ADC / DAQ

AMC-PICO-8

8 Channel Bipolar 20bit Picoammeter with MTCA.4 Rear I/O

8 bipolar current input channels, 20bit resolution, Virtex-5 FPGA for data processing, Spartan-6 FPGA for board management, high resolution multi channel current up to ±1mA, two independent full-scale ranges (±1mA and ±0.1µA), up to 1 MSPS simultaneous and independent sampling, low conversion time delay, low noise, low temperature dependence, external clock input on the front panel, MTCA.4, Zone3 Class D1.1 compatible, double full size form factor

Ordering Information
AMC-PICO-8 8 Channel 20bit Picoammeter, double full size

DAMC-FMC20

Dual (HPC + LPC) FMC Carrier with MTCA.4 Rear I/O

1 HPC and 1 LPC FMC slot, 2 Spartan-6 FPGAs, MTCA.4, one serial link (GTP) for each FMC module, one additional 12V power connector for high current FMC applications, AMC.1 type 1 PCIe, Zone3 Class D1.1 compatible, double mid size form factor

Ordering Information
DAMC-FMC20 Dual FMC Carrier, double mid size

HV-PANDA

4 High Voltage Channel AMC Module with MTCA.4 Rear I/O

4 high voltage (HV) channels with SHV ports, 6kV, 4kV or 500V output voltage, positive or negative polarity, floating return per pair of channels rated up to ±20V with respect to protective earth (PE), nominal voltage accuracy better than 0.05%, current and voltage limits can be changed in real-time, behavior change of the channels when the current limit threshold is exceeded in real-time, IVs to 500IVS ramp speed range configurable with IVs resolution, 0.01% output voltage and current readback resolution, interconnections between CPU and HV channels, infrastructure for management of RTM boards, PCIe x1, MTCA.4, Zone3 Class D1.1 compatible, double full size form factor

Ordering Information
HV-PANDA6KP 4 Channel HV AMC, 6kV@6W channel, double full size
HV-PANDA6KN 4 Channel HV AMC, -6kV@6W channel, double full size
HV-PANDA4KP 4 Channel HV AMC, 4kV@7W channel, double full size
HV-PANDA4KN 4 Channel HV AMC, -4kV@7W channel, double full size
HV-PANDA05P 4 Channel HV AMC, 500V@1.5W channel, double full size
HV-PANDA05N 4 Channel HV AMC, -500V@1.5W channel, double full size

FMC and RTM Overview for IFC-1410 and IFC-1420

ADC_3110/3111 8 Channel 16bit 250 MSPS ADC
ADC_3112 4 Channel 16bit 1 GSPS ADC or 2 Channel 12bit 2 GSPS DAC
ADC_3113 2 Channel 16bit 250 MSPS ADC and 2 Channel 16bit 250 MSPS DAC
DAC_3117 20 Channel 16bit 5 MSPS DAC and 2 Channel 16bit 1 MSPS DAC
RSP_1461 COM Extender µRTM with 1 SFP GbE, 6 SFP+ 10GbE, 2 SMA and D1.4 Interface

Ordering Information
ADC_3110/3111 8 Channel 16bit 250 MSPS ADC
ADC_3112 4 Channel 16bit 1 GSPS ADC or 2 Channel 12bit 2 GSPS DAC
ADC_3113 2 Channel 16bit 250 MSPS ADC and 2 Channel 16bit 250 MSPS DAC
DAC_3117 20 Channel 16bit 5 MSPS DAC and 2 Channel 16bit 1 MSPS DAC
RSP_1461 COM Extender µRTM with 1 SFP GbE, 6 SFP+ 10GbE, 2 SMA and D1.4 Interface

Ordering Information
IFC-1410-40m FMC Carrier, UltraScale KU040, mid size
IFC-1410-40f FMC Carrier, UltraScale KU040, full size
IFC-1410-60m FMC Carrier, UltraScale KU060, mid size
IFC-1410-60f FMC Carrier, UltraScale KU060, full size

Ordering Information
IFC-1420-40m Digitizer AMC Module, UltraScale KU040, mid size
IFC-1420-40f Digitizer AMC Module, UltraScale KU040, full size
IFC-1420-60m Digitizer AMC Module, UltraScale KU060, mid size
IFC-1420-60f Digitizer AMC Module, UltraScale KU060, full size

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AdvancedMC I/O Modules – DSP / FPGA

NAMC-ARRIA10-FMC
FMC Carrier AMC Module with Intel Arria10 FPGA

Intel Arria10 GX1150, GX950, GX660, GX570, SX660 or SX570 FPGA, FMC slot, 16GB DDR4 RAM, up to 256MB flash, 1.5 GHz dual core ARM Cortex A9 CPU, MicroSD slot, AMC.1, AMC.2, AMC.3, AMC.4, GbE, PCIe, SATA, SAS, SRIO via backplane, TCLKA-D, FCLKA, opt. -40°C...+100°C operating temperature range

Ordering Information
NAMC-ARRIA10-FMC-G010 FGPA Module, Arria10 GX1150, mid size
NAMC-ARRIA10-FMC-G090 FGPA Module, Arria10 GX950, full size
NAMC-ARRIA10-FMC-G666 FGPA Module, Arria10 GX660, mid size
NAMC-ARRIA10-FMC-G570 FGPA Module, Arria10 GX570, mid size
NAMC-ARRIA10-FMC-S057 FGPA Module, Arria10 SX570, mid size

