MTCA.4™
MicroTCA™
AdvancedMC™

Catalogue 2025

powerBridge
C o m p u t e r

Index

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.

Our Effort for Your Success

Design Support	Production Support	After Sales Support
Consulting	Integration Service	Online Services
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Technical Training	Series Production	Update Service
Manufacturer Independent Support	Quality Management	Extended Warranty Service
Product Adaptation	Test and Certification	Product Life Cycle Management
Product Hardening	Just in Time Shipment	First Class Repair Service
Customization Product Development	Customer Stock	
Driver Adaptation	Security Stock	

MicroTCA & MTCA.4

That's MicroTCA!

MicroTCA defines backplane-based computer systems based on Advanced MC (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.

The PIGMG MTCA.0 R1.0, Micro Telecommunications Computing Architecture Base Specification of 6 July, 2006 and the PCIMG MTCA.4 R1.0, MicroTCA Enhancements for Rear I/O and Precision Timing of 22 August, 2011 currently apply (January 2015).

MTCA.4

The MTCA 4 specification describes the enhancements of the MTCA standard required by scientists in high energy physics for thier 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.

Scalable AdvancedMC based systems – From multi processor system to complex machine control

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 or NAT-MCH-PHYS80, AM G64/471, 256GB SSD, 600W AC PSU

Ordering Information

MTCA-6P-PH1080a	6 Slot 2U 19" MTCA.4 Starter Kit, NAT-MCH-PHYS80, front to left air flow, NAT-PM-AC600D
MTCA-6P-PH1080b	6 Slot 2U 19" MTCA.4 Starter Kit, NAT-MCH-PHYS80, right to left air flow, NAT-PM-AC600D
MTCA-6P-PH10c	6 Slot 2U 19" MTCA.4 Starter Kit, NAT-MCH-PHYS, right to left air flow with more powerful fan units, NAT-PM-AC600D

MTCA-12S-PH1080-COM

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-PHYS80, NAT-MCH-RTM with NAT-MCH-COMex: Quad Core Xeon E3-1505Lv5, 16GB RAM, 256GB SSD, 4x 600W AC PSU

Ordering Information

MTCA-12S-PH1080-COM	12 Slot 9U 19" MTCA.4 Starter Kit, 4x NAT-PM-AC600D

MTCA-7S

5U 7 Slot Starter Kit, special Clock Module, PCIe Gen 3

5U 7 slot MTCA.4 crate, 6 double mid size AMC slots and µRTM slots, 1 double full size AMC and µRTM slots, MCH & PM slots, NAT-MCH-PHYS, AM G64/471, 256GB SSD, 600W AC PSU

Ordering Information

MTCA-7S-PH10a	7 Slot 5U 42HP MTCA.4 Starter Kit, NAT-PM-AC600D

MTCA-12S-PH10a

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 G64/471, 256GB SSD, 1000W AC PSU, prepared for a RF backplane

Ordering Information

MTCA-12S-PH10a	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

RackPak/M9-01
6U 9 Slot MicroTCA System

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

Ordering Information
RackPak/M9-01	9 Slot MicroTCA System

RackPak/M6-01
3U 6 Slot MicroTCA System

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

Ordering Information
RackPak/M6-01	6 Slot MicroTCA System

RackPak/M2-01
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
RackPak/M2-01	2 Slot MicroTCA System

RackPak/M2-02
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
RackPak/M2-02	2 Slot AdvancedMC System

RackPak/M6-02
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
RackPak/M6-02	6 Slot MicroTCA System

Blu!eco
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 suport on the backplane, direct SATA / SAS connections, single star topology, optimized high-speed routing

Ordering Information
Blu!eco	5 Slot MicroTCA System

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

RackPak/M4-2
2U 6 Slot MTCA.4 Crate

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2U 19" 6 slot MTCA.4 Crate, 6 double mid size AMC slots, 4 µRTM slots for Rear I/O, MCH & PM slots

Ordering Information

RackPak/M4-2F	6 Slot 19" MTCA.4 Crate, front to left air flow
RackPak/M4-2R	6 Slot 19" MTCA.4 Crate, right to left air flow

MTCA-12S-RF2
9U 19" 12 Slot LLRF MTCA.4 Crate

powerBridge Computer

9U 19" 12 slot MTCA.4 LLRF Crate, 12 double mid size AMC slots, 2 MCH + 4 PM slots, ready for an LLRF backplane

Ordering Information

MTCA-12S-RF2	12 Slot 9U 19" MTCA.4 LLRF Crate

RackPak/M12-41 and RackPak/M12-42
9U 19" 12 Slot MTCA.4 Crate with opt. JSM Slot

nVent SCHROFF

9U 19" 12 slot MTCA.4 Crate, 12 double mid size AMC slots, 2 MCH & 4 PM slots, opt. JSM slot and White Rabbit support

Ordering Information

RackPak/M12-41	12 Slot 9U 19" MTCA.4 Crate
RackPak/M12-42	12 Slot 9U 19" MTCA.4 Crate with JSM slot

RackPak/M12-43
7U 19" 12 Slot MTCA.4 Crate with JSM Slot

nVent SCHROFF

9U 12 slot MTCA.4 Crate with JSM slot, 12 double full size AMC slots, 6 double full size RTM slots , 2 MCH slots, 4/2 PM slots, 2 hot swapp fan units with cooling unit manager, bottom to top air flow

