



Edge AI + Industrial Cybersecurity: A New Blueprint for Autonomous and Resilient Factories

White Paper

Industrial automation is undergoing a structural shift driven not only by technology, but by the operational realities manufacturers face today. Instead of simply extending the Industry 4.0 framework, the next phase requires a more adaptive, resilient, and intelligence-first approach - one built around **Edge Autonomy**, **Secure Connectivity**, and **Human-centered Orchestration**. This is where MiTAC sees the future of industrial digitalization taking shape.

For global manufacturers, challenges no longer revolve solely around throughput or machine utilization. Modern factories must withstand volatile supply chains, workforce constraints, cybersecurity threats, and expanding quality demands. Traditional centralized architectures struggle under these pressures. What industries need now is the ability for machines, sensors, and vision systems to make reliable, instant decisions *on the factory floor*, independent of cloud latency or connectivity risks.

MiTAC's edge computing and AI platforms are designed precisely for this reality. By bringing high-performance AI inference, rugged system design, and secure industrial computing directly to the production line, MiTAC enables manufacturers to establish a new layer of operational intelligence at the edge. This architecture empowers real-time quality inspection, autonomous machine response, adaptive process control, and predictive maintenance—without compromising determinism, safety, or long-term system reliability.

Our experience across factory automation, transportation, and smart city infrastructure has shown that industrial transformation is ultimately a convergence of three priorities:

1. **Resilience** — systems must continue operating securely under harsh conditions and cyber threats.
2. **Intelligence** — AI must be deployable where decisions occur, not only in centralized data centers.
3. **Scalability** — solutions must unify hardware reliability with software flexibility to support years of field evolution.

MiTAC differentiates itself by integrating these priorities into a holistic Edge AI ecosystem: from compact vision controllers to rugged AI servers with multi-GPU capability and secure-by-design firmware aligned with IEC 62443 practices. This combination allows customers to modernize automation at their own pace—keeping existing equipment operational while introducing new layers of intelligence and cybersecurity readiness.

Rather than viewing Industry 5.0 simply as an upgrade, MiTAC sees it as a practical blueprint for industrial organizations seeking measurable improvements in uptime, quality, and workforce enablement. By merging rugged edge computing with AI-driven automation, MiTAC helps enterprises transition from reactive operations to **Proactive, Autonomous, and Future-ready industrial Ecosystems**.

Accelerating Intelligent Automation at the Industrial Edge

At MiTAC, we believe the industrial edge has become the decisive frontier for automation. Modern factories demand computing platforms that are not only powerful, but also secure, highly reliable, and adaptable to fast-evolving production environments. With decades of experience in industrial computing and a strong engineering foundation across Taiwan, China, and Vietnam, MiTAC designs edge systems that enable manufacturers to deploy AI-driven intelligence exactly where it matters: at the point of operation.

Engineered for Real-Time Edge Intelligence

MiTAC's approach centers on delivering balanced, application-ready computing platforms that combine high-performance CPU/GPU architectures with rugged industrial design principles. From multi-camera machine vision workloads to predictive maintenance and autonomous robotics, MiTAC systems are purpose-built to support real-time AI inference with consistent thermal performance, stable communications, and a deterministic response under harsh industrial conditions.

MiTAC's edge platforms also emphasize long-term lifecycle support, wide-temperature tolerance, high-reliability components, and flexible I/O configurations—ensuring customers can scale automation capabilities without disruptions to existing infrastructure.

Security and Reliability by Design

In modern industrial environments, operational continuity is inseparable from cybersecurity. MiTAC incorporates secure-by-design development practices aligned with IEC 62443 principles, enabling customers to deploy automation solutions that maintain integrity throughout their entire lifecycle. Through controlled firmware development, structured SBOM management, and vulnerability-response processes, MiTAC helps customers build future-ready automation environments grounded in cybersecurity resilience.



A Cohesive Product Ecosystem for Industrial Automation

Rather than offering isolated hardware products, MiTAC provides a cohesive ecosystem engineered to address multiple layers of industrial automation - from field-level sensing to high-performance edge servers. Our portfolio spans three major pillars:

- **Compact Edge Controllers and Embedded IPCs**
Ultra-reliable, space-efficient systems ideal for integrating AI vision and machine control directly into production lines.
- **Rugged Edge AI Platforms & GPU-Accelerated Systems**
High-performance platforms capable of supporting multi-camera inspection, robotics, and low-latency decision-making at the edge.
- **Industrial Panel PCs and Human-Machine Interfaces**
Designed for factory-floor deployment with hardened enclosures, touch-ready interfaces, and compatibility with MES/SCADA systems.

