# STARDOM Autonomous Controllers
## FCN   FCN-RTU   FCJ

*Network-based Control System*

**STARDOM**™

**FCN**
*Field Control Node*

**FCN-RTU**
*Low Power Autonomous Controller FCN-RTU*

**FCJ**
*Field Control Junction*

**vigilantplant.**®
The clear path to operational excellence

**YOKOGAWA** ◆

# vigilantplant.®

## The clear path to operational excellence

## Integration
- Same Look & Feel as Yokogawa DCS CENTUM Human Machine Interface (HMI) via gateway station
- OPC, DNP3, and Modbus support for use with a variety of SCADA systems
- Asset management via a variety of digital communications

## Network
- TCP/IP based open network configuration
- Support of FOUNDATION™ fieldbus, HART, ISA100, Modbus, PROFIBUS-DP, and CANopen
- Communication using network infrastructure, GPRS, satellite, and more

## Reliability
- Excellent environmental resistance
- Dual redundant configuration for all key components
- ECC memory

## Engineering
- Support of all five IEC61131-3 programming languages
- Extensive regulatory control libraries cultivated in Yokogawa DCS history
- Easy to reuse software architecture

## Information
- Embedded Web server for remote maintenance
- E-mail alarm notification from/to controllers
- Data logging and FTP transmission of log files on controllers

**Network-based Control System**

# STARDOM™

### takumi "craftsmanship"

The FCN, FCN-RTU, and FCJ STARDOM controllers are designed to function as a platform that helps you exercise your takumi (craftsmanship) in the achievement of excellent applications that keep you competitive in a rapidly changing market. This platform brings you the following benefits:

- Increased uptime and reduced inventory through the shared use of reliable, hot swappable modules
- Reduced engineering and maintenance workload thanks to the improved reusability of program components
- Enhanced capability to respond in a timely fashion to rapidly changing market requirements through the adoption of a flexible software architecture and the use of advanced IT functions

STARDOM controllers help you maximize operational excellence.

## FCN  Redundant controller

- Optional redundant configuration
- Two expansion units for additional I/O points
- A variety of I/O modules
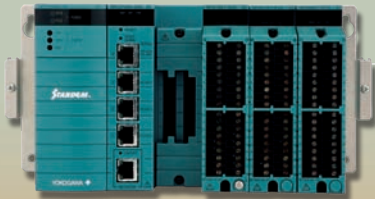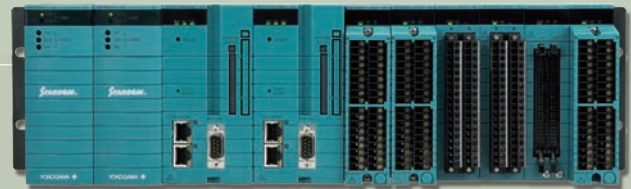
## Low-power controller  FCN-RTU

- Low power consumption
- -40℃ to +70℃ , altitudes up to 3,000 m
- Built-in I/O channels, and 3 or 8 open I/O slots

12 AI (1-5 V), 1 AI (0-32 V), 2 AO (4-20 mA), 2 PI, 16 DI, 8 DO, 1 Ethernet port, 3 RS-232 ports, 1 RS-422/485 port on CPU

## FCJ  All-in-One controller

- Redundant network ports
- Built-in I/O channels

6 AI (1-5 V), 2 AO (4-20 mA), 16 DI, 16 DO
2 Ethernet ports, 2 RS-232-C ports,
2 FOUNDATION fieldbus H1 ports (option)

# ● INTEGRATION

**Providing seamless operation from field to center while enhancing the benefits of digital communications**

The use of STARDOM autonomous controllers is a best practice in geographically distributed SCADA applications. With a seamless connection to a Yokogawa DCS, all your applications can be viewed in a single window.
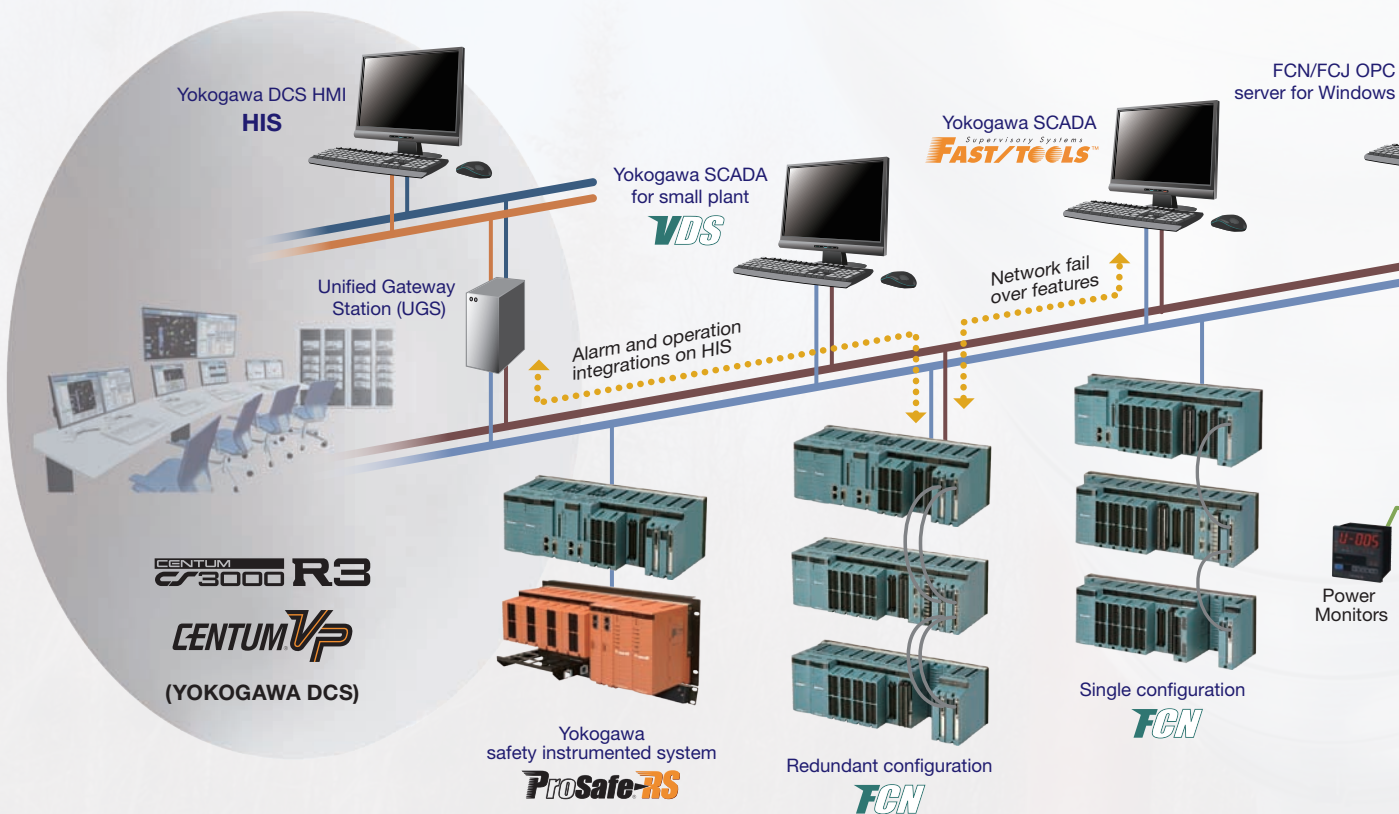
## One network... but dual redundant

A TCP/IP based network enables a seamless connection with control and information networks using COTS network components, and also allows the easy adaption of controllers for use with narrow bandwidth network infrastructure including public telephone lines, GSM/GPRS, satellite, and radio. The use of a redundant network configuration (available with all controllers other than the FCN-RTU) and data buffering guard against the loss of valuable data in the event of a disruption in network communications.

## One window... but multiple systems

Many applications make combined use of DCS and PLC systems. From a single window on the Yokogawa DCS HMI, operators enjoy seamless and transparent access to all the utilities on these different systems, with complete consolidation of all alarms.