Ordering Information

RackPak/M12-43	12 Slot 7U 19" MTCA.4 Crate

RackPak/M5-1
2U 6 Slot MTCA.4 Crate with JSM Slot

Optical uplink for PCIe (Gen 3) with 8 lanes

powerBridge Computer

2U 19" 6 slot MTCA.4 Crate, 5 double mid size and 1 double full size AMC slots, 5 µRTM slots for Rear I/O, MCH with RTM slot, JSM & PM slot, opt. White Rabbit

Ordering Information

RackPak/M5-1F	6 Slot 19" MTCA.4 Crate, front to left air flow
RackPak/M5-1R	6 Slot 19" MTCA.4 Crate, right to left air flow
RackPak/M5-1RS	RackPak/M5-1R with more efficient fans

RackPak/M7-40
5U 7 Slot MTCA.4 Crate

nVent SCHROFF

5U 7 slot MTCA.4 Crate, 6 double mid size AMC slots and µRTM slots, 1 double full size AMC and µRTM slots, MCH & PM slot

Ordering Information

RackPak/M7-40	7 Slot 5U 42HP MTCA.4 Crate

RackPak/M2-40
1U 4 Slot MTCA.4 System with eMCH

nVent SCHROFF

1U 4 Slot MTCA.4 System, 2 double mid size and 2 single mid size AMC slots, 2 double mid size RTM slots, integrated eMCH, integrated 400W AC power supply with wide range AC input

Ordering Information

RackPak/M2-40	4 Slot 1U MTCA.4 System with eMCH

RackPak/M12-44
9U 19" 12 Slot MTCA.4 Crate with JSM Slot

nVent SCHROFF

9U 12 slot MTCA.4 Crate with JSM slot, 12 double full size AMC slots, 6 double full size RTM slots, 2 MCH slots, 4/2 PM slots, 2 hot swapp fan units with cooling unit manager, front to rear air flow
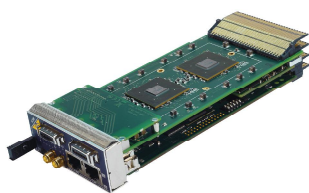
Ordering Information

RackPak/M12-44	12 Slot 9U 19" MTCA.4 Crate with JSM slot

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

NAT-MCH-202201	NAT-MCH-Base12-GbE-SSCH-PCIx48-FP1D
NAT-MCH-200004	NAT-MCH-Base12-GbE-FP0S

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

NAT-MCH-PHYS	NAT-MCH, 16 GbE, PCIe x4, low jitter Clock Module, double full size

NAT-MCH-PHYS80
GbE, PCIe MCH

Optical uplink for PCIe (Gen 3) with 16 lanes

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

NAT-MCH-PHYS80	NAT-MCH, 16 GbE, PCIe x4, 80 PCIe Links, low jitter Clock Module, double full size
NAT-MCH-PHYS80-UPLNK	NAT-MCH, 16 GbE, PCIe x4, 80 PCIe Links, 16 optical PCIe Lanes, low jitter Clock Module, double full size

NAT-MCH-RTM
RTM for MTCA.4 Systems and COM Express Carrier

RTM and COM Express 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, opt. quad core 2.0 GHz Intel Xeon E3-1505LV5, up to 16GB DDR3 RAM

Ordering Information

NAT-MCH-RTM	RTM and COM Express Carrier Module, double full size
NAT-MCH-RTM-BM	NAT-MCH-RTM plus backplane management, zone 2 connector for µRTM (LLRF) backplanes
NAT-MCH-RTM-BM-FPGA	NAT-MCH-RTM-BM plus ZYNQ FPGA for eRTMs
OrderAddOn-COMex-F3	COM Express type 6 Module with quad core Xeon E3 with up to 16GB RAM
other COM Express modules on request	

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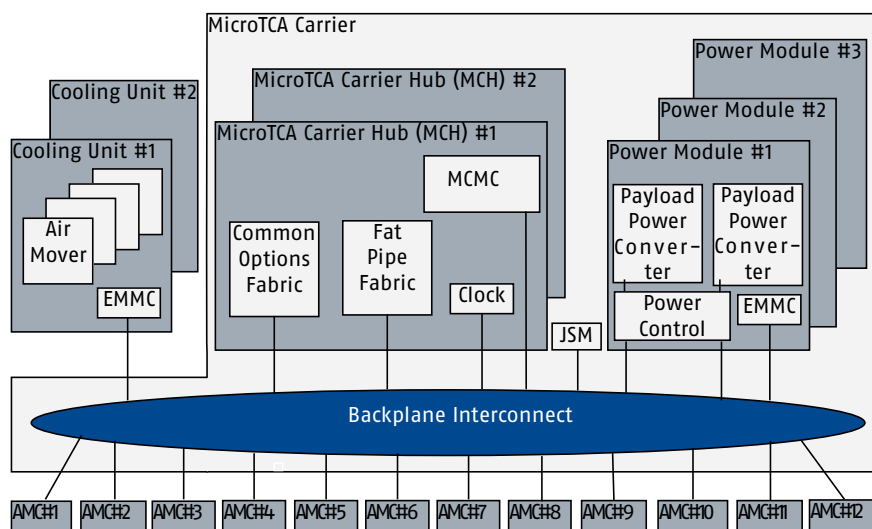
MicroTCA brings together serial high-speed links, system monitoring, efficient cooling and redundancy strategies in one industry standard.

