



Robot Solutions and Services



ROS2
Suite

Rise of the Robots

Global robotics market growth

270%

(USD 110.7 billion) by 2026

Robot Arm
More than
\$74.35B
by 2029

AMR/AGV
More than
\$18B
by 2027

Patrol Robot
More than
\$8.8B
by 2027

Cobot
More than
\$8.6B
by 2030

Industrial Robots Market Demand

Edge AI Management

Allow data processing at edge and empower safer navigation

Real Time Operation

Data analysis and asset management with real time OS solution

Machine Vision & Sensors

Faster decision making or identify abnormal situation with task best route choice

Teleoperation & Data Security

Reliable wireless connection benefit remote management

Robot Solutions and Services



Patrol Robots



Collaborative Robots



AMRs



Robot Arms

Vision AI Acceleration

Edge AI Suite, GPU/MXM integrated,
MiPi/POE/GbE/USB for cameras

Real-Time Motion Control

EtherCAT, CANOpen, Modbus

Wireless Connectivity

Fast roaming, high throughput,
low latency, reliable connection

ROS2 Suite

Issac, RViz, MoveIt, NAV2,
GAZEBO, DDS

OTA Update and Container Mgmt.

Firmware, BIOS, ROS node,
application, AI model

Secure OS with LTS

10-year long-term support for
Ubuntu and Windows IoT

Robot Design-in Services



AI Robot Solutions

 Simplified system integration

 Supports large-scale deployment

 Optimized vision AI performance



Edge AI Suite Software

- NVIDIA TensorRT and DeepStream
- Intel oneAPI and OpenVINO
- Computer vision and deep learning workloads
- Debugging with edge nodes
- Release package through DeviceOn



Multi-Camera Interface

- **MIPI:** small form factor, high data transmission rate, and low power
- **Ethernet/POE:** rugged design, high-speed and long-distance transmission
- **USB 3/3.1/3.2:** high speed, easy to obtain, multiple inputs



AI Acceleration Cards

- MXM 3.1 Type A thin design for easy integration
- Intel Arc A370M & NVIDIA Quadro
- Low power consumption with Advantech strict quality control



Robot Wireless Connectivity



Higher Data Rates
Enables a 25% data rate increase (throughput) in Wi-Fi 6 (802.11ax) access points and devices



Increased Capacity
160 MHz channel utilization capability increases bandwidth to deliver greater performance with low latency



Numerous Devices
Wi-Fi 6 leverages OFDMA (Orthogonal Frequency Division Multiple Access) to split the load when a signal is sent



Energy Efficient
TWT, a new Wi-Fi 6 feature enables devices to schedule communication with the wireless network



AGV

Requirements

- Station Tracking
- Indoor Navigation
- Security

AIW-163BR Wi-Fi 6 module features

- Accuracy : < 1ft
- Fast Roaming
- WPA3 Security Protocol

AMR

Requirements

- Latency: < 20ms
- Jitter : < 5ms
- Throughput: 50-250Mb/ps

AIW-163BR Wi-Fi 6 module features

- Low Latency
- OFDMA
- High Data Rate (1201Mbps)

Robot Development ROS2 Suite



Ready to Develop
One-click Install

- ROS 2 compatible environment with its development software tools and libraries
- AIM-Linux: Linux, Jetson Linux, Ubuntu OS
- Support with verified peripheral drivers



Design for Application Integration
Robot-oriented API & SDK

- Integrated AI accelerator SDKs from silicon vendors
- ROS-compatible Add-Ons & SDKs in docker containers
- Unified SUSI APIs and SUSI-AI for hardware control



Easy to Expand
Cross-platform Solution

- Supports NVIDIA, NXP, MediaTek, Rockchip, Intel
- Design-in service for system integration
- Unified software design for easy migration cross various Arm and X86 platforms

