PACTECH

Automation & Technology Life

Vol. 84

ICP DAS www.icpdas.com

Intelligent Oxygen Monitoring DL-1050

Upgrades Semiconductor Nitrogen Cabinets

Application Story

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ICP DAS Epoch

Application Story

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Products Column

New Products

AIoT × ESG Kaohsiung Seminar

ICP DAS Partners with Industry and Academia for New Green Manufacturing Value

Written by Editorial Team (Translated by Eva Lee)

AIoT is a key enabler for enterprises moving toward sustainability. ICP DAS held the “AIoT Starts Now: Building ESG Execution Power” seminar on Thursday, December 4, bringing together industry and academic experts to explore how AIoT can drive both smart manufacturing and sustainability.

Frank Cheng, President of ICP DAS, starts the seminar with “How AIoT empowers smart manufacturing to boost productivity and support ESG practices,” revealing how data integration and energy intelligence drive smarter decisions and sustainability.

The seminar features insights on smart sensing, predictive diagnostics, safety monitoring, EtherCAT integration, and energy management. The AIoT Demo Zone showcased the industrial communication, redundant control, and smart energy solutions.

With decades of innovation in automation and energy management, ICP DAS is committed to helping enterprises boost efficiency and achieve ESG goals. “AIoT is the key driver for greener manufacturing,” said Cheng. “Together, we can build a smarter, more sustainable industry.”

More Seminar details:

https://www.facebook.com/share/p/1AMWPc9VXU/

https://www.facebook.com/share/v/1AAbreFGBL/

https://www.facebook.com/share/v/182BjDthad/

From Solar Streetlights to Liquid-Cooled Data Centers: ICP DAS Builds an All-Around Smart City Portfolio

Written by Editorial Team (Translated by Lynn Tang)

Energy Taiwan concluded with ICP DAS showcasing a smart-city solution across energy management, smart grids, energy storage monitoring, and safety, enabling data-driven energy savings, carbon reduction, and operational efficiency.

For energy management, ICP DAS combines smart meters, AI energy-saving controls, and a cloud platform. Field data from RS-485, Ethernet, and iWSN is aggregated via PMC/PMD concentrators and uploaded to SCADA, IoTStar, or third-party software for real-time monitoring and predictive maintenance, enabling end-to-end energy efficiency.

On the smart-grid front, MDC-700 monitors thousands of Modbus RTU devices for stable solar-plant communications, while the GTP-541M 4G controller integrates solar and lighting control and, with RTU Center, enables remote monitoring and status feedback for smart city lighting.

For energy storage cabinets, DL-series gas and temperature/humidity detectors with leak cables and I/O modules provide instant warnings and can interlock with fire suppression and ventilation systems. The I-7532M-FD CAN FD bridge offers 3000 VDC isolation and multi protocol support for reliable BMS–PCS communications.

In safety monitoring, ICP DAS uses thermal imaging for comprehensive surveillance, revealing thermal risks missed by conventional sensors. At EV charging stations it monitors vehicle undersides and charging connector contact points in real time, auto-alerting service centers and interlocking with sprinklers to prevent thermal runaway. In AI liquid-cooled data centers, it detects coolant blockages and hotspots, enabling intelligent thermal control instead of passive cooling.

With over 30 years in industrial automation R&D, ICP DAS provides reliable IoT solutions that drive energy savings, carbon reduction, and smart transformation, highlighting Taiwan's innovation in the global smart energy sector. ■

Intelligent Oxygen Monitoring: DL-1050 Upgrades Semiconductor Nitrogen Cabinets

In semiconductor manufacturing—where micro-environment control directly impacts chip quality—ICP DAS's DL-1050 AirBox enables a "self-deciding" smart nitrogen cabinet that monitors humidity and oxygen and automatically stops purging once targets are met, reducing nitrogen use by 50%+ on average. With optional ACS-10V-MF-TC access control integration, it adds both energy savings and security to help fabs advance sustainability and smart manufacturing.

Written by Boris Chen (Translated by Lynn Tang)

Semiconductor Humidity-Control Challenges

Humidity control critically affects yield in wafer fabrication and chip packaging. Per IEC TR 62258 3, wafers and devices should be stored at 7–30% RH and stabilized with ≥99% high purity nitrogen.

Excess humidity causes moisture uptake that can lead to cracking or delamination during reflow or packaging, while overly dry conditions without proper ESD protection can damage devices—so humidity management affects quality, cost, and sustainability.

Fabs typically use nitrogen cabinets with dehumidifiers to comply, but continuous fixed flow purging wastes gas and energy. The industry goal is to maintain product quality while reducing nitrogen use, cutting carbon emissions, and lowering operating costs.

DL-1050 Oxygen Monitoring Powers Smart, Energy-Saving Nitrogen Cabinets

ICP DAS's DL-1050 AirBox brings high-precision oxygen and humidity sensing into nitrogen cabinets and adds an intelligent decision layer—so the cabinet can self-regulate instead of relying on fixed-time purging.

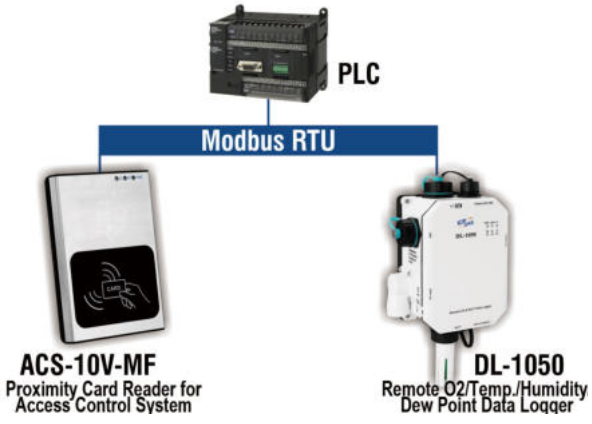
The DL-1050 warms up in 120 seconds, delivers ±5%RH humidity accuracy with stable O_2 monitoring, and connects via Modbus TCP to PLCs or central systems for real time control. When oxygen and humidity reach targets, it stops nitrogen refilling—shifting from time based to on demand control and cutting nitrogen waste.

And the real value isn't just measurement—it's control triggering. In real deployments, the system has achieved over 50% nitrogen savings, translating into clear benefits:

1. Lower operating costs: Nitrogen is a long-term expense—cutting usage by half delivers meaningful savings.
2. Greener operations: Less continuous purging means lower energy use and reduced carbon impact, supporting ESG and sustainability goals.
3. Stable quality: Real-time data helps ensure cabinet conditions continuously meet international storage requirements.

Value-Added: Smart Integration for Industrial Safety

Beyond energy savings, the DL-1050 can also integrate with the ACS-10V-MF-TC proximity access voice card reader to build a more complete smart safety mechanism.



When a user swipes a badge to open the nitrogen cabinet, the system checks whether oxygen is ≥16%. If not, the door stays locked to prevent oxygen-deficient operation and to safeguard on-site safety. One sensing system enables both quality control and personnel safety in a closed-loop workflow.

Smart Sensing That Powers Industrial Upgrades

In semiconductor fabs, nitrogen cabinets are essential for quality stability—but true process maturity also demands energy efficiency. With ICP DAS's DL-1050 intelligent oxygen monitoring, cabinets shift from passive consumption to active energy saving, enhancing reliability and safety while enabling precision humidity and gas management.

Integrated with sensors, cloud platforms, and energy systems, the DL-1050 goes beyond monitoring to drive decisions, enabling a data-centric environment that self-regulates in real time. It creates a continuously optimized control loop, helping semiconductor fabs establish a true benchmark of balance across Quality × Efficiency × Sustainability. ■

DL-1050

Remote O2/Temperature/ Humidity/Dew Point Data Logger

ACS-10V-MF

Proximity Card Reader for Access Control System (English version of voice)

Standalone Smart Temperature Control × High Efficiency & Energy Savings

SC-6104-W5 Automatic Fan Control, Say Goodbye to Manual Cooling

Still relying on manual operation for smart air conditioning? The SC-6104-W5 controls temperature automatically, utilizing a single button and sensors to adjust valves as needed. It's energy-efficient and saves 20% on energy costs. Its 4-channel relay connects to equipment and supports Modbus RTU. This device rapidly upgrades spaces into smart environments in factories, server rooms, or commercial offices!

Written by Evanna Lin (Translated by Eva Lee)

In HVAC systems, temperature control and energy efficiency are closely linked. As smart buildings and factory automation expand, balancing comfort and energy savings has become essential.

Traditionally, most factories and commercial buildings rely on manual switches or fixed fan-speed selection. This approach is inefficient and often results in poor cooling performance and unnecessary energy waste.

If intelligent control using temperature sensing enables dynamic airflow adjustment. It can improve system efficiency, extend equipment lifespan, lower energy costs, and support a more comfortable and sustainable environment.

