Autonomous Mobile Robot Controllers

IEI's New Fulfillment Solution Provides Reliable Computing Brain for Autonomous Mobile Robots

IEI simplifies and accelerates AMR deployments

"IEI offers the edge-ready compute and connectivity technologies you need to get your AMRs up and running smoothly on the factory floor or any challenging conditions."

- Tingting, Senior Product Manager of IEI Integration Corp.

Opportunity

The exponential growth of ecommerce over the last few years means supply chain logistics need new ways to address new challenges. In addition, the COVID-19 not only shifts global consumer behavior but also acted as an activator for automation evolution. As a result, retailers, manufacturers and supply chains have turned their attentions to mobile robots to improve their efficiency and capacities to meet the demands, while reducing direct human contact for social distancing and massive staffing shortages.

Based on various considerations above, ABI Research has indicated worldwide commercial robot revenue in warehouses will have a Compounded Annual Growth Rate (CAGR) of over 23% from 2021 to 2030 and exceed US$51 billion by 2030.

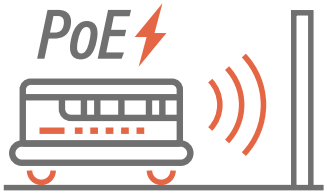
What are AMRs?

Autonomous Mobile Robot (AMR) is a vehicle that uses on-board sensors and processors to autonomously move materials without the need for physical guides or markers. The AMR's main components include controller, computing unit, battery, motors, sensors and camera. An Automated Guided Vehicle (AGV) is an industrial vehicle that can be pre-programmed to transport goods in a warehouse, manufacturing and other environment. The AGV's main components include traction motor, traction batteries, industrial PC (or on-board controller) and payload interface.

Key Challenges to AMRs Machine Builders

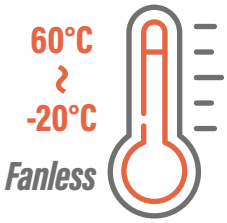
Facing the changing industry landscape, robotics machine builders continue to encounter significant challenges to meet customers' diverse requirements. These include integration obstacles such as more diverse built-in sensors, environmental limitations, and ways to improve human and robot collaboration. IEI specializing in computing power, software, and networking technologies have made assembling, installing, and maintaining robotics technology easier and more scalable than ever before. IEI's control units with the following features can help customers bypass a lengthy development cycle to integrate AMR controllers.

IEI brings next-gen performance plus real-time computing to AMR



Rich I/O Offers Sensor and Component Connections

IEI's powerful embedded systems are equipped with rich I/O for connecting front and rear LiDAR, multi-lens surround cameras, displays and other end devices to ensure maximum operation efficiency of AMR.

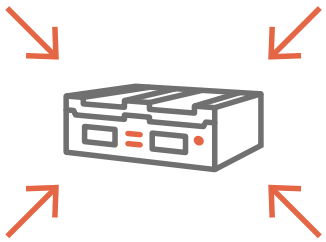


Fanless with Extended Operating Temperature

With excellent thermal design, IEI products can deliver constant CPU performance even in extreme temperature conditions.

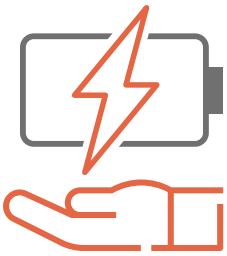
Anti-Shock, Anti-Vibration

Tested to withstand the vibration caused by bumpy and uneven roads, as a robust and stable computer system to meet the basic requirement of AMR.



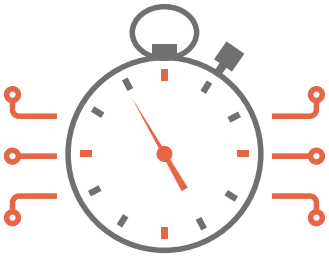
High Performance CPU /GPU in Small FootPrint

High performance computing power has the ability to handle complex software stack, machine vision, realtime calculation of positioning, and map reconstruction algorithms. Furthermore, compact form factor improves the flexibility of robot mechanism design.