NAMC-ZYNQ-FMC
FMC Carrier AMC Module with Xilinx ZYNQ-7000 FPGA

Xilinx ZYNQ-7000 XCG7045 or XCG7100 FPGA, FMC slot, 1GB 64bit RAM, 256MB flash, MicroSD slot, AMC.1, AMC.2, AMC.3, AMC.4, GbE, PCIe, SRIO, 10GBase via backplane, AMC.1, AMC.2, AMC.3, AMC.4, 4x PCIe x8, 16GB DDR4 RAM, 512MB QDR4 SRAM, quad core ARM Cortex A53 CPU, Xilinx ZYNQ-7000 XC7Z100 FPGA, HPC FMC slot, up to 20GB DDR4 RAM, opt. 144MB QDR4 SRAM, quad core ARM Cortex A53 CPU and dual core ARM Cortex RS CPU, MicroSD slot, PCIe x8 Gen3, dual PCIe x4 Gen3, SATA, SAS, dual SRIO, GbE, TCLKA-D, FCLKA, opt. -40°C...+100°C operating temperature range, full size and mid size

Ordering Information
NAMC-ZYNQ-FMC-G010 FGPA Module, Zynq-7000 XC7Z100, full size
NAMC-ZYNQ-FMC-G090 FGPA Module, Zynq-7000 XC7Z100, mid size
NAMC-ZYNQ-FMC-G006 FGPA Module, Zynq-7000 XC7Z100, mid size
NAMC-ZYNQ-FMC-G004 FGPA Module, Zynq-7000 XC7Z100, mid size
NAMC-ZYNQ-FMC-S057 FGPA Module, Zynq-7000 XC7Z100, mid size

NAMC-ODSP-W
Media Accelerator with up to 8 DSPs

Media accelerator AMC module with up to 8 Octasic OCT2224W DSPs with 4 cores, 512 MB RAM for each DSP, Kintex-7 FPGA, two quad core 64bit quadQ 15104x3A CPUs, 8GB DDRAM RAM for each ARM CPU, GbE, 10GBase, GPS, opt. 4 Rx and Tx antenna connector or dual SFP port for CPRI support

Ordering Information
NAMC-ODSP-W-8m ADSP Module, 8 OCT2224W DSPs, full size
NAMC-ODSP-W-M-A NAT Firmware with basic audio codecs
NAMC-ODSP-W-M-AV NAT Firmware with audio and video codec

AMC-RF2X2
Virtex-6 FPGA Module

Xilinx Virtex-6 LX757-2 FPGA with 256 MB DDR3 SDRAM and 128 MB flash, 2 front RF channels, RF frequency: 662MHz-3.84 GHz, 2x2 MIMO, FDD and TDD modes, separate TX and RX sensors, 2 SFP ports, SMX clock i/o, AMC.2 type E2

Ordering Information
AMC-RF2X2 FGPA AMC Module, RF channels, full size

AMC-KU+
FMC Carrier AMC Module with Xilinx Kintex UltraScale+ FPGA

Xilinx Kintex UltraScale+ ZU11EG or ZU17EG or ZU19EG FPGA, HPC FMC slot, up to 20GB DDR4 RAM, opt. 144MB QDR4 SRAM, quad core ARM Cortex A53 CPU and dual core ARM Cortex RS CPU, MicroSD slot, PCIe x8 Gen3, dual PCIe x4 Gen3, SATA, SAS, dual SRIO, GbE, TCLKA-D, FCLKA, opt. -40°C...+100°C operating temperature range, full size and mid size

Ordering Information
NAMC-KU+111m FMC Module, ZU11EG FPGA, FMC Slot, 20GB RAM, mid size
NAMC-KU+172m FMC Module, ZU17EG FPGA, FMC Slot, 16GB RAM, 144MB SRAM, mid size
NAMC-KU+191m FMC Module, ZU19EG FPGA, FMC Slot, 20GB RAM, mid size
NAMC-KU+192m FMC Module, ZU19EG FPGA, FMC Slot, 16GB RAM, 144MB SRAM, mid size

NAMC-OOSP-M
Media Accelerator AMC module with up to 8 DSPs

Media accelerator AMC module with up to 8 Octasic OCT2224W DSPs with 4 cores, 512 MB RAM for each DSP, Kintex-7 FPGA, wide range of audio/video codecs

Ordering Information
NAMC-ODSP-W-8f ADSP Module, 8 OCT2224W DSPs, full size
NAMC-ODSP-M-8m ADSP Module, 8 OCT2224W DSPs, mid size
NAMC-ODSP-M-M-A NAT Firmware with basic audio codecs
NAMC-ODSP-M-M-AV NAT Firmware with audio and video codec

SurfRider/AMC
DSP Resource Board

2, 4, 6 or 8 DSPs, AMC.2 type E2 and opt. AMC.1 type 8 and AMC.4 SerialRapiDIO, mid size and full size, SurfDocker modules, up to 128 MB DDR2 RAM TM212 Gx4x, PowerPC 405 core implemented within FPGA, video transcoding, PICMG SFP I-TDM protocol over GbE, play/record of audio and video streams from host file system to IP, TDM or 3G networks, real time audio-video transcoding, video conferencing, Advanced Video Toolbox

Ordering Information
SurfRider/AMC-2m 2 DSPs, 1 SurfDocker, 18 MB RAM, mid size
SurfRider/AMC-4m 4 DSPs, 1 SurfDocker, 18 MB RAM, mid size
SurfRider/AMC-6m 6 DSPs, 1 SurfDocker, 18 MB RAM, mid size
SurfRider/AMC-8m 8 DSPs, 1 SurfDocker, 18 MB RAM, mid size