## Operation and Monitoring

Yokogawa DCS HMI
**HIS**

Unified Gateway
Station (UGS)

Alarm and operation
integrations on HIS

Yokogawa SCADA
for small plant
**VDS**

Yokogawa SCADA
**FAST/TOOLS**
Supervisory Systems

Network fail
over features

FCN/FCJ OPC
server for Windows

CENTUM 3000 **R3**

CENTUM**VP**

**(YOKOGAWA DCS)**

Yokogawa
safety instrumented system
**ProSafe-RS**

Redundant configuration
**FCN**

Single configuration
**FCN**

Power
Monitors

# STARDOM™

## One field…spanning hundreds of kilometers

With gas fields, pipelines, and other SCADA applications, field devices are often dispersed over a very wide area, and the annual cost of regularly checking these devices is prohibitively high. By making use of remote device diagnostics, Yokogawa's plant asset management system enables a much more efficient maintenance approach with dramatic reductions in costs.

| Connection | Physical layer | Devices (protocols) |
|---|---|---|
| Upper-level systems | Ethernet | VDS (TCP/IP), FAST/TOOLS (TCP/IP, DNP3, Modbus TCP), HIS (Vnet/IP via gateway) other vendor SCADA systems (OPC, DNP3, Modbus TCP) |
| | Serial (RS-232, RS-422/485) | FAST/TOOLS (Modbus RTU/ASCII), Other vendor SCADA systems (Modbus RTU/ASCII, DNP3) |
| Other devices | Ethernet | FA-M3 (driver available), MELSEC (driver available), others (Modbus TCP) |
| | Serial (RS-232, RS-422/485) | FA-M3 (driver available), MELSEC (driver available), others (Modbus RTU/ASCII) |
| Fieldbus | FOUNDATION fieldbus | FOUNDATION fieldbus-H1 devices |
| | HART | HART devices |
| | PROFIBUS-DP | PROFIBUS-DP devices |
| | CANopen | CANopen devices |
| | ISA100 | ISA100 wireless devices |

# HARDWARE
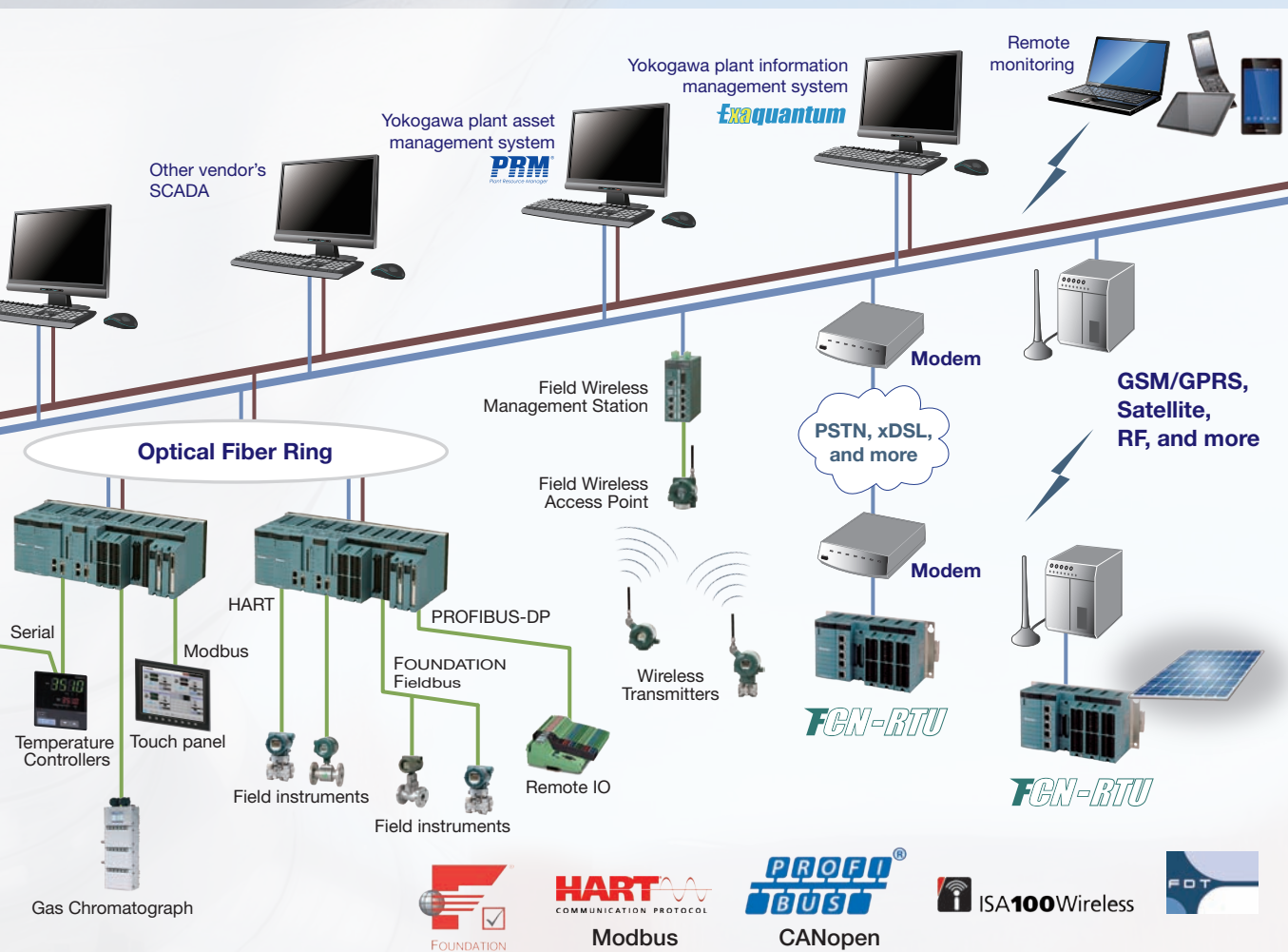
## Rich product line for every application and budget

STARDOM controllers can be flexibly configured for a wide range of PLC/RTU applications.
Select from the following three models based on your budget and application.
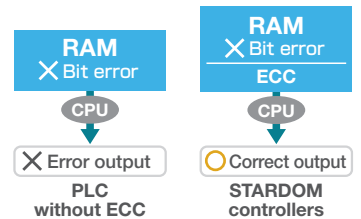
## Reliable and High Speed CPU

### High speed control
- 50 msec analog control, 10 msec CPU scan time

### Error correcting code (ECC) memory
- Correction of single-bit errors in RAM prevents unexpected malfunctions.

### Time synchronization
- Simple network time protocol (SNTP) enables time synchronization as an SNTP server and client.

**RAM** ✕ Bit error
**CPU**
✕ Error output
**PLC without ECC**

**RAM** ✕ Bit error **ECC**
**CPU**
○ Correct output
**STARDOM controllers**

## Durable Construction

### Thrives in harsh environments
- -40℃ to +70℃ and up to 3,000 m altitude for FCN-RTU*
- -20℃ to +70℃ and up to 2,000 m altitude for FCN-RTU*
- 0℃ to +55℃ and up to 2,000 m altitude for FCN
- 0℃ to +60℃ and up to 2,000 m altitude for FCJ
  * Depending on the combination of I/O modules

### Failure-proof
- Fanless design with excellent heat dissipation
- IC chips, which have a higher failure rate, are not mounted on the base module.

### Robust
- Compliant with EMC standards
- Optional Explosion Protection
  - ATEX Type "n"
  - FM/CSA Non-Incendive Class Ⅰ Division
- Optional G3 coating

## Easy Maintenance

### Non-stop operation
- Hot swappable CPU module (FCN only) and power supply module
- All program copy (APC) synchronizes the control side and stand-by side CPUs without interfering with control.
- Applications and parameters can be accessed by a new CPU module by just inserting the system card.

