



Alpha X

**MAKE
MANUFACTURING
MORE
INTELLIGENT**



www.alphaxtec.com



About Us

Alpha X is an innovative technology company specializing in the integration of advanced automation and AI-driven solutions to improve traditional semiconductor manufacturing processes.

What We Deliver

Our core offerings include **CIM software tools** like Equipment Automation System (EAS) to manage, monitor, and optimize factory operations by integrating various production systems, and logistics automation through **Automated Material Handling System (AMHS)**. We also provide **AI-driven solutions** such as A^x Insights (chat-based business intelligence system) and AI FDC for prediction fault detection.

Complementing these technologies, our CIM consulting and implementation services help factories accelerate their digital transformation journey.

Looking ahead, Alpha X is investing in **R&D and strategic acquisitions** to merge AI with automation. Our aim is to develop AI-powered tools like equipment chatbots and virtual expert systems that enable real-time support and smarter operations.

We envision building **industry-specific AI platforms** that lead the next wave of manufacturing intelligence through developing vertical AI models and retrieval-augmented generation (RAG) systems. By creating a fully integrated IT/OT/DT ecosystem, we aim to



Make Manufacturing More Intelligent



Our Unique Proposition



Deep Industrial Know-How

Gain deep insights into real-world use cases, from factory modeling and production tracking to equipment automation, process control, and preventive maintenance.



Top-tier Delivery Capabilities

Our systems deliver industry-leading speed, reliability, and precision. Ensuring on-time execution and exceptional quality every time.



R&D Prowess

Our team brings deep industry expertise from leading firms like IBM, Daifuku, Cisco, Applied Materials, and TSMC.



AI Driven Manufacturing

We develop our core software and hardware in-house, backed by exclusive patents that showcase our innovation and proprietary technology.

Our Key Offerings

CIM - INDUSTRIAL SOLUTIONS



MES: Manages WIP, recipes, lot tracking, equipment status, production rules

EAS: Interfaces with tools to collect data and execute MES commands

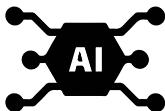
FDC: Detects equipment faults and process deviations using sensor data

RTD: Intelligently schedules and routes wafer lots to optimize throughput

YMS: Analyzes test data to trace yield loss across lots, tools, and steps

EMS: Monitors and optimizes fab-wide energy and resource consumption

AI-DRIVEN SOLUTIONS

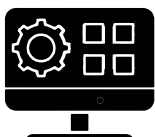


Leverages real-time equipment data and AI algorithms to provide manufacturing know-hows, optimize process operations and AI-assisted decision making.

A^x Insights

AI FDC

LOGISTICS AUTOMATION



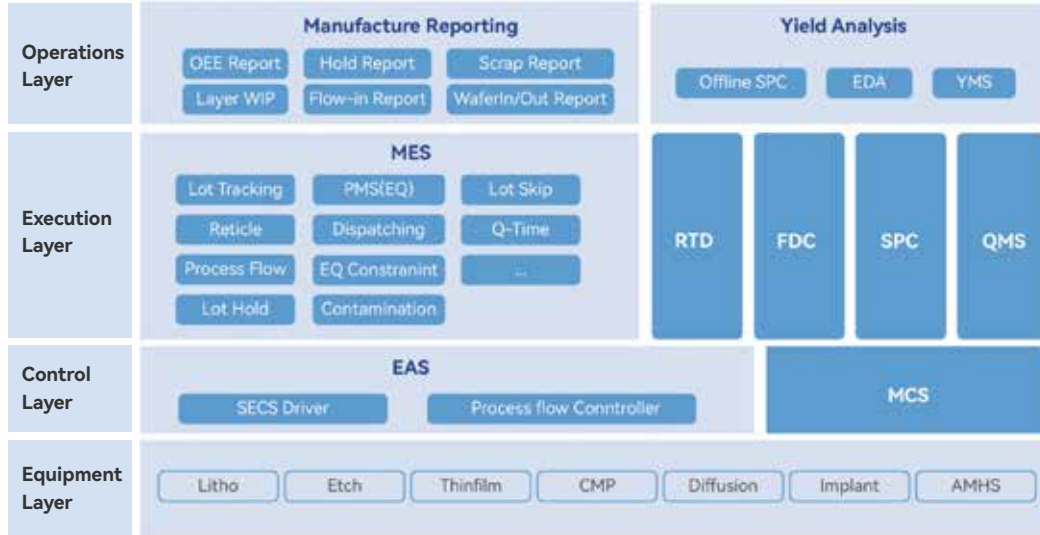
Developed several competitive and mature products in the areas of **logistics**

automation and material transfer (AMHS), with proven capabilities that have been widely recognized by the semiconductor industry.