AMC-RF2X2
Virtex-6 FPGA Module

Xilinx Virtex-6 LX757-2 FPGA with 256 MB DDR3 SDRAM and 128 MB flash, 2 front RF channels, RF frequency: 662MHz-3.84 GHz, 2x2 MIMO, FDD and TDD modes, separate TX and RX sensors, 2 SFP ports, SMX clock i/o, AMC.2 type E2

Ordering Information
AMC-RF2X2 FGPA AMC Module, RF channels, full size

AMC-K2L-RF2
LTE eNodeB Module with 4 DSPs and 2 ARM CPUs

Four 1.2 GHz 24x DSP cores, two 1.5 GHz ARM15 cores, 2GB RAM, 256MB flash, 2 RF channels with 700 MHz to 4 GHz frequency, 2 SMA for RF Rx and 2 SMA for RF Tx and 2 SMA for RF feedback ports, opt. GbE and timing port, CPRI STP+ slot, Power over Ethernet and fan control, opt. conduction-cooled

Ordering Information
AMC-K2L-RF2m LTE AMC Module, mid size
AMC-K2L-RF2f LTE AMC Module, GbE, 4 RX/Tx ports, 2 SFP+ slot, Power over Ethernet, fan control
## AdvancedMC I/O Modules – DSP / FPGA

### AMC-4C6678-SRIO
DSP Module with GPS Transceiver and Serial RapidIO

- Four TMS320C6678 DSPs with eight 1.25 GHz cores and 8 GB DDR3-1600 SDRAM and 512 MB flash, 640 GFLOPs, 1280 GMACS, 16 Gbit/s Serial RapidIO, Front-GenA, AMC.1 type 4, AMC.2 type E2, AMC.4

### Ordering Information

<table>
<thead>
<tr>
<th>AMC-4C6678-SRIO</th>
<th>AMC Module with 4 DSPs, full size</th>
</tr>
</thead>
</table>

### AMC-V7
Virtex-7 FPGA Module

- Xilinx Virtex-7 VX415T-2 or VX690T-2 FPGA with 768 MB DDR3-1066 SDRAM and 128 MB flash, two 20 Gbit/s Serial RapidIO Gen 2.1, 3 front SFP+ or 2 front Mini-SAS port for 4x SRIO, SMB clock I/O, opt. GPS, AMC.2 type E2, AMC.4

### Ordering Information

| AMC-V7-415F | FPGA AMC Module, LX415T-2, GPS, full size |
| AMC-V7-415M | FPGA AMC Module, LX415T-2, mid size |
| AMC-V7-690F | FPGA AMC Module, LX690T-2, GPS, full size |
| AMC-V7-690M | FPGA AMC Module, LX690T-2, mid size |

### AMC-2C6678
DSP Module with FPGA

- Two TMS320C6678 DSPs with eight 1.25 GHz cores and 2 GB DDR3-1600 SDRAM, Xilinx Virtex-6 FPGA with 768 MB DDR3-1066 SDRAM and 128 MB flash, 20 Gbit/s Serial RapidIO Gen2, 3 front SFP+ or 2 front Mini-SAS ports, SMB clock I/O, AMC.2 type E2, AMC.4

### Ordering Information

<table>
<thead>
<tr>
<th>AMC-V7-2C6678</th>
<th>AMC Module with 3 DSPs, 1.25 GHz, LX415T-2, full size</th>
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<tbody>
<tr>
<td>AMC-V7-2C6678-240</td>
<td>AMC Module with 3 DSPs, 1.25 GHz, LX240T-2, full size</td>
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<tr>
<td>AMC-V7-2C6678-550</td>
<td>AMC Module with 3 DSPs, 1.25 GHz, LX550T, full size</td>
</tr>
</tbody>
</table>

### AMC-D24A4-RFx
DSP Module with Virtex-7 FPGA, 4 ARM and 24 DSP Cores

- Three DSPs, one TM320C6636 DSP with eight 1.2 GHz DSP cores, four 1.4 GHz ARM A15 cores and 2 GB DDR3-1600 SDRAM and 256 MB flash, two TMS320C6678 DSPs with eight 1.25 GHz DSP cores and 4 GB DDR3-1333 SDRAM, Virtex-7 FPGA with 1 GB DDR3-1600 SDRAM and 256 MB flash, 20 Gbit/s Serial RapidIO Gen2, opt. 10Gbe, 4 front RF channels, RF frequency: 662MHz-3.84 GHz, 3 SFP+ and one USB port, GPS, 2 SMB clock I/O, stand-alone mode (with just power and cooling) AMC.2 type E2, AMC.4

### Ordering Information

| AMC-D24A4-RF4 | AMC with 3 DSPs and RF channels, double full size |
| AMC-D24A4AF | AMC with 3 DSPs, double full size |
| AMC-D24A4M | AMC with 3 DSPs, double mid size |

### AMC-V7-2C6678
DSP Module with FPGA

- Two TMS320C6678 DSPs with four 1.2 GHz cores and 4 GB DDR3-1333 SDRAM, Xilinx Virtex-7 FPGA with 1,5 GB DDR3 SDRAM and 256 MB flash, 25 Gbaud Serial RapidIO V2.1, 3 front SFP+ ports, SMB clock I/O, opt. GPS, AMC.2 type E2, AMC.4