Tool not required

### Quick start after replacing I/O
- Hot swappable I/O modules
- I/O definitions automatically downloaded to I/O modules without use of tools
- I/O modules can be changed without rewiring.
- Continuous output of values (fallback function) if CPU fails

Tool not required
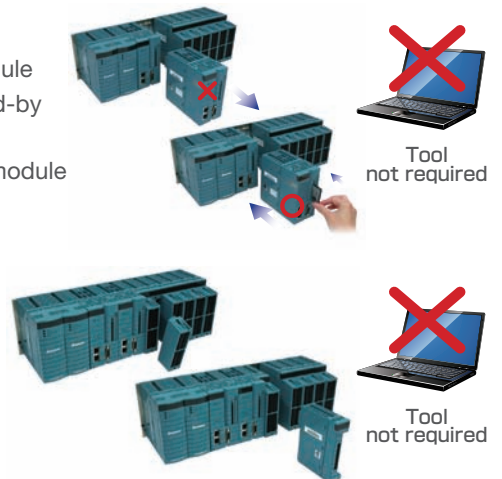
## Open Network

### TCP/IP-based open network technologies
- Direct connection with PLCs from other vendors

### Supports a wide range of fieldbus protocols*
- FOUNDATION fieldbus H1, HART, Modbus, PROFIBUS-DP, CANopen, RS-232/422/485
  * Check to see if supported for your model

### Rich SCADA communication
- DNP3, Modbus, OPC available using CPU ports
- Eliminates need to invest in communication modules and communication gateways

Ethernet

PLC

Various Field Devices
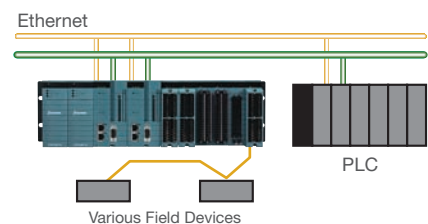
# Easy to Use Redundant Configuration Model FCN

### Various redundant configurations available for your application
- Power supply, CPU, extension unit bus, and control network
- High-speed redundant internal communication bus on backboard even with single configuration

### Same modules and units used with single and redundant configurations
- Reduces the variety of components that need to be kept in inventory

### Simple network redundant configuration
- Two ports for control redundant network embedded on CPU

Ethernet

CPU module

Power supply module

Extension bus

2 extension units
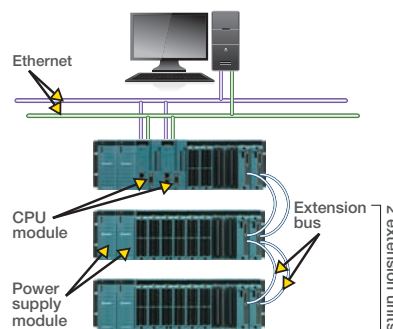
# Low Power Consumption Model FCN-RTU

### Low Power Consumption
- Power consumption : 1.6 W to 2.9 W (use with NFCP050, NFPW426, NFBU050) for solar power applications
- Built-in I/O (12 AI : 1-5 V, 1 AI : 0-32 V, 2 AO : 4-20 mA, 2 PI, 16 DI, 8 DO, 1 Ethernet port, 3 RS-232 ports, 1 RS-422/485 port on CPU ) and up to 8 slots I/O module

# Rich Variety of I/O Modules

### AI/O modules for process control
- AI, AO, mixed AI/O, pulse input, frequency input
- 4 to 20 mA, 1 to 5 V, -10 to +10 V, RTD, TC/mV
- Channel isolated, isolated, non-isolated
- Transmitter power supply from AI/O module*
  * Check to see if supported for your model

### DI/O for a diverse range of applications
- 32 or 64 channels for 24 V DC on/off or transistor contact signals
- 16 channels for 100 V AC or 220 V AC on/off or relay signals
- 4 channels pulse width output

### AI/O and DI/O common features
- Corrosion protection coating (ISA standard G3 option)
- Pressure clamp terminal block and MIL connection with surge absorber (option)

### Same I/O modules used with expansion units
- Reduces the number of spares that need to be kept in inventory

## Bus power to Sensors

*Takumi*

Bus Power To Sensors
To reduce the wiring costs and maintain the safety, power can be supplied to transmitters through AI/O modules.
To maximize this features, two wire (power supplied via AI/O modules) or four wire transmitter can be selected per channel.

# ⬤ENGINEERING

**Maximize productivity at your site with excellent engineering tools for all project phases, from system design to commissioning**

An efficient engineering tool supports all five IEC 61131-3 PLC languages and comes with a wealth of libraries and templates, enabling a modular design for enhanced productivity.

## Enhanced Application Portability through Division of Logical and Physical Layers

A platform independent architecture enhances application portability.
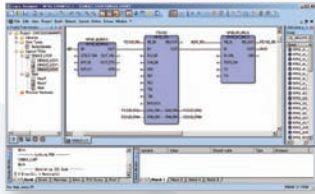
### Logic Designer: Control application development tool
- Supports all five IEC 61131-3 languages
- Intuitive look & feel with automated application layout
- Project comparison function for confirming modifications
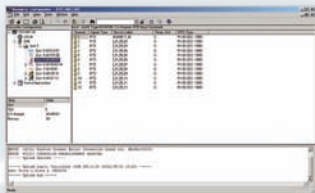
### Resource Configurator:
### Environment configuration tool for control applications
- Connects control application logical I/O with actual hardware I/O
- Configures hardware settings for IP addresses, serial ports, etc.
- Registers software license

### Application portability by separating logic from hardware
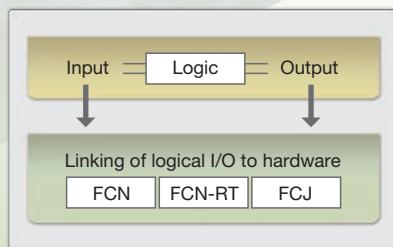
**Logic Designer**
- Platform independent programming tool

**Resource Configurator**
- Hardware configuration tool for linking logical I/O with hardware

With Logic Designer, programming and debugging are platform independent, and with Resource Configurator logic can be easily ported to other hardware platforms.

## IEC 61131-3 Compliant Programming

IEC 61131-3, the de facto PLC programming standard, is platform independent and allows great reusability.
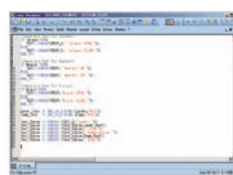
### Support of all five IEC 61131-3 languages
- Choose the language best suited to your logic
- Loop and sequential control with the same development tool

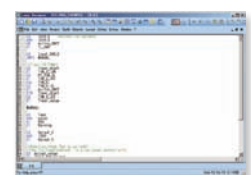| FBD | LD | ST | SFC | IL |
|-----|-----|-----|-----|-----|
| (Function Block Diagram) | (Ladder Diagram) | (Structured Text) | (Sequential Function Chart) | (Instruction List) |

Design programming → Debug commissioning → Operation

## Reusable Programming ✓

Applications programmed with IEC 6113-3 languages are well structured and easily modularized.

**User Function Blocks (FB)**
User logic is encapsulated into user function blocks for reuse in programs.

TLC_1
TLC
— ACTUAL_VAL SWITCH —
— MAX
— MIN

**User logic**

```
IF(ACTUAL_VAL > MIN) THEN
    SWITCH := 1;
ELSE:
    SWITCH := 0;
END_IF
```

User function blocks can be selected from a library list using the Edit Wizard.

**User libraries**
Groups of user function blocks can be used as user libraries. They can be protected with a username and password.

### Modularized applications

- Easy reuse of modularized applications, user function blocks, and libraries
- Password protection of function blocks holding your industry know-how
- Drag and drop of function blocks to a program sheet

## Network Template Function ✓

The network template function enables the use of advanced copy features that eliminate the need to reenter variables. In addition to enabling the creation of network templates from your programs, Yokogawa provides a number of network templates for your convenience.

**When you program from the scratch**
- Insert POU and name it
- Assign variable and name it
- Wire each POU
- Debug function

Wiring    Wiring

**Time Consuming and Unstable Quality**

**When you copy program sheet*:**
- Reassign all variables
- Debug function
- * Variable sheet is not copied to avoid variable name collision.

