



# *Yokogawa Field Wireless Solution*

  
IEC62734 WIRELESS

Bulletin 01W01A13-01EN

<http://www.field-wireless.com/>

**vigilantplant.**<sup>®</sup>  
The clear path to operational excellence

**YOKOGAWA** 

# 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

## Food & Beverage

- 👁️ Molasses tank farm in Sugar plant
- 🌡️ River catchment water flowroom temp.
- 🌡️ Food tank temp. & press.
- 🌡️ Temp. monitoring

## Pulp & Paper

- 🌡️ Diesel generator
- 🌡️ Rotary dryer
- 🌡️ Rotating furnace for slaked lime

## Pharmaceutical

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

## 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 Levels
- 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 vendor system
- Product obsolescence
- Future wireless products portfolio

⋮

- Support system
- Language barrier
- World wide availability

⋮

over  
**70** applications  
have proven results  
based on the Yokogawa  
Field Wireless system

## 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.

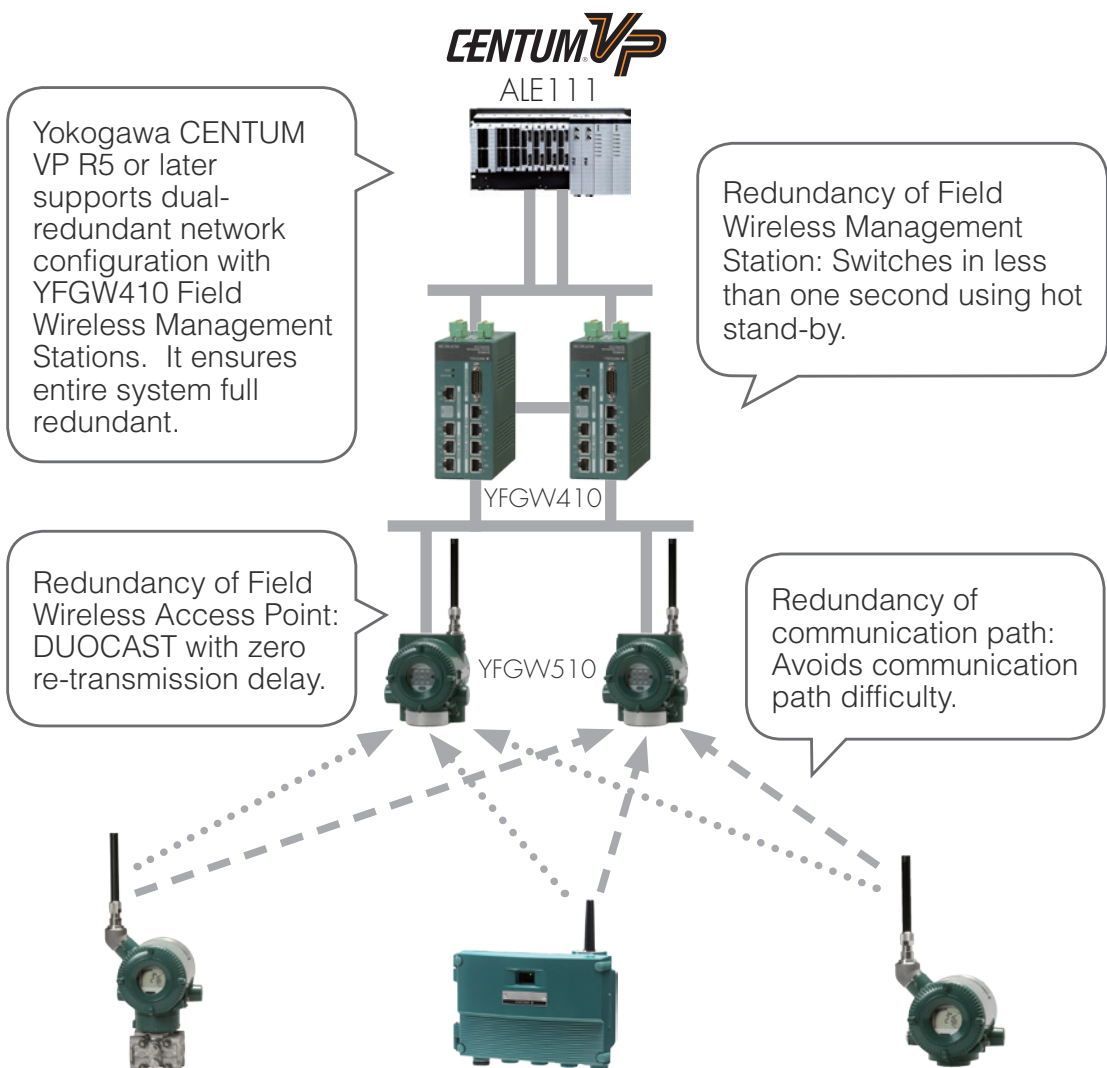
Flexibility

Openness

Support

## 1. Redundancy

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



## 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.

**Protects field wireless network from security attacks.**

### 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.

## Technologies for deterministic behavior

Real-time:

### DUOCAST

establishes redundant communication paths without retransmission delay.

### Manual route setting

defines the communication route and prevents unexpected route change.

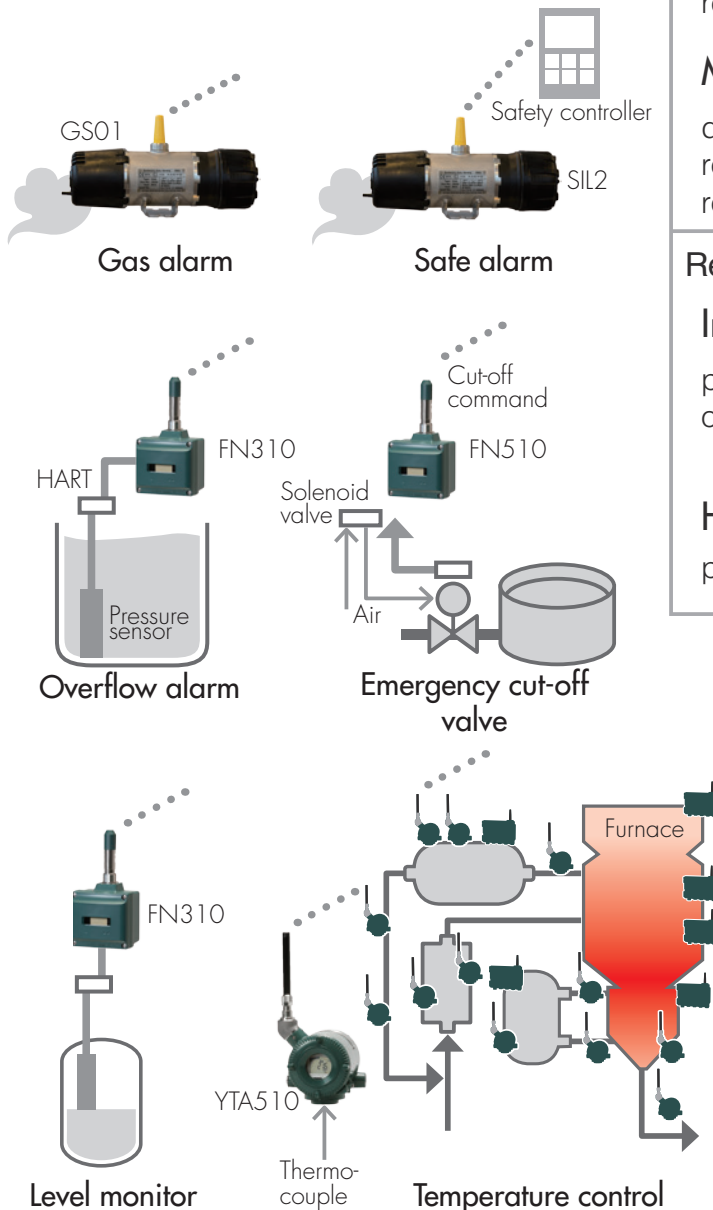
Reliable:

### Interference avoidance

prevents negative effects of other wireless devices.