### Ordering Information

<table>
<thead>
<tr>
<th>AMC-V7-2C6678-240</th>
<th>AMC Module with 3 DSPs, 1.2 GHz, LX240T-2, full size</th>
</tr>
</thead>
<tbody>
<tr>
<td>AMC-V7-2C6678-550</td>
<td>AMC Module with 3 DSPs, 1.25 GHz, LX550T, full size</td>
</tr>
</tbody>
</table>

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AdvancedMC I/O Modules – JTAG / Piezodriver

NAT-JSM
Flexible testing and diagnostic JTAG Switch Module

JTAG vector testing of all slots in a system, JTAG download via MCH through Ethernet, JTAG programming connector at front panel, target selection through JTAG information, multiple JSM pinout configurations via FPGA, mid size and full size form factor

Ordering Information
NAT-JSM-FP0SF JTAG Switch Module, full size
NAT-JSM-FP0SM JTAG Switch Module, mid size

PRTM-PZDR4
4 Channel Piezodriver/sensor Module

4 channel piezodriver/sensor module, 80kHz small signal bandwidth for 1µF load, remotely switchable actuator and sensor functionality, DAC and ADC for fast control and monitoring up to 200 kSPS per channel, 0 .. +100V unipolar or ±100V piezo power supplies, external or internal piezo power supply, digital monitoring of input, output voltage and output current, interlock signal support, 1 kHz, 50 kHz, 100 kHz, 150 kHz low pass frequency range, laser oscillator or piezo tuner MTCA.4, Zone3 Class D1.0-2 compatible, double mid size form factor

Ordering Information
PRTM-PZDR4 4 Channel Piezodriver Module, double mid size

AdvancedMC I/O Modules – Telecom

NAMC-8569-xE1
8/16 Channel E1/T1/T3 Kommunikationscontroller

8 or 16 e1/t1/t3 channel or 1 e3/ts3 channel, up to 1.3 GHz PowerQUICC III MPC8569 with e500 core, SRIQ, Lattice ECP3 FPGA, up to 1 GB DDR2 SDRAM, 128 MB flash, TDM interface with 1024 bidirectional 64kbit/s channels, opt. H.110 alike 32 MHz TDM interface, opt. MicroSD slot, AMC.1 type 4, AMC.2 type E2, AMC.4

Ordering Information
NAMC-8569-8E1/8t 8 Channel E1/T1 AMC Module, mid size
NAMC-8569-16E1/16t 16 Channel E1/T1 AMC Module, full size
NAMC-8569-3E3m 2 Channel DS3/E3 AMC Module, mid size

NAMC-SDH
SDH Module

SDH (Synchronous Digital Hierarchy) module for SDH/SONET networks, 4 SFP front-10 ports, four 155Mbs OC-3/STM1 or two 622Mbs OC-12/STM-4 interfaces, 252 E1 or 336 T1 framers, TDM, TITM, XILINX Kintex-7 FPGA, TSI and opt. HDLC controller, GbE ports, opt. XAUI, SRIQ, full size and mid size

Ordering Information
NAMC-SDH-114 SDH Module, 4 STM1 (OC-3), 2x72Mbit QDR2 + SRAM
NAMC-SDH-122 SDH Module, 2 STM4 (OC-12), 2x72Mbit QDR2 + SRAM
NAMC-SDH-214 SDH Module, 4 STM1 (OC-3), 2 GB DDR3 SRAM
NAMC-SDH-222 SDH Module, 2 STM4 (OC-12), 2 GB DDR3 SRAM

NAMC-xE1/T1
8 or 16 Channel E1/T1 Communication Controller

8/16 E1/T1 channel or 4 E3/T3 channel, AMC.1 type 1, AMC.2 type E2, SRIQ, Lattice ECP3 FPGA with 70.000 logical elements, 32/64-Mbit QDR2 SRAM, TDM-to-I-TDM connecter, H.110-alike 32 MHz TDM interface

Ordering Information
NAMC-8E1/T1-s 8 Channel E1/T1 AMC Module, mid size
NAMC-8E1/T1-f 8 Channel E1/T1 AMC Module, full size
NAMC-16E1/T1-s 16 Channel E1/T1 AMC Module, mid size
NAMC-16E1/T1-f 16 Channel E1/T1 AMC Module, full size

NAMC-SDR
RF Interface AMC for Software Defined Radio

SDR AMC module, Xilinx Zynq XC7Z045 SoC, 2,4,6 or 8 AD9361 RF trans- ceivers for up to 8 antenna interfaces, 1GB RAM, two 256 Mbit flash, 10GbE, GbE, 1 SD card slot, TLLK A-D, CPRI compression enables up to 3x effective bandwidth

Ordering Information
NAMC-SDR-8 SDR Module, Zynq XC7Z045, 8 antenna interface, full size

NAMC-SDH

SHD (Synchronous Digital Hierachy) module for SDH/SONET networks, 4 SFP front-10 ports, four 155Mbs OC-3/STM1 or two 622Mbs OC-12/STM-4 interfaces, 252 E1 or 336 T1 framers, TDM, TITM, XILINX Kintex-7 FPGA, TSI and opt. HDLC controller, GbE ports, opt. XAUI, SRIQ, full size and mid size

