



Case Study: AI in Food & Beverage Industry

(IPC974-519-FL, AX92320 & AX92352)

AI in Food Manufacturing

For today's food manufacturing companies to stay competitive, it is crucial to maintain both top quality output and optimal productivity. To make that happen, food manufacturing companies need to be able to automatically classify products and filter out defective items passing down the production line. The implementation of AI-enabled machine vision can significantly streamline and accelerate this inspection process. By integrating AI, automated optical inspection (AOI) can amplify its capabilities through deep learning to achieve unparalleled speed and accuracy, delivering consistently reliable results not possible with human or traditional rule-based vision inspection.

Challenges

An AI-enabled embedded vision system is required to make the next generation machine vision a reality. In order to scan massive numbers of product images in milliseconds and identify subtle features, the desirable system not only needs a high-performance Intel® Xeon® or Core™ processor, but also relies on a powerful GPU (Graphics Processing Unit) or VPU (Vision Processing Unit) accelerator to carry out automated defect inspection that is heavily dependent on image interpretation and deep learning technology. In addition, the system must integrate real-time vision I/O for connection to triggers and optical sensors and support multiple camera interfaces to accomplish various applications involving machine vision.

Main requirements

- High-computing GPU & VPU support
- High-performance Intel® Xeon® or Core™ processor
- Integrated real-time vision I/O
- Supports camera interfaces

Axiomtek's IPC974-519-FL Empowers AI Vision Inspection

Axiomtek has proposed its IPC974-519-FL – an edge AI-enabled machine vision platform leveraging powerful GPU/VPU computing – to address the needs across most automated visual inspections. Built specifically for AI-driven inspection and image analysis, the IPC974-519-FL not only provides multiple PCIe slots for adding GPU or VPU accelerator cards, but also supports the most popular software toolkits to make AI technology accessible right on the factory floor. It allows users to develop and perform deep learning applications – from image labeling to model training and inferencing – to accelerate flaw detection and product sorting processes, making sure every food item leaving the production line meets all quality and safety criteria. The IPC974-519-FL also incorporates Axiomtek's AX92320 frame grabber and AX92352 I/O card to provide vision I/O and camera interfaces required for real-time timing sequence control and multi-camera synchronization, enabling rapid deployment of machine vision inspection with minimal effort.

Key system features & components



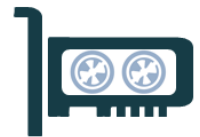
IPC974-519-FL edge AI machine vision platform