One module, Full-Automatic Smart Temperature Control

SC-6104-W5 is a 4-channel Form C relay module with built-in smart temperature control for automated environments.

With integrated logic and an NTC temperature sensor, the module monitors ambient temperature and automatically controls fan stages and chilled water valves

based on pre-set thresholds.

All control functions are handled directly by the module firmware. No external PLC or additional programming is required, enabling true “configure-and-run” operation and significantly lowering deployment complexity.

SC-6104-W5 Four-channel Smart Control, Flexibly Accommodating Various Fan Coil Units

▲ SC-6104-W5 4-channel form C type relay control module

SC-6104-W5 provides 4-channel Form C relay outputs for direct connection to fan coil unit control circuits, including chilled water valve switch and low/medium/high airflow controls.

SC-6104-W5 has built-in temperature coordination. Enable this function via software and input the corresponding temperature threshold conditions. The module can then independently adjust the airflow and chilled water valves without requiring additional controllers.

Key Features:

- Four independent relay outputs for multi-stage fan control
- Built-in temperature control logic for automatic regulation
- Modbus RTU support for easy integration with SCADA or backend systems
- Standalone operation after configuration, without PLCs or extra software

One-Click Upgrade to Auto-Temperature Factory

A manufacturing facility previously operated its cooling system manually, with staff switching fan speeds and chilled-water valves by hand. During hot summer periods, fans were often set to maximum speed throughout the workday, while chilled-water valves remained continuously open.

Although this approach achieved short-term cooling, it also caused the following issues:

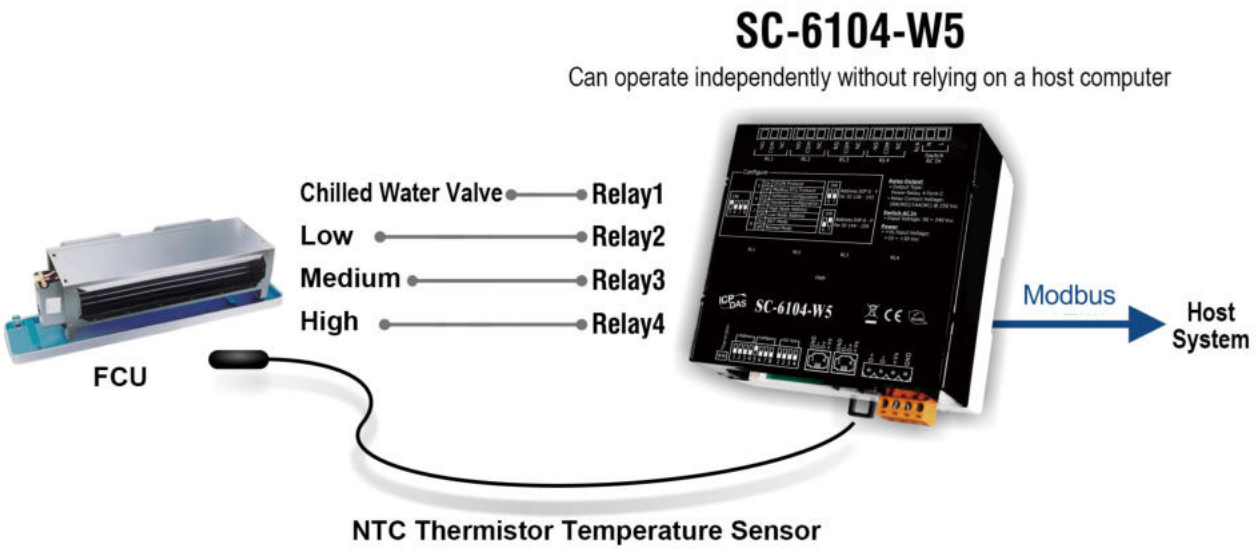
- Overcooling reduced employee comfort and productivity
- Inflexible control resulted in significant energy waste
- Heavy reliance on manual operation increased management effort

Deploying SC-6104-W5: From Manual to Smart Control

After deployment, connections were simplified:

- Chilled Water Valve → Relay 1
- Low speed → Relay 2
- Medium speed → Relay 3
- High speed → Relay 4

With simple configuration of the temperature coordination function and the NTC temperature sensor, the fan system



▲ SC-6104-W5 features 4-channel smart control, flexibly accommodating various fan needs

automatically stages operation based on ambient temperature, without any PLC or external controller.

For example, with a temperature threshold set to 26 °C, the SC-6104-W5 operates as follows:

Ambient Temperature	Action
≥ 30°C	Chilled-water valve ON + High speed (Relay 1 + Relay 4)
28–30°C	Chilled-water valve ON + Medium speed (Relay 1 + Relay 3)
26–28°C	Low speed (Relay 2)
≤ 26°C	All OFF, energy-saving standby

Energy Savings and Benefits

This strategy prevents continuous high-power operation, simplifies control, and reduces energy costs by about 20%.

For small to mid-sized spaces or distributed fan control applications, the SC-6104-W5 simplifies deployment and enables flexible, PLC-free automated temperature control.

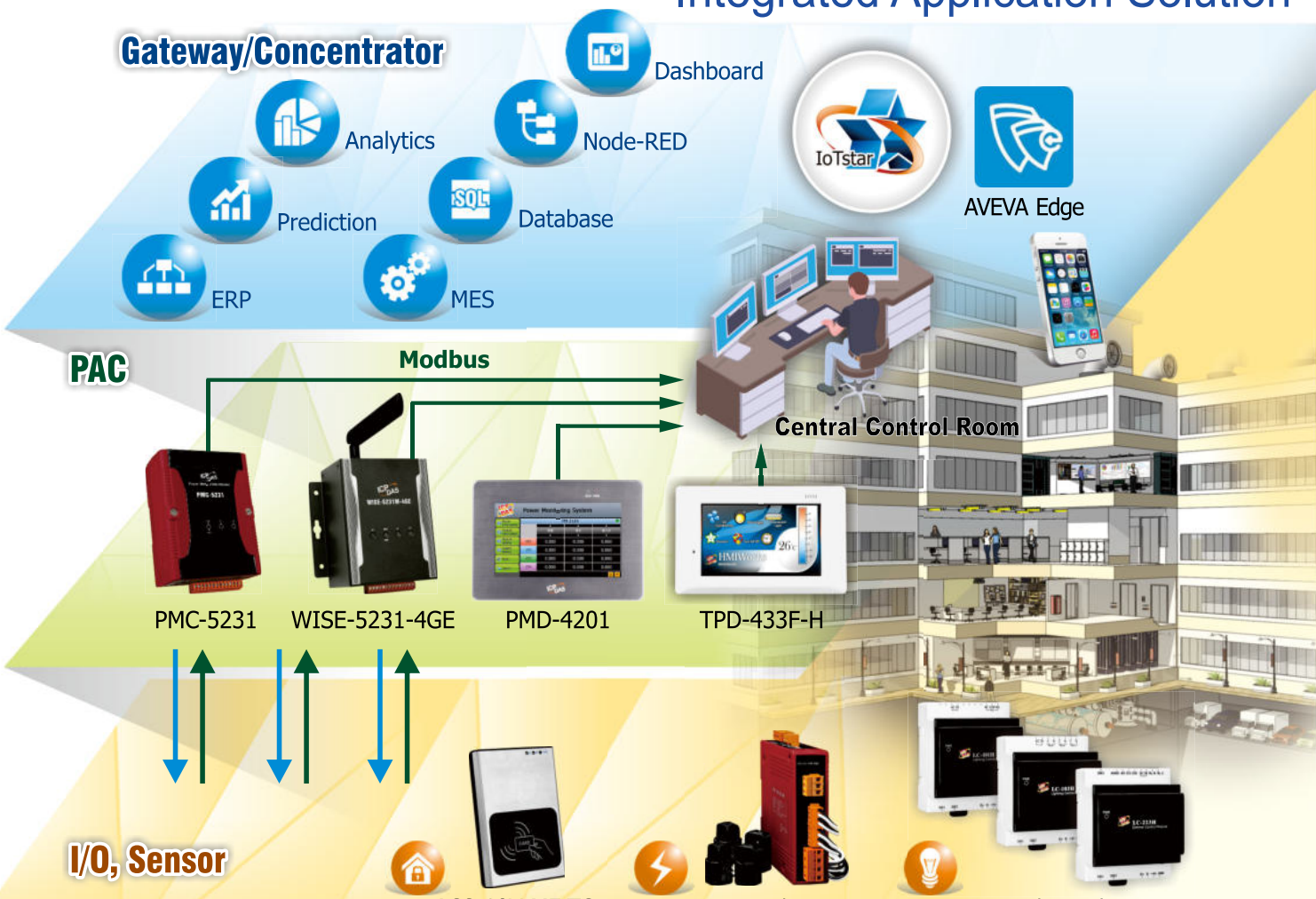
The Ideal Tool for Energy-Saving Smart Control

SC-6104-W5 condenses complex logic and system integration into a compact, responsive, and intelligent module. Whether used for factory cooling, data center ventilation, or commercial HVAC systems, it is a reliable solution for achieving energy-efficient smart control.