Bridging the Gap: From “Experience-Driven” to “AI-Powered Intelligence”

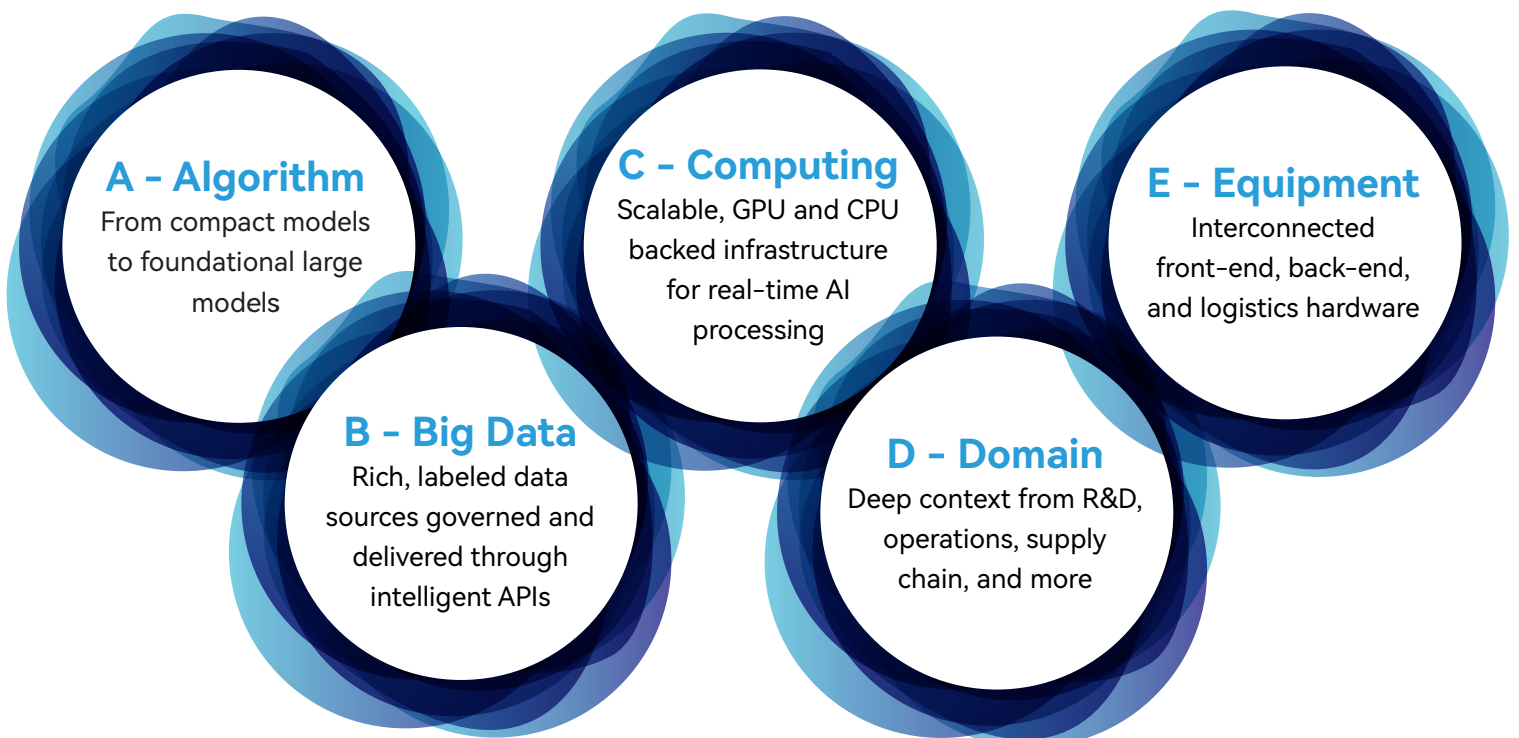
CIM Architecture

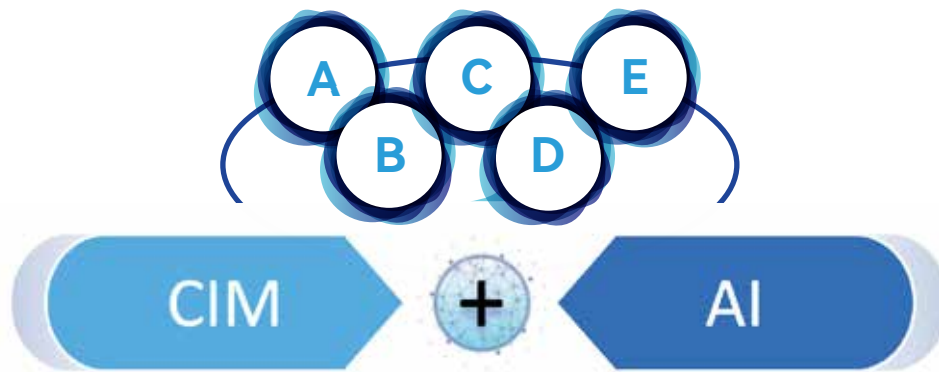


Traditional CIM systems have long relied on “**experience-driven**” models, decisions shaped by human intuition, manual workflows, and retrospective analysis. But as the industry accelerates into an era of complexity, scale, and precision, this model is no longer sustainable.