Each family is built with flexibility in mind - supporting customizable I/O, modular expansion, and industrial-grade power and thermal design - allowing customers to deploy systems tailored to their specific automation goals.

Practical Intelligence for Real-World Industrial Challenges

Whether enabling real-time machine vision, digitalizing legacy equipment, or powering AI-enabled robotics, MiTAC's mission is to provide manufacturers with platforms that improve uptime, enhance quality, and accelerate their path toward autonomous industrial operations. With a commitment to reliability, security, and global manufacturability, MiTAC helps customers build smarter, more resilient, and future-proof automation ecosystems.



MZ1 for SMT/PCBA Machine Vision: Stable, Zero-Downtime Edge AI Inspection

Application Scenario: AOI (Automated Optical Inspection) on SMT/PCBA Lines

High-speed SMT production requires precise inspection of component placement, solder quality, and alignment. The customer sought to enhance AOI accuracy with **AI-based machine vision**, but needed a controller capable of 24/7 stable operation near reflow ovens, in environments with dust, fumes, and vibrations.

How the MiTAC MZ1 Solves the Challenge

The MiTAC MZ1 Industrial Computer integrates:

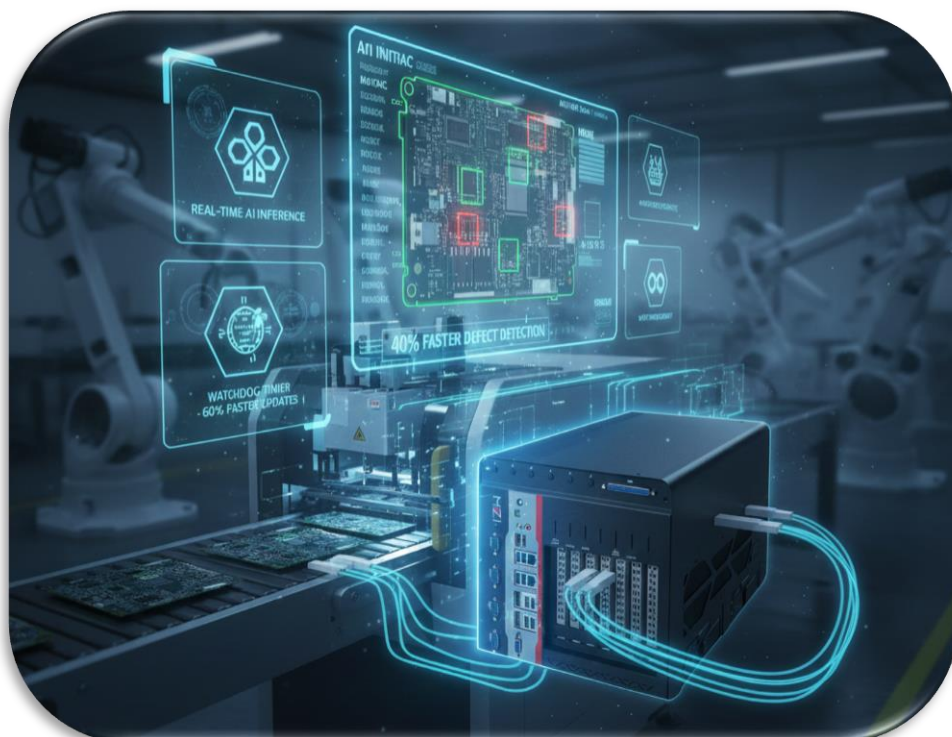
- **12th/13th/14th Gen Intel® Core™ processors up to 125W** for real-time AI inference
- **Multiple USB 3.2 and 2.5GbE ports** for high-speed industrial cameras
- **9-48V wide-range DC input** for seamless integration into SMT equipment
- **Fanless, wide-temperature design (-40°C ~ 70°C)** for harsh production zones
- **Watchdog Timer (WDT)** to prevent system freeze and production stoppage
- **TPM & secure boot** for equipment cybersecurity

Deployment Outcome

A major ODM integrated the MZ1 into its AOI stations:

- **85% reduction in unplanned downtime** due to WDT protection
- **40% faster defect detection** from edge inference
- AOI program updates completed **60% faster** via USB 3.2
- System remained stable despite heat, dust, and long operating hours

The MZ1 delivered the reliability, bandwidth, and ruggedness required for next-generation SMT inspection.



