

Critical Manufacturing MES V10 for Electronics

Expect more from your MES

# A future-ready MES runs a smart factory: expect more

As electronics have become an integral part of almost every product, the demand for electronic components, SMT processing, and PCBs have become a core global industry. This can cause several specific challenges for the industry, including supply chain constraints, variable demand, shrinking margins, and shortened product life cycles.

Your MES must provide complete command and control to drive factory floor production in real-time to meet every possible condition. The key to an MES for electronics manufacturing is flexibility with end-to-end traceability, shop floor connectivity, and real-time shop floor visibility.



#### Expect more from your MES

The Gartner Critical Capabilities report places Critical Manufacturing as the number one MES solution for repetitive/ batch flow complex discrete manufacturing and as a leader in the Magic Quadrant. Critical Manufacturing MES is the best-in-class, most comprehensive top-tier Manufacturing Execution System solution for electronics manufacturing and is easier to use than ever before. It will advance your digital transformation to the next level with Industry 4.0 ready outof-the-box modules to drive quality control, traceability, and superior material management. From material incoming through SMT, assembly, and finished goods, it offers real-time visibility across manufacturing operations with an advanced IoT data platform and connectivity, so you know the status of the shop floor with data on actual performance in real-time. The Critical Manufacturing MES is the market-leading solution with a selection of pre-integrated modules and an advanced architecture for cloud, on-prem, or hybrid deployment.

#### Meeting your needs at every phase

Electronics and SMT Manufacturing is a complex operation involving people, materials, machines, and enterprise-level infrastructure. Increasing complexity in product designs with the reduced size of SMDs and higher PCB component density, changing customer requirements and demand, and components shortage present additional pressure on manufacturers while they strive to increase quality and reduce production costs. Critical Manufacturing MES integrates shop floor information and functionalities into a single source of truth for contextualized manufacturing data to make informed strategic business decisions. When you expect more from your MES, it will support your entire operation with real-time performance data and help identify issues and solve problems before they impact production.

# Why Critical Manufacturing MES

Critical Manufacturing MES is recognized as a top-tier manufacturing solution in both the Gartner Magic Quadrant and the Critical Capabilities Report.

#### Complete end-to-end traceability

As products become more complex, so does supply chain management and the ability to track all the components that go into end products. Traceability becomes essential for customer satisfaction and regulatory compliance, warranty claims, recalls, and other customer-oriented activities. As Critical Manufacturing MES guides each production step, it offers complete end-to-end traceability and genealogy by the individual batch, lot, serialized unit, and reference designator.

#### Manage product variation with quality control

With many products that have multiple configurations, managing quality is a challenge. Sampling is a cost-effective method to ensure that products meet quality and performance expectations. Critical Manufacturing MES enables users to define sampling plans by product or batch, how many materials to test/inspect, and how often by defining time- and counterbased, dynamic, and static sampling plans.

### Shop floor integration and connectivity

A modern electronics manufacturing facility generates large volumes of data through multiple disparate operating systems, equipment, and IoT sensors. However, little information is realized without a strong platform to organize and contextualize the data for analysis and performance improvement. The Critical Manufacturing MES offers connectivity with enterprise systems, SMT lines, or other equipment, harmonizing this varied data and putting it into context as information ready for analysis generates valuable insights.

#### Real-time shop floor visibility

Shopfloor visibility speeds up the troubleshooting process by providing teams with the necessary information and documentation – anywhere, anytime, and on a wide range of devices, reducing human errors and improving OEE. Critical Manufacturing MES enables real-time enterprise-wide visualization and monitoring with a digital twin, a real-time virtual window into the shop floor with interactive performance monitoring.







### **Advanced Electronics/SMT use cases**

SMT and electronics manufacturers face significant challenges related to the need to properly optimize and manage inventory and supply chain variability, high-mix production, and drive down costs to mitigate shrinking margins. All while not losing focus on delivering products on time and with quality, which cannot be done without an integrated MES.

### 1.

#### **Complex BOM structures**

In electronics manufacturing, there are several cases where the base product is the same, but the BOM can vary according to special configurations. For example, PCBs with LEDs. The potential for defects is introduced when the same product can be manufactured using different combinations of LEDs - Bin Code and Resistors, but in the end, the same desired brightness and color need to be ensured.