### High performance radio

prevents noise and jamming.



## Wireless usage class

class 0	Emergency action
class 1	Closed loop regulatory control
class 2	Closed loop supervisory control
class 3	Open loop control
class 4	Flagging
class 5	Logging & downloading/ uploading

Following deployment of Yokogawa field wireless infrastructure at a plant, future wireless applications can be seamlessly introduced - increasing the return on the infrastructure investment.

Reliability

Flexibility

Openness

Support

# 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.

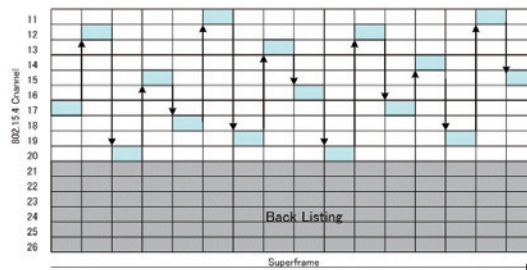
## Channel black listing

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



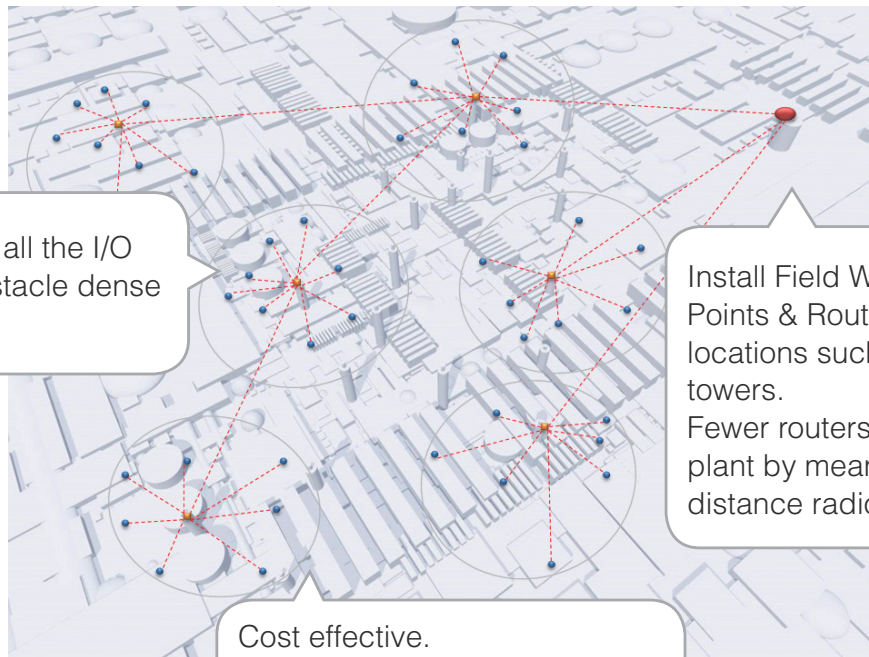
## Channel hopping

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.



Router covers all the I/O devices in obstacle dense area below it.

Install Field Wireless Access Points & Routers at high locations such as the tops of towers. Fewer routers cover all of the plant by means of long distance radio links.

Cost effective.  
Easy expansion and flexibility.  
Easy maintenance.

Reliability

Higher level 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.

Openness

Support

	YFGW610
Maximum transmission distance	2 km
Power supply	24 VDC 10W(Max.)