Contact ICP DAS for integration support and build a more efficient, user-friendly temperature control system. ■

Smart Building

Integrated Application Solution



I/O, Sensor

ACS-10V-MF-TC
Proximity Card Reader for Access Control System

PM-3114/2133D
Single/3-phase Smart Power Meter

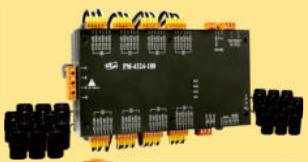
LC-101H/103H/223H
Smart Lighting Control Module

DL-110S-E
Illuminance/Temp./Humidity Data Logger Module

CL-203-WF
Wireless CO/CO2/Temp./Humi. Data Logger Module

CL-2S-E
Gas Sensing Data Logger Module

iSN-104
Liquid Leak Detection Module



PM-4324
Multi-circuit Smart Power Meter

SC-6104-W5
FCU Control Module

DL-303-IP65
CO/CO2/Temp./Humi. Data Logger Module

CL-207-E
HCHO Sensing Data Logger Module

PIR-230-E
PIR Motion Sensing Data Logger Module

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Toward Carbon-Neutral Electronics Manufacturing

iWSN Wireless Energy Management Launched

To overcome wiring limitations and construction risks in cleanrooms, ICP DAS iWSN uses 433 MHz wireless technology for Dual-circuit power monitoring. Its three-layer architecture integrates sensing, aggregation, and monitoring to deliver accurate, real-time, and intelligent energy visibility.

Written by Bao Huang (Translated by Carol Hsu)

Efficient Energy Management is Crucial For Competitiveness

Facing pressures of energy conservation, carbon reduction, and smart transformation, the electronics industry must effectively monitor energy across production areas and equipment. Facilities have large, distributed electrical loads—from cleanrooms and machinery to HVAC and lighting—each consuming significant energy. Traditional monitoring systems often fall short due to wiring difficulties, space limits, and short communication ranges.

ICP DAS iWSN Solution Breaking Wired Limits, Starting in a New Wireless Era

With deep expertise in automation and communication, ICP DAS offers a wireless energy management solution built around the “iWSN Wireless Power Meter.” It integrates wireless transmission, centralized management, and energy analysis to boost deployment efficiency and data usability. The following shows how ICP DAS wireless power meters support electronics manufacturers.

The Need For Cleanroom Energy Monitoring is Growing

The electrical cabinets are equipped with collective power meters that only provide total consumption, without circuit-level machine data. As a result, individual machine energy usage and comparisons cannot be obtained.

Each loop needs extra power meters to capture equipment energy data.

Since the energy monitoring area is located within a cleanroom, the system must be deployed within a limited space. Construction activities generate dust, and due to safety considerations for AC wiring, live-wire operations are prohibited. This significantly increases construction costs and project duration as the number of electrical cabinets grows. Therefore, a simplified installation with minimal wiring is preferred.

When deploying hundreds of power meters, reducing construction cost and installation time is critical compared to traditional wired energy monitoring solutions.

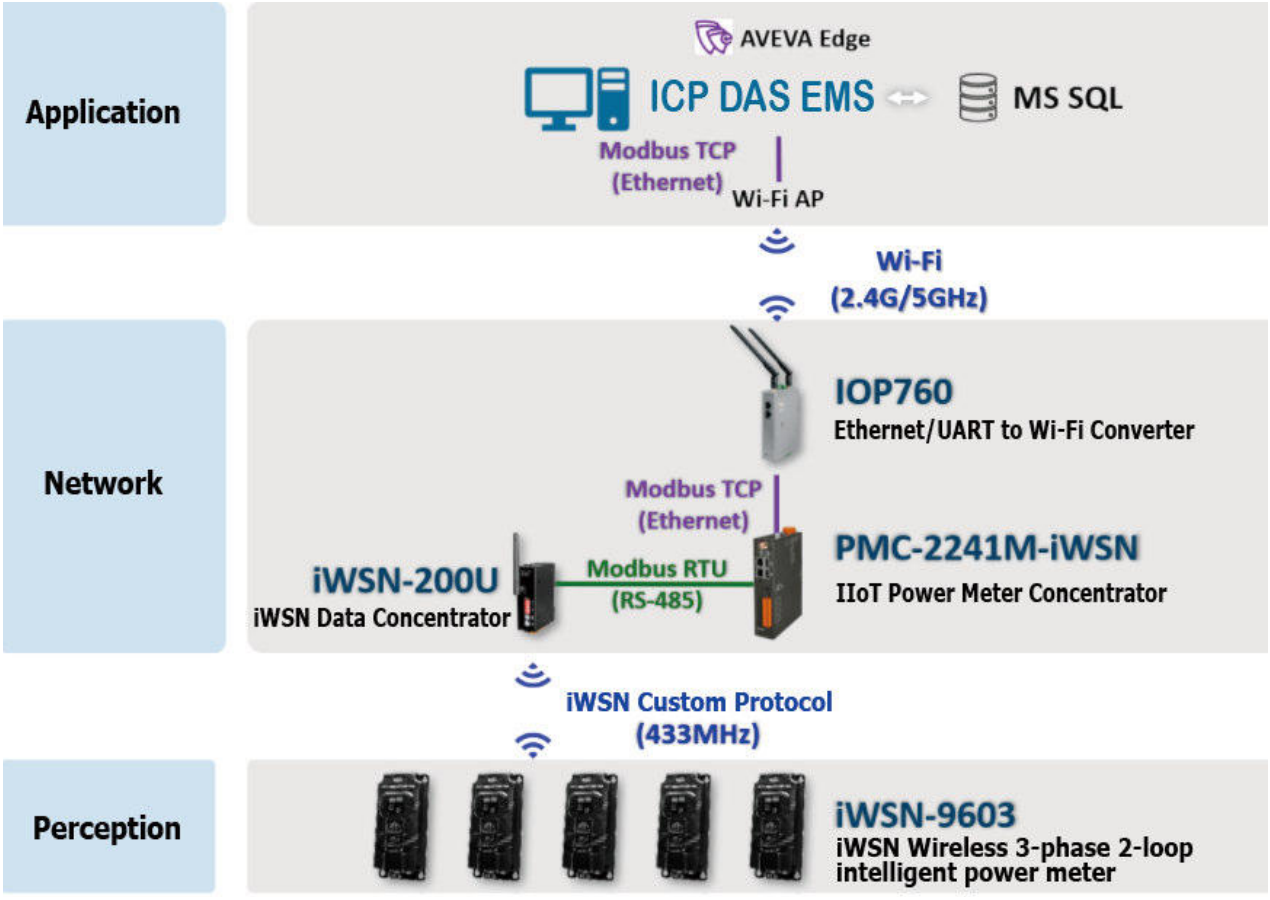
ICP DAS Creates a Fully Wireless Smart Energy Solution

ICP DAS developed a three-layer solution based on the iWSN wireless power meter.

Layer 1 – Smart Perception: Precise kWh Measurement

The sensing layer uses the iWSN-9603 3-phase 2-loop wireless power meter to simultaneously measure voltage, current, power, and kWh, sending data via 433 MHz iWSN to the iWSN-200U concentrator.

- 2-loop design: Monitors two 3-phase loops with fewer modules and less space.



▲ iWSN Three-Layer Energy Management Architecture

- Quick installation: Connect the CT and use the measured voltage for power—no extra cables needed.
- Wireless Communication: 433 MHz iWSN protocol enables wireless data transfer, reducing wiring, installation complexity, and risks.

Layer 2 – Establish a stable communication network within the data set

Combining the iWSN-200U data concentrator, PMC-2241M-iWSN power meter concentrator, and IOP760 Wi-Fi converter, this system consolidates, converts, and buffers data to ensure stable transmission in wireless environments.

- The iWSN-200U collects and temporarily stores data from up to 31 wireless power meters, which is then accessed via Modbus RTU over RS-485 through the PMC-2241M-iWSN.
- PMC-2241M-iWSN performs data integration and format conversion, providing a Modbus TCP (Ethernet) interface. Supporting up to 3 iWSN-200U units—93 wireless power meters or 186 3-phase loops.
- The IOP760 converts LAN Ethernet to WAN Wi-Fi and supports NAT, allowing multiple PMC-2241M-iWSN devices to share a single WAN IP and reduce IP usage.