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.

AdvancedMC CPU Modules x86

AM G6x/msd
Intel Xeon E3-1505M v6/Core i3 Gen. 7 CPU

Optical uplink for PCIe (Gen 3) with 8 lanes

CONCURRENT TECHNOLOGIES

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

AM G6x/msd	4 Core Intel Xeon E3-1505M v6 AMC CPU, double mid size
AM G6x/msd	4 Core Intel Xeon E3-1505M v6 AMC CPU, double full size
AM G6x/msd	2 Core Intel Core i3-7102E AMC CPU, double mid size
AM G6x/msd	2 Core Intel Core i3-7102E AMC CPU, double full size

AM E4x/msd
Intel Xeon D-1500 CPU with PCIe Fabric

CONCURRENT TECHNOLOGIES

Processor AMC with Intel Xeon D-1500 CPU, 32 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), PCIe Fabric, TCLKA clock input

Ordering Information

AM E41/msd	8 Core, 1.6 GHz D-1539, 32 GB RAM, mid size
AM E42/msd	12 Core, 1.5 GHz D-1559, 32 GB RAM, mid size

AM F5x/msd
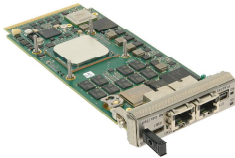Intel Xeon E3-1500 v5 CPU with PCIe Fabric

CONCURRENT TECHNOLOGIES

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), PCIe Fabric, TCLKA clock input

Ordering Information

AM F51/msd	4 Core, 2.8 GHz E3-1515M v5, 16 GB RAM, mid size
AM F52/msd	4 Core, 2.8 GHz E3-1505M v5, 16 GB RAM, mid size
AM F53/msd	4 Core, 2.8 GHz E3-1505L v5, 16 GB RAM, mid size

AM C1x/msd
Intel Core i7 4 Generation CPU with Serial RapidIO Fabric
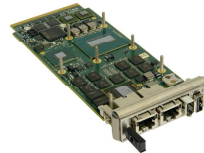
CONCURRENT TECHNOLOGIES

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

AM C1x/msd-yz	2 Core, Core i5-4410E, 4 GB RAM, full size
AM C1x/msd-yz	2 Core, Core i5-4410E, 4 GB RAM, mid size
AM C1x/msd-yz	4 Core, Core i7-4700EQ, 4 GB RAM, full size
AM C1x/msd-yz	4 Core, Core i7-4700EQ, 4 GB RAM, mid size

AdvancedMC CPU Modules ARM

NAT-AMC-LX2
ARM NXP LX2160A CPU

N.A.T.

Processor AMC with NXP LX2160A ARM CPU, up to 64 GB DDR4 RAM, 128 MB QSPI, up to 128 GB eMMC, M.2 slot for PCIe x4 or SATA SSD or USB 3.0/PCIe x4 extension, MicroSD slot, 100GbE QSFP port or 2 50GbE ports or 4 25GbE ports, USB 3.0, USB-C console port, AMC.1 type 4 and AMC.2 type E2 and type 5

Ordering Information

NAT-AMC-LS2-F	16 Core A72, 2.2 GHz LX2160A ARM, full size
NAT-AMC-LS2-F	16 Core A72, 2.2 GHz LX2160A ARM, 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, redundat 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, 48-bit/1µs time stamp, DMA engine, front Micro-D connector, AMC.1 type 4, opt. Conformal Coating

Ordering Information
BU-65590A0	MIL-STD-1553, ARINC 429 Controller, mid size
BU-65590A1	MIL-STD-1553, ARINC 429 Controller, full size

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
CAN-4f	4 Channel CAN Interface, full size
CAN-4m	4 Channel CAN Interface, mid size
AMC-CAN4-DSUB-Adapter	RJ45-to-9-pin DSUB Adapter cable, 1,5m

NAMC-ECAT
EtherCAT Slave Module

EtherCAT Slave module, 3 front RJ45 connectors, ET1100 slave controller, AMC.1 type 1

Ordering Information
NAMC-ECATf	EtherCAT Slave Module, full size
NAMC-ECATm	EtherCAT Slave Module, mid size

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

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
EPS-9905	EtherCAT chassis for Slave Modules
EPS-6000	EtherCAT Bus Coupler

EtherCAT Slave Modules Overview for EPS-9905

EPS-1032	32 Channel Sourcing Type Digital Input	
EPS-1132	32 Channel Sinking Type Digital Input	
EPS-2032	32 Channel Sourcing Type Digital Ouput	
EPS-2132	32 Channel Sinking Type Digital Ouput	
EPS-2308	8 Channel Relay Output	
EPS-3032	32 Channel ±10V Analog Input	
EPS-3216	16 Channel 0-20mA Analog Input	
EPS-3504	4 Channel RTD Thermal Input	
EPS-4008	8 Channel +/-10V Analog Output	
EPS-7002	2 Channel Pulse-Train Motion Control	

AdvancedMC I/O Modules – PMC Carrier

TAMC260
AMC Module with one PMC Slot
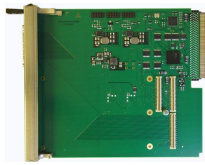
AMC carrier module for one PMC module, front and P14 I/O via 68-pol. SCSI-V connector, AMC.1 type 1, –40°C .. +85°C operating temperature range