## YFGW610

### Field Wireless Media Converter

YFGW610 converts communication media between 100BASE-TX and 100BASE-FX to extend the transmission distance between YFGW410 and YFGW510. YFGW510 with optical fiber interface is required.



Field network

Field backbone network

## YFGW510

### Field Wireless Access Point

YFGW510 provides a backbone router function specified in ISA100 Wireless and functions as an access point for field wireless devices.

A pair of YFGW510 offer route redundancy without degrading network latency.



## YFGW410

### Field Wireless Management Station

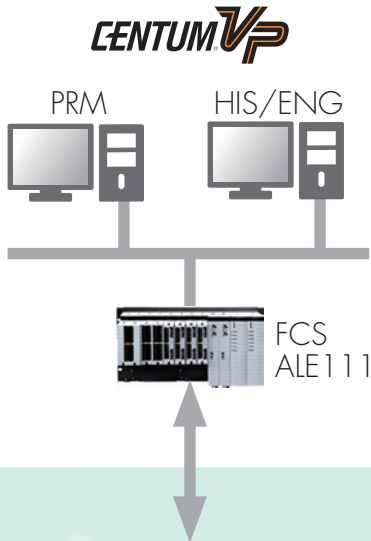
YFGW410 manages the wireless network and security based on ISA100 Wireless and works as a gateway to host applications. A pair of this product form a redundant gateway.

The YFGW410 handles up to 20 YFGW510 access points to support large service areas.

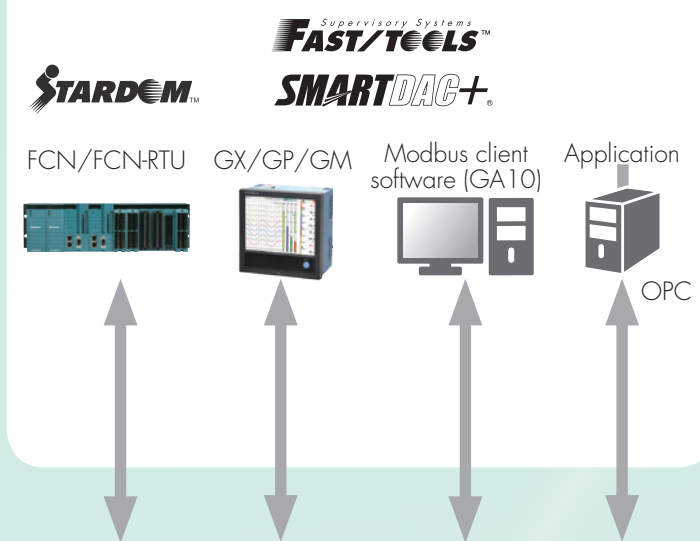
	YFGW510	YFGW410
Maximum number of field devices	500 devices	
Power supply	24 VDC 3.5W(Max.)	24 VDC 10W(Max.)
Field backbone network interface	100BASE-TX/FX/WLAN	100BASE-TX
Field network interface	-----	100BASE-TX/RS485
Redundancy	DUOCAST:YFGW510 x2	Hot standby:YFGW410 x2



## DCS connection



## SCADA, PLC, Recorder connection



Field network



## YFGW710

Field Wireless Integrated Gateway

YFGW710 integrates the gateway function between higher level systems and ISA100 Wireless field wireless devices, network configuration/management function, and field wireless network communication function into an all-in-one box, providing communication infrastructure for a small scale field wireless system.