Layer 3: Intelligent Management for Enhanced Energy Data Value

At the top layer, the ICP DAS EMS on the AVEVA Edge platform collects real-time loop-level energy data via Modbus TCP through the PMC-2241M-iWSN and stores

Item	Traditional Wired System	iWSN Wireless System
Transmission	RS-485 wired communication	433 MHz wireless
Wiring Needs	Each power meter requires power communication cables	Only power cable needed
Installation Time	Long, increases with more power meters	Short, saves cabling time
Space Requirement	Multiple modules, more space needed	Compact modules, flexible placement
Maintenance	Cable aging requires replacement	No communication cables, low maintenance
System Expansion	Difficult, requires new wiring and setup	Easy, add a power meter and connect after setup.
Flexibility	Fixed, hard to relocate	Flexible placement, easy to move
Deployment Cost	High (materials + labor)	Medium (less wiring)
Overall Benefits	High cost, less flexible, difficult expansion	Lower cost, flexible, easy expansion

▲ Flexible Energy Management with iWSN Wireless Power Meters

it in an MS SQL database.It also provides a visualized interface for remote monitoring, making energy usage clear at a glance.

The system offers an intuitive visual interface and multiple functions:

- Real-time monitoring and trend charts
- Peak load alerts and event notifications
- Electricity Usage Statistics, Breakdown Reports
- Energy Efficiency Analysis (kWh/output, kWh/area)

Unlocking Energy Value Through Wireless Smart Manufacturing

As shown in the table below, iWSN wireless power meters outperform traditional wired systems. They offer advantages in installation convenience, scalability, and maintenance cost. The solution is ideal for rapid deployment in dense electrical cabinets or panel environments. Accurate energy data enables smart energy management and energy-saving goals.

For detailed module information, please visit the ICP DAS website (https://www.icpdas.com/?Lang=US), search for the module name.■

Production Electricity – Equipment by Area

Electricity Comparison

Production Electricity – Equipment Daily Report

Alarm Management – Real-Time Alarms

Production Electricity – Machine Circuit Information

Boost Equipment Reliability with Precision Bearing Vibration Monitoring

ICP DAS developed a smart maintenance system utilizing the iSN-701X-mA vibration signal/current converter, which integrates real-time monitoring, anomaly alerts, and cloud analytics to prevent downtime and reduce costs in the Steel Plant. This data-driven approach advances equipment management toward smart manufacturing.

Written by Adam Tsai (Translated by Carol Hsu)

Silent Risks on High-Pressure Production Lines

Steel plant environments are extremely harsh, with equipment operating under high temperatures, heavy loads, and continuous high-frequency conditions. Bearing health is crucial to the stability of rotating machinery and the overall production process. Undetected abnormal vibrations can cause failures, shutdowns, and high repair and downtime costs.

Traditionally, steel plants rely on manual inspections such as visual checks or listening, which are inefficient and lack continuous data. These methods require personnel to approach operating equipment, creating safety risks. As a result, they fail to meet smart factory requirements for real-time monitoring and traceability.

Vibration data can reveal bearing wear, gear defects, misalignment, and imbalance, enabling fault localization. Therefore, continuous and precise vibration monitoring has become central to smart maintenance.

From “Listening for Faults” to “Data-Driven Insights” — Vibration Monitoring

The iSN-701X-mA vibration signal to current converter is a key tool for steel plants advancing smart maintenance. It converts vibration signals into standard voltage/current outputs and integrates with host computers or PLCs via Modbus RTU or TCP for real-time monitoring and anomaly alerts.

Product Comparison

Model	iSN-701X	iSN-701X-mA
Product Image		
Analog Input	IEPE x 1, ±10 V, 24 bit, 32/64 kHz, 6 Hz~6.4 kHz, 4 mA excitation current	
Analog Output	Voltage ±10 V	Voltage ±10 V, Current 0~20 mA / 4~20 mA
Commu-nication	RS-485, 115200 bps Max., Modbus RTU slave	
Ethernet	RJ-45, 10/100Base-T(X), Modbus TCP server	

Build a Real-Time All-in-One Early Warning System

The system architecture uses the iSN-701X-mA with the iSN-701-F15-L030 for real-time vibration measurement, while a PLC performs judgment and control to trigger DO alarms, as shown below.

- **iSN-701-F15-L030 1-axis Accelerometer**

Uses a magnetic mount on the bearing housing for continuous vibration monitoring.

- **iSN-701X-mA Vibration Signal to Current Converter**

Receives analog vibration signals, converts them to voltage/current outputs, and supports Modbus communication for easy data transmission.

- **VPD-133-H2 HMI**

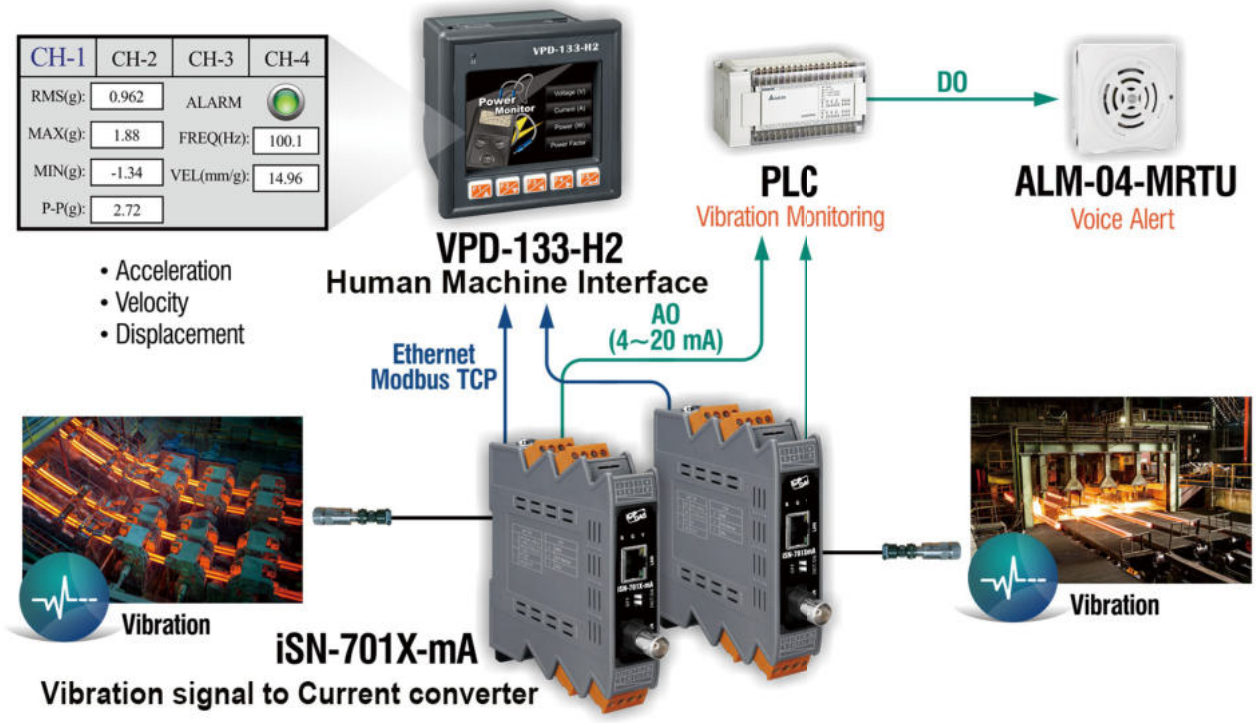
Displays real-time vibration data for on-site monitoring and queries.

- **PLC**

It integrates data from multiple iSN-701X-mA units for anomaly detection and alarm-based preventive maintenance.

- **ALM-04-MRTU MP3 Alert module**

When vibration exceeds the threshold, the PLC



triggers a voice alert for immediate action.

This architecture enables cross-platform integration via voltage/current, Modbus RTU, or Modbus TCP, with scalable support for future multi-machine and production line expansion in steel plants.

High-Precision Sensing, Seamless Integration Making Vibration Data Understandable

1. High-Precision Data Conversion
Supports a ±10 V input range, 24-bit high resolution, and a bandwidth of 6 Hz to 6.4 kHz, enabling precise capture of vibration details.

2. Real-Time Communication & Visualization
Simultaneously provides ±10 V and 0–20/4–20 mA outputs and supports Modbus RTU/TCP for easy integration with PLC, SCADA, and IoT systems. Data can be uploaded to the IoTstar cloud for trend analysis and dashboard visualization.

3. Smart Feature Analysis and Early Warning
Built-in vibration feature conversion and threshold checks trigger instant alerts when limits are exceeded.

Physical Quantity	Feature Values
Acceleration	RMS, Maximum, Peak-to-Peak
Velocity	RMS
Displacement	Peak-to-Peak

4. Modular Design, Flexible Scalability
Modular design enables scalable channel expansion and IoT integration for centralized management, supporting smart factory growth.