Energy Saving

AMR can work 24 hours a day, stopping only when they need to recharge their batteries. IEI's AMR controllers provide power efficient platforms, extending battery operation tme and reducing downtime.



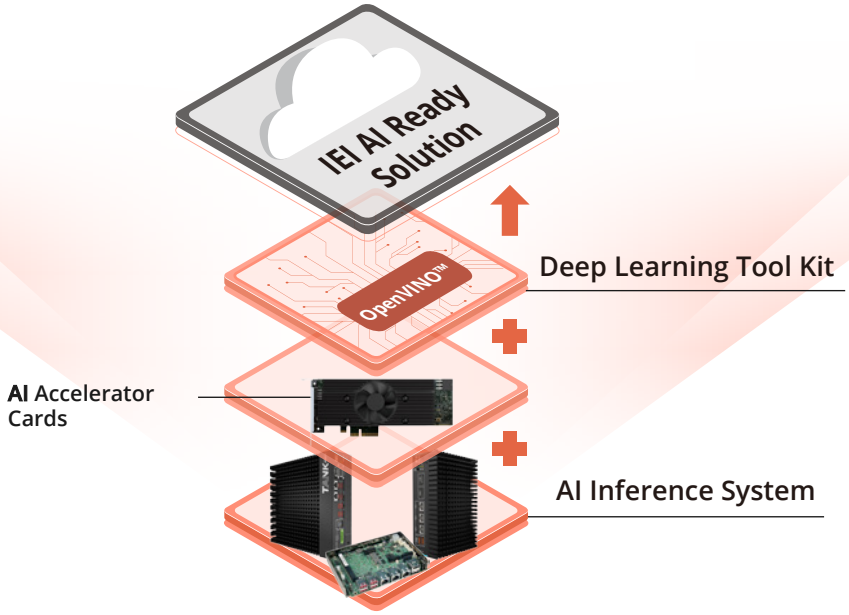
Real-Time Computing

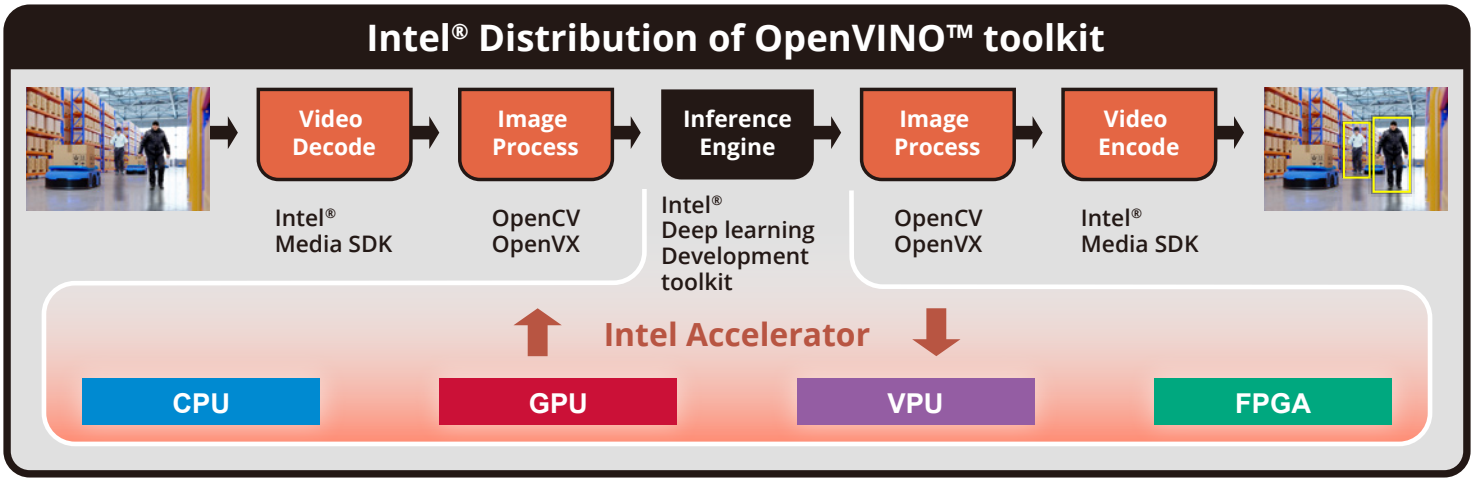
IEI TSN/TCC Developer Kit supports both Intel® TCC and TSN; these technologies assure accurate and stable delay time for critical real-time data across the network and make AMR movement, interaction and control more accurate and fast.