If you use Network Template provided by Yokogawa

**When you use Network Template**
1. Select template
2. Input key variable name

**Best Quality with Minimum Engineering Hours**

**Best Quality**
- Yokogawa Network Templates are all tested.

**Minimum Engineering Hours**
- Selected function includes several POUs
- POUs are automatically laid out and wired
- Variable names are automatically assigned

### Efficient reusable engineering process

Takumi

Typical engineering process

Project → Select
Network template → Insert → Your application
Application portfolios (FB libraries) → Insert

Your application → Reuse / Create → User project template
Your application → Reuse / Create → User network template
→ User function blocks → Create → User libraries
Your application → Reuse / Create → User libraries

Available from Yokogawa
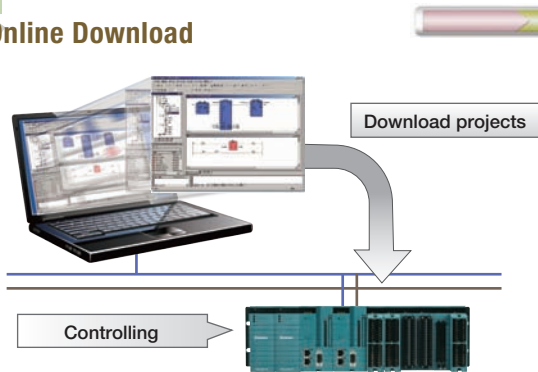
Many skid and utility programs are quite similar. Through modularization, you can have better applications, reduce engineering costs, and speed up commissioning.
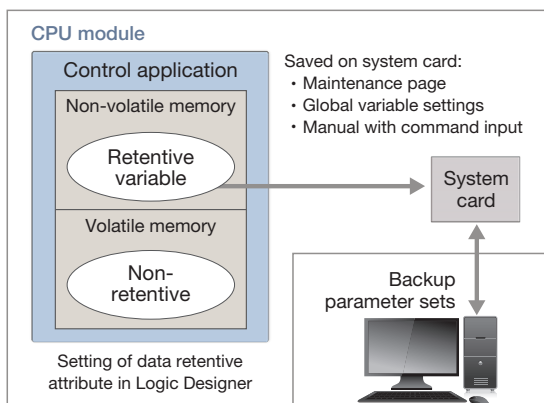
# ● ENGINEERING

## ◣ Online Download

Modify your application without interfering with a process.

■ No need to stop a controller to modify a control application

■ Automatic application synchronization of dual redundant CPUs when downloading with Logic Designer

■ Variables inherited from previous applications

Download projects

Controlling

## ◣ Parameter Saving

**CPU module**

Control application

Non-volatile memory

Retentive variable

Volatile memory

Non-retentive

Setting of data retentive attribute in Logic Designer

Saved on system card:
· Maintenance page
· Global variable settings
· Manual with command input

System card

Backup parameter sets

Through every phase, from debugging to commissioning, you no longer have to worry about losing essential tuning parameters.
Essential tuning parameters such as P, I, and D in PID control instruments and critical parameters for applications can be retained in a variety of ways.

■ As a default, essential instrument parameters such as P, I, and D are retentive variables.

■ In Logic Designer, the retentive attribute can be set for an application variable.

■ Multiple parameter sets can be backed up to a PC.
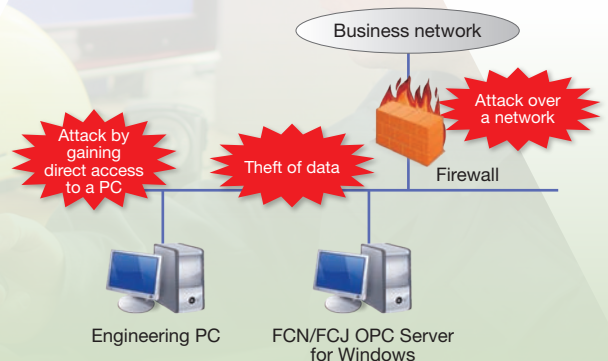
## ◣ Industry Quantity Conversion

FIC001.PV = 10.2 KPa
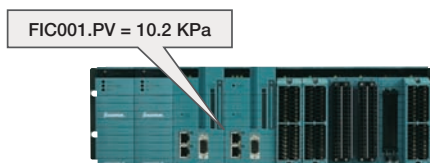
The intuitive display of data improves programming efficiency.

■ Internal analog data (0% to 100%) is converted to industrial quantity such as ℃ for easy and intuitive programming and debugging.

## Strengthening System Security

Protecting your system from cyber attacks and ensuring its robustness is a challenge. It can be time-consuming to configure the security with Windows' security and network settings. To assist you in this, Yokogawa has developed an IT security tool. All you need to do is select the desired security model and the security tool will take care of the rest.
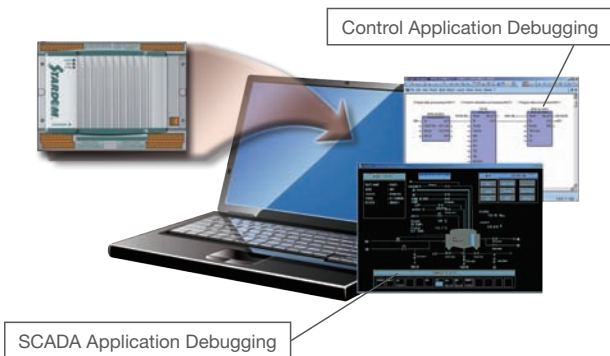
Business network

Attack over a network

Attack by gaining direct access to a PC

Theft of data

Firewall

Engineering PC

FCN/FCJ OPC Server for Windows

## Debugging functions for enhanced engineering efficiency

Design programming → Debug commissioning → Operation

### Application Debugging on PCs

✓

Control Application Debugging

SCADA Application Debugging

Minimize engineering costs by doing both programming and debugging on one PC.

- Simulate control functions
- Program, modify, and debug logic
- Debug both control and SCADA applications

### Software Wiring

✓

Software wiring function simulates the input and output signals without the actual wiring. This eliminates the need for a signal generator and test switches during loop check and logic debugging.

- Wizard available for easy configuration
- Advanced settings for adjustments to process

IN → PID → OUT

Wiring block

Analog input module | Analog output module
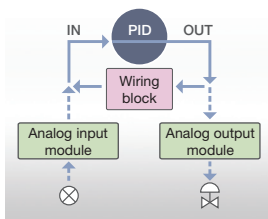
### Wiring Check

✓ ✓

Resource Configurator's loop check (wiring check) tool allows you to check the status of your wiring without having to use a calibrator or test switch.

- Confirm the actual input signals for each channel.
- Manually output signals to I/O modules.
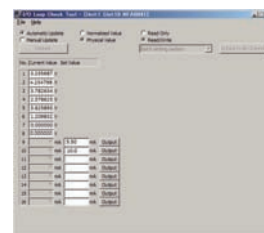
### Logic Analyzer

✓ ✓

Logic Analyzer saves you time investigating and analyzing software malfunctions.

- Records variables in continuous and cycle modes
- Exports the recorded data to text format files
- Adjusts curve colors and scales/ranges on individual axes
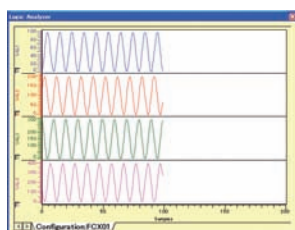
### Extensive Help Files

✓ ✓ ✓

Extensive help files for all of your programming questions are included.

- More than 3,500 pages
- From IEC 61131-3 basics to specific information on the use of each library
- Instructions on how to use the engineering tool

# ENGINEERING



Design programming | Debug commissioning | Operation

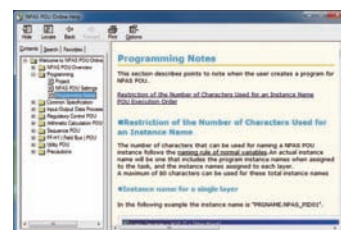## Multiple controllers configuration in a project

Multiple controllers can be assigned to the same application. Once an application is modified and debugged, all the settings can be quickly and easily transferred to the controllers.

- Both the FCN and FCN-RTU controllers can be assigned to the same application.
- Only those applications that will be used need to be assigned to a controller.
- Any modifications to an application can be downloaded to selected controllers.
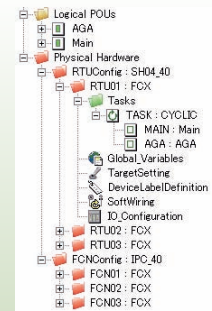


## Page Layout

The diagram of an application can be easily documented in various ways.