Transformation Seen Through Field Experience

In a steel plant, the iSN-701XmA monitored multiple bearings and continuously collected vibration data, providing the following benefits:

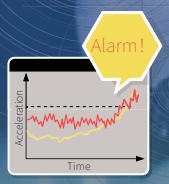
- **Preventive Maintenance:** The system analyzes long-term data to detect abnormal vibrations early, preventing downtime.
- **Reduce maintenance time:** Fault alerts quickly identify faulty bearings, minimizing manual troubleshooting time.
- **Extend Lifespan:** Continuous monitoring prevents overuse, protecting bearings and equipment.
- **Reduce Costs:** Minimize unexpected downtime and part replacements to boost production uptime.
- **Data-Driven Decisions:** Use historical data to create an "Equipment Health Score," quantifying status and guiding management decisions.

Let Stability Become The Gentlest force in smart manufacturing

As the steel industry moves toward smart manufacturing and ESG goals, equipment maintenance has become a critical challenge. Vibration monitoring shifts maintenance from "passive repair" to "preventive maintenance." The iSN-701X-mA, with precise measurement and modular design, enables real-time, reliable, and scalable bearing monitoring. This reduces maintenance costs and ensures stable production, showcasing ICP DAS innovation.■

Equipment Vibration Measurement Solution

Data Acquisition | **Data Logging** | **Data Monitoring**



Eigenvalues
(including velocity, acceleration, FFT spectrum value, etc.)

Raw data

Chat Room

SMS

API

- Calculation of eigenvalues
- User-defined algorithm
- AI big data analysis model

Advanced Applications

E-Catalog
Vibration Measurement Solutions

IEPE Single Axis Accelerometer

Factory Manufacturing Equipment

Periodic Threshold Comparison

Cold chain | Pump | Fan Coil | Robot | Motor | Bearing

Real-time Measurement & Physical Modeling

Low frequency alarm solution

Wireless

iWSN Series - Environmental Sensing Module

iWSN-100X-CLE iWSN-101X-CLE	iXN-2VB1 IXN-2VB3

Wireless vibration sensing solution: quick installation, no power supply required.

Wired

iSN Series - Vibration Sensor Module

iSN-711-MRTU iSN-713-MRTU	iSN-701-F15-L030 iSN-701-F15-L060	iSN-701X-mA iSN-701X

Easy-to-use. A quick analysis of eigenvalues.

High-speed data predictive analysis solution

Multi-signal Sampling

PoE Ethernet High-speed Data Acquisition Module + SG Series

PET-7H16M PET-7H24M	SG-3227 SG-3037	iSN-701-F15-L030 iSN-703-F1-L015

High-speed data acquisition easily realizes multi-signal monitoring.

Online Real-time Sampling

PoE Ethernet High-speed Data Acquisition Module

PET-AR400	iSN-701-F15-L030 iSN-701-F15-L060

High-speed vibration data acquisition keeps you posted on every detail.

Offline Scheduled Sampling

AR Series - High-speed Accelerometer Data Logger

AR-200/300-T/400	iSN-701-F15-L030 iSN-701-F15-L060

Trigger and schedule high-speed real-time/offline data acquisition and logging.

Edge Computing

The Controller Providing Openness + High-speed Vibration Data Acquisition Module of e-9K Series

AXP-9000-series ALX-9000-series	e-AR300T e-AR400T	iSN-701-F15-L030 iSN-701-F15-L060

The controller provides openness and deep integration of high-speed vibration data acquisition and edge computing needs.

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ETS-7200 Industrial IoT Module

Secure & Rugged × Flexible Communication × Edge Intelligence

Building Security Foundation for Next-Generation IIoT

Facing the rise of smart manufacturing and smart cities, cybersecurity and real-time communication are essential. The ETS-7200 combines high security, multi-protocol support, and edge computing to help enterprises build stable and secure IIoT systems.

Written by Golden Wang (Translated by Eva Lee)

In smart manufacturing and smart cities, cybersecurity and real-time communication are key to digital transformation. The ETS-7200 IIoT I/O modules from ICP DAS support RESTful API, Modbus TCP, and MQTT to simplify the deployment of efficient and secure industrial IoT systems.

Security Protection: Layered Safeguards for Data Transmission

SSL/TLS Encryption for Ensured Security and Data Protection

The ETS-7200 supports SSL/TLS with PKI authentication to prevent MITM(man-in-the-middle) attacks and ensure the privacy, integrity, and authenticity of data transmission.

The ETS-7200 module encrypts all data transmission, providing continuous security protection and enabling industrial control networks to operate securely.

DoS/DDoS Attack Defense

The ETS-7200 protects against DoS and DDoS attacks. It actively regulates network traffic to reduce the impact of abnormal network packets, ensuring the module remains functional and reliable.

Dual Watchdog with Power-on and Safe Values

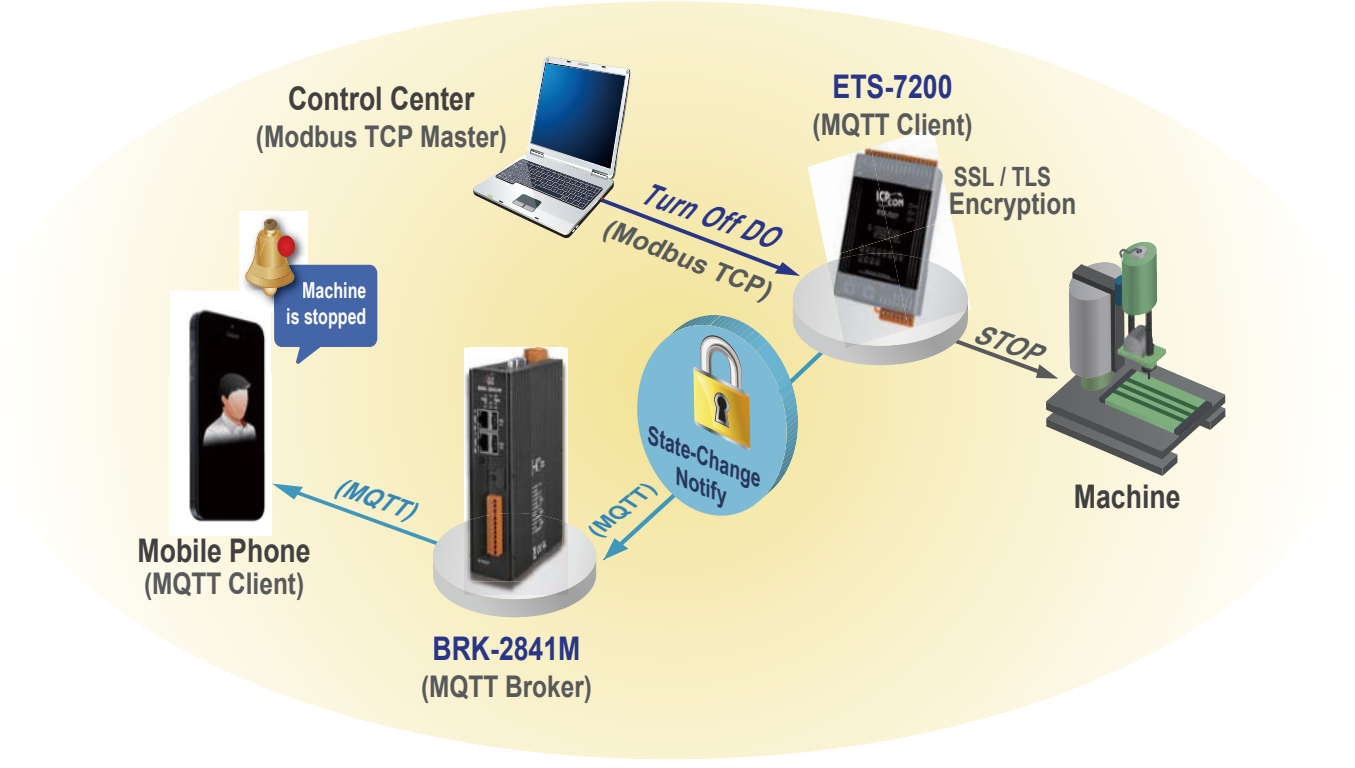
The Dual Watchdog design ensures system reliability, stability, and continuous operation. If a module freezes, the Hardware Watchdog resets the MCU and loads the AO/DO values according to user-defined power-on settings. The Software Watchdog monitors communication activity between the host controller and the module, and if the watchdog timeout occurs, the module switches outputs to safe values.

Flexible Communication, Multi-Layer System Integration

Support MQTT and Modbus for Flexible System Integration

ETS-7200 supports both the MQTT Client (V3.1.1) and the widely used Modbus TCP protocol for industrial automation simultaneously, providing flexibility and simplifying system integration.