## Easy instrumentation

**SMARTDAC+**



## 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.

Application example :

- Visualize field condition
- Substitute for daily check
- Temporal monitoring

YFGW710	GX20W	
50 devices	50 devices	Maximum number of field devices
24 VDC 10W(Max.)	100-240 VAC 110VA(Max.)	Power supply
-----	-----	Field backbone network interface
100BASE-TX/FX	100BASE-TX	Field network interface
N/A	N/A	Redundancy

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

Reliability

## 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.



## 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.



	YTA510	YTMX580
Input type	Thermocouples, RTD, ohms, DC millivolts	Thermocouples, RTD, ohms, DC milivolts, DC miliamperes
Input channels	1 or 2	8
Update period	1 – 3600 seconds	1 – 3600 seconds
Battery life	10 years (10 seconds update time)	6 years (60 seconds update time)
Ambient temp. limit	-40 to 85°C (-40 to 185°F)	

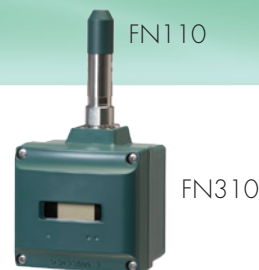
Flexibility

## FN 310-J, FN310-M

### Field Wireless Multi-Protocol Module

FN 310-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.



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

\*1: One to one connection. Device is powered by FN310. \*2: 4-20mA loop connection.

Openness

Support

EJX110B  
EJX310B  
EJX430B



EJX510B  
EJX530B



EJX210B



EJX118B EJX438B

Wireless  
Pressure  
Transmitter

EJX-B series measure differential pressure, absolute pressure or gauge pressure of liquid, gas, steam flow, as well as flow and liquid level. The accuracy of these products is the same as wired transmitters. The low power consumption design achieves long battery life. Extension coaxial cables allow flexible antenna installation.

	EJX Series	Mount type	Input	Model
Input	Differential pressure Absolute pressure Gauge pressure	Traditional -mount	Differential pressure	EJX110B
			Absolute pressure	EJX310B
			Gauge pressure	EJX430B
Update period	0.5 – 3600 seconds	In-Line Mount	Absolute pressure	EJX510B
			Gauge pressure	EJX530B
Battery life	10 years (30 seconds update time)	Flange Mounted	Differential Pressure	EJX210B
Ambient temp. limit	-40 to 85°C (-40 to 185°F)*3	Diaphragm Sealed	Differential Pressure	EJX118B
			Gauge Pressure	EJX438B

\*3: -40 to 60°C (-40 to 140°F) for EJX118B/438B

## 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.



	FN510 (+FN110)			
Input output function	AI (4-20mA)	DI	PULSE input	DO
Input output channels	1	2	1	1
Update period	1 – 3600 seconds		2 – 3600 seconds	
Battery life	10 years (10 seconds update time)		3 years (30 seconds update time) with continuous DO=ON	
Power supply to external device	N/A			
Ambient temp. limit	-40 to 85°C (-40 to 185°F)			

Reliability

Flexibility

**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 ►

Achieves 24-hour, 365-day down-time-free communication	Expands the range of wireless applications	Control of latency, and low error rates	Number of wireless field devices, longer distance communication, and faster update rates.
Devices can be purchased from multiple suppliers	Robust encryption technology	Technology supported by many countries	

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.

Support

## Examples

of 3rd party ISA100 Wireless compliant registered devices.

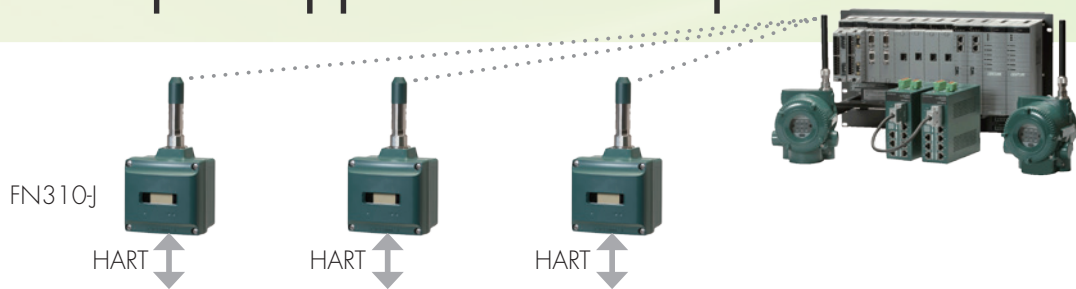
GS01  
Hydrocarbon Gas Detector  
ISA100 enables this time critical application.