PD10ANI for Smart Logistics: Real-Time Computing for AMR/AGV Navigation

Application Scenario: Autonomous Mobile Robots (AMR) in Warehouses

A logistics operator needed a compact, low-power edge controller to handle SLAM, obstacle detection, sensor fusion, and real-time decision-making. Traditional IPCs were too large or power-hungry to be embedded in AMR chassis.

How the MiTAC PD10ANI Solves the Challenge

The **PD10ANI (Intel® Alder Lake-N)** provides:

- **Fanless, wide-temperature operation** for indoor/outdoor storage areas
- **Ultra-compact Thin Mini-ITX form factor**
- **2 LAN ports (2.5GbE)** for synchronous multi-sensor inputs
- **Rich I/O: COM, USB, DIO** supporting IMU, LiDAR, ToF, cameras
- **8–24V DC input** compatible with AMR battery systems
- **Low power consumption design** enabling longer battery runtimes
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Deployment Outcome

A smart logistics center adopted PD10ANI for its AMR fleet:

- **32% lower navigation latency** thanks to 2.5GbE LAN
- **12% longer battery life** from low-power architecture
- Indoor localization accuracy improved from **±10 cm to ±3 cm**
- Fleet uptime reached **98.7% annually**

PD10ANI became the preferred embedded controller for OEM AMR/AGV platforms seeking compactness and reliable real-time performance.



P210-11TGS for Smart Factory HMI + SCADA: Enhancing Operator Efficiency

Application Scenario: HMI and SCADA Interfaces in Automotive Parts Manufacturing

The customer required a rugged HMI + SCADA front-end panel for production lines with heavy oil mist, vibration, glare, and constant operator interaction. The device needed to handle edge analytics while providing a clean, durable, and responsive interface.

How the MiTAC P210-11TGS Panel PC Solves the Challenge

The **P210-11TGS Industrial Panel PC** offers:

- **11th Gen Intel® Tiger Lake-UP3 Core™ Processor** for HMI visualization + local analytics
- **IP65 front panel** for dustproof and waterproof operation
- **Anti-glare, glove-friendly touchscreen** for harsh lighting and PPE usage
- **Multiple LAN / COM / USB ports** for PLC and sensor integration
- **Flexible mounting: VESA & panel-mount**
- **Industrial shock/vibration resistance** for machine-side installation
- **Long-lifecycle industrial components** suitable for mass deployment
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Deployment Outcome

A Tier-1 automotive supplier deployed more than 40 units:

- **28% reduction in operator errors** due to improved touchscreen and visibility
- **35% faster response to production events** via edge analytics + SCADA
- **50% lower maintenance effort** (IP65 front panel allows easy cleaning)
- **>99% system uptime** across the entire facility

The P210-11TGS significantly improved the factory's operational efficiency and human-machine collaboration.



MiTAC Edge AI: Secure, Rugged, and Ready for the Next Era of Industrial Automation

MiTAC is driving the next phase of industrial automation by bringing real-time intelligence to the edge. As factories evolve beyond traditional Industry 4.0 models, manufacturers need rugged, AI-ready systems that can operate reliably under harsh conditions while supporting secure digital transformation.

With decades of industrial computing expertise and a global manufacturing footprint, MiTAC delivers edge platforms designed for machine vision, predictive maintenance, AMR/AGV control, and smart factory modernization. Our systems combine fanless wide-temperature engineering, long-life components, and flexible I/O to ensure consistent performance on the production floor.

Security is built into every stage of development. MiTAC follows **IEC 62443-4-1–aligned secure-by-design practices**, ensuring that our firmware, lifecycle processes, and software architecture support the cybersecurity resilience required by modern industrial networks. From compact embedded controllers to high-performance edge AI servers and industrial panel PCs, MiTAC enables manufacturers to achieve higher uptime, better quality, and scalable automation capabilities. These technologies also power applications across transportation, energy, and smart city infrastructure - wherever real-time intelligence must meet industrial reliability.

MiTAC continues to advance industrial automation with secure, rugged, and future-ready Edge AI solutions that help enterprises move confidently into the next era of autonomous and sustainable operations.



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