AMR with Artificial Intelligence Technology

- Deep learning obstacle detection

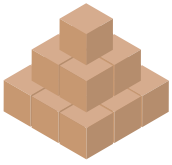
Artificial intelligence (AI) makes it possible for machines to learn from experience, adjust to new inputs and perform human-like tasks. AI will become an integral part of setting up and using AMRs, simplifying their deployment process and improving their workflow. Some AMRs are taking those smarts to the next level with artificial intelligence coupled with strategically placed cameras that function as extended robot sensors. With AI, AMRs can learn to adapt their behavior appropriately, even before they enter an area. This means they can avoid high-traffic areas during specific times, including when materials are regularly delivered and transferred by fork truck, or when large crowds of workers are present during breaks or shift changes.



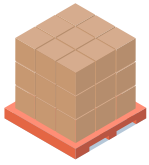


Deployt Autonomous Automations in Hours

Manual operations are costly, low in efficiency and always result in errors. The use of Autonomous Mobile Robots (AMR) can help improve the efficiency of logistics and supply chain operations. From improving floor operations, transportation and processing to generating warehouse layout reports, AMR offers enormous advantages for further automation.



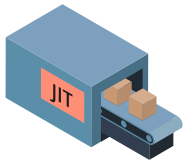
Raw Material and WIP Movements



Pallet Picking

Receiving and Putaway

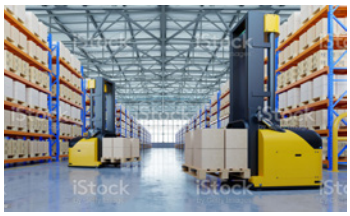
Cross-Docking and Long Haul



JIT and Line Replenishment

AMR Segmented Market & IEI's Product Offerings

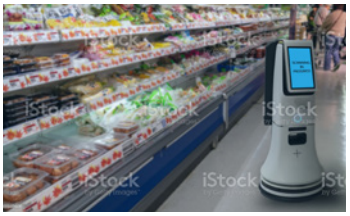
In the dynamic environments, the development and deployment of AMRs on a large scale is a major challenge, especially in industrial environments. This is exactly what IEI aims to solve. IEI has a comprehensive product line to meet diverse needs of customers, from single board computers, fanless embedded systems to AI accelerators. These reliable and robust industrial-grade products ideallyfit different AMR applications, including manufacturing, warehousing, public sector, healthcare and hospitality.



Manufacturing, Warehousing, and Logistics

Smart Cities and Public Sector

Healthcare



Retail, Banking, and Hospitality

Tird-party Extensions

SLAM | Motion Control | Image Processing | Fleet Management | Object Recognition | Navigation

Midware/OS

ROS | Linux

Connectivity

Wi-Fi | 5G | LTE | Bluetooth

AI & Robotics Core

OpenVINO | intel. MOVIDIUS | intel. CELERON | intel. CORE i5 | intel. CORE i3

AMR Controller

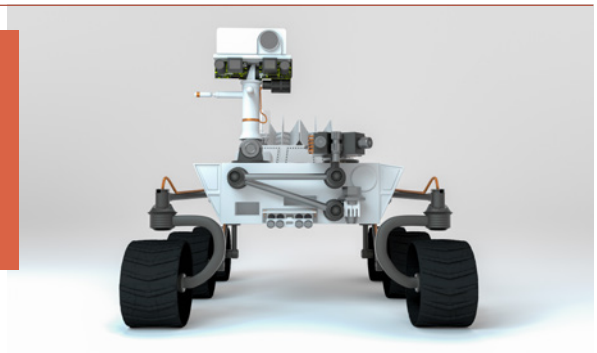
Modular Edge AI System	Compact and cost effective controller		3.5" SBC	TSN/TCC Developer Kit
				