ROS2 Suite

■ Advantech's offerings □ Third-party software integration

AI Accelerator SDKs

OpenVino



Tensorflow
Lite, eIQ



TensorRT



RKNN API
Rock-X



NeuroPilot



ROS-Compatible Add-Ons & SDKs



Remote Control

Powered by **DeviceOn**

Device Status, Management, OTA

Hardware Control

SUSI, SUSI-AI

Protocol

Modbus, OPCUA

Security

Trusted OS, TPM

Database

Edge DB

Integrated Development Utilities

➤ **Movelt1**



RQT

rqt_graph



ROS2™

OS



Windows



Ubuntu



Linux



Jetson Linux



debian

Robotics Peripheral Integration

- ✓ Ultrasonic
- ✓ Medium-Range RADAR
- ✓ Camera
- ✓ LIDAR
- ✓ Long-Range RADAR
- ✓ Wireless
- ✓ Battery & charging
- ✓ Real-time robotic controller
- ✓ Motor control system

ADVANTECH

Robot Real-Time Control



Motion Control

- Enable SoftMotion with CODESYS runtime package
- Windows real-time configured control by CPU core dedication

Vision Control

- Realize video stream processes on resource arrangement with Intel TCC

Autonomous Navigation Control

- Provide movement control on task priority management with Preempt RT

Real-Time Communication

- Time and data synchronization with IEEE TSN integrated

Real-Time System Level



CODESYS for EtherCAT

- SoftMotion
- SoftPLC



Real-Time TSN / TCC

- Time-Sensitive Networking (TSN)
- Intel® Time Coordinated Computing (TCC)

Real-time OS Level



Ubuntu with Preempt RT

- Out-of-tree PREEMPT_RT patch
- Supports x86 and Arm



Windows with RT Kernel

- Soft Real-Time in version 21H2
- Advantech Power Suite

Robot Security Services

Flexible for AI development

Easy deployment for IoT

Long-term support

ADVANTECH



ubuntu

How Do We Secure Your Robots



Secure Boot

Ensures the code launched by firmware is trusted



Partition Encryption

Protect both the confidentiality and integrity of a device's data following physical access to a device, or after its lost or stolen



Hardening Tool for CIS

Use CIS benchmark to check whether system configurations satisfy security baselines. Automated audit and compliance



Uncomplicated Firewall (UFW)

The default firewall configuration tool for Ubuntu is UFW. This provides a user-friendly way to create an IPv4 or IPv6 host-based firewall

Fully-supported, full-stack secured, software/hardware certified IoT solution

OTA Update & Container Management

Over-the-air (OTA) update of firmware/driver/application



Upload



Status & Progress Update

Batch Deploy



On-prem/ cloud repository

- Firmware, software, and OS
- Customizable rules and script
- On-demand/scheduled, 1-1 or 1-many batch operation
- Secured process by digital signature and MD5 file checksum



On-demand and scheduled batch reboot, screenshot, and KVM



- Manages 10,000+ devices
- Remote control
- Real-time monitoring
- Remote diagnostics
- Notification and alert

Container management: build once and run everywhere



- Reduced time for AI deployment — from months to minutes
- Reproduce, scale up, and manage AI application with ease
- AI brings solutions to production faster
- Hardware and OS agnostic

Robot Design-in Services

Real-Time OS Solution

- Windows 10 RT
- Windows Codesys
- Ubuntu20.04 + Preempt RT WSL2

ROS2 Suite

- ROS 2 Distribution
- ROS 2 DDS Client
- Robotic Packages : Rviz, rpt_graph, MoveIt
- SDK & Docs

Edge AI Suite

- NVIDIA TensorRT and DeepStream
- Intel oneAPI and OpenVINO
- Computer vision and deep learning workloads

Device Management

- Plug-in for ROS2 Visualization
- Remote Monitor Peripherals (Location, Sensor, Battery...etc.)
- Black Box Diagnostics



Collaborative Robot

- Multi-camera image analysis
- High performance for acting and communicating : Up to 6-axis control, motor control
- Machine learning and training for efficiency enhancement

Solutions Highlights



High Performance Edge Computer

ARK-3534

12th/13th Gen Intel Core i3/i5/i7/i9
Intel TCC & TSN Support



NVIDIA Quadro GPU cards RTX A2000

NVIDIA Ampere GPU
Gen 4 PCIe x16



PCIe GPU Card VEGA-P110

Intel Arc A370M
Gen 4 PCIe x16

Performance Boost

Up to 24 cores Dual channel DDR5 SO-DIMM ECC/
non-ECC memory up to 64GB support

Rich I/O for Quick Application Integration

4GbE, 8 x USB, 8 x COM, Audio, Dual HDMI, Remote
switch, 16 bit DIO(Optional), 2 x CANBus (Optional)

Supports AI Accelerate GPU Card

Dedicated power and thermal design for AI-accelerated
GPU cards: NVIDIA RTX-A2000, Intel® Arc™ graphics
solutions, etc.

