



WISE - Web Inside, Smart Engine



Features

- Runs on browsers, no extra software tool is required
- No more programming, Web pages provided for control logic editing
- IF-THEN-ELSE logic rules execution ability
- Support XV-board
- Support DCON or Modbus RTU Slave devices (Up to 32)
- Support Modbus TCP Slave devices (Up to 16)
- SSL/TLS Email sending function supported
- Timer and Schedule functions supported
- Data logger and data files send back function supported
- Active I/O sending function for real-time data transfer
- CGI Command sending and receiving function supported for IP Camera and Network device
- Support Modbus TCP/RTU, SNMP, FTP and MQTT protocols
- WISE-5231M-3GWA support 3G Wireless data communication and SMS message sending/receiving



Introduction

WISE(Web Inside, Smart Engine) is a product series developed by ICP DAS that functions as control units for use in remote logic control and monitoring in various industrial applications. WISE offers a user-friendly and intuitive web site interface that allows users to implement IF-THEN-ELSE control logic on controllers just a few clicks away; no programming is required. With its powerful and easy-to-use features, it will minimize the learning curve, shorten time to market and dramatically reduce the labor and cost spent on system development.

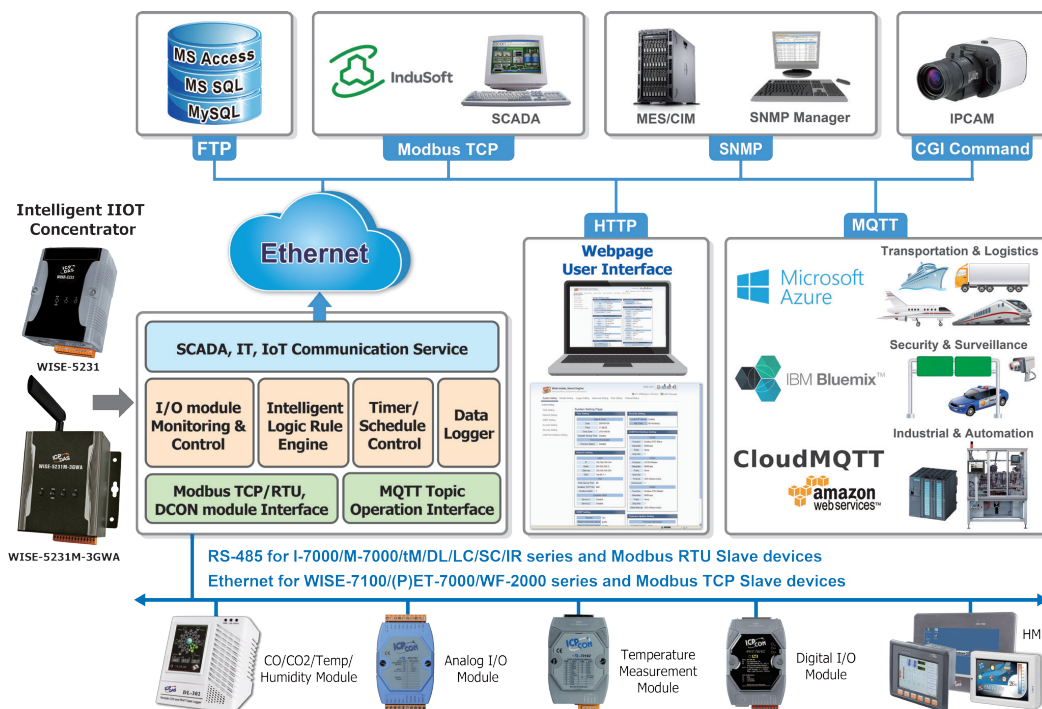
WISE-5231 provides more supports in I/O functions. It allows connections to XV-board; supports DCON I/O modules, Modbus RTU Slave modules and Modbus TCP Slave modules together. The wide range of selection options enables flexibility in I/O module integration to meet the requirements from various applications. WISE-5231 provides Data Logger function to record the I/O channel data by periodic cycle or event trigger. And it allows to send the data files by FTP to the control center. In addition to the CGI command sending function, WISE-5231 now supports the CGI command receiving function that allows the devices (such as IP camera) connected to the network to trigger the operation of IF-THEN-ELSE logic rule of WISE-5231. The well thought-out CGI command functions make WISE-5231 being able to interact with the devices flexibly in the network environment. WISE-5231 also supports SNMP, SNMP Trap, MQTT and DDNS protocols and services. The flexible integration ability with the SCADA and IT software or devices and the reliable ability of real-time I/O logic control and data logger make WISE-5231 the most cost-effective I/O controller in the IIoT (Internet of Things) Age.