Vender	Model	Description
GasSecure	GS01	Hydrocarbon Gas Detector*4
GE	185410-01	wSIM module (Vibration Sensor)
Spirax Sarco	STAPS	Steam Trap Monitoring Device
Flowserve	PMV D3	Valve Monitor and Positioner
Cosasco	MWT-3905	Corrosion Monitoring Transmitter
Armstrong	AIM ST6700	Steam Trap Monitoring Device
Honeywell	STDW 930 etc.	Pressure Transmitter etc.

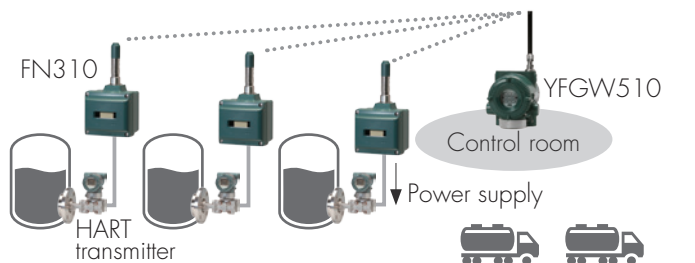
\*4: Under registration.

# Wireless adaptor application examples

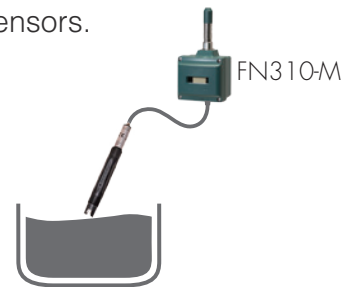


Category	Pressure	Temperature	Flow meters	Analyzers	Level Measurement
Model	EJX110A	YTA70	DYA/DY	FLXA202	VEGA series
	EJX910/EJX930	YTA320	AXR025G	FLXA21 (1ch only)	

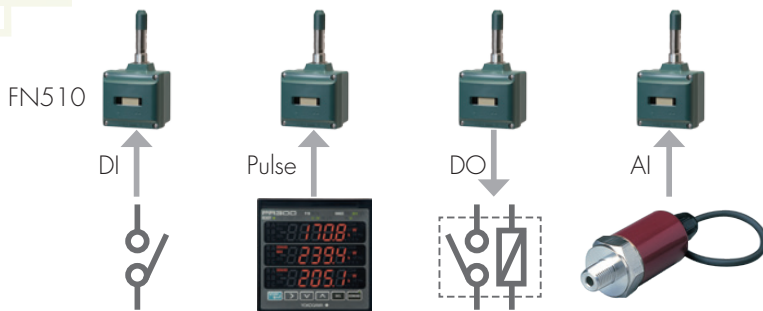
A wide variety of Yokogawa field devices can be connected through wired HART and Modbus interface such as pressure transmitters, temperature transmitters, flow meters, liquid analyzers, level meters and pH sensors.



Tank level monitoring with HART pressure transmitter



Water pH monitoring with SENCOR sensor



It is also possible to integrate field devices such as analog (4-20mA) output sensors, pulse output equipment and ON/OFF devices to the ISA100 Wireless system.

**FN110** is a wireless communication module with built-in ISA100 protocol stack. This module is Intrinsically Safe explosion proof 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.



Use of extension cable is recommended in case that measuring point is in the pipe jungle.

# Yokogawa - your field wireless partner, from system design, through commissioning, and life cycle maintenance!

Reliability

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

Flexibility

Site survey\*

- Validate wireless signal strength
- Examining location for access points and routers

Layout design

- Actual drawing based access point and device layout design
- Based on Sky Mesh method to ensure deterministic behavior

Openness

System design /  
Cost estimation

- Network security design
- Network redundancy design
- Radio channel alignment design
- Device selection & procurement

After-installation care

- Operation & maintenance design
- Life cycle support

\*Site survey can be skipped if result of estimation tool shows sufficient margin of communication distance.