Use Cases

China

Collaborative Robot with AI Accelerate Analysis



Challenges

- Request for high computing power for analysis and quality sorting
- Different device connectivity with various I/O Interfaces
- Harsh environment usage required

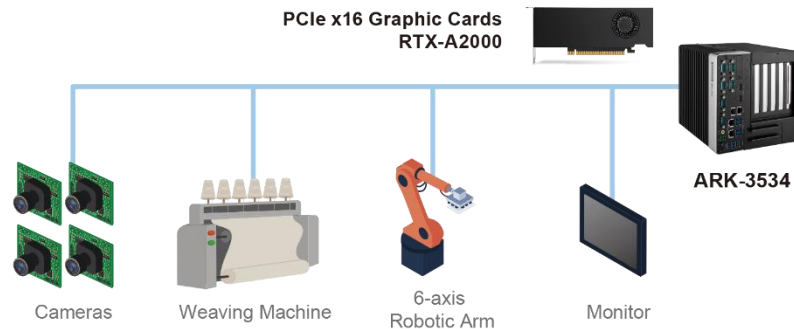
Solutions

- Supports both high performance CPU and GPU computing power to improve efficiency and accuracy
- Provides versatile I/O options for multiple device connections
- Wide power input (9-36V) and operating temp. (-20~60°C)

Benefits

- Provides complete power and thermal solution for CPU & GPU system integration
- Designed to support multiple I/Os and flexible expansion ability to meet different types of application requirements
- Rugged design with wide power input and operating temp. to support stable system computing in harsh environments

System Diagram



Patrol Robot

- Palm-sized, Core-I level performance & flexible operation with AI acceleration
- Multi-purpose cameras & different types of I/Os or sensor solutions
 - LiDar / PTZ / thermal / infrared camera
 - Ultrasonic / weather / altitude sensors
 - Wheel control, battery design for autonomous purposes
- High reliability in harsh environments

Solutions Highlights



High-Performance, Low-Power SBC

MIO-5377

12th/13th Gen Intel Core i3/i5/i7
Intel TCC & TSN Support



5G LTE Mini-PCIe Card FM-350

TDD LTE/FDD LTE/WCDMA/GPS
Supported Regions: Global
-30 ~ 75 °C/-40 ~ 85 °C



Memory Module SQR-SD5N

SODIMM DDR5 4800MHz
up to 32GB

Performance Computing Power with Integrated AI

- 3.5"(146x102mm) SBC with up to 96EUs for parallel AI workload
- Optional MXM GPU module through USB4 (Type C)

Multiple & High Speed I/O, Sensors within one Main board

- 1 x USB 4 (Type C), 1 x USB 3.2 (Type C), 4 x USB3.2, 2 x USB2.0, 2 x GbE
- 6 x COM (1Mbps)
- 3 x I2C (1Mbps), 2 x CANBus

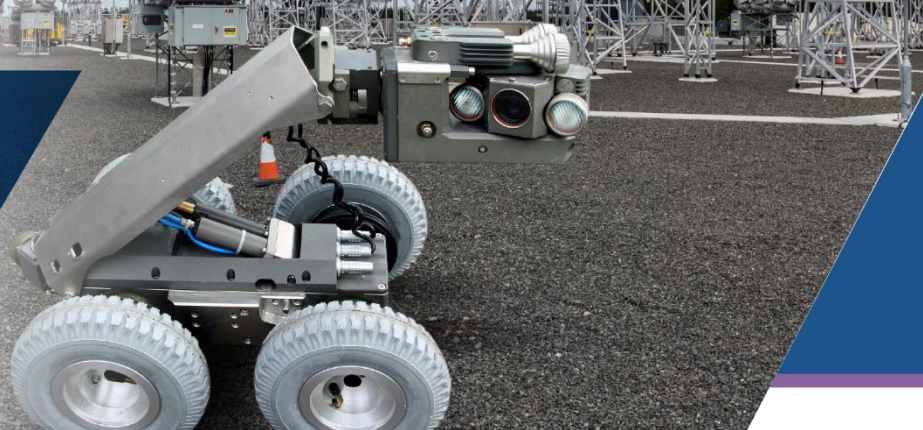
Support Indoor/ Outdoor and Reliable Design