Hardware Specifications

Model	WISE-5231		WISE-5231M-3GWA
System			
CPU	32-bit ARM CPU		
Software	Built-in WISE Firmware		
microSD Expansion	Built-in one 4 GB microSD card (support up to 32 GB microSDHC card)		
Communication			
Ethernet	RJ-45 x 1, 10/100/1000 Base-TX (Auto-negotiating, Auto MDI/MDI-X)		
COM 2	RS-232 (Tx/D, Rx/D, GND), non-isolated, Speed: 115200 bps max.		
COM 3/COM 4	RS-485 (Data+, Data-), Speed: 115200 bps max. COM 4 provides 2500 VDC isolation		
LED Indicators			
Indicators	Power/Run LED(Green, Red),L1(Green), L2(Green)		Power/Run LED(Green, Red),3G/4G LED(Green), L1(Green), L2(Green)
I/O Module Support			
Local I/O Module	Yes, one XV-board		
Remote I/O Module	COM3 can connect to Max.16 DCON or Modbus RTU Slave modules; COM4 can connect to Max.16 DCON or Modbus RTU Slave modules; LAN interface can connect to Max. 16 Modbus TCP Slave modules.		
Power Requirements			
Input Range	12 to 48 VDC		
Power Consumption	4.8 W		6.5W
Mechanical			
Dimensions/Installation	91 mm x 132 mm x 52 mm (W x L x H) / DIN-Rail Installation		117 mm x 126 mm x 58 mm (W x L x H) / Wall Mounting Installation
Environmental			
Temperature	Operating Temperature: -25 °C to +75 °C; Storage Temperature: -40 °C to +80 °C		
Humidity	10 to 90% RH, Non-condensing		
3G System			
Frequency Band	-		WCDMA 850/900/1800/1900 MHz



System Architecture



WISE-5231 : A perfect concentrator of sensor and I/O modules in the IoT age

Industry 4.0 is based on Internet of Things (IoT) that incorporates the technological concept of communicating and exchanging information between all facilities which brought manufacturing industry to a new era. The WISE-5231 Intelligent IoT Controller developed by ICP DAS is a perfect start point to facilitate the vision of the Smart Factory.

WISE-5231 provides powerful and flexible integration with the I/O modules and sensors at the field side, and also supports various IoT protocols for seamless integration with the SCADA/MIS/MES/IT/Network Management systems to transfer the real-time I/O information from the front-end modules (or sensors) to the back-end management systems. It also features reliable real-time I/O logic control and data logger functions. All of these features make WISE-5231 a perfect concentrator of sensor and I/O modules in the IoT age.

- Support Modbus TCP/RTU Protocol
- Support SNMP (Simple Network Management Protocol)
- Support MQTT (MQ Telemetry Transport) for message publish/subscribe mechanism
- Support FTP Server/Client for the maintenance of data logger files
- Support SSL/TLS authentication Email sending for alarm notification
- Support full CGI command operations - CGI command sending and CGI command receiving
- Support DDNS (Dynamic DNS)
- Support 3G Wireless data communication, and SMS message sending/receiving (WISE-5231M-3GWA only)