TANK-XM81 Series	DRPC-240 Series	DRPC-W-JL Series	WAFER Series	DRPC-240AI Series

Sensors, Discrete Devices

I2C/DIO			LAN	USB3.0	RS-485	PCIe	HDMI	Serial Port
								
LED Indicator	E-Stop	Inertial measurement unit	2D/3D LiDAR	3d depth sensing camera	Servo/Stepping Motor		IP65 Industrial Touch Monitor	PLC

Public Sector

Smart cities and government agencies are leveraging AMRs to improve residential services, such as trash removal or public transportation, and public agencies are using AMRs for surveillance, rescue missions, and supporting police officers by patrolling city areas.



-20°C ~ 60°C

DRPC-240AI

Real-Time Compute
TSN/TCC Developer Kit

- Fanless system with Intel® Core™ i5 processor
- Intel® Time Coordinated Computing (Intel® TCC) and Time Sensitive Networking (TSN) for those real-time applications that require determinism
- Expandable VPU deep learning accelerator

-20°C ~ 60°C

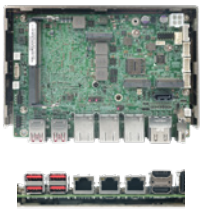
TANK-XM811

Modular Edge AI Embedded System

- Fanless system with 13th/12th Gen Intel® Core™ i processor
- Modular eChassis/eBP to support PCI/PCIe expansion
- GPU expansion capibilities
- 12V ~ 28V DC wide-range power input
- PoE capability: IEEE 802.3at with 30W

Healthcare

Thoughtful use of AMRs reduces disinfection, automates delivery of medication and medical supplies, and further alleviates the burden on overstressed workers, freed up to spend more time with patients.



WAFER-TGL-U

11th Gen Intel® Core™ i 3.5"
Single Board Computer

- 11th generation Intel® Core™ i7/i5/i3 ULT3 processor
- Triple Intel® I225V 2.5GbE LAN Port
- 4 x USB 3.2 Gen 2 ports (10Gb/s)
- Well-design thermal solution
- Four independent display: 2 x HDMI, 1 x DP, 1 x iDPM
- Operating temperature: 0°C ~ 60°C

-20°C ~ 60°C

DRPC-240

Fanless DIN-Rail Embedded System

- Intel® Core™ i5-1145G7E/i7-1185G7E/ Celeron® 6305 processor
- Four 2.5GbE network interfaces (PoE capable)
- Stackable, modular PCIe x4 design for added functionality
- -20°C ~ 60°C for extreme weather and 12V ~ 28V DC input
- Wireless connectivity: 4G/LTE, Wi-Fi and Bluetooth

Manufacturing, Warehousing, and Logistics

AMRs are quickly becoming a valuable part of manufacturing, warehouses, and logistics businesses because they are easy to be integrated into existing infrastructures. Using AMRs in handling/picking goods, delivering items to employees, and carrying out security checks can greatly increase efficiency and productivity of operations.

DRPC-W-JL

DIN-Rail Embedded System

- Fanless system with Intel® N5105 processor
- Small size design (176 mm x 116 mm x 61 mm)
- 910g light weight
- M.2 A/B key slots for wireless modules
- Operating temperature: -20°C ~ 60°C

uIBX-250-BW

Ultra Compact Size Embedded System

- Fanless system with Intel® Celeron® N3160 processor
- Dual display
- Two RS-232/422/485
- Full-size PCIe Mini slot for expansion
- Four USB 3.0 ports
- Two GbE LAN ports
- Operating temperature: -20°C ~ 60°C