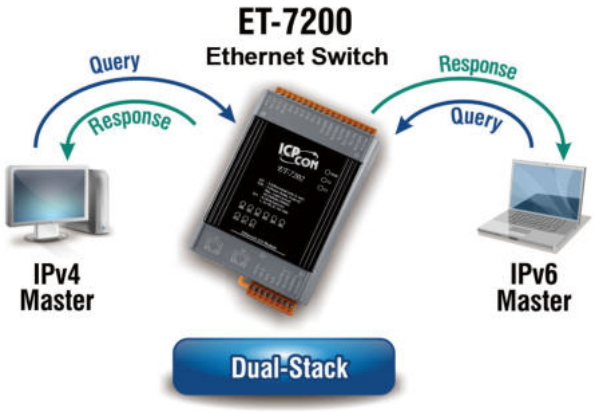
Users achieve remote control via SCADA systems or IIoT platforms. By incorporating SSL/TLS protocols into MQTT and Modbus TCP communications, we enhance security and prevent unauthorized access.



▲ ETS-7200 supports both MQTT and Modbus TCP, enhancing the flexibility of IIoT systems.

IPv4/IPv6 Dual-Protocol for Flexible Network Configuration

The ETS-7200 incorporates dual-stack technology for communication over IPv4 and IPv6 networks, automatically configuring through SLAAC. The module automatically requests IP information from the router, so IPv6 addresses don't need to be manually set, ensuring seamless connectivity.

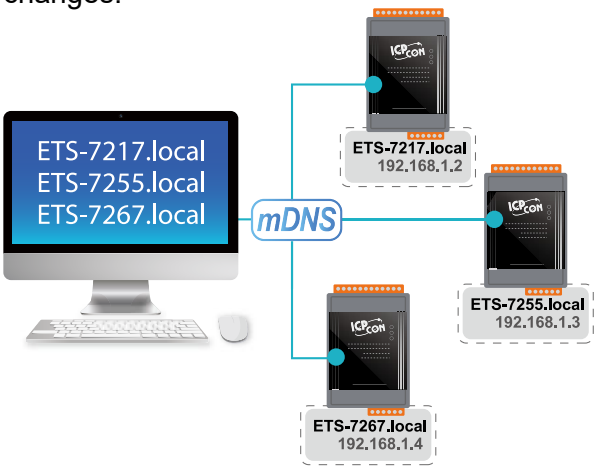


Seamless Device Interaction via a RESTful API

Supports reading and writing of I/O and virtual points over HTTP, with HTTPS ensuring secure, encrypted communications. Enable secure data transmission, facilitate remote access, and offer cross-platform compatibility. Also, it provides scalability for system growth and simplifies integration.

mDNS Hostname Resolution for Easy Connection

The ETS-7200 modules support the mDNS (Multicast DNS) protocol, allowing easy-to-remember domain names (e.g., EthernetIO.local) for local network communication with compatible browsers and software. Whether the module operates with static or dynamic IP addresses, users can maintain communication through the fixed mDNS domain name, helping to prevent problems associated with IP address changes.



▲ ETS-7200 supports RESTful API, enabling read/write I/O via HTTP/HTTPS to ensure secure communication and seamless interaction.

Stable and Reliable, Ensuring Uninterrupted Operation

Fast Boot (< 5 Seconds) for Immediate Operation

The module powers up and becomes fully operational in less than 5 seconds, ensuring immediate system availability. This Fast Boot enhances productivity, reduces delays, and improves efficiency. Enabling a quick reboot after power cycles or unexpected shutdowns minimizes downtime.

802.1Q and 802.1p Tagging for Prioritized Network Transmission

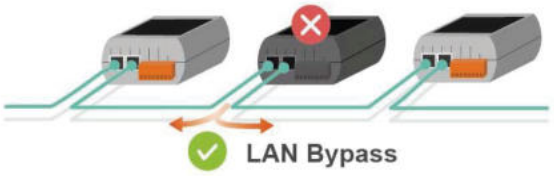
Supporting 802.1Q and 802.1p priority tagging, the ETS-7200 module tags data frames on selected protocols for use with 802.1Q compliant switches.

In a limited bandwidth network, this feature effectively preserves network resources, ensuring low-latency and high-reliability transmission.

Ethernet Daisy-Chain Cabling with LAN Bypass

Built-in 2-port Ethernet switch supports daisy-chain network topology, simplifying wiring, reducing maintenance complexity and costs, while enhancing network scalability.

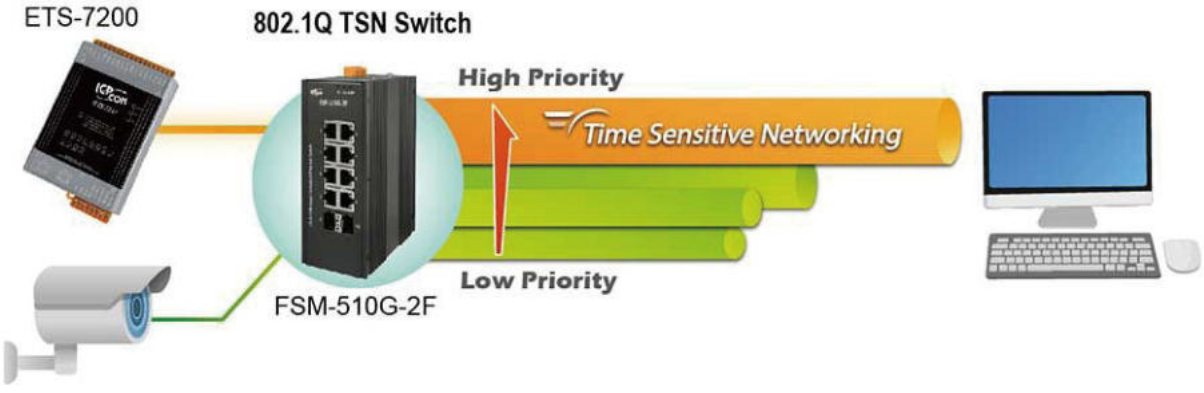
Additionally, the module features a LAN Bypass function that automatically activates when the module loses power, ensuring stable Ethernet communication.



Intelligent Edge: Empowering On-site Control

Rule Logic Engine for Streamlined Edge Control

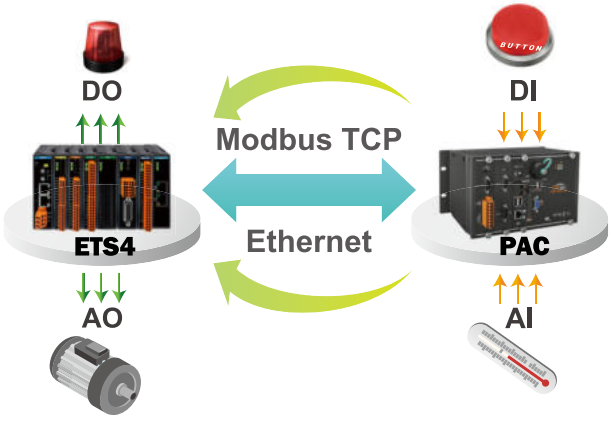
Built-in logic engine that supports IF-THEN-ELSE rules to make decisions with physical I/O and software points. This capability enables stable and efficient execution of automated monitoring tasks and encrypted or unencrypted e-mail notifications when specific events occur.



▲ ETS-7200 supports 802.1Q/802.1p priority tagging to ensure low delay for time sensitive networking within a limited bandwidth

Built-in Various I/O Functions

Support various I/O types, including optically isolated digital inputs, power relays, PhotoMOS relays, and open-collector outputs. The I/O Pair-Connection function establishes mirrored input-to-output pairs over Ethernet. Once configured, the module automatically transfers data between their respective paired I/O channels via Modbus TCP.



Building Secure and Intelligent IIoT

The ETS-7200 focuses on security, integration, and reliability, providing comprehensive solutions. ETS-7200 is a reliable partner for enterprises advancing toward intelligence, automation, and security.