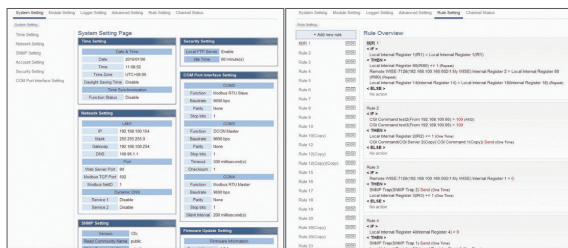


WISE - Web Inside, Smart Engine

■ Features

■ Simple, easy-to-use, no-programming-required for system development

WISE provides user-friendly Web UI pages for editing control logic on the controllers. To edit control logic, it only requires a browser to connect to the Web server on WISE. No extra software tool installation is needed. WISE enables implementation of logic edition by a few clicks on the mouse to set up and deploy logic rules without writing a single line of code.

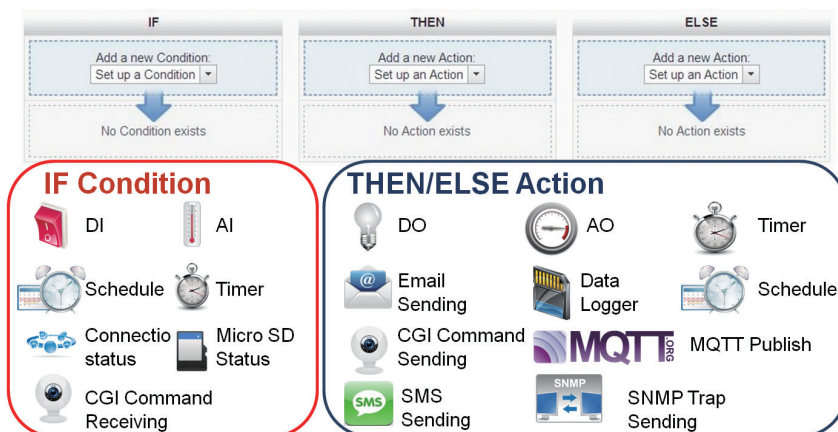


▲ WISE Web User Interface

▲ Click and get done!

■ IF-THEN-ELSE logic rules execution ability

WISE controller features an IF-THEN-ELSE logic rule engine; it offers IF-THEN-ELSE rules for users to set up the logic content. After completing rule edition and downloading rules to the WISE, the rule engine will loop execute the rules in accordance with the execution order under specific conditions.



▲ The function overview of IF-THEN-ELSE rule engine

■ Real-time alarm notification via SSL Email

WISE supports SSL Email sending function for real-time message notification operation. The message sending action can be added to the logic edition as part of logic control to provide real-time message notification to the related personnel when an event occurs.



▲ SSL Email Sending function

■ CGI Command sending & receiving for surveillance system integration

WISE supports full CGI command operations - CGI command sending and CGI command receiving. The CGI command sending action can be added to the logic edition as part of logic control in response to specific events. The CGI command receiving function enables WISE to receive the CGI commands from others network devices. The content of CGI command received can be used in IF condition statements to trigger the THEN/ELSE actions.

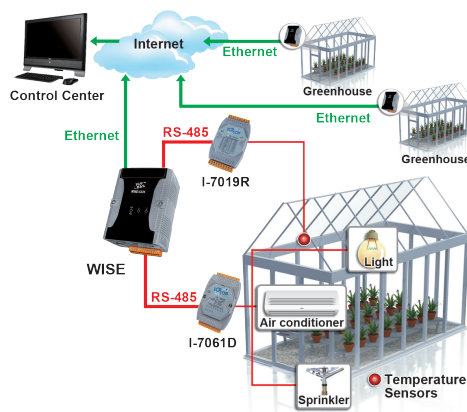


▲ CGI Command Sending function



■ Active I/O sending mechanism

In addition to the Modbus TCP/RTU slave function that enables SCADA system to poll the I/O channel data of the WISE, now WISE provides "Active I/O sending" mechanism (Modbus TCP master, SNMP Trap and MQTT publish). Based on the "Active I/O sending", WISE allows to send the I/O channel data of the controller actively to SCADA/IT system by event trigger (change of the I/O channel data) or periodic cycle. This function will improve the efficiency of the data communication between WISE and SCADA/IT system.