BOM variation allows users to specify a certain BOM item that would only apply to a certain characteristic, such as brightness. This allows the users to define all the valid LED/Resistor combinations (LED Pairing) for a given product at the BOM level. At runtime, the system can validate that the combination LED/Resistor used in production matches a valid combination defined at the BOM for that product.

### 2.

#### **Defects and repair handling**

To prevent defects from shipping, manufacturers often rework products while still in production. This typically involves replacing or touching-up components in PCBs as needed. However, the number of components on PCBs and PCBs per panel challenges the operators at the repair station to identify the component and the PCB that requires a repair activity.

When repairing a defect on a multi-panel PCB, the MES delivers the defect code, the board ID, the board side (top/bottom), the part number, and the reference designator. The system can also highlight these visually in the PCB ECAD to support the operator in quickly identifying the location of the defective PCB and component.

### 3.

#### Material management

A centralized material management system with all the relevant information around a single component, such as supplier part number, internal part number (e.g., reel ID), and detailed logic about the parts and materials and their environmental and handling requirements.

Being missing, mishandled, or damaged material one of the primary causes of SMT line stoppages, Critical Manufacturing MES ensures MSD handling. It also provides the ability to define minimum component inventory at a given piece of equipment, manage and request materials, fulfill requests, and move material between locations ensuring material replenishment takes place on time.

#### **4**. NPI

NPI speed is crucial in most electronics segments, whether based on direct competitors' activity or customer requirements for product improvements. The MES includes components for every new product BOM, and it lets operations personnel see the ECAD files.

The system loads and associates these ECAD design files with each product, allowing users to zoom, pan, rotate, measure, and select which components they want to visualize or hide. Manufacturing engineers can use the same ECAD file to create work instructions and checklists for operators. Delivering all this information to operations reduces errors, even for a product no one has seen before.

# Critical Manufacturing MES V10

Drive next-level digital transformation for Industry 4.0 in your factory with the most complete, modular MES. Critical Manufacturing MES is an essential part of your manufacturing operation management (MOM) system for SMT and electronics manufacturing to increase efficiency. It covers not only the SMT lines but manages the entire factory, ensuring incoming, assembly, testing, inspection, packing, and shipping operate smoothly as an entire production process. With the ability to define quality monitoring for each product, costs are reduced, and quality is increased. It offers flexible and customizable workflows and interfaces to increase throughput and material/order traceability. Using advanced analytics for the factory, data access reduces unplanned downtime and cycle time, increasing OEE.

The selection of pre-integrated modules offers capabilities that include IoT-integrated systems, end-to-end material traceability, in-depth quality control, and reliable on-prem, cloud, or hybrid deployment to multiple sites.

Expect more from your MES and empower your enterprise using data from your factory to make digital transformation and Industry 4.0 a reality with advanced capabilities from Critical Manufacturing.

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ter	Advanced Planning and Scheduling						
	Manufacturing Operations	Materials & Containers	Resource Tracking & Tools	Routing & Dispatching	Data Collection	Master Data Management & Change Control	Tasks, Checklists & Work instructions
	Visibility & Intelligence	Dashboards	BI Cards	Data Warehouse	fabLIVE: Factory Digital Twin	Alarm Management	Augmented Reality
$\bigcirc_{-}^{\neg}$	Quality Management	Sampling Based Inspection/AQL	Statistical Process Control (SPC)	Non-Conformance Management	Document Management	New Product Introduction (NPI)	Material Defects
	Operational Efficiency	Maintenance Management	Order Management	Labor Management	Costing	Advanced Layout & Printing	Material Logistics / MSD & Floor Life Control
Ļ	Integration & Automation	Enterprise Integration	Equipment Integration: Connect IoT	Recipe Management	Weigh & Dispense	Factory Automation	Mapping
° ₽ ₽	IoT Data Platform						

Low Code Platform

Solution map



Critical Manufacturing provides the most modern, flexible and configurable manufacturing execution system (MES) available. Critical Manufacturing MES helps manufacturers stay ahead of stringent product traceability and compliance requirements; reduce risk with inherent closed-loop quality; integrate seamlessly with enterprise systems and factory automation and provide deep intelligence and visibility of global production operations. As a result, customers are Industry 4.0-ready. They can compete effectively and profitably by easily adapting their operations to changes in demand, opportunity or requirements, anywhere, at any time.

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