AX92320 frame grabber & AX92352 vision I/O card



High performance Intel® Xeon® desktop processor, up to 80W



4 expansion PCIe/PCI slots for AI accelerator cards



Huge data capacity with up to 4x 2.5" SATA drives



Multi-camera interfaces



Wi-Fi & 4G LTE via PCI Express Mini Card

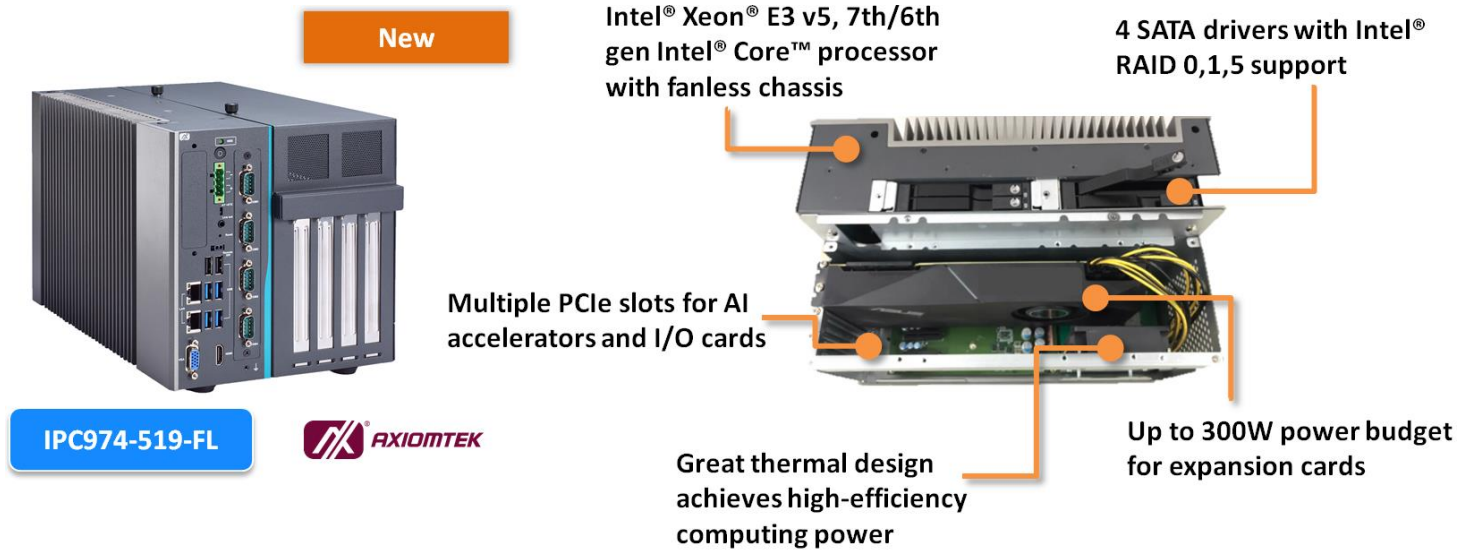


I/O connectivity sensors



Software compatibility for AI model training & inferencing

IPC974-519-FL AI training and inference system

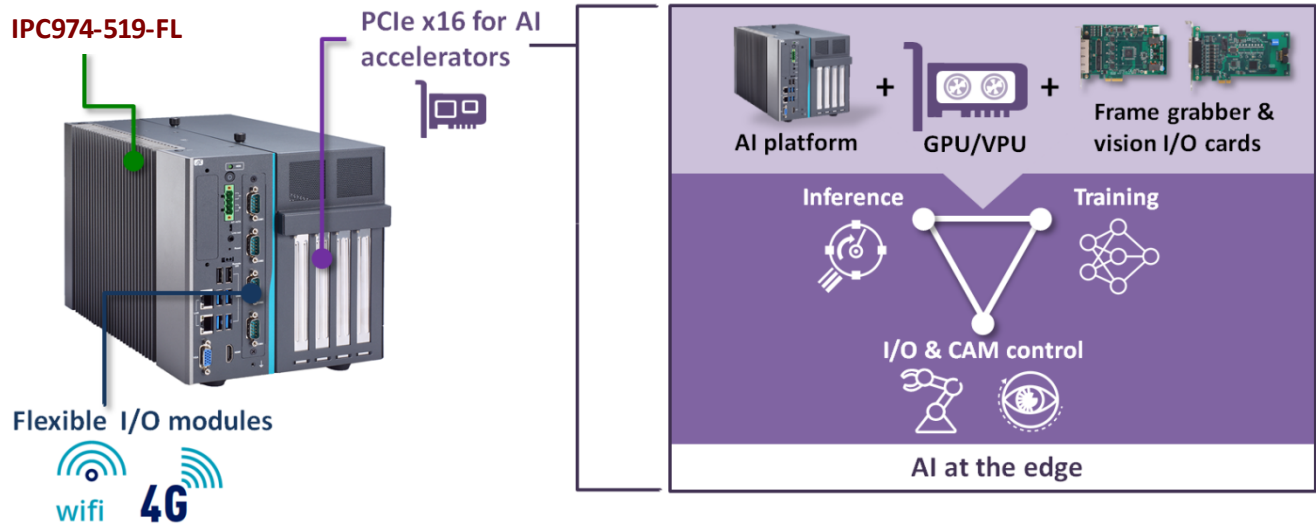


Application: How IPC974-519-FL Facilitates Vision Inspection with AI

The IPC974-519-FL enables AI-based inspection by allowing manufacturers to perform deep learning training and inference tasks to increase inspection speed and accuracy:

1. Users can train the IPC974-519-FL to identify specific images by performing the tasks of image labeling and model training, or use pre-trained models to perform inferencing directly on image data. The IPC974-519-FL provides a unified user interface to simplify application development and control.
2. By running inferencing on captured images or real-time video feeds, the IPC974-519-FL helps to catch defects and irregularities such as surface cracks or broken seals, or sort products by size or quality.
3. Based on inference results, the vision system determines a product's pass/fail status and triggers robotic arms or other actuators to eject defective items from the production line.