For More Information:

Product website:

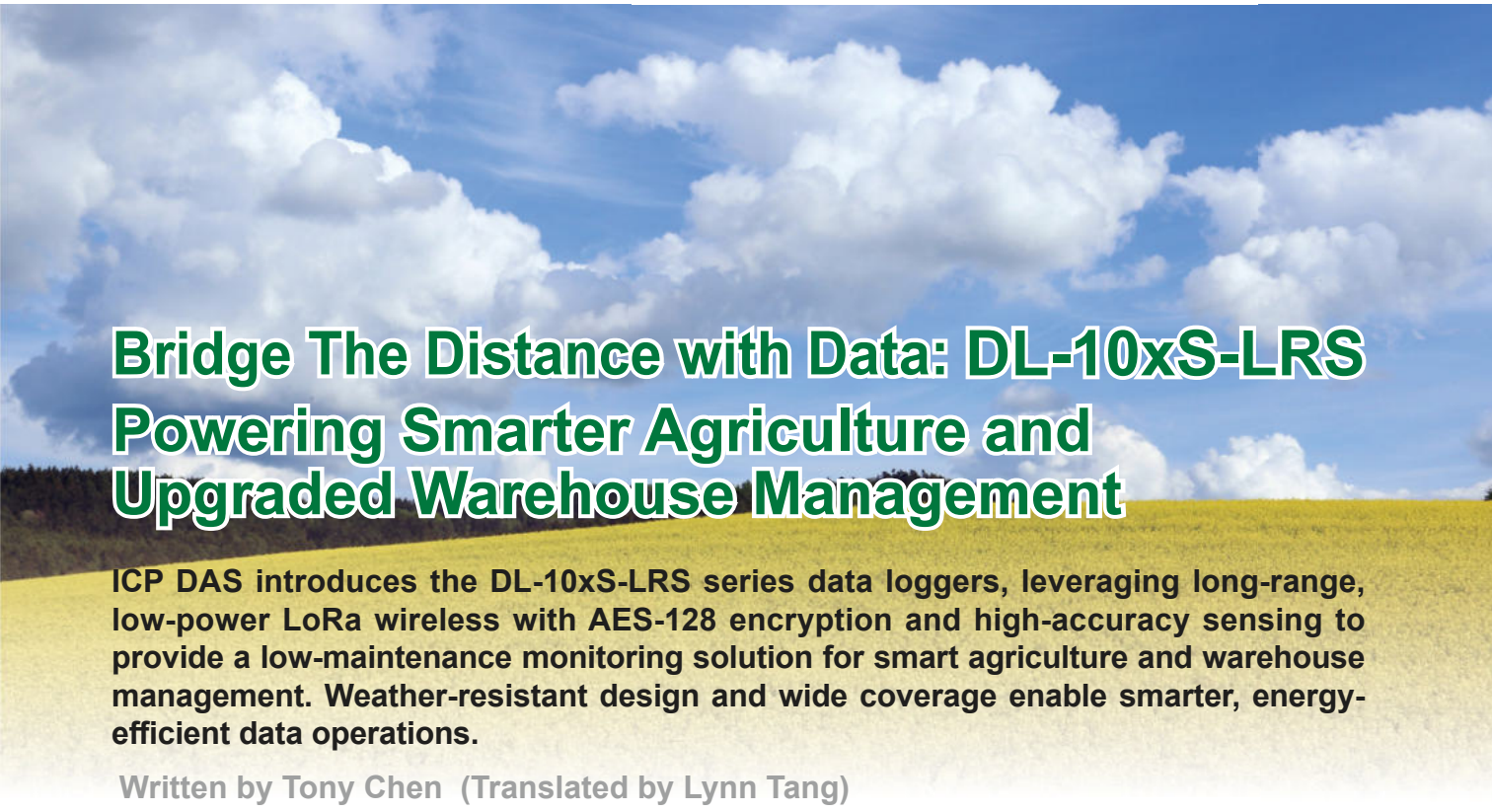
https://www.icpdas.com/?Lang=US

Technical support email:

service@icpdas.com■

Type	Model	Key Features	Notes
Analog Input	ETS-7217	8 AI, 4 DO (open collector)	±150 mV–±10 V, 0–20 mA, 4–20 mA
Multifunction I/O	ETS-7226	6 AI, 2 AO, 2 DI, 2 DO	Suitable for diverse signal control
Digital I/O	ETS-7255	8 DI + 8 DO (650 mA/ channel)	Supports NPN/PNP
Relay Output	ETS-7260 / ETS-7267	6 or 8 relay outputs	Form A (SPST N.O.), 5 A/channel

▲ ETS-7200 Series Selection Guide



Bridge The Distance with Data: DL-10xS-LRS Powering Smarter Agriculture and Upgraded Warehouse Management

ICP DAS introduces the DL-10xS-LRS series data loggers, leveraging long-range, low-power LoRa wireless with AES-128 encryption and high-accuracy sensing to provide a low-maintenance monitoring solution for smart agriculture and warehouse management. Weather-resistant design and wide coverage enable smarter, energy-efficient data operations.

Written by Tony Chen (Translated by Lynn Tang)

Breaking Distance and Power Barriers: Efficient, Low-Power Long-Range Connectivity

As IoT technology accelerates, long-range and low-power wireless communication has become a key driver for industrial upgrades. While traditional Wi-Fi offers high-speed transmission, its limitations in coverage and energy consumption become increasingly evident in wide-area monitoring, remote deployments, or long-term battery-powered applications.

Built around LoRa wireless technology, ICP DAS's DL-10xS-LRS series data loggers integrate a proprietary protocol to deliver highly stable and secure data transmission—meeting the needs of diverse IoT scenarios such as agricultural monitoring, warehouse management, smart buildings, and smart cities.

The Ideal Long-Range IoT Data Transmission Solution

The DL-10xS-LRS series enhances the DL-1xxS-WF's reliable environmental measurements such as temperature/humidity, dew point, and barometric pressure with a LoRa proprietary protocol. Using Chirp Spread Spectrum (CSS), LoRa enables long-range, low-power transmission—ideal for sites lacking continuous power or wiring.

The series offers multi-parameter environmental monitoring with large onboard storage, AES-128 data security, and an IP67 enclosure for industrial/outdoor reliability. Paired with GW-100-LRS or GW-200-LRS gateways, it enables remote, cross-site monitoring and seamless SCADA/HMI integration.

Product Highlights

- Ultra-Long-Range LoRa Wireless Communication: Powered by advanced LoRa technology to deliver multi-kilometer, ultra-long-distance wireless data transmission—effectively overcoming the coverage limitations of conventional wireless solutions.
- AES-128 Enterprise-Grade Encryption: Wireless communication is protected by AES-128 (Advanced Encryption Standard), a symmetric encryption algorithm designed to safeguard data security and privacy.
- Multi-Function Sensing Capability: Accurately measures temperature, humidity, dew point, and wet-bulb temperature. The DL-102S-LRS also supports barometric pressure and altitude measurement to meet diverse environmental monitoring needs.
- Large-Capacity Data Storage: Built-in storage for up to 650,000 records, ensuring uninterrupted long-term data logging, with support for CSV data download.
- Real-Time Data Access: Users can monitor real-time data anytime, anywhere via SCADA applications or HMI through Modbus.
- PhotoMOS Relay Outputs: Equipped with two PhotoMOS relay outputs to trigger alarms or execute automated control based on preset conditions and thresholds.
- Rugged, Weather-Resistant Design: IP67-rated protection ensures stable operation in harsh outdoor and industrial environments.

Smart Agriculture: Make Every Drop Count—with Data

Traditional large-farm monitoring relied on complex wiring or Wi-Fi repeaters—slow to deploy and hard to expand. With LoRa self-networking, farmers can place sensors at critical points—root zones, greenhouse interiors/exteriors, and irrigation lines—and transmit data reliably to a gateway kilometers

Technical Insight: Performance Comparison Between LoRa and Wi-Fi

By adopting LoRa technology, the DL-10xS-LRS series overcomes Wi-Fi limitations in long-range and low-power applications—unlocking broader possibilities for IoT deployments.

Feature	LoRa	Wi-Fi
Transmission Range	Several kilometers to tens of kilometers (depending on environment)	Tens to hundreds of meters (depending on router and environment)
Bandwidth	Low bandwidth, suitable for small data payloads	High bandwidth, suitable for large data transmission
Deployment Cost	Wide gateway coverage; low cost per site	Requires multiple routers; higher deployment cost
Penetration Capability	Stronger; suitable for complex environments	Weaker; more affected by obstacles such as walls
Security Mechanism	Built-in AES-128 encryption	Relies on WPA/WPA2 protocols
Applications	Remote monitoring, asset tracking, smart agriculture, smart cities, etc.	Local area networks, high-speed data transfer, video/audio streaming, etc.

away. The gateway uploads data to the cloud for storage, analytics, and visualization, delivering real-time field insight via a mobile app or web dashboard. No trenching, no extra access points—just scalable coverage with lower maintenance overhead.

Sensor nodes continuously report temperature, humidity, and dew point to reveal environmental trends. If readings exceed preset thresholds, the system sends instant alerts for timely irrigation, ventilation, or pest control. With built-in PhotoMOS relay outputs, the DL-10xS-LRS can also trigger irrigation or ventilation equipment automatically—enabling farms to shift from monitoring to self-regulation.

A LoRa-based network lets one gateway cover several square kilometers, cutting deployment and maintenance costs. Ultra-low power extends battery life for long-term outdoor operation. Farmers save water and fertilizer while using analytics to achieve true precision agriculture.