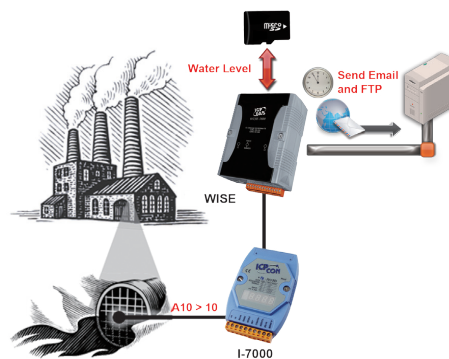
▲ Active I/O sending mechanism

■ Provide Timer and Schedule operation

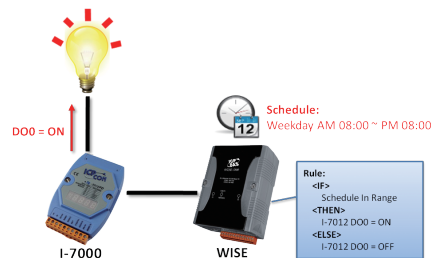
WISE features Timer and Schedule functions: It allows user to schedule specific date or time for control logic execution, or perform specific tasks such as time delay. With calendar user interface provided, Schedule setting can be more efficient and flexible.

■ Data Logger operation

With the microSD card, WISE provides Data Logger function to real-time record the I/O channel data of the controller and sends the data files automatically by FTP to the control center for further administration management or data analysis.



▲ Data Logger function



▲ Schedule function

■ Connection ability to a variety of sensors and devices

WISE Controller allows to connect with sensors and devices that support Modbus TCP/RTU protocol for I/O monitoring. The ability to connect with Modbus TCP/RTU slave devices enables the flexibility and scalability for system implementation and allows to meet various requirements of the applications from the clients.



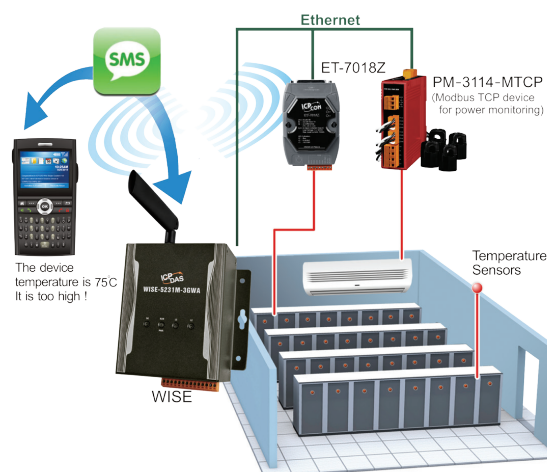
▲ Connect to a variety of sensors and devices



WISE - Web Inside, Smart Engine

■ Support 3G Wireless data communication, and SMS message sending/receiving (WISE-5231M-3GWA only)