Product Selection Guide

Industrial Embedded Systems





		TANK-XM811	TANK-XM810	DRPC-W-JL	DRPC-240-TGL-U	uIBX-250-BW
Processor	CPU	6-core Intel® Core™ i5-12500TE 12-core Intel® Core™ i7-12700TE 16-core Intel® Core™ i9-12900TE	4-core Intel® Core™ i3-10320 6-core Intel® Core™ i5-10500 6-core Intel® Core™ i5-10500TE 8-core Intel® Core™ i7-10700E 8-core Intel® Core™ i7-10700TE	4-core Intel® Celeron® N5105	2-core Intel® Celeron® 6305 4-core Intel® Core™ i5-1145G7E 4-core Intel® Core™ i7-1185G7E	4-core Intel® Celeron® N3160
	Frequency/ Turbo Freq	1.9 GHz (up to 4.3 GHz) 1.4 GHz (up to 4.6 GHz) 1.1 GHz (up to 4.8 GHz)	3.8 GHz (up to 4.6 GHz) 3.1 GHz (up to 4.5 GHz) 2.9 GHz (up to 4.5 GHz) 2.3 GHz (up to 3.7 GHz) 2.0 GHz (up to 4.4 GHz)	2.0 GHz (up to 2.9 GHz)	1.8 GHz (up to 4.4 GHz)	1.6 GHz (up to 2.24 GHz)
	Chipset	Intel® R680E	Intel® Q470/Q470E	SoC integrated	SoC integrated	SoC integrated
Memory		2 x SO-DIMM DDR4 3200 MHz (up to 64GB)	2 x SO-DIMM DDR4 2933 MHz (up to 64GB)	1 x SO-DIMM DDR4 2933 MHz	2 x SO-DIMM DDR4 3200 MHz (up to 64GB)	1 x 204-pin DDR3L SO-DIMM (up to 8 GB)
Dimension	W x H x D (Unit: mm)	230.6 x 256.04 x 76.2		176 x 116 x 60.8	190 x 81 x 150	137 x 52 x 102.8
I/O Interface	Serial Port & Other interfaces	2 x RS-232/422/485, 4 x RS-232 1 x 12-bit Digital I/O (6-in/ 6-out) DB-15		-	2 x DB-9 2.5Kv isolated RS-232 2 x DB-9 2.5Kv isolated RS-422/485 1 x DB- 15 12-bit Digital I/O (6-in/ 6-out)	2 x RJ-45 RS-232/422/485 (AFC) 1 x Line-out, 1 x Line-in
	USB	8 x USB 3.2 Gen 2 ports	6 x USB 3.2 Gen 2 ports 2 x USB 2.0 ports	2 x USB 3.2 ports	2 x USB 3.2 Gen 2 ports 2 x USB 2.0 ports	4 x USB 3.2 Gen 1 ports
	LAN	2 x 2.5GbE RJ45 LAN ports		3 x 2.5GbE RJ45 LAN ports	4 x 2.5GbE RJ45 LAN ports (optional PoE 802.3 af module)	2 x GbE RJ45 LAN ports
	Display	1 x HDMI, 1 x DP++	1 x HDMI, 1 x DP++	1 x HDMI, 1 x DP	1 x HDMI, 1 x DP++	1 x HDMI, 1 x VGA
Expansions	M.2/PCIe Mini	1 x 2280 M-key (PCIe x4) 1 x 2230 A-key (USB+PCIe x1, supports vPRO)	2 x 2280 M-key (PCIe x2) bay (RAID 0/1 support)	1 x M.2 A Key 2230 1 x M.2 B Key (PCIe x2) 2242/2280 w/SIM slot	1 x 2230 A-key (PCIe x1/USB 2.0) 1 x 3042/52/80 B-key (PCIe x2/ USB 3.0/USB 2.0)	1 x Full-size PCIe Mini card (support mSATA, colay with SATA)
	Module	Supports IEI eChassis Modules	Supports IEI eChassis Modules	-	Supports IEI Expansion Module	-
Storage		1 x 2.5" SATA 6Gb/s HDD/SSD bay				
Power Input		12~28V DC	12~28V DC	12 V DC	12 ~ 28V DC	12 V DC
Thermal Design		Fanless				
Operating Temperature		-20°C ~ 60°C with air flow (CPU TDP35W & SSD) -20°C ~ 50°C with air flow (CPU TDP65W & SSD)		-20°C ~ 60°C with air flow	-20°C ~ 60°C with air flow (SSD)	

*Specifications are subject to change without prior notice.