- Temp. -40 ~ 85°C
- 12-24 VDC wide-range power input
- TDP 15W/ 28W, fan/fanless

Use Cases

China

Inspection Robots with GPU Module Cards in Power Substations



Challenges

- Palm-sized, minimum Core i computing power, with flexibility for AI acceleration for different user scenarios & easy assembly
- Multi-camera, sensor, and I/O applications
- Must work outdoors with high reliability

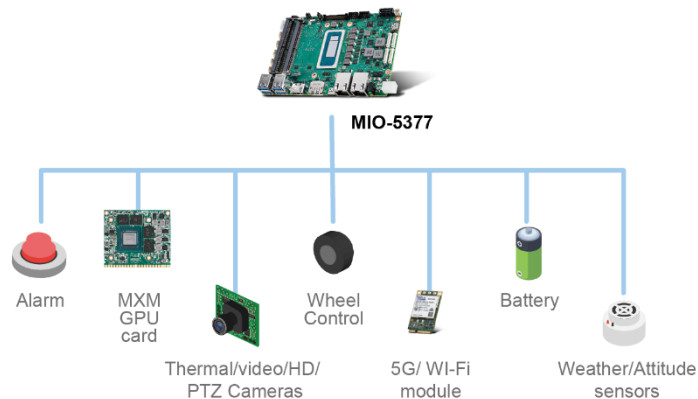
Solutions

- 3.5", USB4 Type-C flexible choice for MXM GPU modules and convenient assembly
- Various I/Os and sensor interface design on one board
- Wide power input (12-24V), wide operating temp. (-40~85°C)
- DeviceOn remote management with validated wireless modules

Benefits

- 3.5 SBC and flexible selection on AI acceleration modules for different applications to save space, shorten development schedules, and reduce costs
- Multiple high-speed I/Os in one board to save costs to find other solutions and reduce integration efforts
- Rugged design with wide power input and wide operating temp to operate under harsh environments

System Diagram



High-end & Multi-task AMR

- On-device real-time monitoring and analytics
- Vertical I/Os and ROS2 ready
- Data communication services required for edge AI ecosystems

Solutions Highlights



Powerful Edge AI System

AIR-030

NVIDIA Jetson AGX Orin SoM built-in

ROS2
Suite



Wireless Module AIW-163

Wi-Fi 6 & BT 5.2
M.2 2230 A-E key



PoE Module MIOe-PSE-DPA1

PoE Dual Port 15.4W/each

Scalable AI Performance Up to 275 TOPs

- Adopts latest NVIDIA Jetson AGX Orin SoM built-in
- 8 times performance better than AGX Xavier
- NVIDIA Ampere™ GPU, 2048 NVIDIA® CUDA® cores, 64 Tensor cores

Versatile I/Os and Expansion Slots for Device Connectivity

- 4 x USB3.2, 1 x Type C, 3 x 2.5GbE (optional PoE), 4 x COM, 1 x CANBus, 1 x DI/O
- Supports Wi-Fi, 5G via M.2 for ultra-high-speed data transmission
- Expandable extension layer for multi-function cards via PCIe x16 slot

Quick AI Deployment System

- Pre-load Ubuntu 20.04 image, JetPack 5.0 SDK above
- ROS2 and Edge AI Suite ready for robot applications

Use Cases

China

AI-Enabled AMR for Video Analytics



Challenges

- Request for high computing performance and multiple tasks
- High-speed data transmission for real-time data monitoring and analysis
- Dynamic environment usage required

