Yokogawa Field Wireless Solution
Wireless applications are expanding.

Field wireless system assumes a large role in Business Continuity Plan (BCP) in case of an incident. Wireless system ensures an operation continuity during accident which destroys power and communication infrastructure in the field.

Gas
- Flammable gas detection
- Gas distribution station
- Heat exchanger temp.
- LNG temp. monitoring
- Natural gas extraction separator unit
- Process monitoring
- Separation water
- UGS well press. & temp. monitoring
- Vibration sensor

Oil
- Oil cellar pit press. & temp.
- Pipe leakage monitor
- Pipeline temp. monitoring
- Press. monitoring (Gauge)
- Tank level monitoring
- Tank temp. monitoring
- Vibration sensor

Water & Wastewater
- Wastewater pressure & pH
- Water flow in effluent treatment
- Water intake yard
- Water level (River) monitoring
- Water reservoir - Utilities
- Water well level

Pharmaceutical
- Clean room monitoring
- Cosmetics plant
- Freezer temp.
- Rotary machine
- Warehouse pallet temp.
- Water flow in effluent treatment
- Water well level

Food & Beverage
- Molasses tank farm in sugar plant
- River catchment water flow room temp.
- Food tank temp. & press.
- Temp. monitoring

Pulp & Paper
- Diesel generator
- Rotary dryer
- Rotating furnace for slaked lime

Power
- Remote Dam Measurements
- Temporary pressure diagnosis
- Tide level
- Turbine press. & temp. for start-up
- Wastewater pressure & pH

Chemical
- PVA (Polyvinyl Alcohol, POVAL) plant temp.
- Rotary kiln
- Salt water monitoring
- Styrene plant temp. monitoring
- Tank drainage pipe press.
- Tank level monitoring
- Tank temp.
- Tank yard & Utility
- Temp. monitoring

Iron & Steel
- Blast furnace temp. & press.
- Conveyor fire detection
- CDQ & Blast furnace
- Dedusting
- Dissolved oxygen analyzing
- Electric furnace cooling water
- Reduced iron
- Rotary furnace temp.
- Silo level
- Steam press. & temp.
- Water jacket temp.
- Temperature control

What's your concern?
- Radio reliability
- Security of radio communication
- Usability in hazardous area
- Overhead cost to introduce small system
- Requirement for higher level system
- Continuous usability
- Single vender system
- Product obsolescence
- Future wireless products portfolio
- Support system
- Language barrier
- World wide availability

Our solutions...
Reliable technology

Yokogawa understands very well that reliable, high-performance field-wireless solutions are important for end-users to trust and adopt field wireless in their plants.

1. Redundancy

Reliability of the wireless system is ensured through use of redundant wireless communication paths, wireless equipment and fast switching redundancy.

- Yokogawa CENTUM VP R5 or later supports dual-redundant network configuration with YFGW410 Field Wireless Management Stations. It ensures entire system full redundant.
- Redundancy of Field Wireless Access Point: DUOCAST with zero re-transmission delay.
- Redundancy of Field Wireless Management Station: Switches in less than one second using hot stand-by.
- Redundancy of communication path: Avoids communication path difficulty.

2. Safe battery pack

- Battery is commercially-supplied, replacements are easy to obtain
- Battery pack is replaceable in hazardous area

3. Security

Device Authentication
Preventing a spoofing device from joining a network is the linchpin of a secure wireless network. As countermeasures for a false device and a false gateway, ISA100.11a introduces a provisioning, which is a mechanism for sharing an authentication key, and necessitates mutual authentication between a gateway and a device using an authentication key.

Message Authentication
Message authentication is a mechanism for checking that messages are from proper partners and not falsified. The message authentication code introduced into the ISA100.11a is greatly effective for preventing falsification.

Encryption
Encryption is an effective countermeasure against wireless sniffing. The ISA100.11a uses the Advanced Encryption Standard (AES) as an encryption algorithm. The ISA100.11a uses a 128-bit key and it takes a billion years for a billion sets of the fastest supercomputers to break the code.

Protection Against Replay Attacks
An effective countermeasure against replay attacks is to introduce the concept of “freshness” into communication messages. In this concept, only messages received within a certain period of time after their transmission are accepted.
4. Deterministic feature

It is essential for the industrial wireless system to be deterministic. It enables time critical application like gas detection alarming over a wireless link. Control applications such as emergency valve cut-off becomes a reality due to reliability and real-time features. Deterministic infrastructure enables valuable applications.

Manual route setting defines the communication route and prevents unexpected route change.

Reliable:
Interference avoidance prevents negative effects of other wireless devices.