Ordering Information
NAMC-SDH-114 SDH Module, 4 STM1 (OC-3), 2x72Mbit QDR2 + SRAM
NAMC-SDH-122 SDH Module, 2 STM4 (OC-12), 2x72Mbit QDR2 + SRAM
NAMC-SDH-214 SDH Module, 4 STM1 (OC-3), 2 GB DDR3 SRAM
NAMC-SDH-222 SDH Module, 2 STM4 (OC-12), 2 GB DDR3 SRAM
AdvancedMC I/O Modules – Storage

AMC 600/x0x
1.5 Gbit/s SATA Storage Module with RAID Function

SB-AMC-68
6 Gbit/s SAS/SATA HDD/SSD Storage Module

PAMC-Serie
3 Gbit/s SATA HDD/SSD Storage Module

SB-AMC-71
PCIe Gen 2 SAS Controller with 6 Gbit/s SAS/SATA HDD/SSD

Renice Technology: Reliable FLASH memory modules for industrial and safety-critical applications

The Renice Technology storage solutions fit perfectly demands for high reliability and extended operating temperature range. The Renice product offering includes SSD memory modules in 1.8” and 2.5” size with SATA or PATA interface, M.2, ZIF, mSATA, Half Slim SATA, CompactFlash and CFast designs.

More information about Renice: www.powerbridge.de

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AdvancedMC I/O Modules – Storage

AMC 600/x0x
1.5 Gbit/s SATA Storage Module with RAID Function

SB-AMC-68
6 Gbit/s SAS/SATA HDD/SSD Storage Module

PAMC-Serie
3 Gbit/s SATA HDD/SSD Storage Module

SB-AMC-71
PCIe Gen 2 SAS Controller with 6 Gbit/s SAS/SATA HDD/SSD

Renice Technology: Reliable FLASH memory modules for industrial and safety-critical applications

The Renice Technology storage solutions fit perfectly demands for high reliability and extended operating temperature range. The Renice product offering includes SSD memory modules in 1.8” and 2.5” size with SATA or PATA interface, M.2, ZIF, mSATA, Half Slim SATA, CompactFlash and CFast designs.

More information about Renice: www.powerbridge.de
AdvancedMC I/O Modules – Misc.

**AG Atx/m1d**  
GPGPU Module

GPGPU AMC with up to 4 NVIDIA Tegra K1 processors, up to 16 2.2 GHz ARM Cortex-A15 cores, up to 768 933 MHz Kepler CUDA GPU cores, up to 4 GB RAM per CPU, up to 64 GB eMMC flash per CPU, DisplayPort, SRI0, GBE, SATA, USB, AMC.2 E2, AMC.3 S2 (SATA), AMC.4 type 5 and type 10, FIN+5 support

**Ordering Information**

<table>
<thead>
<tr>
<th>Model</th>
<th>Description</th>
</tr>
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<tbody>
<tr>
<td>AG Atx/m1d</td>
<td>AMC 2 Core GPGPU Module, full size</td>
</tr>
<tr>
<td>AG Atx/mid</td>
<td>AMC 2 Core GPGPU Module, mid size</td>
</tr>
<tr>
<td>AG Atx/m1d</td>
<td>AMC 4 Core GPGPU Module, full size</td>
</tr>
<tr>
<td>AG Atx/mid</td>
<td>AMC 4 Core GPGPU Module, mid size</td>
</tr>
</tbody>
</table>

**SB-AMC-80**  
PCIe Low Power Video Controller

PCIe x1, 16 MB VRAM, low power <1.5 W, dual VGA/DVI ports via DMS-59 connector, up to 1920x1440 resolution, 128bit 2D graphics engine, AMC.1 type 1, 0°C .. +70°C operating temperature range

**Ordering Information**

<table>
<thead>
<tr>
<th>Model</th>
<th>Description</th>
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<tbody>
<tr>
<td>SB-AMC-68F</td>
<td>AMC Video Controller Module, full size</td>
</tr>
<tr>
<td>SB-AMC-68M</td>
<td>AMC Video Controller Module, mid size</td>
</tr>
</tbody>
</table>

**MFG**  
Frame Grabber Module for MTCA.4 Systems

Xilinx Artix-7 FPGA, MTCA.4 Rear I/O, CameraLink (base, full, extended full), CoaXPress, Universal I/O Module

**Ordering Information**

<table>
<thead>
<tr>
<th>Model</th>
<th>Description</th>
</tr>
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<tbody>
<tr>
<td>MFG-CL</td>
<td>CameraLink (base, full, extended full), double mid size</td>
</tr>
<tr>
<td>MFG-CL10</td>
<td>CameraLink + 32 I/O Module, double mid size</td>
</tr>
<tr>
<td>MFG-2CL</td>
<td>2-fach CameraLink (base, full, extended full), double mid size</td>
</tr>
<tr>
<td>MFG-CXP</td>
<td>CoaXPress, double mid size</td>
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</table>

**NAMC-psTimer**  
AMC Fast Timing Module with ps Resolution

Fast timing module, 10ps clock and trigger jitter, 23 programmable outputs, clock and trigger distribution, data words and table distribution via fiber, receivers can recover clock and data, 2 front panel trigger ports and one precision clocks as LVDS signal, up to 255 trigger event numbers, 2.5 .. 650 MHz precision clocks, trigger position with 0 .. 160ms delay and 1ns resolution, trigger width with 0 .. 160ms delay and 10ns resolution