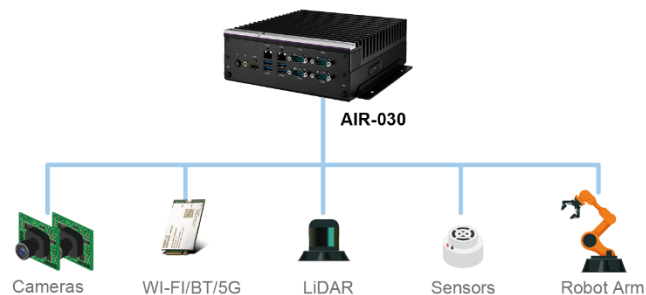
Solutions

- Adopts NVIDIA Jetson AGX Orin delivers up to 275 TOPS of AI performance
- Provides versatile I/Os for multiple devices connections
- Wide power input (9-36V), wide operating temp. (-10~60°C), and heavy industry compliance

Benefits

- Quick AI deployment system bundles with Ubuntu 20.04, ROS2 Suite, and NVIDIA JetPack SDK
- Robust industrial design provides stable operation in harsh environments
- Rich I/Os support high-resolution camera connections, industrial protocol communication, and wireless connectivity

System Diagram



AMR

- Dedicated AI accelerators with low latency and scalability
- MCU enables real-time motor control
- ROS 2 with DDS for timely communication and interoperability

Solutions Highlights



Ultra-Compact Barebones Box PC

EPC-R7300

NVIDIA® Jetson Orin™ NX and Orin™ Nano

ROS2
Suite



Wireless Module AIW-163

Wi-Fi 6 & BT 5.2
M.2 2230 A-E key



Wireless Module AIW-357

5G Sub 6 with GNSS
M.2 3052 Key B
Made in Taiwan

Ready-to-use Barebones PC: BUILD & SCALE FAST

- Production carrier board for easy prototyping and mass deployment
- Jetson Orin family module compatibility for up to 100 TOPS AI capability
- JetPack™ 5.1 SDK supported

Compact Footprint for Limited Space Application

- Easily deploy the PC in diverse applications without sacrificing space
- Modular thermal design for each module to fit in with the unified barebones design

Expandable I/O Design Fulfills Diverse Application

Requirements

- M.2 expansion for boot and wireless connectivity: Key M for NVMe, Key E, and Key B for wireless
- Application-oriented UIO40-Express I/O expansion
- Connecting edge devices and peripherals via USB, RS-485, GPIO, CAN, and LAN

Use Cases

China

Cost-effective and Efficient Solution for Industrial Cleaning Robot



Challenges

- Thorough planning ensures no interruption to core warehouse activities
- Lightweight and longer-battery-life solutions secure six hours of autonomous cleaning on one charge
- To ensure operational safety, the cleaning robot needs to be capable of instant reaction to obstacles

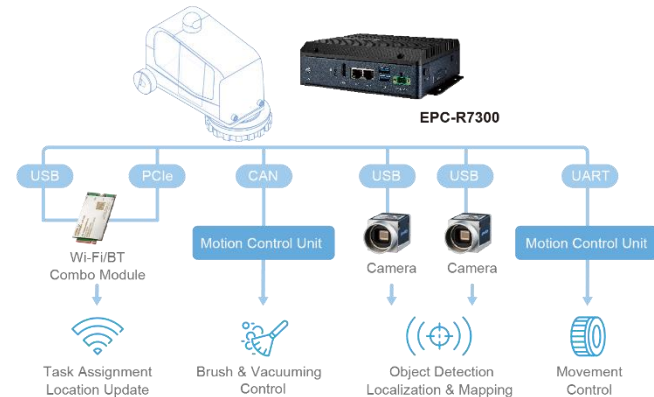
Solutions

- Mapping, data logging, storage and real-time monitoring through wireless connection
- Low power consumption to increase efficiency per charge
- Two USB industrial cameras inputs and up to 100 TOPS native AI inference capability to assist instant reaction

Benefits

- Cost-effective and can be easily scaled as digital 3D map data is easy to transfer than human experience
- Manage OTA update of firmware/application/OS/security patches at scale
- The cleaning performance is consistent and can be traced transparently through digital logging

System Diagram



AGV / AMR

- Responsive, high-performance computing power with AI/deep learning capabilities
- Configurable CPU power for battery life time optimization
- Extended temperature support ideal for harsh or outdoor environments

