

Sustainable Smart Manufacturing: Advanced Clean Room Control

SMARTDAC+

Transform your clean room from a cost center into a sustainable asset. Optimize yields and minimize carbon footprints with Yokogawa's autonomous sensing technology.

Introduction

In 2026, the semiconductor and high-tech manufacturing sectors face a dual challenge: meeting the surging demand for micro-scale precision while adhering to stringent ESG (Environmental, Social, and Governance) mandates. Maintaining a pristine clean room environment is no longer just about quality control—it is about resource efficiency. Inefficient HVAC systems and poor environmental stability lead to catastrophic product defects, excessive energy consumption, and unnecessary waste. Yokogawa empowers manufacturers to achieve "Sustainable Digital Transformation" by integrating high-precision sensing with real-time data visibility, ensuring compliance with evolving international standards for airborne molecular contamination and energy management



Example of the silicon wafer inspection stage during the semiconductor production process

Challenges

Traditional clean room monitoring often suffers from fragmented data and manual intervention, leading to several pain points.

- **Energy Waste:** HVAC systems often run at peak capacity unnecessarily due to a lack of granular, real-time data.
- **Contamination Risks:** Physical entry for maintenance (e.g., changing chart paper) introduces particles and compromises the sterile environment.

- **Data Silos:** Information regarding humidity, pressure, and temperature is often trapped in local recorders, preventing enterprise-wide analytics.
- **Alarm Fatigue:** Frequent door cycles or minor fluctuations trigger nuisance alarms, distracting operators from genuine critical events.

The Solution

Yokogawa's latest **SMARTDAC+ Series** and **OpreX™ Data Acquisition** technologies provide a centralized, digital-first approach to clean room management. By transitioning to a paperless, networked architecture, facilities can achieve seamless "Smart Manufacturing."

Paperless, remote-ready monitoring with SMARTDAC+

For remote monitoring applications, **SMARTDAC+ GM10** provides built-in capabilities to support fast response and practical digitalization of cleanroom records:

- **Instant remote access:** View real-time values and trends via a standard web browser by accessing the unit over the network.
- **Event notification:** Use **e-mail alerts** to notify personnel when conditions deviate from defined thresholds—supporting faster intervention.
- **Data capture and traceability:** Store and export historical records to support quality reviews and audit readiness.
- **Operational-friendly alarms:** Apply a **delay alarm** to suppress nuisance alarms during expected events (e.g., brief door openings), reducing alarm fatigue while keeping excursion response disciplined.

Multi-parameter recording with SMARTDAC+ GX series

SMARTDAC+ GX series provides universal input capability for continuous monitoring and recording of key cleanroom parameters, including:

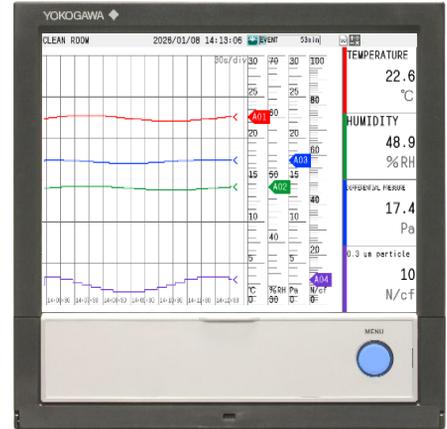
- Temperature, humidity
- Atmospheric pressure / differential pressure (as applicable)
- Airborne particle counts, airflow, vibration, and VOCs
- Door opening/closing status and other digital inputs
- Additional analog/digital signals tied to cleanroom utilities and supporting equipment



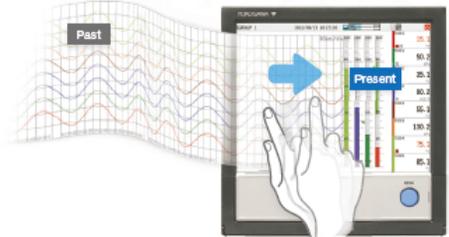
Result: an upgrade path from manual charting to a more scalable, networked monitoring approach that supports expansion, revamps, and continuous improvement programs.

Key Benefits

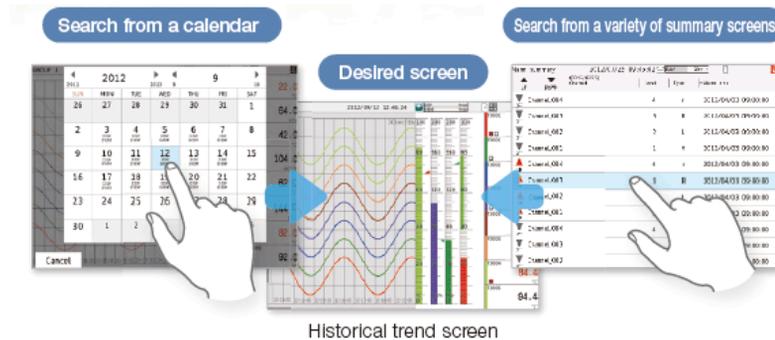
- Operational Efficiency:** Eliminate the need for technicians to enter clean rooms for routine data collection or maintenance (e.g., ink/paper replacement), significantly reducing contamination risk and labor costs.
- Sustainability & Circular Economy:** A 100% paperless solution eliminates paper waste and dust. Real-time data integration allows for "Demand-Controlled Ventilation," drastically reducing CO2 emissions from HVAC systems.
- Digital Transformation (DX) Ready:** All data is accessible via secure URLs and automated e-mail/SMS notifications, supporting remote operations and centralized "Command Center" management.
- Enhanced Safety & Compliance:** Maintains a digital audit trail that meets global regulatory requirements for electronic records, ensuring total traceability of the manufacturing environment.



Touch Screen GX10/GX20



Flick



Historical trend screen

OpreX™ Yokogawa achieves operational excellence by providing products, services, and solutions based on the OpreX comprehensive brand that cover everything from business management to operations.

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