High performance radio prevents noise and jamming.

5. Interference avoidance

It is necessary to have counter measures to prevent noise and interference from other equipment already installed in the field. These performance differences define the stability of a field wireless system.

Channel black listing
Avoids use of channels with significant interference. Improves coexistence capability with Wi-Fi system.

Channel hopping
Continuously switches between channels for communication. Improved success rate of data retransmission with "hop" to a different channel.

6. Sky Mesh

Sky Mesh is an innovative design method for wireless devices to communicate using a 2.4GHz wireless network in plants. Our well designed radio, which provides long distance radio links and stable communications in obstacle dense areas, enables this advanced approach.

Following deployment of Yokogawa field wireless infrastructure at a plant, future wireless applications can be seamlessly introduced - increasing the return on the infrastructure investment.
Host system support ranges from a standalone RTU or DAQ to a fully redundant DCS. Up to 500 field devices can be installed in the system.

**Flexible architecture**
It is important for future investments that a single, flexible architecture supports systems ranging from standalone to large DCS.

**Host-integrated gateway**
GX20W
Paperless Recorder Wireless Model
GX20W is a paperless recorder with built-in ISA100 Wireless integrated gateway function. GX20W directly receives ISA100.11a signal and records field data remotely.

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**YFGW510/YFGW520**
Field Wireless Access Point
YFGW510/YFGW520 provides a backbone router function specified in ISA100 Wireless and functions as an access point for field wireless devices. A pair of YFGW510/YFGW520 offer route redundancy without degrading network latency.

<table>
<thead>
<tr>
<th>YFGW410</th>
<th>YFGW510/YFGW520</th>
</tr>
</thead>
<tbody>
<tr>
<td>Maximum number of field devices</td>
<td>500 devices</td>
</tr>
<tr>
<td>Power supply</td>
<td>24 VDC 10 W (Max.)</td>
</tr>
<tr>
<td>Field backbone network interface</td>
<td>100BASE-TX</td>
</tr>
<tr>
<td>Field network interface</td>
<td>100BASE-TX/RS485</td>
</tr>
<tr>
<td>Redundancy</td>
<td>Hot standby: YFGW410 x2</td>
</tr>
</tbody>
</table>

**YFGW610**
Field Wireless Media Converter
YFGW610 converts communication media between 100BASE-TX and 100BASE-FX to extend the transmission distance between YFGW410 and YFGW510/YFGW520. YFGW510/YFGW520 with optical fiber interface is required. (*Choose YFGW520 for single mode fiber)

<table>
<thead>
<tr>
<th>YFGW610</th>
</tr>
</thead>
<tbody>
<tr>
<td>Optical fiber type</td>
</tr>
<tr>
<td>Maximum transmission distance</td>
</tr>
<tr>
<td>Power supply</td>
</tr>
</tbody>
</table>

For more information, please refer to General Specifications for each product.
### YTA510
**Wireless Temperature Transmitter**
YTA510 can accept measurement from thermocouples (8 types) or RTD signals (3 types). The two input model can measure and process each input independently. Extension coaxial cables allow flexible antenna installation.

<table>
<thead>
<tr>
<th>YTA510</th>
<th>YTMX580</th>
</tr>
</thead>
<tbody>
<tr>
<td>Input type</td>
<td>Thermocouples, RTD, ohms, DC millivolts</td>
</tr>
<tr>
<td>Input channels</td>
<td>1 or 2</td>
</tr>
<tr>
<td>Update period</td>
<td>1 – 3600 seconds</td>
</tr>
<tr>
<td>Battery life</td>
<td>10 years (10 seconds update time)</td>
</tr>
<tr>
<td>Ambient temp. limit</td>
<td>-40 to 85°C (-40 to 185°F)</td>
</tr>
</tbody>
</table>

### YTMX580
**Multi-Input Temperature Transmitter**
YTMX580 can accept up to 8 points of measurement from thermocouples (8 types) or RTD signals (3 types). It can also accept DC voltage, resistance, and 4 to 20 mA DC signal input in non-hazardous locations.