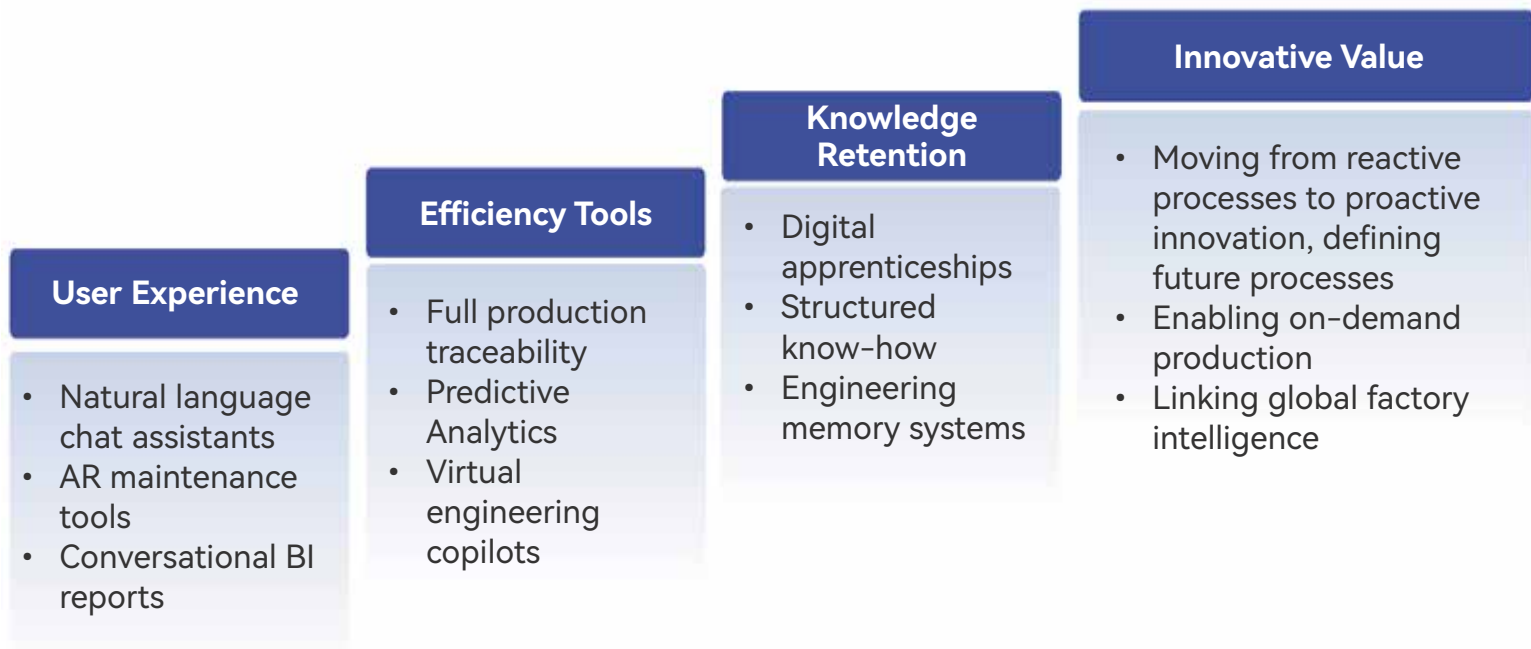
Urgency for Transformation

To leap across the widening gap in **AI application deployment**, fabs must adopt a modern framework that is **data-driven and AI-enabled**. This requires integrating **ABCDE capabilities**:





The Shift of CIM in Semiconductor Manufacturing from “Experience-Driven” to “Data-Driven with AI Enablement”



With the shift to “**Data-Driven with AI Enablement**”, the future of semiconductor manufacturing lies not just in smarter machines, but in **smarter decisions**. It’s time to close the gap between potential and performance by transforming CIM with the **power of AI**.



A^X EAS (Equipment Automation System)

In today's fast-paced semiconductor fabs, every second matters. Machines must operate with precision, speed, and transparency. This is where Alpha X's **Equipment Automation System (EAS)** steps in. Designed as a future-ready platform, EAS transforms traditional tool control into a smart, integrated experience, delivering real-time monitoring, automated control, and predictive insights across your equipment fleet.

Challenges in Semiconductor Manufacturing



Fragmented Equipment Communication



Lack of Real-Time Equipment Visibility



High Downtime & Maintenance Costs



Inconsistent Process Control & Decision-Making

Semiconductor fabs often face fragmented equipment communication, delayed visibility into machine status, high unplanned downtime, and inconsistent process control. These issues stem from **legacy systems** that can't keep up with the complexity and pace of modern manufacturing. Without a unified, intelligent equipment layer, factories risk bottlenecks, yield loss, and high maintenance overhead.

How A^X EAS Delivers Value

Connectivity

Machine Communication Integration