AIoT Developer Kit

Real-time edge control via TSN and Intel® TCC

		TANK-XM811AI	DRPC-240AI	DRPC-240AI-i5RC
Processor	CPU	6-core Intel® Core™ i5-12500TE	4-core Intel® Core™ i5-1145G7E	4-core Intel® Core™ i5-1145GRE
	Frequency/ Turbo Freq	1.9 GHz (up to 4.3 GHz)	1.5 GHz (up to 4.1 GHz)	
	Chipset	Intel® R680E	Intel® SoC Integrated	SoC integrated
Memory		2 x 8GB SO-DIMM DDR4 3200MHzpre-installed	8GB DDR4 3200MHz pre-installed	
Dimension	W x H x D (Unit: mm)	230.6 x 256.04 x 76.2	190 x 81 x 150	
I/O Interface	Serial Port & Other interfaces	8 x USB 3.2 Gen 2 ports	2 x DB-9 2.5KV isolated RS-232 2 x DB-9 2.5KV isolated RS-422/485 1 x DB- 15 12-bit Digital I/O (6-in/ 6-out)	
	USB	8 x USB 3.2 Gen 2 ports	2 x USB 3.2 Gen 2 ports 2 x USB 2.0 ports	
	LAN	2 x 2.5GbE RJ45 LAN ports	4 x 2.5GbE RJ45 LAN ports	
	Display	1 x HDMI, 1 x DP++		
Expansions	M.2/PCIe Mini	1 x 2280 M-key (PCIe x4) 1 x 2230 A-key (USB+PCIe x1, supports vPRO)	1 x 2230 A-key (PCIe x1/USB 2.0) 1 x 3042/52/80 B-key (PCIe x2/USB 3.0/USB 2.0)	
	Module	Supports IEI eChassis Modules	2 x PCIe x8 expansion	
Storage		1 x 2.5" HDD/SSD bay (256GB SSD pre-installed)		
Power Input		12 ~ 28V DC		
Thermal Design		Fanless		
Operating Temperature		-20°C ~ 60°C with air flow (CPU TDP35W & SSD) -20°C ~ 50°C with air flow (CPU TDP65W & SSD)	-20°C ~ 60°C with air flow (SSD)	

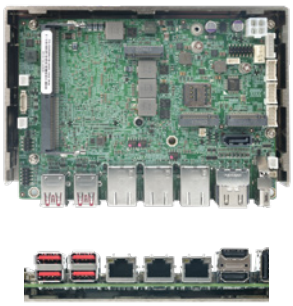
AI Accelerator

	Mustang-V100-MX4
Chipset	4 x Intel® Movidius™ Myriad™ X MA2485 VPU
Power Consumption	Approximate 15W
Operating Temperature	-20°C ~ 60°C
PCIe	Gen 2 x 2
Cooling method/ System Fan	Active fan

	Mustang-V100-MX8
Chipset	8 x Intel® Movidius™ Myriad™ X MA2485 VPU
Power Consumption	Approximate 25W
Operating Temperature	-20°C ~ 60°C
PCIe	x4
Cooling method/ System Fan	Active fan

*Specifications are subject to change without prior notice.