- Printing of diagram for entire control applications
- Extensive frame, logo, title, font, and other layout options
- Several design page layout templates
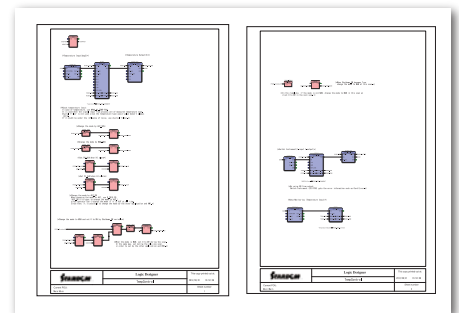


## Maintenance

CPU and I/O module information as well as system logs can be confirmed on a Web browser, dramatically improving maintenance efficiency.

### System overview
Memory size, OS version, and IP address can be checked online.

### System logs
System logs help you identify the cause of an application error.

### CPU status
Information on each CPU (in dual redundant mode) including OS version and serial number can be checked.
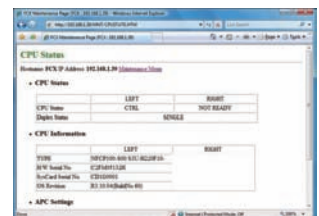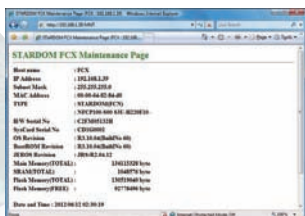


## I/O modules and other settings

In addition to CPU information, I/O module and other settings can be confirmed on a Web browser, eliminating the need to use special software and handheld terminals for on-site calibration and maintenance.
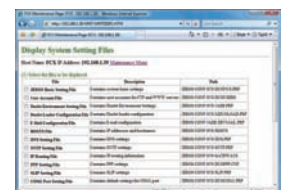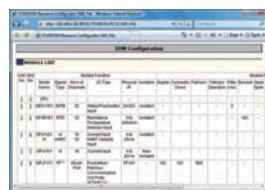
# SOFTWARE ARCHITECTURE

## Flexible software architecture for reduced CAPEX

The combination of reliable control with advanced IT functions that harness the power of the Internet gives you greater flexibility in your applications and improves efficiency.

## PLC with Advanced IT Functionality

In addition to the functions of a conventional PLC, all FCN, FCN-RTU, and FCJ controllers come with advanced Web-based and other IT functions for the processing, acquisition, and transfer of data.

### Advanced IT functionality
- Web server, FTP server, e-mail, file logging

### Java enabled
- Co-existence of Java applications and control functions on the same platform
- No extra module needed for Java applications
- Separation of Java and control application areas for guaranteed control performance

### Easy and intuitive interface for creation of Java applications
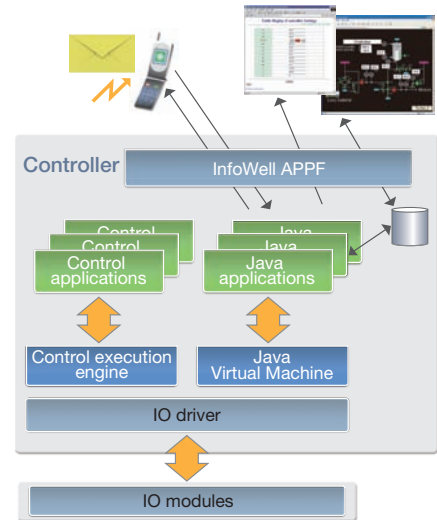- With the InfoWell interface package of application portfolios (APPF), even PLC programmers who aren't familiar with Java can develop Java applications.



Controller
InfoWell APPF
Control applications
Java applications
Control execution engine
Java Virtual Machine
IO driver
IO modules

## True autonomous controller

In addition to the functions of a conventional PLC, all FCN, FCN-RTU, and FCJ controllers come with advanced Web-based and other IT functions for the processing, acquisition, and transfer of data.

Examples of SCADA applications
- Gas & oil wellheads
- Wind turbines



Control room

Internet

Field
- Control
- Metering
- Log data
- Report files

GPRS, ADSL, satellite, and more

- View current status on Web browser
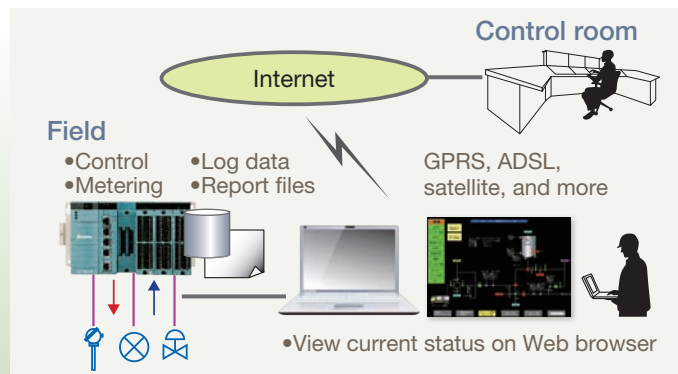
## Reliable Control Application Architecture



Project (control application)

Configuration

Resources(controllers)

Task | Task

Program (POU)

Program (POU)

Global variables
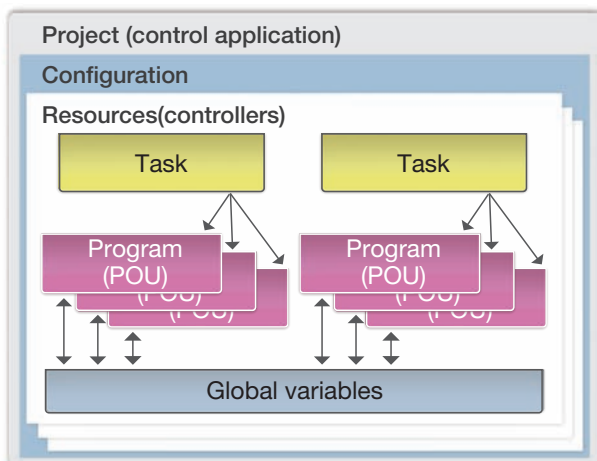
Applications can be developed in project units. A project consists of one or more configurations (programs) running on several different resources (controllers). Multiple tasks are allowed to run on each controller.

### Guaranteed control performance
- Application performance can be set based on task priority and schedule.
- First priority is given to control applications, which run separately from Java applications.

### Excellent reusability
- Hardware-independent projects can be easily assigned to controllers.
- Libraries of independently developed common elements for application development can be easily imported to projects.

13

# APPLICATION PORTFOLIOS

**A variety of application portfolios reduce engineering hours and enhance quality**

Minimize engineering time by using IEC 61131-3 compliant program organization units (POUs) arranged in application portfolios (APPFs). POUs greatly speed up the programming of complicated processes.

## NPAS Portfolio

All of Yokogawa's long experience with distributed control systems (CENTUM series) has gone into the development of the POUs that are included in the new process automation system portfolios (NPAS POUs). These cover a wide range of functions such as regulatory control, mathematical calculations, and sequencing.