- Supports both SECS and non-SECS equipment
- Compatible with data files (STDF), GPIB, and PLC
- Enables fast and reliable tool communication
- Collects high-speed trace and equipment data efficiently



Convergent

Machine Event Flow Mapping

- Automatically processes equipment event data
- Interprets and calculates equipment data
- Integrates with CIM systems like MES, RMS, PMS, FDC
- Keeps detailed equipment history records



Cognitive

Know-How Configuration & Deployment

- Configurable equipment modeling workflows
- EAS admin tools for user access, data security, and recovery
- Ready-to-use equipment knowledge templates
- Predictive maintenance with Remaining Useful Life (RUL) estimation
- Detects equipment abnormalities early



Conversation

Human-Machine Digital Integration

- Real-time view of equipment status and events
- Digital Twin to simulate equipment processing
- User interface for tasks like material loading and mode changes
- Virtual Reality for machine operations, maintenance, and troubleshooting

AX EAS is more than a control system, it is a digital backbone for intelligent manufacturing. This means **lower downtime, faster troubleshooting, improved process control**, and a smarter path to factory efficiency.



Case Study 1 - Materials manufacturer headquartered in Japan Integrate EAS into MES for seamless automation

Project Description

Alpha X's EAS offers a user-friendly interface for IT and production teams to monitor equipment remotely, reducing physical floor checks. With deep MES expertise and a strong local team, we achieve faster deployment, completing the first integration in just over a month, versus the typical three. Our approach streamlines operations and enhances visibility through a real-time equipment dashboard.