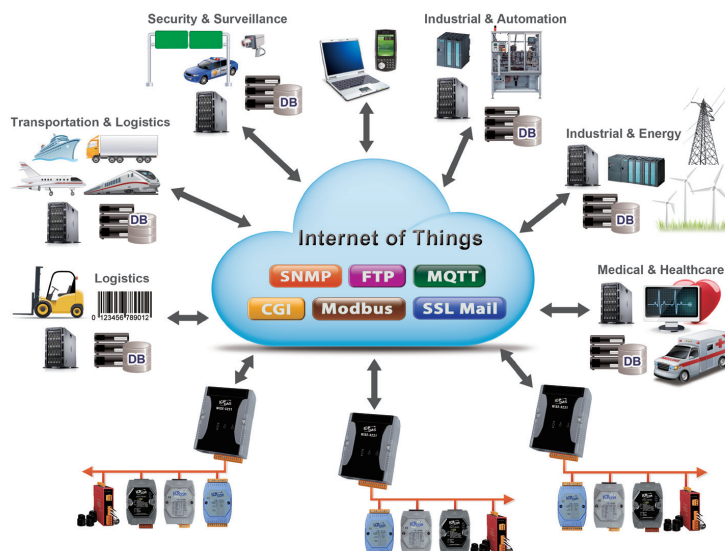
In addition to Ethernet interface, WISE-5231M-3GWA also provides 3G Wireless communication interface. It can send the real-time data of sensors and I/O modules, data logger files and Email alarm message back to the control center by 3G Wireless Network. WISE-5231M-3GWA also supports SMS message sending function for real-time message notification. The message sending action can be added to the logic edition as part of logic control to provide real-time message notification to the related personnel when an event occurs. WISE also is equipped with SMS command receiving function. It allows to receive the SMS commands sent by specific phone numbers to perform tasks such as real-time I/O channel value monitoring, I/O channel value modification and logic rules execution (triggered by SMS), etc.



▲ 3G Data Communication and SMS Message Notification

■ A variety of protocols supported for integration with SCADA/IT/IoT System

WISE supports various communication protocols to perform real-time monitoring and control of the controllers. The Modbus TCP/RTU protocol of WISE allows sharing I/O channel and system data with the SCADA system. WISE also support the SNMP, CGI, FTP and MQTT protocols for easy integration with the IT/MIS/MES/Facility management /Network management system. The flexible integration ability with the SCADA and IT system make WISE the most cost-effective I/O controller in the IoT (Internet of Things) applications.



▲ A variety of protocols supported for SCADA/IT/IoT System



ICP DAS IoTstar - The IoT Software for Controller Remote Monitoring & Management

IoTstar is a software product developed by ICP DAS that functions as a software unit for use in remote monitoring and management of WISE-52xx controllers in a variety of industrial applications. IoTstar offers a user-friendly and intuitive HMI interface that allows users to implement System Setting/Management/Control Logic Editing/Status Monitoring on remote WISE controllers just a few clicks away; no programming is required. After the remote WISE-5231 or WISE-5231M-3GWA controllers completing the Network connection with the IoTstar by Ethernet/3G Network interface, WISE can communicate with the IoTstar even the WISE controller is in the Private IP Domain configuration (For example : Locate behind the firewall or occupy the Dynamic Virtual IP setting) . By using the IoTstar Web page interface, the remote monitoring and management of WISE-52xx controllers can be easy.

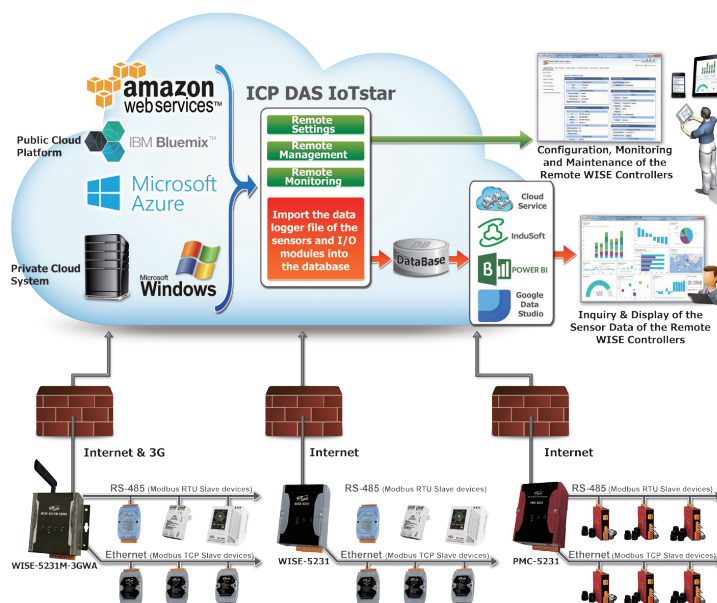
With the microSD card, WISE-52xx provides the Data Logger function to real-time record data of the Sensors and I/O modules and sends the data logger files back to the IoTstar via FTP protocol. When the IoTstar receives these data logger files from the remote WISE-52xx, it will import the content of these files into the Database system. After that, user can use the SCADA system or Data analysis tool (for example: Power BI) to retrieve the data of the Sensors or I/O modules directly from the Database system for further information analysis or display operations.