List of POUs in the NPAS portfolio

| | POU Name | Description |
|---|---|---|
| I/O Data Processing | NPAS_AI_ANLG | Standard analog input |
| | NPAS_AI_TEMP | Measured temperature input |
| | NPAS_AI_PULS_QT | Exact totalization pulse train input |
| | NPAS_AI_PULS_CI | Control priority type pulse train input |
| | NPAS_AI_PCNT | Regularized data (%) input |
| | NPAS_AI_FREQ | Frequency input |
| | NPAS_AI_REAL | Real data input |
| | NPAS_AI_DINT/UDINT | DINT/UDINT data analog input |
| | NPAS_AO_ANLG | Standard analog output |
| | NPAS_AO_PCNT | Regularized data (%) output |
| | NPAS_AO_REAL | Real data output |
| | NPAS_AO_DINT/UDINT | DINT/UDINT data analog output |
| | NPAS_DI_STS | Status input |
| | NPAS_DI_PUSHB | Push button input |
| | NPAS_DI_WORD | WORD data contact input |
| | NPAS_DO_STS | Status output |
| | NPAS_DO_STS_PW | Pulse width output |
| | NPAS_DO_STS_TP | Time-proportional ON/OFF output |
| | NPAS_DO_STS_PWH | High resolution pulse width output |
| | NPAS_DO_WORD | WORD data contact output |
| | NPAS_FFI_ANLG | FF-H1 analog input |
| | NPAS_FFI_STS | FF-H1 status input |
| | NPAS_FFO_ANLG | FF-H1 analog output |
| | NPAS_FFO_STS | FF-H1 status output |
| | NPAS_AI_HART | HART variable input |
| | NPAS_FFRD_ANLG | FF-H1 analog data reading |
| | NPAS_FFRD_STS | FF-H1 status data reading |
| | NPAS_FFRD_DINT | FF-H1 integer data reading |
| | NPAS_FFWT_ANLG | FF-H1 analog data writing |
| | NPAS_FFWT_STS | FF-H1 status data writing |
| | NPAS_FFWT_DINT | FF-H1 integer data writing |
| Regulatory Control | NPAS PVI | Indicator |
| | NPAS_PID | PID controller |
| | NPAS_PI_HLD | Sampling PI controller |
| | NPAS_ONOFF | Two-position on/off controller |
| | NPAS_ONOFF_G | Three-position on/off controller |
| | NPAS_MLD | Manual loader without output tracking |
| | NPAS_MLD_PB | Manual loader with output pushback |
| | NPAS_MLD_BT | Manual loader with bias tracking |
| | NPAS_RATIO(_RT) | Ratio set (with ratio tracking) |
| | NPAS_PG_L30(_BP) | 30-zone program set (with bumpless) |
| | NPAS_VELLIM(_PB) | Velocity limiter (with output pushback) |
| | NPAS_AS_H/M/L | Auto-selector High/Medium/Low |
| | NPAS_FOUT | Cascade signal distributor |
| | NPAS_FFSUM(_BL) | Feedforward signal summing (with balancing) |
| | NPAS_XLMT_S/D | Single/Double cross-limit |
| | NPAS_BSET_F | Batch set block for flow measurement |
| | NPAS_BSET_LW | Batch set block for weight measurement |

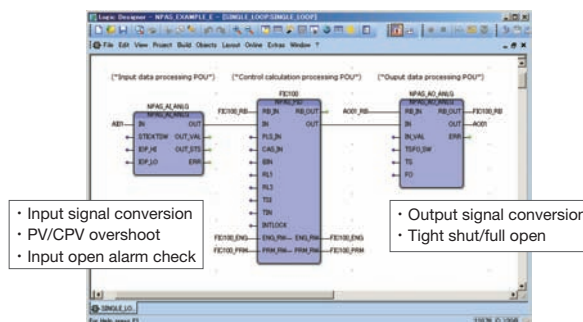| | POU Name | Description |
|---|---|---|
| Arithmetic Calculation | NPAS_LDLAG | Lead/Lag |
| | NPAS_DLAY | Dead time |
| | NPAS_AVE_M | Moving average |
| | NPAS_AVE_C | Cumulative average |
| | NPAS_FUNC_VAR | Variable line-segment function |
| | NPAS_TP_CFL | Temperature and pressure correction |
| | NPAS_T_CFL | Temperature correction |
| | NPAS_P_CFL | Pressure correction |
| | NPAS_ASTM1 | Old JIS-based ASTM correction |
| | NPAS_ASTM2 | New JIS-based ASTM correction |
| | NPAS_SW_13 | One-pole three-position selector switch block |
| | NPAS_SW_19 | One-pole nine-position selector switch block |
| | NPAS_BDBUF_R | Data buffer for real data |
| | NPAS_BDBUF_T | Data buffer for time data |
| Sequence | NPAS_SI*/SO*/SIO* | Switch instrument (NPAS_SI_1,NPAS_SI_2, NPAS_SO_1, NPAS_SO_2, NPAS_SIO_11, NPAS_SIO_12, NPAS_SIO_21,NPAS_SIO_22) |
| | NPAS_TM | Timer with preset value |
| | NPAS_CT | Counter with preset value |
| Utility | NPAS_SQRT_LC | Square root extraction with low-input cutoff |
| | NPAS_CDR_DESTR | Analog De-structuralization POU |
| | NPAS_CDR_STR | Analog Structuralization POU |
| | NPAS_BPLS_SW | Bumpless switching block |
| | NPAS_CDB_DESTR | Digital De-structuralization POU |
| | NPAS_CDB_STR | Digital Structuralization POU |
| | NPAS_CDD_DESTR | Integer De-structuralization POU |
| | NPAS_CDD_STR | Integer Structuralization POU |
| | NPAS_BCD_CI16 | 16-bit BCD input block |
| | NPAS_BCD_CO16 | 16-bit BCD output block |
| | NPAS_SIOCHGPLS | Contact Signal Pulse Form Conversion |
| | NPAS_DGFLT | Digital Filter |
| | NPAS_DFILE | General-purpose Data Filing |
| | NPAS_ADDSW NPAS_ADDINT NPAS_SUBSW NPAS_SUBINT | INT-type parameter support POU |
| | NPAS_AI2SW_A/B | Dual signal selector type A/B |
| | NPAS_AI3SW | Analog-input 2-out-of-3 circuit |
| | NPAS_SL2SW_A/B | High-low range switching type A/B |
| | NPAS_DI3 | Digital input 2 out of 3 circuit |
| | NPAS_NPS_STR | Totalization Structuralization |
| | NPAS_PB6 | Six-pushbutton block |
| | NPAS_RS8_A | Eight-input resource scheduler typeA/B (permission non-holding) |
| | NPAS_RS8_B | Eight-input resource scheduler (permission holding) |

## NPAS Features

### Straightforward programming for easy maintenance

A variety of input, control calculation, and output processing POUs prepared for straight forward programming.

- Input and output POUs include routines for the processing of 4-20 mA, RTD, mV, FOUNDATION fieldbus, and other types of input and output signals.

- Input and output POUs can be selected based on signal type.

- Read back (RB) connections prevent code nesting in feedback control.



- Input signal conversion
- PV/CPV overshoot
- Input open alarm check

- Output signal conversion
- Tight shut/full open

### Integrated control processing in a single POU

Input, alarm, control calculation, and output processing can all be integrated in individual POUs for smooth linking between functions.

- The integration of various types of processing in a single POU simplifies the creation of programs.

- Individuals POUs can be accessed as a tag by an FCN/FCJ application or SCADA system.
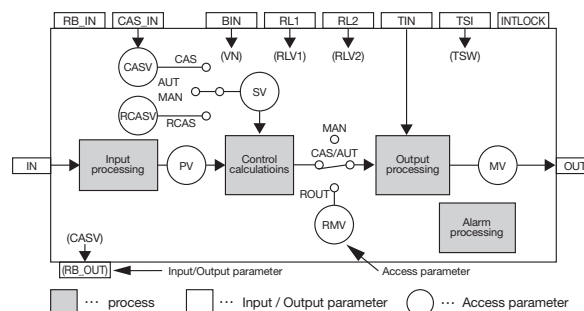


### Access and engineering parameters

NPAS POUs have two types of parameters that perform different functions.

- The function of a parameter can be identified by looking at its type.

- Access parameters (PV, SV, MV and others) are set on SCADA during operation phase.

- Engineering parameters (tracking definition, control action switch, bypass switch, and others) are specified during the engineering phase and have initial values.

### Easy to understand data structure

Intuitive data handling reduces debugging time.

- Analog signals are converted into easy to understand data with units such as degrees Celsius by an analog input processing POU.

- Industrial quantity data on controllers eliminate the data normalization by SCADA.

- Related values are included in the data structure.

### Optimization to prevent alarm flooding

Alarms are handled consistently during input and output processing to prevent alarm flooding and ensure that operators focus on the most important control tasks. All of the alarm handling know-how that Yokogawa has acquired working on DCS projects has gone into the development of the FCN/FCJ. This includes techniques for the suppression of duplicated and non-essential alarms and the simulation of control data on the controller.

Example

Input open alarms (IOP) and output open alarms (OOP) are generated when a sensor wire is disconnected. However IOP and OOP can be ignored during the debugging phase when a wire is disconnected and software wiring is used.