Solutions Highlights



Din-Rail Edge Computer

ARK-1250L

11th Intel® Gen low power Core™ i processor

ROS2
Suite

DeviceOn/iEdge



Wireless Module AIW-163

Wi-Fi 6 & BT 5.2
M.2 2230 A-E Key

High-Performance, Real-Time Computing

- 4 cores with up to 4.1GHz turbo frequency
- Supports TSN for a real-time robotic controller

Diverse, Flexible I/O Connectivity for Quick Application Integration

- 3 x Ethernet for Lidar and sensors, 1 x optional CANbus for robotic arms, 3 x USB 3.2 for cameras
- M.2 E Key and B Key for 5G/LTE, WiFi, GPS integration
- Supports over 10 selected iDoor I/O expansion modules

Ruggedized and Reliable Design

- IP4x mechanical design
- Wide operation temperature range: -40 to 60°C
- Wide power input range: 12-24VDC for battery connectivity

Use Cases

China

Compact Fanless Edge Computer for AMRs



Challenges

- A compact controller that can simplify cable routing and mechanical design
- Diverse I/Os for multiple sensor and device connections

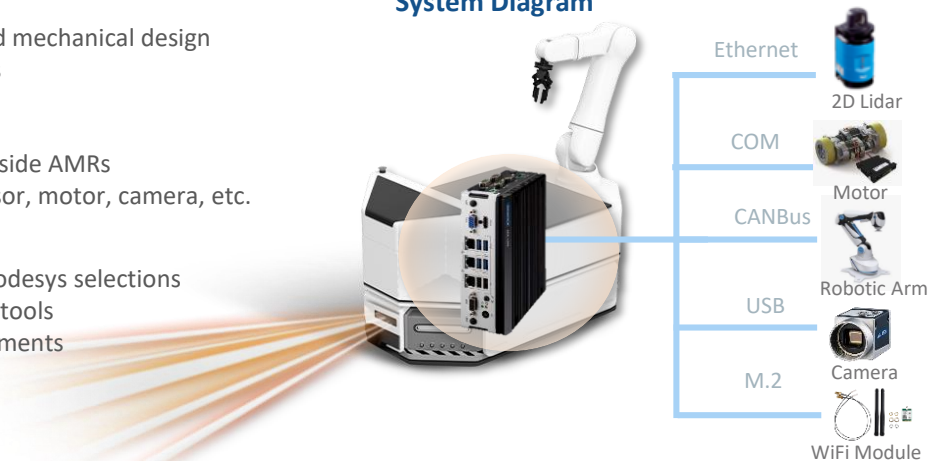
Solutions

- Coastline I/O placement provides good cable routing inside AMRs
- Provides versatile I/Os for AMR peripherals : Lidar, sensor, motor, camera, etc.

Benefits

- Solution package ready with Ubuntu, ROS2 Suite and Codesys selections
- Provides real-time functions with I/O, protocol, OS and tools
- Compact size and rugged design to meet harsh environments

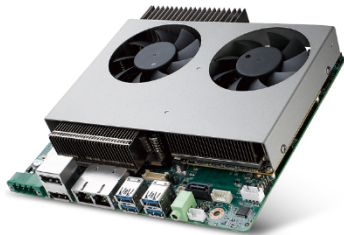
System Diagram



Manipulation Robot

- AI-assisted computing capability for AI training and inferencing
- 3D sensing capability: object detection and obstacle detection
- Accelerate deployment with COTS solution

Solutions Highlights



GPU-accelerated THIN Motherboard

AIMB-288E

12th Gen Intel Desktop Core
NVIDIA RTX MXM GPU Module



Memory Module SQR-SD5N

SODIMM DDR5 4800MHz
up to 32GB



Storage Module SQF-CM8 920

PCIe Gen3x4
M.2 2280

CPU & GPU Accelerated Computing

- 12th Gen Intel Desktop Core, 16 cores and DDR5 memory
- NVIDIA RTX T1000 or A2000 integration up to 8.6 TFLOPS
- CPU & GPU integration ready to use

Versatile I/O and Expansion

- 2 x GbE, 6 x USB, 2 x COM for cameras and LiDAR
- M.2 M-key for NVMe storage
- M.2 B-Key for 4G/LTE wireless connectivity