Ordering Information

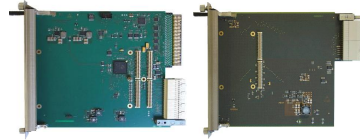|	
TAMC260-10R	AMC Carrier for 1 PMC Module, 5V, double full size
TAMC260-11R	AMC Carrier for 1 PMC Module, 3.3V, double full size
TAMC260-20R	AMC Carrier for 1 PMC Module, 5V, double mid size
TAMC260-21R	AMC Carrier for 1 PMC Module, 3.3V, double mid size

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

TAMC261 and TAMC020
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** you can find more than 100 PMC Modules

AdvancedMC I/O Modules – FPGA

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

Xilinix 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-MOTDRV22	Dual Channel Stepper Motor Driver
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
NAT-FMC-4GigE-PoE	Quad GbE with Power over Ethernet
TFMC684	32 diff. M-LVDS
TFMC900	Test Module, Spartan-2 FPGA

IC-ADC-FMCc
4 Channel ADC, 1.6 GSPS

TFMC684
32 diff. M-LVDS

FMC-MOTDRV22
Dual Channel Stepper Motor Driver

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, 4 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-30R	µRTM for TAMC532
TA900-10R	Program and Debug Box

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

ADQ7DC
14bit Digitizer Module

Optical uplink for PCIe (Gen 3) with 4 lanes

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-F	14bit Digitizer Module, double mid size

ADQ14
1 to 4 Channel 14bit Digitizer Module

**Optical uplink for PCIe (Gen 2) with 4 lanes**

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	ADQ14 Digitizer Module, AC-coupled, double mid size
ADQ14-DC	ADQ14 Digitizer Module, DC-coupled, double mid size

AMC-ADIO24-HD50
24 Channel Analogue-Digital-I/O AMC Module
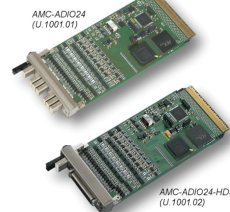
24 TTL digital I/Os, 8 16bit analogue inputs, 2 16bit analogue outputs, 4 RS-485 trigger ports, 7 10-pin Harting har-link connector, Spartan-2 FPGA

Ordering Information

AMC-ADIO24-HD50f	24 Channel Analogue-Digital-I/O AMC, full size
AMC-ADIO24-HD50m	24 Channel Analogue-Digital-I/O AMC, mid size

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

8 bipolare 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 ±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

AdvancedMC I/O Modules – FPGA / ADC / DAQ

DAMC–FMC2ZUP
Ultrascale+ FMC+ Carrier with MTCA.4 Rear I/O

1 FMC+ slot and 1 HPC FMC slot, Xilinx UltraScale+ FPGA with 1.5GHz 4 core ARM Cortex–A53, MTCA.4, 64–bit 4GB DDR4 RAM, 16–bit 1GB DDR4 RAM, White Rabbit support, SD slot, 8GB eMMC, Front USB–C with DisplayPort and USB 3.0, AMC.1 type 8 PCIe, Zone3 Class D1.1 compatible, double mid size form factor

Ordering Information

DAMC–FMC2ZUP	Ultrascale+ FMC+ Carrier, double mid–size

DAMC–FMC25
Dual (HPC) FMC Carrier with MTCA.4 Rear I/O

2 HPC FMC slots, Xilinix Virtex–5 with 256MB DDR2 RAM and Spartan–6 XC6SLX45T–3FGG484C FPGA with 128MB DDR2 RAM, external clock input (SMA), SMA and Micro–USB port on the front panel, MicroSD slot, 2 tempe-rature sensors, 77 Diff. Pairs and 2 GTX @ 6.5 Gbit/s fast links to each FMC, 42 Diff. Pairs and 2 GTX @ 6.5 Gbit/s fast links to RTM, 4 low latency links, AMC.1 type 4 PCIe Gen1, MTCA.4, Zone3 Class D1.1 compatible, double mid size form factor

Ordering Information

DAMC–FMC25–1	2 FMC Carrier, XC5VFX70T–1FFG1136C, Virtex–5 Speed Grade up to 4.25 Gbit/s, double mid size
DAMC–FMC25–2	2 FMC Carrier, XC5VFX70T–2FFG1136C, Virtex–5 Speed Grade up to 6.5 Gbit/s, 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, 1V/s to 500V/s ramp speed range con-figurable with 1V/s 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 compa-tible, double full size form factor

Ordering Information

HVPANDA6KP	4 Channel HV AMC, 6kV@6W channel, double full size
HVPANDA6KN	4 Channel HV AMC, –6kV@6W channel, double full size
HVPANDA4KP	4 Channel HV AMC, 4kV@7W channel, double full size
HVPANDA4KN	4 Channel HV AMC, –4kV@7W channel, double full size
HVPANDA05P	4 Channel HV AMC, 500V@1,5W channel, double full size
HVPANDA05N	4 Channel HV AMC, –500V@1,5W channel, double full size