## Continuous support

We support customers for all the phases from introductory study to after-installation care.

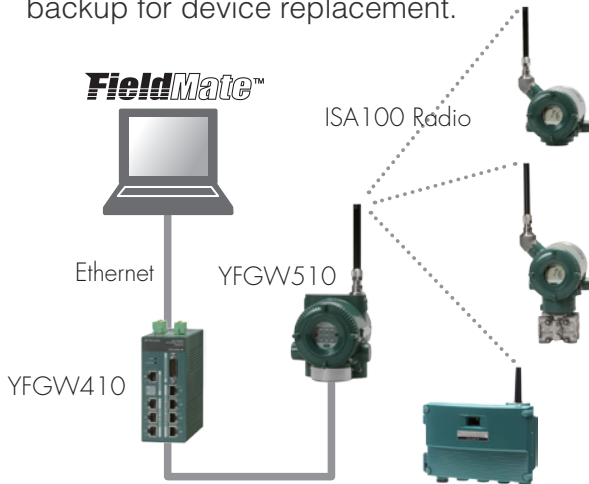
Yokogawa understands industrial application thoroughly based on long and substantial experience.

# System configuration

## 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.

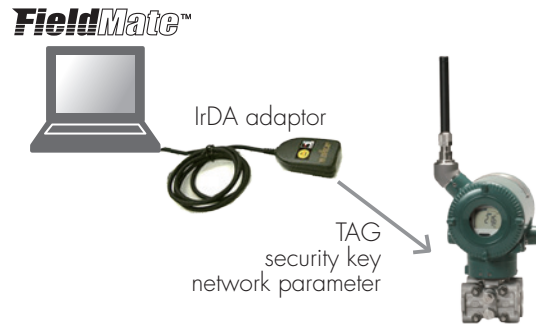


## Provisioning

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 wireless interface port (OTA:Over The Air)

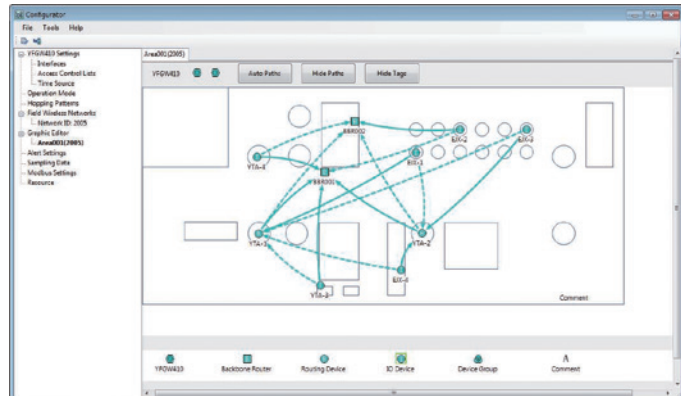


## Network configuration

Setting wireless communication routes.

- Wireless Management Console function built in the YFGW410 is used.
- Easy to manage communication routes with graphical user interface.
- Definite routing make communication latency predictable.

Wireless network configuration is performed on the Field Wireless Console function in the management station. No need for dedicated application software because this function can be accessed via browser on the PC.



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.



More information



<http://www.field-wireless.com/en/>

**vigilantplant.**<sup>®</sup>

The clear path to operational excellence

SEE  
CLEARLY

KNOW  
IN ADVANCE

ACT  
WITH AGILITY

VigilantPlant is Yokogawa's automation concept for safe, reliable, and profitable plant operations. VigilantPlant aims to enable an ongoing state of Operational Excellence where plant personnel are watchful and attentive, well-informed, and ready to take actions that optimize plant and business performance.

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