<table>
<thead>
<tr>
<th>EJX Series</th>
<th>Mount type</th>
<th>Input</th>
<th>Model</th>
</tr>
</thead>
<tbody>
<tr>
<td>EJX110B</td>
<td>Traditional</td>
<td>Differential pressure</td>
<td>EJX110B</td>
</tr>
<tr>
<td>EJX310B</td>
<td>In-Line Mount</td>
<td>Absolute pressure</td>
<td>EJX310B</td>
</tr>
<tr>
<td>EJX430B</td>
<td>Flange Mounted</td>
<td>Gauge pressure</td>
<td>EJX430B</td>
</tr>
<tr>
<td>EJX210B</td>
<td>Diaphragm Sealed</td>
<td>Absolute pressure</td>
<td>EJX210B</td>
</tr>
<tr>
<td>EJX530B</td>
<td>Differential Pressure</td>
<td>Gauge Pressure</td>
<td>EJX530B</td>
</tr>
<tr>
<td>EJX118B</td>
<td></td>
<td></td>
<td>EJX118B</td>
</tr>
<tr>
<td>EJX438B</td>
<td></td>
<td></td>
<td>EJX438B</td>
</tr>
</tbody>
</table>

### FN310
**Field Wireless Multi-Protocol Module**
FN310-J and FN110 convert a wired device to a wireless device. The built-in batteries power the FN110. The connected wired device can be powered by this module or external power source. This module supports HART and Modbus protocol. Extension cables allow flexible FN110 installation.

<table>
<thead>
<tr>
<th>FN310-J (+FN110)</th>
<th>FN310-M (+FN110)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Input protocol</td>
<td>HART 7</td>
</tr>
<tr>
<td>Input channels</td>
<td>1</td>
</tr>
<tr>
<td>Update period</td>
<td>5 – 3600 seconds</td>
</tr>
<tr>
<td>Battery life</td>
<td>4 years (600 seconds update time)*1 8 years (10 seconds update time)*2</td>
</tr>
<tr>
<td>Power supply to external device</td>
<td>Available (for HART device running 4 mA mode) Available (for SENCOM sensor)</td>
</tr>
<tr>
<td>Ambient temp. limit</td>
<td>-40 to 85°C (-40 to 185°F)</td>
</tr>
</tbody>
</table>

### FN510
**Field Wireless Multi-Function Module**
FN510 and FN110 convert a variety of I/O to a wireless device. Batteries are included and power the FN110. External power may be required for some I/O. Extension cables allow flexible FN110 installation.

<table>
<thead>
<tr>
<th>IO function</th>
<th>FN510 (+FN110)</th>
<th>FN510-C (+FN110)</th>
</tr>
</thead>
<tbody>
<tr>
<td>AI (4-20 mA)</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>DI</td>
<td>2</td>
<td>N/A</td>
</tr>
<tr>
<td>PULSE input</td>
<td>1</td>
<td>Available (for LN01 sensor)</td>
</tr>
<tr>
<td>DO</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>AI (vibration)</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>IO channels</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Update period</td>
<td>1 – 3600 seconds</td>
<td>10 – 3600 seconds</td>
</tr>
<tr>
<td>Battery life</td>
<td>10 years (10 sec. update time)</td>
<td>10 years (60 sec. update time)</td>
</tr>
<tr>
<td>Power supply to external device</td>
<td>N/A</td>
<td>Available</td>
</tr>
<tr>
<td>Ambient temp. limit</td>
<td>-40 to 85°C (-40 to 185°F)</td>
<td>-40 to 85°C (-40 to 185°F)</td>
</tr>
</tbody>
</table>

*1: One to one connection. Device is powered by FN310.  *2: 4-20 mA loop connection.
**ISA100.11a / IEC62734** is one of the most famous industrial, open wireless protocols. Yokogawa introduced this Open, Secure and Scalable standard to provide high reliable field wireless products.

**features**

<table>
<thead>
<tr>
<th>Devices can be purchased from multiple suppliers</th>
<th>Robust encryption technology</th>
<th>Technology supported by many countries</th>
</tr>
</thead>
<tbody>
<tr>
<td>Achieves 24-hour, 365-day down-time-free communication</td>
<td>Expands the range of wireless applications</td>
<td>Control of latency, and low error rates</td>
</tr>
</tbody>
</table>

The WCI (Wireless Compliance Institute) is a non-profit organization, which provides ISA100 related certification and verification support, and education and technical support. As a WCI board member, Yokogawa is working with other members of the ISA100 WCI to make a wider range of ISA100.11a-compliant products available to the market. Yokogawa’s Field Wireless Products are WCI certificated. Please refer to “ISA100 Wireless Product Listing” for ISA100 Wireless Compliant™ products. (http://www.isa100wci.org/End-User-Resources/Product-Portfolio)

**Open standard**

The ISA100.11a / IEC 62734 open standard is important to customers in that it allows best-in-class ISA100 enabled devices from many vendors with compatibility ensured by WCI. Yokogawa supplies both ISA100.11a compatible infrastructure equipment and field devices.