Challenges

Client's existing setup relies on outdated IBM ECS and customized local vendor software with limited functionality.

Scope of Work

- Automating client's new equipment using EAS and integrating it with their MES system.
- Provides end-to-end support, ensuring efficient implementation, seamless integration, and long-term optimization of client's production operations.

Case Study 2 - France-based semiconductor materials company Enhancing manufacturing processes through advanced automation and application modernization

Project Description

The project aims to secure recipe management to improve process quality, support equipment automation requests to boost operational productivity and efficiency and develop a new application to replace outdated Vendor CIMS systems.

Additionally, the project involves maintaining and supporting ongoing and incoming CIMS applications.

Challenges

Success will require navigating resource and knowledge constraints, particularly around our client's internal systems and vendor applications.

Close coordination with both internal teams and external partners will be critical to ensure smooth execution.

Scope of Work

- Manage recipes and automate setup for new tools
- Handle equipment automation and integration support
- Upgrade Siview from R18 to R24
- Build an app to expose R24 Siview API logic
- Migrate legacy CIMS to .NET 8
- Coordinate project tasks across vendors

A^x Insights

In today's semiconductor factories, where complexity is rising and time-to-decision is shrinking, access to real-time, actionable insights is no longer optional. **A^x Insights**, developed by our R&D team, is Alpha X's next-generation, chat-based business intelligence platform that turns natural language queries into powerful data-driven decisions. Built on advanced NLP and LLM technologies, users can simply ask questions and receive instant visualizations, analytics, and recommendations with no coding or technical expertise required.

Challenges in Semiconductor Manufacturing

Semiconductor fabs generate massive volumes of data from yield, equipment logs, traceability systems, and AOI images. However, traditional reporting systems are static, slow to adapt, and rely heavily on manual effort. This results in **siloe insights, delayed problem-solving, and a growing dependence** on specialists. For companies with shifting product lines like OSATs, transferring domain knowledge is also a persistent challenge. Without a flexible and intelligent system, identifying root causes of yield loss becomes time-consuming and inconsistent.

How A^x Insights Delivers Value

A^x Insights changes the game by unifying diverse data sources into one intelligent platform. Users can **instantly query yield trends, trace defects, or compare tool performance** through plain-language questions. The system dynamically **generates dashboards** based on user roles, enabling customized views for engineers, QA teams, or management. Its ChatYMS module goes further by **enabling deep yield analysis** through statistical methods like ANOVA and Commonality, helping users **quickly identify root causes of low yield and equipment-related anomalies**. A^x Insights also preserves expert know-how by building AI assistants that replicate decision logic and ensuring knowledge is not lost over time.

Case Study - Optical solutions company

Empowering OSAT Efficiency with Chat-Based Analytics

Project Description

An OSAT (Outsourced Semiconductor Assembly and Test) company aimed to modernize its yield analysis capabilities using A^x Insights.

Challenges

The company's current reporting system could only generate static yield reports, lacking root cause analysis capabilities.

As an OSAT with varied products, it faced difficulties in transferring expert knowledge, leading to high training costs. Limited data utilization and high system maintenance further hindered efficiency.

Scope of Work

- Implemented A^x Insights to unify and analyze Yield, Traceability, and AOI image data
- Enabled dynamic dashboard generation using NLP/LLM based on user roles
- Developed AI assistants to preserve and apply expert knowledge
- Integrated with existing systems for both co-driving and independent analysis



A^X AI FDC

In semiconductor manufacturing, unexpected equipment faults can lead to costly downtime, scrap, and delays in production. Traditional fault detection systems rely heavily on static thresholds and manual configuration, limiting their responsiveness to real-time changes. **Alpha X's AI FDC**, developed by our R&D team, redefines fault detection by integrating machine learning and deep learning to deliver a fully adaptive, intelligent system that evolves with your production environment.