IoTstar can be installed on a general PC platform as a Private Cloud system. It also can be installed on the Public Cloud platform (for example: Microsoft Azure, IBM Bluemix or Amazon AWS). Based on these Public Cloud platforms, the IoTstar also provides System setting/Management/Control Logic Editing/Status Monitoring on the remote WISE-52xx controllers, and import the content of the data logger files of remote WISE-52xx into the Database system of the Public Cloud platform. Based on the standard Database interface, the Cloud Services which the Public Cloud platform provide can directly retrieve the data of the Sensors or I/O modules of the WISE-52xx from the Database system for further information display or analysis operations.

By using IoTstar and WISE-52xx, it is easy to build a IoT Cloud Remote Monitoring and Management system, during the whole process of system development, no programming is required; by a few settings of WISE-52xx and connection parameters for Database; the user could quickly convert the sensor and I/O module data of the WISE-52xx into Database system, easily integrate with the Cloud Service from the Public Cloud platform (or Private Cloud system) for the remote monitoring and management of the WISE-52xx controllers. The IoTstar and WISE-52xx is an easy-to-use and easy-to-build IoT Cloud solution for the IoT(Internet of Things) and Industry 4.0 applications.

Feature

- Support WISE-5231 and WISE-5231M-3GWA. IoTstar must be installed on Windows 7/8/10 or Windows Server system.
- Enables the settings of the system parameters, IF-THEN-ELSE logic rule editing and status monitoring of the WISE-52xx controllers at the remote side via user-friendly and intuitive Web page interface.
- Receive the data logger file of the sensors and I/O modules from the remote WISE-52xx controllers and import the content of the data logger files into the Database system (My SQL or MS SQL) for future data analysis and management.
- By standard Database interface, it is easy to integrate with SCADA or Data analysis tool (for example: Power BI) for the data analysis, display and management of the historical data of the sensors and I/O module connected to the remote WISE-52xx controllers.
- IoTstar can be installed on the Public Cloud platform (such as: Microsoft Azure, IBM Bluemix, or Amazon AWS), and work with the Cloud Service provided by the Public Cloud platform. Based on the standard Database interface, it is easy to set up an IoT Cloud system for the data analysis, display and management of the sensors and I/O modules connected to the remote WISE-52xx controllers.