PRTM–PZDR4
4 Channel Piezodriver/–sensor Module
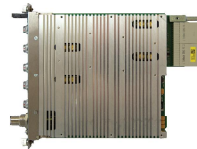
4 channel piezodriver/–sensor module, 80kHz small signal bandwidth for 1µF load, remotely switchable actuator and sensor functionality, DAC and ADC for fast control and monitoring up to 200 kSPS per channel, 0 .. +100V unipolar or ±100V piezo power supplies, external or internal piezo power supply, digital 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 – FPGA / ADC / DAQ

SIS8160
Kintex Ultrascale FPGA based dual HPC FMC Carrier

Xilinx Kintex Ultrascale XCKU040-1FFVA1156C or XCKU060-1FFVA1156C FPGA, 4GB DDR4 RAM, 2 high pin count (HPC) FMC slots, two 256 Mbit SPI boot proms, 2 SFP+ ports, 4 PCIe Gen3 lanes, 12V standalone operation, White Rabbit option

Ordering Information

SIS8160-40	XCKU040 FPGA, double mid size
SIS8160-60	XCKU060 FPGA, double mid size

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

10 channel 250 MSPS 16bit ADC, MTCA.4 Rear I/O, 10 – 250 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

SIS8325	10 Channel 16bit ADC, double mid size

RTM Overview for SIS8300-L and SIS8300-KU

SIS8900	Single ended input card
RTM7201	4 channel signal modulator
DWC8300	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

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

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 XC6VLX130T-2FFG1156C FPGA, 1 GSample memory, dual boot, in-field firmware upgrade support

Ordering Information

SIS8300-L	10 Channel 16bit ADC, double mid size
SIS8300-L25AC5DC	5 Channel 16bit AC ADC and 5 Channel 16bit DC ADC, DAC to front panel, Zone3 Class A1.1C0, double mid size
SIS8300-L28AC2DC	8 Channel 16bit AC ADC and 2 Channel 16bit DC ADC, DAC to Zone3, Zone3 Class A1.1C0, double mid size

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

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 A1.1C0 compatible, White Rabbit option

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

AdvancedMC I/O Modules – FPGA / ADC / DAQ

SIS8864
64 Channel Digital-Analogue-I/O Artix-7 FPGA based AMC Module

64 channel 32bit DAC, Artix-7 XC7A15T-2FGG484C FPGA, PCIe Gen2, LVTTL with TTL tolerance, one LEMO LVTTL control input with TTL tolerance, one LEMO LVTTL control output, interrupt generation, 4 MLVDS µTCA ports, 8 MLVDS lines

Ordering Information
SIS8864	64 Channel 32bit DAC, Artix-7 FPGA, double mid size

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

16 front counter channel histogramming Scaler/Multiscaler/counter, MTCA.4 Rear I/O, up to 200 MHz count rate, 4 control inputs and 4 control outputs, 2GB RAM, Virtex-6 FPGA, GbE, 4 PCIe lanes, in-field firmware upgrade support

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 – DSP / FPGA

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

Intel Arria10 GX1150, GX900, 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-G105	FGPA Module, ARRIA10 GX1150, mid size
NAMC-ARRIA10-FMC-G090	FGPA Module, ARRIA10 GX900, full size
NAMC-ARRIA10-FMC-G066	FGPA Module, ARRIA10 GX660, mid size
NAMC-ARRIA10-FMC-G057	FGPA Module, ARRIA10 GX570, mid size
NAMC-ARRIA10-FMC-S066	FGPA Module, ARRIA10 SX660, mid size
NAMC-ARRIA10-FMC-S057	FGPA Module, ARRIA10 SX570, mid size

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

Media accelerator AMC module with up to 8 Octasic OCT2224M DSPs with 24 cores, 512 MB RAM for each DSP, Kintex-7 FPGA, iTDM, GbE, 10GbE, wide range of audio/video codecs

Ordering Information
NAMC-ODSP-M-8f	ADSP AMC Module, 8 OCT2224M-DSPs, full size
NAMC-ODSP-M-8m	ADSP AMC Module, 8 OCT2224M-DSPs, mid size
NFW-ODSP-M-A	NAT Firmware with basic audio codecs
NFW-ODSP-M-AV	NAT Firmware with audio and video codec

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

Xilinix ZYNQ-7000 XC7Z045 or XC7Z100 FPGA, FMC slot, 1GB 64bit RAM, 512MB 32bit RAM, 256MB flash, MicroSD slot, AMC.1, AMC.2, AMC.3, AMC.4, GbE, PCIe, SRIO, 10GbE via backplane, TCLKA-D, FCLKA

Ordering Information
NAMC-ZYNQUP-FMC-0-045	FGPA Module, Zynq-7000 XC7Z045, mid size
NAMC-ZYNQUP-FMC-1-045	FGPA Module, Zynq-7000 XC7Z045, full size
NAMC-ZYNQUP-FMC-0-100	FGPA Module, Zynq-7000 XC7Z100, mid size
NAMC-ZYNQUP-FMC-1-100	FGPA Module, Zynq-7000 XC7Z100, full size

NAT-AMC-TCK7
Xilinx Kintex-7 FPGA AMC Module with MTCA.4 Rear-I/O

Xilinix Kintex-7 XC7K355T or XC7K420T FPGA, 16GB DDR3 RAM, 2x 256MB QSPI flash, up to eight 10Gbit/s SFP+ ports, low-latency, MicroUSB, SMB connector, AMC.1 type 4, AMC.2, MTCA.4