**Ordering Information**

<table>
<thead>
<tr>
<th>Model</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>NAMC-psTimer</td>
<td>AMC Fast Timing Module, one trigger input, one trigger output, double mid size</td>
</tr>
<tr>
<td>NAMC-psTimer-P</td>
<td>Mezzanine Submodul for NAMC-psTimer for increasing number of trigger inputs and outputs to a total of fours</td>
</tr>
<tr>
<td>NAMC-psTimer-RTM-C</td>
<td>RTM with up to 9 additional triggers, double mid size</td>
</tr>
<tr>
<td>NAMC-psTimer-RTM-F</td>
<td>RTM with up to 9 additional fibre links, double mid size</td>
</tr>
</tbody>
</table>

**GPS180AMC**  
GPS AMC Module for Time Synchronisation

12 channel GPS receiver, ultra stable quartz, high resolution time synchronisation., RS-232, Micro USB 2.0, AMC.1 type 1

**Ordering Information**

<table>
<thead>
<tr>
<th>Model</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>GPS180AMCF</td>
<td>Satellite Clock AMC Module, full size</td>
</tr>
<tr>
<td>GPS180AMCM</td>
<td>Satellite Clock AMC Module, mid size</td>
</tr>
</tbody>
</table>

**MPCIe16**  
External PCIe Link for MTCA.4 – Host and Target Card

PCIe bus coupler, PCIe solution to connect external CPU with MicroTCA.4 systems, transfer rate up to 128 Gb/s, PCIe x16, no needed additional driver or software

**Ordering Information**

<table>
<thead>
<tr>
<th>Model</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>MPCIe16-H3-C</td>
<td>PCIe x16 Host Card, double full size</td>
</tr>
<tr>
<td>MPCIe16-H3-C-L3</td>
<td>PCIe x16 Host Card with 3m cable, double full size</td>
</tr>
<tr>
<td>MPCIe16-H3-T3-C-L3</td>
<td>PCIe x16 Link Set with 3m cable, double full size</td>
</tr>
<tr>
<td>MPCIe16-T3-C</td>
<td>PCIe x16 Target Card, double full size</td>
</tr>
<tr>
<td>MPCIe16-T3-C-L3</td>
<td>PCIe x16 Target Card with 3m cable, double full size</td>
</tr>
</tbody>
</table>
AdvancedMC I/O Modules – Development

**NAMC-EXT**

**AMC Extender Module**

Extender module, management and payload power can be separated individually, management power can be generated from onboard payload power, 
-40°C .. +85°C operating temperature range

**Ordering Information**

<table>
<thead>
<tr>
<th>NAMC-EXT</th>
<th>Extender Module</th>
</tr>
</thead>
</table>

**NAMC-LM**

**Load Module**

Load AMC, DC load simulation 0W to 100W in 10W steps, thermal heat simulation within 3 independent zones, 4 temperature sensors, surveillance and configuration via NATView V2.5, 
-5°C .. +50°C operating temperature range

**Ordering Information**

<table>
<thead>
<tr>
<th>NAMC-LM-F</th>
<th>AMC Load Module, full size</th>
</tr>
</thead>
<tbody>
<tr>
<td>NAMC-LM-M</td>
<td>AMC Load Module, mid size</td>
</tr>
</tbody>
</table>

**NAMC-EXT-RTM**

**Extender for AMC Modules**

Extender Module for MTA-4, management and payload power can be separated individually, test points for JTAG interface and for soldering additional cables, opt. onboard 3.3V power supply, 
-40°C .. +85°C operating temperature range

**Ordering Information**

<table>
<thead>
<tr>
<th>NAMC-EXT-RTM-F</th>
<th>Extender Module</th>
</tr>
</thead>
<tbody>
<tr>
<td>NAMC-EXT-RTM-F-PS</td>
<td>Extender Module, onboard 3.3V power supply</td>
</tr>
<tr>
<td>NAMC-EXT-RTM-R</td>
<td>Extender Module for RTM</td>
</tr>
</tbody>
</table>

**NAMC-MMC-RefDesign**

**Modul Management Controller Reference Board**

MMC reference board based strictly on MMC Design Package, temperature and voltage sensors, hot-swap, DC/DC converter (12V to 3.3V), serial interface on the front panel via mini USB, MMC Design Package to implement a fully AMC and IPMI compliant MMCs on customer AMC modules, time and cost saving even before customer hardware becomes available by developing and testing customer MMCs based on MMC Design Package

**Ordering Information**

<table>
<thead>
<tr>
<th>NAMC-MMC-REF</th>
<th>AMC MMC Module, mid size</th>
</tr>
</thead>
<tbody>
<tr>
<td>NIPMI-OBJ</td>
<td>MMC Design Package, royalty-free object code license</td>
</tr>
<tr>
<td>NIPMI-SRC</td>
<td>MMC Design Package, royalty-free source code license</td>
</tr>
<tr>
<td>NATView</td>
<td>Java based GUI for monitoring and control of MTA- systems</td>
</tr>
</tbody>
</table>

**Phone** +49 5139-9980-0 • info@powerbridge • www.powerbridge.de
**MicroTCA - Power Modules**

**NAT-PM-AC600**
600W AC Power Module

600W MicroTCA power module, protection against short circuit, under voltage, over voltage, and over temperature, 92% efficiency, N+1 and 2+2 redundancy, full HPM support, -5°C .. +55°C operating temperature range

**Ordering Information**
- NAT-PM-AC600 600W AC Power Module, full size
- NAT-PM-AC600D 600W AC Power Module, double full size