All-in-One Kit Simplify Integration

- Kit offering with integration of CPU, GPU, memory, SSD, and QFCS2.0 cooling system
- 42mm (<1U) height and 24V DC input ease chassis design
- Supports Window 10 LTSC or Linux Ubuntu

Use Cases

Japan

Upgrade Manufacturing Efficiency for Manipulation Robot

Challenges

- Enhancing manufacturing efficiency and reducing the impact of human resource shortages
- AI-enabled equipment with sensing capability for object and obstacle detection
- Wireless design for free movement

Solutions

- AIMB-288E motherboard supports 12th Gen Intel Core data processing and NVIDIA Quadro T1000 GPU accelerator
- Versatile I/O interface for camera and sensor connection
- 19-24V DC power input and compact size for space limited system requirement

Benefits

- Delivers extreme performance with CPU and GPU design-ready and ultra-thin cooling system
- Simplifies system integration with all-in-one design and 1U THIN cooling system
- 0~60°C operating temperature for unmanned environments

System Diagram

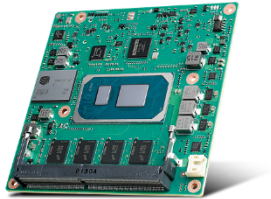


ADVANTECH

Robot Arm

- Time-critical requirements for fast boot-up to operate
- 2.5GbE efficient and wide networking bandwidth
- Quality & reliable for long-term safe & stable operation

Solutions Highlights



Secure IP Enabled COME Compact Module

SOM-6883

11th Gen Intel® Core™ U-Series



Memory Module SQR-SD4N

SODIMM DDR4 3200MHz
up to 32GB

Fast Boot BIOS

BIOS modifications and optimizations enable optimizing the boot up speed to less than 3 seconds

Reliability & Multi I/O Configuration

Power on/off cycling testing and component quality control for operational reliability.

Versatile I/Os for multiple device connections, up to 2.5G wide data bandwidth for huge data spheres

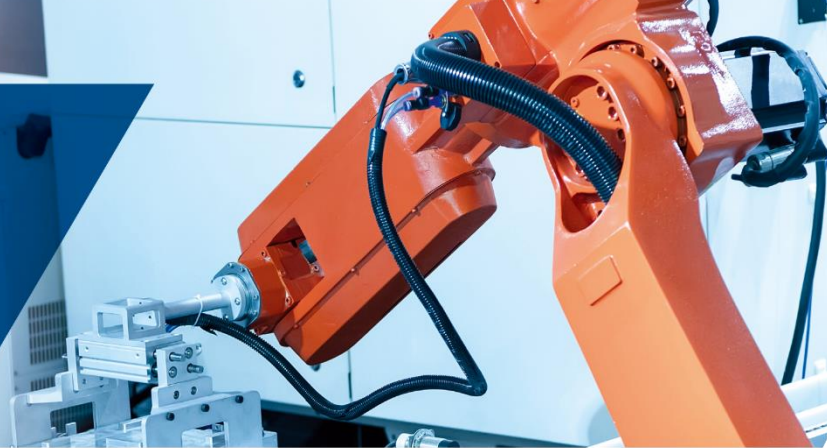
Quality & Services

Prompt technical support and well-organized quality planning for VIP quality control processes

Use Cases

Europe

Reliability & Production Efficiency for Robot Arm



Challenges

- Request for ultra-fast boot (<3 s) for quick start-up operations
- High reliability for power on/off cycles (20,000 times)
- Different device connectivity with various I/O interfaces
- Strict quality control 200 DPPM (under 0.002% fail rate) with precise on-time delivery schedule

Solutions

- Supports Advantech Slim Boot BIOS for specific requirements
- Circuit design and component selection for stable power cycling test
- Provides versatile I/Os for multiple device connections
- Provides agile production service

Benefits

- Provides Advantech Slim Boot for customers, enabling fast boot-up within 3 s, helping customers get realize fast product start up
- The most suitable design for applications requiring high reliability standards and requirements for robotics
- Designed to support multiple I/Os and flexible expansion to meet different requirements

System Diagram