Ordering Information
NAT-AMC-TCK7-355M	FGPA Module, Kintex-7 XC7K355T, double mid size
NAT-AMC-TCK7-355F	FGPA Module, Kintex-7 XC7K355T, double full size
NAT-AMC-TCK7-420M	FGPA Module, Kintex-7 XC7K420T, double mid size
NAT-AMC-TCK7-420F	FGPA Module, Kintex-7 XC7K420T, double full size

AdvancedMC I/O Modules – DSP / FPGA

IFC–1410
Intelligentes FMC Carrier

1.8 GHz NXP QorIQ T2081, AltiVec Xilinx Kintex UltraScale KU040 or KU060 FPGA, TOSCA III FPGA Design Kit, 2 HPC FMC slots, D1.4 compliant RTM interface, full size and mid size

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

IFC–1420
Digitizer AMC Module

1.8 GHz NXP QorIQ T2081, AltiVec Xilinx Kintex UltraScale KU040 or KU060 FPGA, TOSCA III FPGA Design Kit, 10 channel 16bit 250 MSPS ADC (from RTM), 5 channel 16bit DAC (to RTM), 1 HPC FMC slot, A1 compliant RTM interface for analog signals, full size and mid 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

AMC–D24A4–RFx
DSP Module with Kintex-7 FPGA, 4 ARM and 24 DSP Cores

Three DSPs, one TM320TCI6636 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, Kintex-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, standalone 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-D24A4F	AMC with 3 DSPs, double full size
AMC-D24A4M	AMC with 3 DSPs, double mid size

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

ADC_3110/3111	8 Channel 16bit 250 MSPS ADC
ADC_3112	4 Channel 12bit 1 GSPS ADC or 2 Channel 12bit 2 GSPS DAC
ADC_3117	20 Channel 16bit 5 MSPS ADC and 2 Channel 16bit 1 MSPS DAC
ADC_3210	Eight 14-bit ADC, 1300/625 MSPS
DAC_3113	2 Channel 16bit 250 MSPS ADC and 2 Channel 16bit 250 MSPS DAC
DIO_3118	16 TTL Digital In/16 TTL Digital Out, LVDS In/Out, HPC
RSP_1461	COM Extender µRTM with 1 SFP GbE, 6 SFP+ 10GbE, 2 SMA and D1.4 Interface
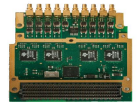
AMC–4C6678–SRIO
DSP Module with GPS Transceiver and SerialRapidIO
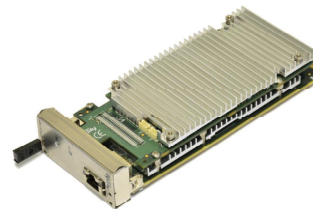
Four TMS320C6678 DSPs with eight 1.25 GHz cores and 8 GB DDR3-1600 SDRAM and 512 MB flash, 640 GFLOPS, 1280 GMACS, 16 Gbit/s Serial RapidIO, Front-GbE, AMC.1 type 4, AMC.2 type E2, AMC.4

Ordering Information

AMC-4C6678-SRIO	AMC Module with 4 DSPs, full size

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

Four 1.2 GHz C66x 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 Tx and 2 SMA for RF Rx or TRx ports on the front panel, AMC.1 type 1 and AMC.2 type E2, –40°C .. +70°C operating temperatue range, opt. GPS and 2 SMA for RF feedback ports, opt. GbE and timing port, CPRI SFP+ 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, GPS, Timing + Feedpack Ports, full size
AMC-K2L-MC	Micro Carrier for AMC-K2L-RF2, GbE Port, CPRI SFP+ slot, Power over Ethernet, fan control

AdvancedMC I/O Modules – Telecom

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, SRIO, Lattice ECP3 FPGA with 70.000 logial elements, 32/64–Mbit QDR2 SRAM, TDM-to-I-TDM connecter, H.110–alike 32 MHz TDM interface

Ordering Information

NAMC–4E3/T3–s	4 Channel E3/T3 AMC Modul,e mid size
NAMC–4E3/T3–f	4 Channel E3/T3 AMC Module, full size
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–SDH
SDH Module

SHD (Synchronus Digital Hierachy) module for SDH/SONET networks, 4 SFP front-IO ports, four 155Mbps OC-3/STM1 or two 622Mbps OC-12/STM-4 interfaces, 252 E1 or 336 T1 framers, TDM, iTDM, XILINX Kintex-7 FPGA, TSI and opt. HDLC controller, GbE ports, opt. XAUI, SRIO, 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–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, TCLK A–D, CPRI compression enables up to 3x effective bandwidth

Ordering Information

NAMC–SDR–8	SDR Module, Zynq XC7Z045, 8 antenna interface, full size

AdvancedMC I/O Modules – JTAG

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
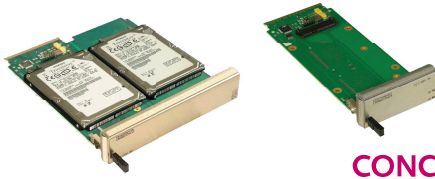
Ordering Information

NAT–JSM–FP0SF	JTAG Switch Module, full size
NAT–JSM–FP0SM	JTAG Switch Module, mid size

AdvancedMC I/O Modules – Storage

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

Up to 2.5" SATA HDDs or CompactFlash, 1.5 Gbit/s, RAID 0 or 1, AMC.3, opt.
–40°C .. +85°C operating temperature range