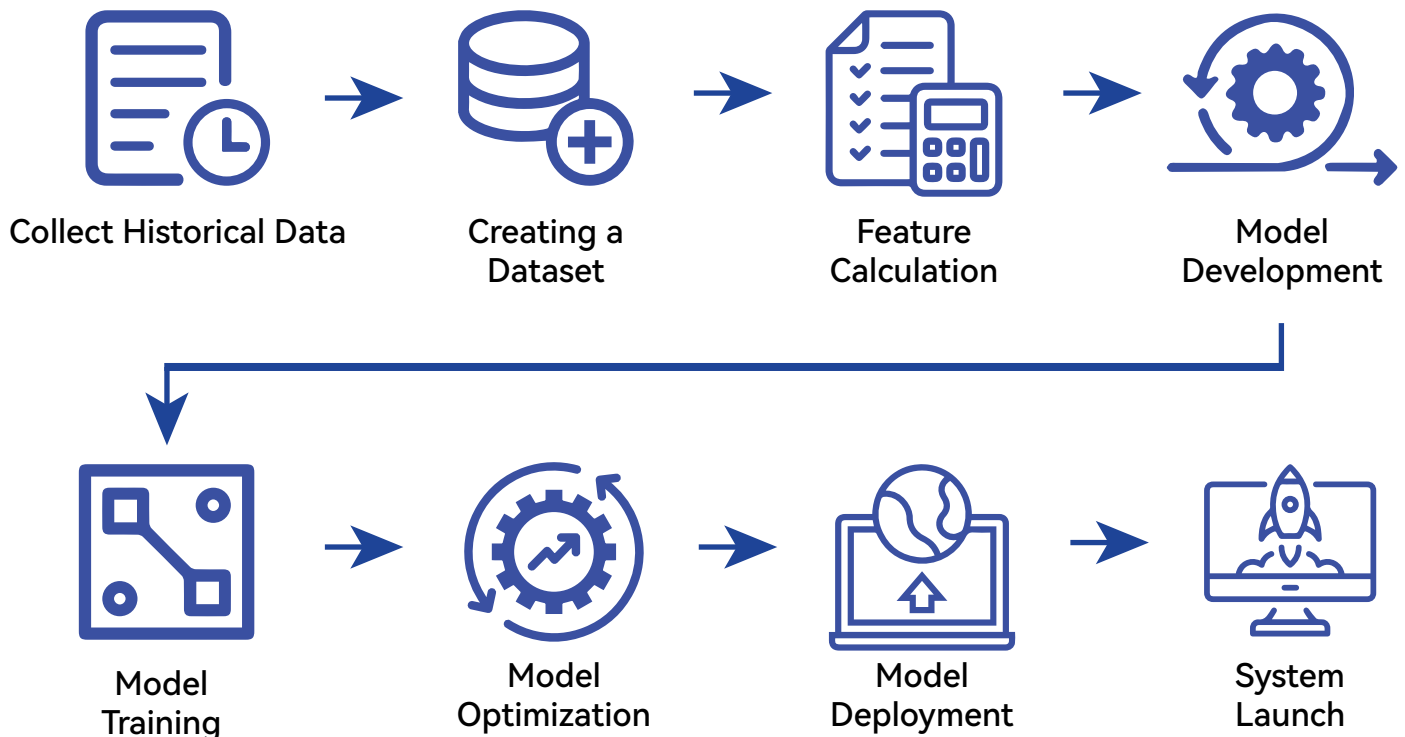
Challenges in Semiconductor Manufacturing

Traditional FDC systems struggle to keep pace with the dynamic nature of modern fabs. They often require manual sensor selection, rule setting, and constant tuning to remain effective, making them resource-intensive and slow to adapt to new tools or processes. As a result, fault detection may be inaccurate or delayed, leading to unplanned downtime, excessive maintenance, and lost yield. Manufacturers need a solution that can respond in real time, scale across tools, and reduce dependence on expert intervention.

How A^X AI FDC Delivers Value

AI FDC automates the entire fault detection workflow without human intervention. By **combining non-parametric AI models with parameterized analysis**, it dramatically improves fault classification accuracy. Its **self-learning engine** continuously adapts to shifts in process and environment, identifying root causes and calculating impact factors in real time. This proactive approach not only flags issues early but also enables **predictive maintenance, reducing downtime and extending equipment life**.