The diagram below illustrates how the IPC974-519-FL combines edge AI and machine vision elements to enable food & beverage inspection with greater speed and precision:



System Configurations – IPC974-519-FL

AI Platform with Intel® Xeon® E3 v5, 7th/6th Gen Intel® Core™ Processor



- Supports GPU & VPU (up to 300W TDP)
- Supports Intel® RAID 0,1,5
- -10°C to +70°C operating temperature range
- Supports 4 expansion slots for full-size add-in cards
- Dual-View: VGA, HDMI
- Industrial-grade quality & robust chassis design
- Supports system power on delay function
- Optional system fan
- Wide operating temperatures -10°C to 70°C

*For detailed specifications, visit www.axiomtek.com and go to: [Products > Systems & Platforms > Industrial PC > Industrial System > IPC974-519-FL](#).

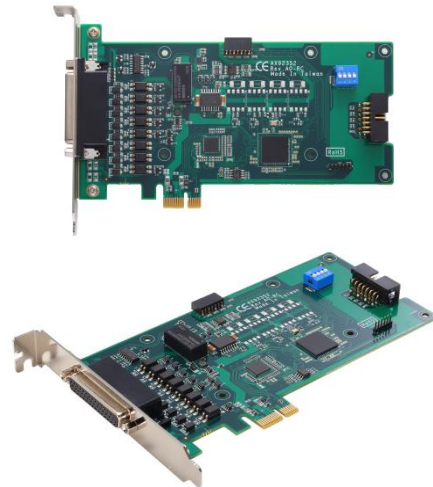
System Configurations – Frame Grabber & Vision I/O Cards



AX92320

2/4-port PCI Express GigE Frame Grabber Card

- PCI Express x4 compliant
- 2 or 4 independent Gigabit PoE ports
- Supports 9.5KB Jumbo Frame and IEEE 1588
- Compliant with IEEE802.3at to deliver 30W at 54 VDC per port; up to 20/120W PoE power from PCIe 6-pin ATX power connector
- 0°C to +60°C operating temperature range
- PoE power management software
- Supports LAN port smart on/off



AX92352

2-CH Encoder Card with Real-time Trigger I/O

- Synchronizes devices via real-time I/O
- Applicable to area scan and line scan applications
- Integrates multiple I/O:
 - 2-CH 32-bit incremental quadrature encoder input
 - 4-CH trigger input
 - 4-CH trigger output
 - 8-CH isolated DI, 8-CH isolated DO
- Programmable interrupt functions
- PCI Express x1 compliant

About Axiomtek Co., Ltd.

Axiomtek has experienced extraordinary growth in the past 30 years because of our people, our years of learning which resulted in our tremendous industry experience, and our desire to deliver well-rounded, easy-to-integrate solutions to our customers. These factors have influenced us to invest in a growing team of engineers including software, hardware, firmware and application engineers. For the next few decades, our success will be determined by our ability to lead with unique technologies for AIoT and serve our key markets with innovatively-designed solution packages of hardware and software – coupled with unmatched engineering and value-added services that will help lessen the challenges faced by our systems integrator, OEM and ODM customers and prospects alike. We will continue to enlist more technology partners and increase collaborations with our growing ecosystem who are leaders in their fields. With such alliances, we will create synergy and better deliver solutions, value and the expertise our customers need.

Axiomtek is a Member of the Intel IoT® Solutions Alliance. A global ecosystem of more than 800 industry leaders, the Alliance offers its Members unique access to Intel technology, expertise, and go-to-market support—accelerating deployment of best-in-class solutions.