Protect Product Quality with Smarter Warehouse Sensing

Food, pharmaceuticals, and electronic components are highly sensitive to temperature and humidity changes—exceeding limits can cause losses. The DL-10xS-LRS series delivers wide-area, low-maintenance LoRa monitoring with flexible, wire-free sensor deployment and real-time data to a central platform. Staff can track conditions via HMI or mobile devices, and the system can automatically trigger ventilation or cooling when abnormalities occur to maintain optimal storage conditions.

LoRa's wide-area coverage enables cross-warehouse monitoring. Sensor nodes on different floors or dispersed sites can aggregate data and manage alarms through a single gateway, supporting centralized, intelligent warehouse operations for easier multi-site supervision.

▲ LoRa wireless sensors upgrade farms with real-time cloud data, enabling precision irrigation and automated environmental control.

Go Farther. Stay Stronger. Spend Less.

The DL-10xS-LRS series combines long-range, low-power LoRa with proven environmental monitoring expertise—expanding what's possible for IoT deployments.

From precision irrigation in large farms to temperature-and-humidity control in warehouses, the DL-10xS-LRS series delivers stable, long-range, low-power data collection. It enables accurate monitoring, smarter automation, and centralized management while reducing deployment and operating costs. Build scalable, sustainable IoT systems faster—with a reliable foundation across dispersed sites and harsh industrial environments.

DL-101S-LRS / DL-102S-LRS LoRa Wireless Temperature & Humidity Data Logger

Item	Specification
Measured Parameters	Temperature, Humidity (DL-102S also includes Barometric Pressure)
Measurement Range	-20 to +60 °C, 0–100% RH, 300–1200 hPa (DL-102S)
Accuracy	Temperature ±0.4 °C, Humidity ±3% RH, Pressure ±1 hPa
Digital Output	2-channel PhotoMOS, 1000 mA / 100 VDC
Data Logging Capacity	650,000 records
Wireless Communication	LoRa 900 MHz, AES-128 encryption
Model Comparison	DL-101S-LRS: Temp/Humidity sensing version DL-102S-LRS: Adds barometric pressure

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Smart Sensing · Precise Monitoring

Industrial Environment Sensor Guide

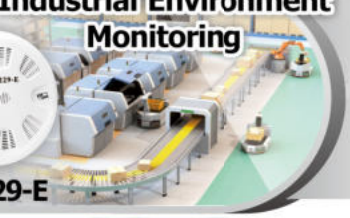
- Records 450,000 sensor data entries with timestamps for full traceability.
- Supports Modbus RTU/TCP and MQTT protocols with RS-485, Ethernet, and Wi-Fi interfaces for easy system integration.
- Supports remote monitoring to track air quality in real time and ensure environmental safety.
- Built-in relay output for connecting alarm lights, sirens, or HVAC systems to automatically regulate environmental conditions

DL-1029

DL-306-IP65

CL-229-E

Industrial Environment Monitoring



Monitored Parameters

PM2.5, PM10, Carbon Monoxide, Carbon Dioxide, TVOC, Formaldehyde, Ammonia, Hydrogen Sulfide, Sulfur Dioxide, Humidity, Temperature

CL-204-E

DL-303

Indoor Air Quality Monitoring

Monitored Parameters

Carbon Dioxide, Formaldehyde, TVOC, Humidity, Temperature

CL-20A-C

CL-2S-E

Fire Safety

Monitored Parameters

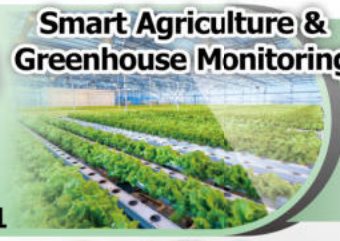
Methane, Smoke, Humidity, Temperature

DLW-1120

DL-111S-WF

DL-11

Smart Agriculture & Greenhouse Monitoring



Monitored Parameters

Wind Speed, Wind Direction, Humidity, Temperature, Atmospheric Pressure, Sea Level Height, Illuminance, Rainfall

DLW-2069-01

Smart City & Outdoor Monitoring

Monitored Parameters

PM2.5, Wind Speed, Wind Direction, Humidity, Temperature, PM10, Atmospheric Pressure, Sea Level Height, Illuminance, Rainfall

E-Catalog
工業物聯網 IIoT：
環境感測、微型氣象站

E-Catalog
IIoT: Environmental Monitoring, Mini Weather Station

ICP DAS 泓格科技

Industrial Computer Products and Data Acquisition Systems

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ET-7217-A5 / PET-7217-A5

Ethernet High-Voltage Analog Input / Digital Output Module

From Wiring to Power Supply: Fewer Cables, Greater Efficiency

The ET-7217-A5/PET-7217-A5 feature 4 digital output channels and 8 differential high-voltage input channels. Each input channel supports two selectable voltage ranges and can be configured independently, providing maximum flexibility for a wide range of applications. With full networking capabilities and an intuitive web-based user interface, the ET-7217-A5/PET-7217-A5 allow easy configuration and remote monitoring. Supporting Modbus TCP/UDP protocols, these modules integrate seamlessly with HMI, SCADA, PLCs, and other industrial automation systems.

Features

- 2-port Ethernet Switch (LAN bypass) for Daisy-chain Wiring
- 8 Channels High Voltage AI(±50 V / ±150 V)
- 4 Channels DO
- Support for both Modbus TCP and Modbus UDP Protocols
- Support an intuitive web-based user interface
- 2500 V_{DC} 2-way Isolation
- Support Multi-Host Access
- Supporting Ethernet Daisy Chain can reduce network switch usage
- PET-7217-A5 Support PoE (IEEE 802.3af, Class 1)
- Configurable IP, analog input range, and digital output mode
- Dual Watchdog

More Information

More about ET-7217-A5 / PET-7217-A5, please refer to:

https://www.icpdas.com/en/product/ET-7217-A5

https://www.icpdas.com/en/product/PET-7217-A5

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GW-2439M

BACnet/IP Client to Modbus TCP Server / RTU Slave Network Gateway

Professional-Grade BACnet and Modbus System Integration Solutions

The GW-2439M is a high-performance industrial network gateway designed for data integration and conversion between BACnet/IP systems and Modbus network architectures. It simultaneously functions as a BACnet/IP Client, Modbus TCP Server, and Modbus RTU Slave, establishing a real-time, reliable data exchange bridge between heterogeneous systems. Using the GW-2439M, users can easily map device data provided by a BACnet/IP Server to Modbus registers. This allows higher-level systems (such as SCADA, HMI, or PLC) to perform read/write operations as a Modbus TCP Client or Modbus RTU Master, achieving system integration and centralized monitoring.

Features

- Read/write BACnet object values via Modbus registers
- Configurable for up to 10 BACnet/IP server devices.
- Supports both Modbus TCP Server and Modbus RTU Slave simultaneously
- Supports BACnet object types: AI, AO, AV, BI, BO, BV, MSI, MSO, MSV
- Supports conversion of up to 9,000 BACnet objects' present_value to Modbus registers
- Software tool supports scanning BACnet/IP servers and their objects
- Software tool allows configuration of BACnet/IP objects and automatically generates the Modbus mapping table

More Information

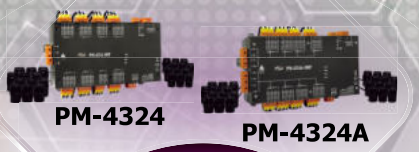
More about the GW-2439M module, please refer to https://www.icpdas.com/en/product/GW-2439M ■

ICP DAS Smart Power Meters

Create the Foundation of Energy Visualization

Multi Protocol | **Accurate Measurement** | **Smart Early Warning**

Wired Power Meters



PM-4324 PM-4324A

Multi-circuit Power Meter

3-phase Power Meter

Single-phase Power Meter

Communication Interface

- RS-485 Modbus RTU
- Ethernet Modbus TCP
- Ethernet Ethernet/IP
- CANbus CANopen

Isolated | Rogowski Coil

PM-3033 PM-3133 PM-3133i PM-3133-RCT

LED Display

PM-2133D

Demand Management

PM-5133-00P

PM-3112 PM-3114

Wireless Power Meters

100M | Sub-GHz | Timestamp | Data Recovery | Retransmission | Voltage Power

- 64 subnets; each subnet supports up to 31 sensor modules.
- Sub-GHz ensures low-interference and long-distance stable communication, transmission distance up to 100m.
- Wireless Retransmission & Data Recovery.
- Timestamps for data integrity and machine difference energy-saving application.
- Powers by the measured voltage cable.

iWSN-9601/9603 series

Single-phase/3-phase Smart Power Meter

Supports connection of up to 3 iWSN-200 Data Concentrators & up to 93 iWSN wireless sensors.

iWSN-200U PMC-224xM-iWSN

Wireless Data Concentrator

E-Catalog
iWSN Power Meter Wireless Energy Management Solution

E-Catalog
Energy Management Best Practices

E-Catalog
Energy Management Solutions

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Industrial Computer Products and Data Acquisition Systems

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