A^X AI FDC Delivery





Logistics Automation

In the highly automated world of semiconductor manufacturing, every wafer transfer must be precise, clean, and fast. Alpha X's **Automated Material Handling System (AMHS)** forms the backbone of smart fab logistics, powering seamless material flow across front-end and back-end facilities. With an integrated suite of high-performance **Overhead Hoist Transport (OHT) systems, Stockers and EFEM modules**, Alpha X delivers the infrastructure that keeps fabs running at top speed, 24/7.

Challenges in Fabs

Modern fabs face serious challenges: rising labor shortages, tighter cleanliness requirements, and the need for high-throughput, low-error production. Front-end fabs increasingly view OHT as essential infrastructure, but **back-end fabs** face additional hurdles, such as limited ceiling height, non-standard carriers, and stricter cost constraints. Meanwhile, manual handling continues to introduce inefficiencies and variability that hurt yield and productivity.

How Alpha X AMHS Delivers Value

Alpha X's OHT system offers **high speed, high efficiency transport** ideal for cleanroom environments, intelligently routing carriers across bays and zones with minimal human intervention. In parallel, our EFEM solutions ensure precision wafer handling at the tool level, verifying, aligning, and transferring wafers with robotic accuracy. Smart Stockers provide real-time storage and retrieval, keeping operations agile and responsive to fab dynamics.

What sets Alpha X apart is our **full-stack automation approach**. We don't just supply hardware, we integrate it with intelligent software (EAS, RTD, FDC) to deliver end-to-end material flow visibility and control. This results in improved tool utilization, fewer handling errors, and higher throughput. For back-end fabs, **our thin-profile OHT and modular AMHS designs** ensure cost-effective deployment.

By merging logistics, equipment control, and predictive intelligence, Alpha X AMHS transforms material movement from a cost center into a competitive advantage.

OHT Models



AF1100

Carrier Type: 12" FOUP, 6"/8" SMIF Pod
Application Scenarios:
Front-end and back-end processes
(e.g. bumping, TSV etc)



AM690

Carrier Type: Magazine
Application Scenarios: Back end processes (e.g. die or wire bonding)



AM490

Carrier Type: Magazine
Application Scenarios: Back end processes (e.g. die or wire bonding)



Material Storage System (Stocker)

The stocker is designed to store carriers like FOUPs and SMIF Pods, featuring a continuous structural design to **enhance shock resistance and storage density**. It offers intelligent space management, reducing retrieval time and improving conveyor efficiency. Alpha X can customize the stocker's size based on the layout to optimize Fab space utilization.

Stocker

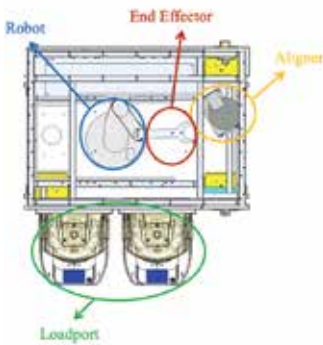


Tower Stocker



The Tower Stocker is used for material transfer and storage across floors, and can move magazines across floors with a Crane. Each floor can be connected to the overhead hoist transport system via Auto Port /Convey for material handling between different floors.

EFEM (Equipment Front End Module)



The Equipment Front End Module (EFEM) is a key interface between the wafer carrier and semiconductor processing equipment. It typically includes load ports, aligners, robotic arms, and end-effectors. EFEM's primary functions are to retrieve wafers from carriers, identify and align each wafer, transfer them precisely to the tool, and return them to the carrier after processing.

Aligners



AGE-03-A0	ASG-02-B0	AGG-11-A0	ASG-02-A0	AGG-01-A0	ATE-03-A0	AVS-14-A0
12" Wafer	8" Wafer	6"+8" Wafer	8" Wafer	6" Wafer	12" Wafer	6"+8"+12" Wafer
Gripper	Gripper	Gripper	Gripper	Gripper	Gripper& Vortex	Vacuum

Aligners are critical components within EFEM (Equipment Front End Modules) used to precisely position wafers before they enter processing equipment. Their main function is to verify the wafer's orientation and alignment, ensuring that the wafer notch or flat is correctly positioned according to tool specifications.



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