Ordering Information

AMC 600/101-1y	Storage AMC Module, SATA HDD, full size
AMC 600/202-1y	Storage AMC Modue, 2 SATA HDDs, double full size
AMC 600/302-49	Storage AMC Module, CompactFlash, mid size
AMC 600/402-1y	Storage AMC Module, 2 SATA HDDs, double mid size

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

Flash and SSDs in all form factors

· High performance: continuous write/
read access rastes up to 500/520 MB/s

· Extreme reliability:
MTBF up to 4.000.000 hours

· Safety: Guaranteed data storage of 10 years

· All versions support 128bit encryption

· Robustness: Extended operating temperature range
–40°C ... +85°C

· Extreme strength:
2.000 G Shock and 20 G Vibration at 40–2000 Hz

· Secure Delete, and physical self-destruction in military products

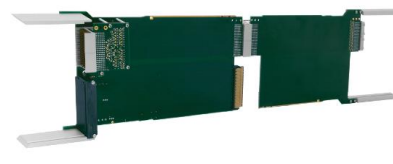# AdvancedMC I/O Modules – Development

NAMC-EXT
AMC Extender Module

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

Ordering Information

NAMC-EXT	Extender Module

NAMC-EXT-RTM
Extender for AMC Modules

Extender Module for MTCA.4, management and payload power can 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

NAMC-EXT-RTM-F	Extender Module
NAMC-EXT-RTM-F-PS	Extender Module, onboard 3.3V power supply
NAMC-EXT-RTM-R	Extender Module for RTM

AdvancedMC I/O Modules – Development

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

NAMC–LM–F	AMC Load Module, full size
NAMC–LM–M	AMC Load Module, mid size

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 devolping and testing customer MMCs based on MMC Desgin Package

Ordering Information

NAMC–MMC–REF	AMC MMC Module, mid size
NIPMI–OBJ	MMC Design Package, royalty–free object code license
NIPMI–SRC	MMC Design Package, royalty–free source code license
NATView	Java based GUI for monitoring and control of MTCA-systems

AdvancedMC I/O Modules – Misc.

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

NAMC–psTimer	AMC Fast Timing Module, one trigger input, one trigger output, double mid size
NAMC–psTimer–P	Mezzanine Submodul for NAMC–psTimer for increasing number of trigger inputs and outputs to a total of fours
NAMC–psTimer–RTM–C	RTM with up to 9 additional triggers, double mid size
NAMC–psTimer–RTM–F	RTM with up to 9 additional fibre links, double mid size

GPS180AMC
GPS AMC Module for Time Synchronisation

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

Ordering Information

GPS180AMCF	Satellite Clock AMC Module, full size
GPS180AMCM	Satellite Clock AMC Module, mid size

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-AC1000
1000W AC Power Module

1000W MicroTCA power module, protection against short circuit, under voltage, over voltage, and over temperature, N+1 and 2+2 redundancy, full HPM support, –5°C .. +55°C operating temperature range

Ordering Information

NAT-PM-AC1000	1000W 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-FP0S	600W LVDC Power Module, MTCA.0 front panel
NAMT-PM-DC600LV-FP1D	600W LVDC Power Module, MTCA.1 front panel
NAMT-PM-DCCABLV	Power cable, 24VDC

NAT-PM-DC1300
1300W DC Power Module

1300W DC MicroTCA power module, input voltage range –40 to –60 V, 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-DC1300-FP0S	1300W DC Power Module, MTCA.0 front panel
NAMT-PM-DC1300-FP1D	1300W DC Power Module, MTCA.1 front panel
NAMT-PM-DCCAB	Power cable

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-DC420	420W DC Power Module
NAMT-PM-DC840	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.
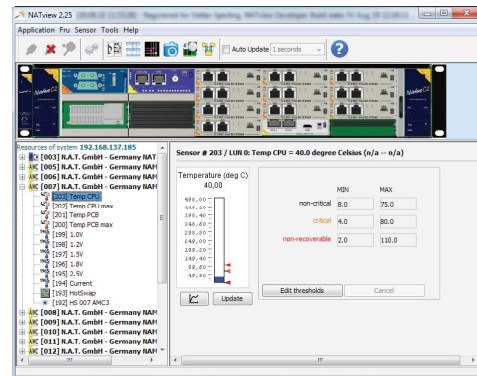
The Hardware Platform Management (HPM) is a standardized protocol to update any programmable part of a FRU in side a MicroTCA system.

NATview can accomodate the personal look-and-feel. Moreover, NATview allows the user to add own images for the photo-realistic display.

ESD: EtherCAT Master Stack for several (Real-Time) Operating Systems
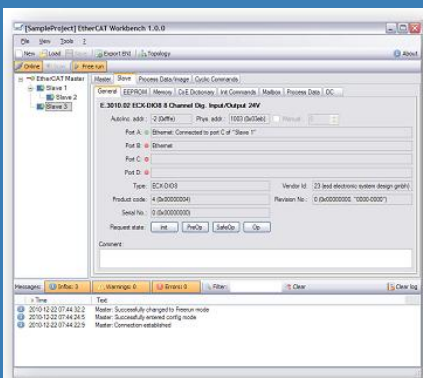
The EtherCAT Master Stack from ESD electronics is designed for high performance, small resource usage and scalability. The core components are operating system (OS) and CPU architecture independent. An adaption to many prevalent (real-time) operating systems is available from stock which guarantees a 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

AdvancedMC Specification

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.