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■ Software Specifications

Function	Description
User-friendly and intuitive web site interface	<ul style="list-style-type: none"> ● Runs on browsers, no extra software tool is required ● No more programming, Web pages provided for control logic editing and system parameters setting
Various options for easy I/O module integration	<ul style="list-style-type: none"> ● Support XV-board ● Support DCON or Modbus RTU Slave devices (Up to 32) ● Support Modbus TCP Slave devices (Up to 16)
Intelligent Logic operation and data logger ability at field sites	<ul style="list-style-type: none"> ● Provide IF-THEN-ELSE logic rule editing, and the ability for IF-THEN-ELSE logic rules execution ● Offers various options for I/O channel settings; for example: deadband setting for AI signals, linear scale setting, temperature degree in Celsius or Fahrenheit setting, power on value setting for DO channel, pulse output setting and DI counter setting, etc ● Perform the timing function. The status of Timer can be included in IF condition statements to trigger the THEN/ELSE actions ● Perform the prescheduled routine tasks. The status of Schedule can be included in IF condition statements to trigger the THEN/ELSE actions. "Calendar" and "Weekly repeat" schedule setting UI are provided. ● Execute Email message sending. The SSL/TLS authentication is provided ● Perform CGI command sending and receiving functions. The content of CGI command receiving can be used in IF condition statements to trigger the THEN/ELSE actions ● Perform Data Logger function to real-time record the I/O channel data of the controller by Period or Event Trigger operation ● Work as a variable to hold the temporary value, and provide the basic mathematical operation.
Various protocols for seamless integration with SCADA/MIS/ MES/IT/ Network Management systems	<ul style="list-style-type: none"> ● Support Modbus TCP/RTU protocol for SCADA system ● Support SNMP and MQTT protocols for the integration with MIS/MES/IT/Network Management systems ● CGI Command sending and receiving function supported for the integration with IP Camera and Network devices. ● Active I/O sending mechanism supported ● FTP Server/Client ability for the maintenance of data logger files and the data logger files automatically send back operation ● Provide data recovery mechanism so that when experiences network disconnection, the data log files will be kept in WISE, and be recovered after the network is resumed ● Provide alarm notification mechanism so that when microSD card is damaged, the data log file will be stored in WISE to ensure zero data loss of the data logger ● DDNS (Dynamic DNS) service supported ● Support 3G Wireless data communication, and SMS message sending/receiving (WISE-5231M-3GWA only)

■ I/O Module Support

☑ Local I/O Expansion (XV-board)

AI, AO, DI, DO XV-board						
Model Name	DI	DO	AI (16-bit)		AO (12-bit)	
			Ch	Range	Ch	Range
XV107, XV107A	8	8	-	-	-	-
XV110	16	-	-	-	-	-
XV111, XV111A	-	16	-	-	-	-
XV116	5	2 Signal Relay 4 Power Relay	-	-	-	-
XV306	4	4(Relay)	4	$\pm 1\text{ V}$, $\pm 2.5\text{ V}$, $\pm 5\text{ V}$, $\pm 10\text{ V}$, $\pm 20\text{ mA}$, $0 \sim 20\text{ mA}$, $4 \sim 20\text{ mA}$	-	-
XV307	4	4(Relay)	-	-	2	$0\text{ V} \sim +5\text{ V}$, $\pm 5\text{ V}$, $0\text{ V} \sim +10\text{ V}$, $\pm 10\text{ V}$, $0\text{ mA} \sim +20\text{ mA}$, $+4\text{ mA} \sim +20\text{ mA}$
XV308	DI+DO=8		8	$\pm 1\text{ V}$, $\pm 2.5\text{ V}$, $\pm 5\text{ V}$, $\pm 10\text{ V}$, $\pm 20\text{ mA}$, $0 \sim 20\text{ mA}$, $4 \sim 20\text{ mA}$	-	-
XV310	4	4	4	$\pm 1\text{ V}$, $\pm 2.5\text{ V}$, $\pm 5\text{ V}$, $\pm 10\text{ V}$, $\pm 20\text{ mA}$, $0 \sim 20\text{ mA}$, $4 \sim 20\text{ mA}$	2	$0\text{ V} \sim +5\text{ V}$, $\pm 5\text{ V}$, $0\text{ V} \sim +10\text{ V}$, $\pm 10\text{ V}$, $0\text{ mA} \sim +20\text{ mA}$, $+4\text{ mA} \sim +20\text{ mA}$