**NAT-PM-DC600LV**
600W Low-Voltage DC Power Module

600W low-voltage DC MicroTCA power module, dual -24V inputs, 16 independent 12V channels for payload power and 3.3V management power, eMMC, output short circuit protection and output over voltage protection, input under voltage shutdown, over temperature protection, fully redundant operation, N+1 redundancy, hot-swap, -5°C .. +50°C operating temperature range

**Ordering Information**
- NAMT-PM-DC600LV-FPO5 600W LVDC Power Module, MTCA.0 front panel
- NAMT-PM-DC600LV-FPID 600W LVDC Power Module, MTCA.1 front panel
- NAMT-PM-DCCABLV Power cable, 24VDC

**NAT-PM-DC840**
420/840W DC Power Module

420 or 840W DC MicroTCA power module, dual -48V input, protection against short circuit, under voltage, over voltage, and over temperature, 95.5% efficiency, N+1 and 2+2 redundancy, -5°C .. +65°C operating temperature range

**Ordering Information**
- NAMT-PM-DC840 420W DC Power Module
- NAMT-PM-DC840D 840W DC Power Module

**W-IE-NE-R**
1000W Power Module

1000W MTCA.4 power module, USB, ripple & noise (PP) < 10mV, 93% efficiency, 0°C .. +50°C operating temperature range

**Ordering Information**
- PS-MTCA.4 1000W Power Module
NATview

Overview
NATview is an easy to use visualization tool for any MicroTCA system that includes a NAT-MCH. NATview allows the user to view at and manipulate the components of the MicroTCA system in a graphical way. Being operating system independent NATview runs on any host computer that is internal or external to a MicroTCA system and can be started from a USB thumb drive. Thus NATview is ideally suited for any system or support engineer to check and analyze the status of a MicroTCA system.

Connecting to the MicroTCA system
NATview connects to the NAT-MCH using the Remote Management Control Protocol (RMCP). The RMCP host part is included in NATview, so no additional protocol support is required for the host. The MicroTCA system is identified by the IP address of the NAT-MCH. Once connected to a MicroTCA system, NATview will display a photo-realistic view of the chassis including the inserted Field Replaceable Units (FRU). Moreover, NATview can be configured to periodically update the displayed sensor information.

Backplane, FRU Editor and HPM Update Manager
The Backplane Viewer allows a user to look at the theoretical and actually established connections in a connected MicroTCA system.

The optional FRU Editor provides the needed tool to manipulate the records contained in the EEPROM of a FRU.

ESD: EtherCAT Master Stack for several (Real-Time) Operating Systems

The EtherCAT Master Stack from ESD electronics is designed for high performance, small resource usage and scalability. The core components are operating system (OS) and CPU architecture independent. An adaption to many prevalent (real-time) operating systems is available from stock which guarantees a cost efficient fast time-to-market integration into a custom application.

Features
- Configuration and management of EtherCAT networks
- Cyclic exchange of process data
- Sophisticated API common to all implementations as interface between the application and the EtherCAT master stack
- Mailbox based communication:
  - CAN application protocol over EtherCAT (CoE)
  - Ethernet over EtherCAT (EoE)
  - File over EtherCAT (FoE)
  - Servo Drive over EtherCAT (SoE)
- Built-in detailed diagnostics and profiling functions
- Written in ANSI-C designed for high performance, small resource usage and scalability
- Core components of the stack software are operating system and CPU architecture independent
- Adaption to many prevalent (real-time) operating systems available from stock
- EtherCAT Master Class A according to ETG.1500

Backplane, FRU Editor and HPM Update Manager
The Backplane Viewer allows a user to look at the theoretical and actually established connections in a connected MicroTCA system.

The optional FRU Editor provides the needed tool to manipulate the records contained in the EEPROM of a FRU.
AMC Modules

The PICMG Advanced Mezzanine Card (AdvancedMC, AMC, AMC Module) specification describes computer interface cards. The original purpose was to define a follow-on format for PCI mezzanine cards (PMCs) as an in-operation-replaceable mezzanine module for Advanced TCA systems. Subsequently, housing systems for the operation of AMC modules were defined with the PICMG MicroTCA specification. They can be plugged in from outside and as such allow maintenance-friendly systems to be developed. AMCs can have any number of functions and as such may be I/O or CPU modules. Table 2 compares the features of AMC modules and PCI cards. As every AMC slot can take a CPU module, multi-processor systems are also easy to implement.

Module Formats and Front Panels

The AMC circuit board measures 181.5 x 73.8 mm²; and is also available in double size 181.5 x 148.8 mm². The compact (3HP), mid-size (4HP) and full-size (6HP) front panel formats allow a total of six module sizes (see figure 2). For example, mid-size or double mid-size formats are referred to. The most common are mid-size or full-size AMC modules.

Card Interface

The AMC module (see figure 1) has a 170-pin card connector with 20 serial high-speed ports and 5 clock lines. The ports are bi-directional differential pairs and the clock lines are also differential signals. Two leading presence pins are used for controlling the power control function (in the MicroTCA system or on the carrier board). The management interface (I²C-Bus) uses two pins, and three pins are used for geographical addressing. There is one enable signal and five JTAG test lines.

The module is powered by a 12 V voltage (payload power, PP) and an additional 3.3 V voltage (management power, MP). A total of eight pins are available for the payload power, one pin for the management power and there are a total of 56 ground wires. The high number of payload power pins allows high supply currents, and as such a maximum module power dissipation of 80 Watt.