In Operation — Alarm generated / Control calculation setting

In Debugging — Alarm not generated

The following settings will ensure that the generation of an IOP or OOP during normal operations does not interfere with control:
- Set data to SH, SL, or previous data.
- Suspend totalizing.
- Specify that the control mode switches automatically from automatic (AUT) to manual (MAN).

# APPLICATION PORTFOLIOS

## Communication Portfolios

FCN/FCJ controllers communicate with other PLCs and SCADA systems using the following communication portfolios:

■ Modbus communication portfolio

| Type | Mode | Function |
|------|------|----------|
| Serial | ASCII | Master / Slave |
| | RTU | Master / Slave |
| Ethernet | TCP | Client / Server |

■ DNP3 communication portfolio

| Type | Function |
|------|----------|
| Serial | Slave |
| Ethernet | Server |

■ FA-M3 communication portfolio

■ MELSEC communication portfolio

■ SYSMAC communication portfolio

### Communication ports on CPU module

Unlike other PLCs, the FCJ, FCN, and FCN-RTU utilize Modbus and DNP3 communications through an RS or Ethernet port embedded on the CPU module. This eliminates the need for dedicated communication modules.
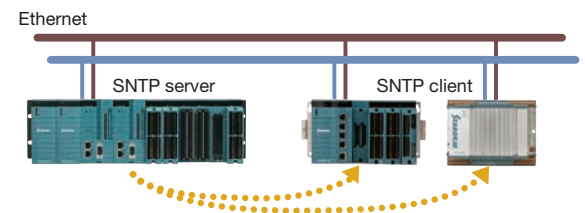
Note: The RS port is disabled when the FCN operates in a dual-redundant CPU configuration.

Ethernet

RS-232-C
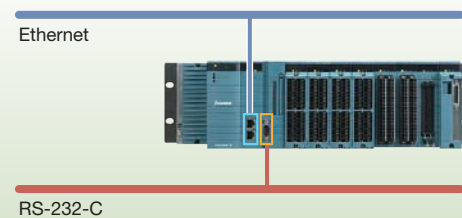
## Time Synchronization

Time is synchronized between the FCJ, FCN, and FCN-RTU using the simple network time protocol (SNTP).

Note: The FCN-RTU does not support SNTP server functions.

Ethernet

SNTP server    SNTP client

## Gas Flow Calculation

Gas flow volume is calculated using the following gas flow calculation POUs:

■ AGA 3, 7, 8, 9, 10, 11

■ GPA2172

■ API21.1 compliant

Web browser    Logging

Offline report view

Report Alarm

Online report view

Ethernet

FTP

Parameter setting    Dataview

Gas flow calculation POU

SD_AGACALC_MAIN_1

SP        FLOW
DP        REPORT
T         ERR_CODE
PULSE     ERR_STR
TM_UNIT
PARAMS    PARAMS

Report Alarm

Logging
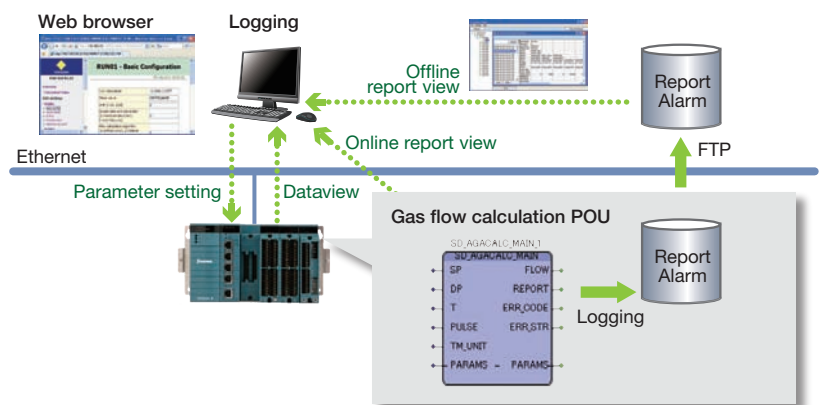
## FCN/FCJ OPC Server for Windows

FCN/FCJ OPC Server for Windows supports the OPC DA 2.05a and A&E 1.10 compliant interfaces.
Via OPC Server for Windows, the FCJ, FCN, and FCN-RTU controllers can connect with a variety of SCADA systems.

PC    FCN/FCJ OPC Server for Windows    PC (*1) OPC Client

Compliance Tested OPC FOUNDATION

OPC Communication

Ethernet

Up to 100 controllers

FCN/FCJ

*1 : OPC Client software can be installed on the same PC with FCN/FCJ OPC Server for Windows.

# SCADA

*Supervisory Systems*
**FAST/TOOLS™**
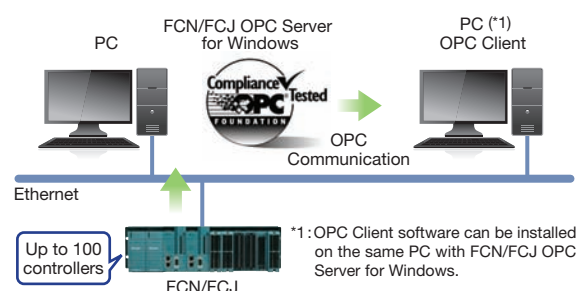
## Integrated remote control and monitoring of distributed utilities

The use of the FAST/TOOLS supervisory control and data acquisition (SCADA) system in a client/server configuration enables the integrated remote control and monitoring of distributed utilities and reduces engineering workload.

### Web-based supervision

A Web-based HMI is a cost effective solution that provides anytime / anywhere access to the information needed to make quick and timely decisions.
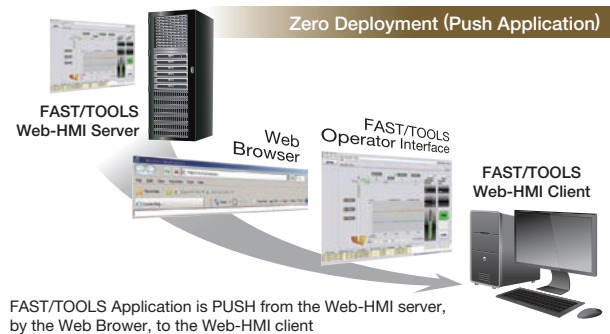
- The Web-based HMI eliminates the need for client software installation and maintenance.
- Process and product information can be shared across the enterprise on devices such as a notebook PCs and smartphones.
- Web security technology on HMI clients ensures that only authorized individuals gain access to data and applications.

### Scalable and Flexible

At minimum cost, the system can be scaled up to cover applications of any size.

- Capable of handling up to one million I/O points
- Online configuration with no downtime
- Supports Windows Server 2008, Windows 7, Windows XP, Solaris 10, and Linux 6



Zero Deployment (Push Application)

FAST/TOOLS Web-HMI Server
Web Browser
FAST/TOOLS Operator Interface
FAST/TOOLS Web-HMI Client

FAST/TOOLS Application is PUSH from the Web-HMI server, by the Web Brower, to the Web-HMI client

### Reliable Architecture

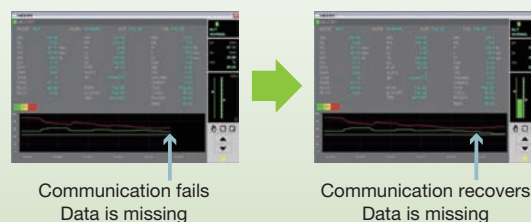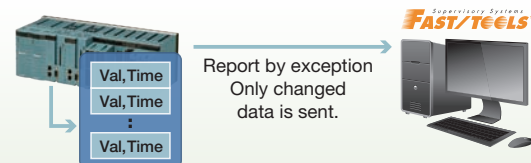Continuous operation and zero downtime assured with high availability computing (HAC)

- An HAC package enables the configuration of a standby FAST/TOOLS server.
- Real-time data synchronization and watchdog monitoring of system health
- Fast automatic or manual switch-over



FAST/TOOLS Workstations
SCADA LAN 1
SCADA LAN 2
FAST/TOOLS Server 1
FAST/TOOLS Server 2
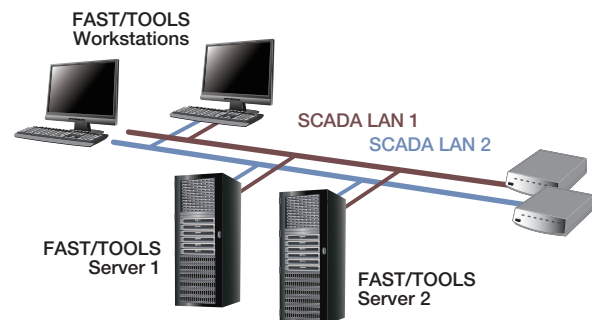
### SCADA integration with controllers

Takumi

With applications that are distributed over a wide area, GPRS, satellite, and other types of narrow bandwidth wireless communications are often used. However, communications can easily be disrupted and the cost of transferring large amounts of data is often prohibitive. The use of FAST/TOOLS with the FCN/FCJ controllers enables the following:

- Report by exception
  To hold down communications costs, only changed data is sent to FAST/TOOLS.