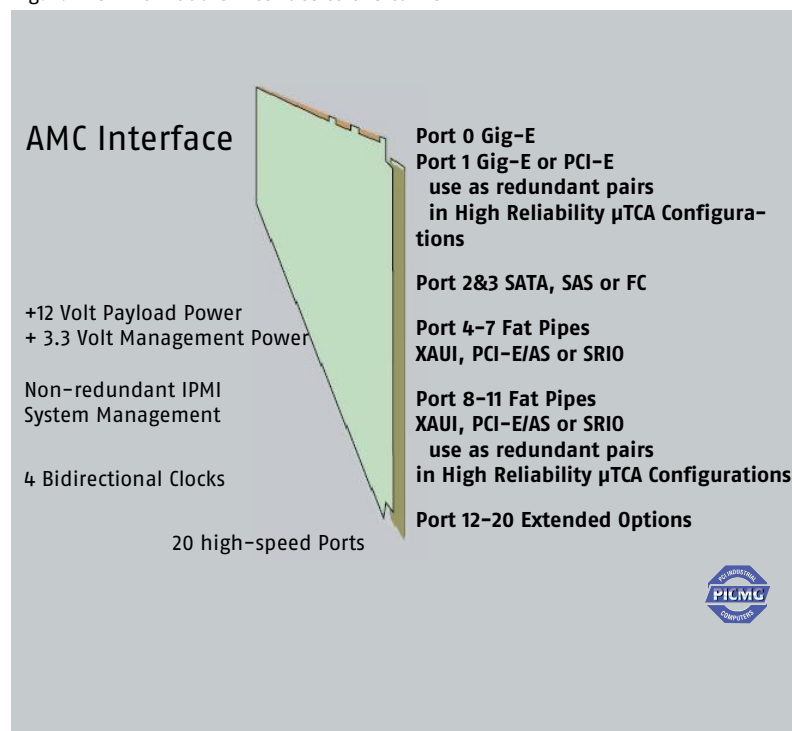Fig. 1: The AMC module interface to the carrier

AMC Interface

+12 Volt Payload Power
+ 3.3 Volt Management Power

Non-redundant IPMI System Management

4 Bidirectional Clocks

20 high-speed Ports

Port 0 Gig-E
Port 1 Gig-E or PCI-E
  use as redundant pairs
  in High Reliability µTCA Configurations

Port 2&3 SATA, SAS or FC

Port 4–7 Fat Pipes
XAUI, PCI-E/AS or SRIO

Port 8–11 Fat Pipes
XAUI, PCI-E/AS or SRIO
  use as redundant pairs
  in High Reliability µTCA Configurations

Port 12–20 Extended Options

Table 1: Use of AMC ports

	Connector Region	AMC Port#	AMC.1				AMC.2			AMC.4
Basic Side	Clocks	TCLKA								
		TCLKB								
		FCLKA								
	Common Options	0	GbE AMC.2 Typ E1			or	GbE AMC.2 Typ E2			
		1	unassigned				GbE AMC.2 Typ E2			
		2	AMC.3 SATA/SAS/FC							
		3	AMC.3 SATA/SAS/FC							
	Fat Pipe	4	Typ 1	Typ 2	Typ 4	Typ 8			Typ 6 10 GbE	AMC.4 x4 SRIO
		5								
		6								
		7								
Extended Side	Extended Fat Pipe	8					Typ 1	Typ 2 Typ 3 Typ 4	Typ 5 10 GbE	AMC.4 x4 SRIO
		9						GbE GbE GbE	10 GbE	
		10						GbE GbE	10 GbE	
		11						GbE		
	Extended Options	12–15								
		TCLKC/D	Ports 12 to 15 and 17 to 20 are reserved for rear I/O							
		17–20								

	PCI	AMC
Form factor	Intern installed, half size, full size, standard or low profile	Front pluggable, double board size possible, 3HP, 4HP, 6HP front panels
System architecture	Single master	Multi master, up to six PCIe root-complexes
Connector	Direct connector	Direct connector, harting connectors
Interconnect	PCI (66/64) PCI-X (133/64) PCI Express	20 serial high speed ports: 1GB/10GB Ethernet Fibre channel, SATA, SAS, PCI Express, Serial RapidIO
IPMI	no	yes
Hot swap	Not available, card exchange is a main problem	yes
I/O	Front or internal I/O	Front or Rear I/O
Power dissipation	Cooling is a main problem / 7.5Watt PMC	80 Watt

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 1/10 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.
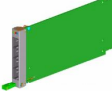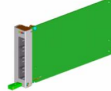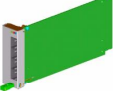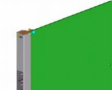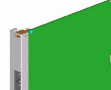

Fig. 2: Designs of AMC modules

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.

MicroTCA NG

Currently there is a PICMG working group, working on continuing the MTCA standard, this will include necessary extensions of the current fabrics to state-of-the-art speeds, such as 40/100GbE as well as PCIe Gen.4 and Gen.5. It also tackles higher power dissipation per AMC module, to keep up with the demand of todays customer applications and needs. The work shall be ratified within 2023.

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