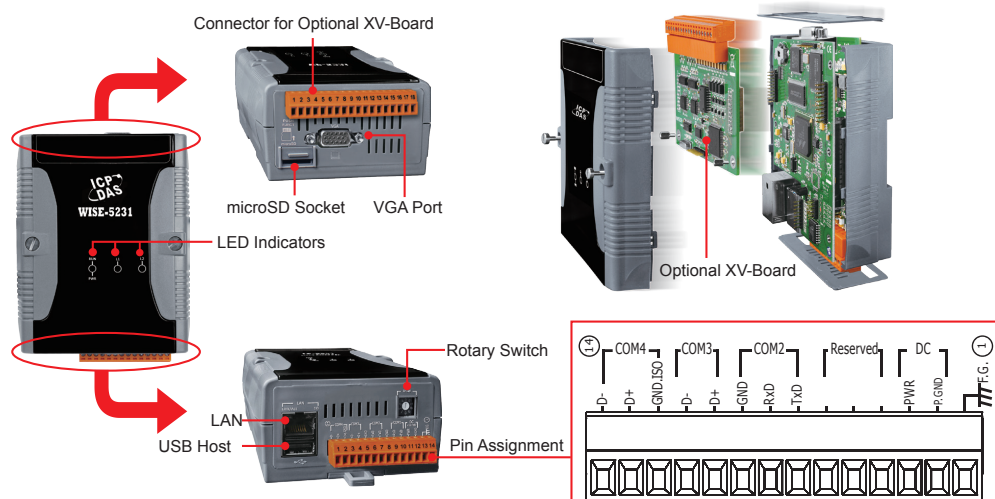
☑ Remote I/O Expansion Modules

DCON Module	ICP DAS I-7000/DL series module
Modbus RTU Slave Module	ICP DAS M-7000/tM/DL/LC/SC/IR series module and Modbus RTU Slave module
Modbus TCP Slave Module	ICP DAS WISE-7100/(P)ET-7000/WF-2000 series module and Modbus TCP Slave module

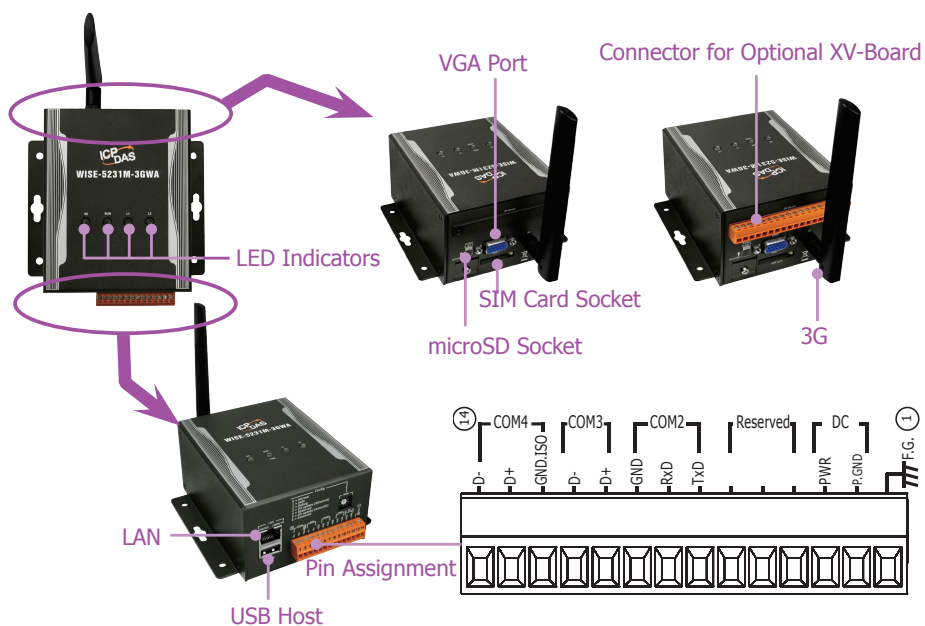


■ Appearance

WISE-5231



WISE-5231M-3GWA



■ Ordering Information

WISE-5231	Intelligent IIoT Edge Controller
WISE-5231M-3GWA	IIoT Edge Controller (Support 3G Wireless data communication)

■ Accessories

NS-205 CR	Unmanaged 5-Port Industrial Ethernet Switch (RoHS)
MDR-20-24 CR	24V/1A, 24 W Power Supply with DIN-Rail Mounting (RoHS)
DIN-KA52F CR	24V/1.04A, 25 W Power Supply with DIN-Rail Mounting (RoHS)