**Examples**

<table>
<thead>
<tr>
<th>Vender</th>
<th>Model</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dräger</td>
<td>GS01</td>
<td>Hydrocarbon Gas Detector</td>
</tr>
<tr>
<td>Armstrong</td>
<td>AIM ST6700</td>
<td>Steam Trap Monitoring Device</td>
</tr>
<tr>
<td>Spirax Sarco</td>
<td>STAPS</td>
<td>Steam Trap Monitoring Device</td>
</tr>
<tr>
<td>Flowserve</td>
<td>PMV D3</td>
<td>Valve Monitor and Positioner</td>
</tr>
<tr>
<td>Cosasco</td>
<td>MWT-3905</td>
<td>Corrosion Monitoring Transmitter</td>
</tr>
<tr>
<td>BHGE</td>
<td>70M303, 70M301</td>
<td>Ranger Pro (Vibration Sensor)</td>
</tr>
<tr>
<td>Honeywell</td>
<td>STDW 930 etc.</td>
<td>Pressure Transmitter etc.</td>
</tr>
</tbody>
</table>

Please refer to “ISA100 Wireless Product Listing” for ISA100 Wireless Compliant™ products.

**Wireless adaptor application examples**

<table>
<thead>
<tr>
<th>Model</th>
<th>Pressure</th>
<th>Temperature</th>
<th>Flow meters</th>
<th>Analyzers</th>
<th>Level Measurement</th>
</tr>
</thead>
<tbody>
<tr>
<td>EJX110A</td>
<td>EJX910/EJX930</td>
<td>YTA70</td>
<td>DYAYA</td>
<td>FLXA202</td>
<td>VEGA series</td>
</tr>
</tbody>
</table>

A wide variety of Yokogawa field devices can be connected through wired HART and Modbus interface such as pressure transmitters, temperature transmitters, flow meters, liquid analyzers, level meters and pH sensors.

**FN110** is a wireless communication module with built-in ISA100 protocol stack. This module is Intrinsically Safe explosion proof *1 and ISA100 Wireless compliant registered device. FN110 can be flexibly installed in the location where good radio environment would be assumed, without moving connected module from sensing point.

*1: Please refer to General Specification for Gateway Module FN110-R1

It is also possible to integrate field devices such as analog (4-20 mA) output sensors, pulse output equipment and ON/OFF devices to the ISA100 Wireless system.
Yokogawa - your field wireless partner, from system design, through commissioning, and life cycle maintenance!

Introductory study / Consulting
- Network security policy
- Network redundancy design
- Wireless networks coexistence

Scale estimation
- Map based access point and device layout design using Wireless Route Design Tool
- Wireless path estimation
- Validate wireless signal strength
- Examining location for access points and routers

Site survey*

Layout design
- Actual drawing based access point and device layout design
- Based on Sky Mesh method to ensure deterministic behavior
- Network security design
- Network redundancy design
- Radio channel alignment design
- Device selection & procurement
- Operation & maintenance design
- Life cycle support
*Site survey can be skipped if result of estimation tool shows sufficient margin of communication distance.

System design / Cost estimation

After-installation care

Continuous support
We support customers for all the phases from introductory study to after-installation care. Yokogawa understands industrial application thoroughly based on long and substantial experience.

Device setting
FieldMate is used for field device setting and adjustment. FieldMate is a PC based configuration tool that performs numerous tasks, including initial setup, daily maintenance, troubleshooting, and configuration backup for device replacement.

- Graphical interface eases managing communication paths
- Deterministic route configuration keeps latency within expectation
- Web browser-based client makes purchasing configuration software unnecessary

Provisioning
Initial settings for field equipment to connect to ISA100 wireless system. Device TAG, security key, and wireless network parameters are set during provisioning. Two setting methods are provided:
1. Using infrared interface port (OOB: Out Of Band)
2. Using ISA100 Wireless interface port (OTA: Over The Air)

FN110-R1 allows basic configuration from an upper system to reduce time for configuring network.

For more information, please refer to General Specifications for each product.

Network configuration
Use wireless management console embedded in gateway to configure Yokogawa field network.
- Graphical interface eases managing communication paths
- Deterministic route configuration keeps latency within expectation
- Web browser-based client makes purchasing configuration software unnecessary

YFGW410
YFGW510
Ethernet
ISA100 Radio
YFGR510
IrDA adaptor
TAG network parameter
Yokogawa serves its customers worldwide through a network of sales, engineering, and service companies and manufacturing subsidiaries located in the following countries and regions. Support is also provided by sales and service representatives around the world. Please contact the following Yokogawa company for support in your area.