Use of Ports

Various sub-specifications define how the AMC ports are used. The potential protocols are Gigabit and 10 Gigabit Ethernet, PCIe, Serial RapidIO, SATA, SAS and Fibre Channel. Table 1 provides details about the options for use.

Management

An AMC module communicates with the carrier via IPMI commands. The foundations for the management functions between the carrier and the AMC module are defined in the AdvancedMC and AdvancedTCA specifications. For example, an AMC module provides information about power requirements, supported interfaces and operating temperature. The management functions allow the module reset, power-on/off and enable also complex operations like e.g. a firmware update.

Benefits of AMC Modules

The use of AMC modules in industrial computers or their design based on AMC modules has many advantages: Up to 6 (six) PCIe root complexes, high data throughput, protocol diversity, the possibility of high power dissipation, system management and hot-swap make an application future proof and long-lived. The serviceability of AMCs, their long product life cycle and the stability of this industry standards provide safety for investors and keeping the total cost low.

Table 1: Use of AMC ports

<table>
<thead>
<tr>
<th>Connector</th>
<th>Region</th>
<th>Basic Side</th>
<th>Extended Side</th>
<th>AMC.1</th>
<th>AMC.2</th>
<th>AMC.3</th>
<th>AMC.4</th>
</tr>
</thead>
<tbody>
<tr>
<td>Clocks</td>
<td>TCLKA</td>
<td>+12 Volt Payload Power</td>
<td>+ 3.3 Volt Management Power</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td></td>
<td>TCLKB</td>
<td></td>
<td></td>
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<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>TCLKA</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Common Options</td>
<td>0</td>
<td>20 high-speed Ports</td>
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<td>Fat Pipe</td>
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<td>12-15</td>
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<td>16-20</td>
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<td></td>
</tr>
</tbody>
</table>

**Fig. 1:** The AMC module interface to the carrier
**AdvancedMC Specification**

<table>
<thead>
<tr>
<th>PCI</th>
<th>AMC</th>
</tr>
</thead>
<tbody>
<tr>
<td>Form factor</td>
<td>Intern installed, half size, full size, standard or low profile</td>
</tr>
<tr>
<td>System architecture</td>
<td>Front pluggable, double board size possible, 3HP, 4HP, 6HP front panels</td>
</tr>
<tr>
<td>Connector</td>
<td>Single master</td>
</tr>
<tr>
<td>Interconnect</td>
<td>Multi master, up to PCIe root-complexes</td>
</tr>
<tr>
<td>IPMI</td>
<td>Direct connector</td>
</tr>
<tr>
<td>Hot swap</td>
<td>Direct connector, harting connectors</td>
</tr>
<tr>
<td>I/O</td>
<td>20 serial high speed ports: 1GB/10GB Ethernet, Fibre channel, SATA, SAS, PCI Express, Serial RapidIO</td>
</tr>
<tr>
<td>Power dissipation</td>
<td>Not available, card exchange is a main problem, yes</td>
</tr>
</tbody>
</table>

Table 2: Comparison AMC modules and PCI cards

**Standards and Sub-Standards**

The AMC standard consists of the basic AMC.0 specification as well as the further AMC.1, AMC.2, AMC.3 and AMC.4 sub-standards. AMC.0 sets out mechanics, layout and pin allocation, AMC.1 describes the pin allocation for PCIe, AMC.2 the pin allocation for I/O Gigabit Ethernet. AMC.3 defines SATA/SAS/Fibre Channel and AMC.4 Serial RapidIO.

The current (January 2015) valid AMC standards are:

- PICMG AMC.0 R2.0 Advanced Mezzanine Card Base Specification of 15 November, 2006,
- PICMG AMC.1 R2.0 PCI Express on AdvancedMC of 8 October, 2008,
- PICMG AMC.2 R1.0 Ethernet Advanced Mezzanine Card Specification of 1 March, 2007,
- PICMG AMC.3 R1.0 Advanced Mezzanine Card Specification for Storage of 5 August, 2005,
- PICMG AMC.4 Advanced Mezzanine Card Specification for Serial RapidIO of 9 July, 2009,

A further AMC standard, PICMG ARTM.0 AdvancedTCA Rear Transition Module, is in the definition.

**The Hot-Swap Mechanism and its Implementation in MicroTCA**

Where an AMC module is inserted into a running system, a process is started whose individual steps are described below by way of example.

At first the management controller (on ATCA carrier, MCH or SSM) is notified about the new module via the presence signal. Now the management voltage for this slot is activated allowing the module’s inventory to be created. Here, information about the AMC module such as power consumption, name and manufacturer of the module, as well as further information about the physical interfaces (e-keying) is collected by the management controller. This provides it with the necessary information for the protocols used and allows it to activate the corresponding switch connections. Only then is the power supply (12 V, payload power) to the AMC module switched on. During creation of the inventory, the blue hot-swap LED in the front panel flashes. It goes out when the supply voltage is switched on and the AMC module is ready for operation.

When an AMC module needs to be removed during operation, this is first notified by activating the handle on the front panel. The associated micro-switch sends a signal to the IPMI controller located on the AMC module that in turn notifies the carrier management controller about the initiation of this procedure. This in turn ensures that the respective AMC slot is de-energised. The blue LED flashes during this procedure. Once the procedure is completed, the blue LED on the front panel lights up constantly and the AMC can be safely removed.

When an AMC module fails, the management controller identifies the fault and interrupts the supply voltage to the respective AMC module. The blue hot-swap LED on the front panel lights up constantly and the AMC module can be replaced.