3.5" Single Board Computers



		WAFER-TGL-U	WAFER-JL	WAFER-EHL
Form Factor		3.5" SBC	3.5" SBC	3.5" SBC
Processor	CPU	4-core Intel® Core™ i7-1185G7E 4-core Intel® Core™ i5-1145G7E 2-core Intel® Core™ i3-1115G4E 2-core Intel® Celeron® 6305	4-core Intel® Celeron® N5105	Intel® Celeron® J6412
	Frequency/ Turbo Freq	1.80 GHz (up to 4.4GHz) 1.50 GHz (up to 4.1GHz) 2.20 GHz (up to 3.9GHz) 1.80 GHz	2.0 GHz (up to 2.9 GHz)	2.0 GHz (up to 2.60 GHz)
I/O Interface	Serial Port	2 x RS-232/422/485 (2x5 pin, P=2.0) 1 x RS-232 (2x5 pin, P=2.0)	2 x RS-232 (1x9 pin, P=1.25)	2 x RS-232/422/485 (1x9 pin, P=1.25)
	USB	4 x USB 3.2 Gen 2 Type A (10Gb/s) 2 x USB 2.0 pin header (P=2.0)	2 x USB 3.2 Gen 2 Type A (10Gb/s) 2 x USB 2.0 (2x4 pin, P=2.0)	2 x USB 3.2 Gen 2 Type A (10Gb/s) 4 x USB 2.0 (2x4 pin, p=2.0)
	LAN	3 x Intel® I225V 2.5G Ethernet	3 x Intel® I225V 2.5G Ethernet	2 x Intel® I225V 2.5GbE Ethernet
	SATA	1 x SATA 6Gb/s	1 x SATA 6Gb/s	1 x SATA 6Gb/s
	Display Output	Four independent displays: 2 x HDMI 1.4 (up to 4096 x 2160@30Hz) 1 x DP 1.4 (up to 4096 x 2160 @60Hz) 1 x IEI iDPM 3040 slot (for IEI eDP/LVDS/VGA module)	Dual independent displays: 1 x DP 1.4 (up to 4096 x 2160 @60Hz) 1 x HDMI 1.4 (up to 4096 x 2160@30Hz)	Triple independent display 1 x HDMI 1.4 (up to 4096 x 2160@30Hz) 1 x DP 1.4 (up to 4096 x 2160 @ 60Hz) 1 x IEI iDPM 3040 slot (for IEI eDP/LVDS/VGA module)
Expansion Slot		1 x 2230 M.2 A-key(PCIe Gen3 x1/USB 2.0 signal) 1 x M.2 B key (3052/2242) w/ SIM holder (PCIe Gen3 x2/USB 2.0 signal)	1 x M.2 2230 A key (PCIe Gen3 x1, USB 2.0) 1 x M.2 3042/2280 B key w/ SIM holder (PCIe Gen3 x2, USB 2.0)	1 x M.2 2230 A key for Wi-Fi & BT (PCIe Gen3 x1 / USB 2.0 signal) 1 x M.2 3042/2242 B key w/ SIM holder (PCIe Gen3 x2 / USB 2.0 signal) 1 x PCIe Gen3 x4 (x2 signal) (x2 or x1+x1)
Power Input		12V DC	12V DC	12V DC
Operating Temperature		0°C ~ 60°C with heatsink and air flow		-0°C ~ 60°C with heatsink and air flow

*Specifications are subject to change without prior notice.

Founded in 1997, IEI Integration Corp. is known as a leading solution provider committed to delivering advanced technology for edge computing, networking and healthcare IT. We offer edge-to-cloud solutions through a comprehensive technology-oriented portfolio of hardware, software, services and global logistics.With cutting-edge technologies plus more than 25-year industry knowledge and experiences, we deliver reliable and innovative products for a wide variety of mission-critical applications. We also offer professional customized design and manufacturing services from initial product conceptualization to after-sales support, enabling customers to benefit from time-to-market, high-quality products and the best fully integrated and fit-for-purpose applications.IEI prides our corporate value at continuous persistence on driving premium products and CSR commitment to uphold staff care, environmental protection, and social participation.

Website: www.ieiworld.com

Interested in learning more about hardwares for AMRs?

Reach out to IEI to start a conversation with one of our specialists.

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