- Network fail-over
  With the time stamping of data from the FCN/FCJ controllers, a smooth switch-over with the recovery of all data is assured in the event of a network failure.



*Supervisory Systems*
**FAST/TEELS™**

Val,Time
Val,Time
Val,Time

Report by exception
Only changed data is sent.

Communication fails
Data is missing

Communication recovers
Data is missing

# INFORMATION

## Dramatic changes in utility management at remote site

By including advanced IT functions in its industrial use controllers,
Yokogawa has given them an integrated control and information processing capability.
InfoWell allows you to make full use of these IT functions without the need for any special programming skills.
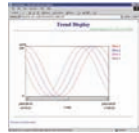
### Web Application Portfolio

Data can be displayed in a variety of ways on Internet Explorer to facilitate the monitoring and operation of equipment.
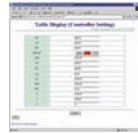
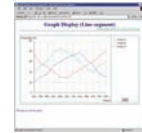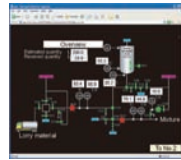| Real-time numeric box | Real-time bar chart | Real-time trend chart | Table | Bar chart | Line-segment chart | Messages |

### Graphic Portfolio

Graphic elements such as numeric boxes and bar charts allow data to be viewed in a number of ways. For the creation of more attractive presentations, photo, and blueprint background images are available.
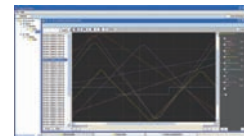
### Web Application Portfolio

Alarms and messages can be e-mailed automatically by FCN/FCJ to mobile phone or PC.
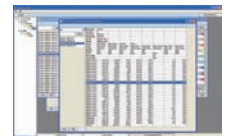
Alarms/messages
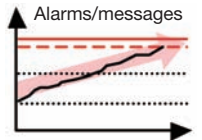
### Logging Portfolio

The application data collected and logged on the controller can be viewed in either a table or trend chart. Data on the FCN/FCJ controllers can be viewed either online (via a browser) or offline (by FTP file transfer to a PC). Periodical FTP tool to a PC is preared.

Trend chart          Table

| Logging & Reporting Function | The InfoWell logging portfolio logs data and creates daily, monthly, and yearly reports.<br>**Logging of control application data on controllers**<br>• Periodic data logging : High speed (every 1 to 60 seconds) or low speed (every 1 to 60 minutes)<br>• Batch logging : High speed (every 1 to 60 seconds) or low speed (every 1 to 60 minutes)<br>• Snapshot logging : Continuous or trigger    • SOE logging : 100 msec or longer    • Message logging : Alarm and event messages<br>**Report file generation**<br>• Report type : Daily, monthly, yearly          • Closing data : Minimum, maximum, average, total |
|---|---|
| Logging view | Logging data can be viewed online using a Web browser or offline using the Logging Viewer.<br>Data can be displayed in trend or tabular format.<br>• Trend format : Up to 10 pens can be assigned.          • Tabular format : Up to 40 items can be viewed. |
| Logging configuration | Logging can be configured online or offline using the Logging Configurator tool. |
| Logging file collection | Logging files from multiple controllers can be periodically collected using the Logging File Collector tool. |
| E-mail | Logging and report files are sent as e-mail attachments. |

### Easy "Fill in Form" (FIF) Engineering

No need to know Java or HTML to use the InfoWell package

E-mail application portfolio
Web application portfolio
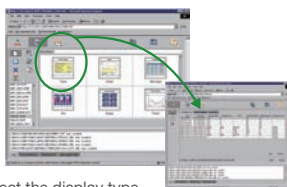
1. Select the display type
2. Select the displayed data

Graphic portfolio

TEXT    Bar graph
Numeric data
Image
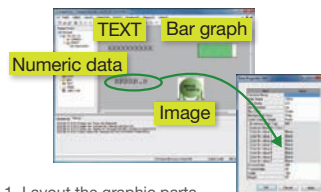
1. Layout the graphic parts
2. Specify the parts properties

Logging portfolio
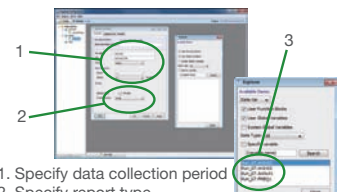
1. Specify data collection period
2. Specify report type
3. Specify logged data

## Features and Benefits

Precious data on rugged hardware at remote side
■ Built-in functionality allowing remote access to data logged securely on rugged controllers

Minimize Total Cost of Ownership
■ No need for dedicated software or an industrial-purpose PC to control and monitor your applications

Agile action in utility maintenance
■ E-mail notification of alarms and messages from controllers

**Control room**

**SCADA system**

Monitoring and operation

**Intranet /Internet**

GPRS, ADSL, satellite, etc.

**Field**

**Control output AO/DO**

**As a local HMI**
Notebook PC Web browser

**Data logging**
AI/DI/PI/digital communications

**Daily/monthly/yearly report creation**
Status, production volume, etc.

Ready access to a wealth of securely stored data
■ Secure storage of data on rugged hardware
■ Large capacity for storing field data and calculation results
■ Easy data access via FTP file transfer

**Office**

**Remote maintenance**
Desktop PC Web browser

Remote monitoring with versatile data display and security features
■ Use a Web browser to monitor the status of an application from a remote location. No need to be in central control room
■ Data display in numeric, tabular, or graphical format
■ User authentication required to prevent tampering with data

**Office**

**E-mail access to process information**

Alarm and message notification
■ Secure storage of data on rugged hardware
■ Large capacity for storing field data and calculation results
■ Easy data access via FTP file transfer

**InfoWell**   An information processing and transmission software package for the FCN/FCJ

*Takumi*

**InfoWell helps you to create the simple HMI**

Parameter setting and monitoring windows corresponding to IEC 61131-3 application can be easily made without SCADA, VB and other programming skills using InfoWell.
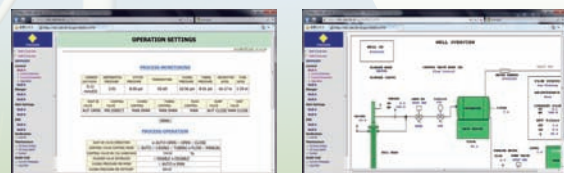
# APPLICATIONS

**Proven solutions that demonstrate the integrity of the STARDOM control system**

The following installations make use of STARDOM's highly reliable hardware, powerful control capabilities, and web-based HMI.

# Oil & gas

## Application

Wellhead control and monitoring

## Challenges

1. Oil and gas wellheads are located in remote and hazardous areas
2. New control functions and more reliable hardware are required to increase productivity
3. RTUs must be able to flexibly accommodate changing requirements over the entire wellhead lifecycle.
4. System software needs to match the workflow (not the other way around).

## Solution

Yokogawa's FCN-RTU controllers and the FAST/TOOLS SCADA package enhance productivity at well sites in the following ways:

1. At unmanned wells in remote locations, there is no room for compromise in hardware reliability. Failure proof in design, the STARDOM control system makes use of ECC memory that, for example, can detect and correct errors caused by exposure to background radiation. The programs running on the hardware are also highly reliable, and have been prepared using libraries (application portfolios) of control and metering code written in the five IEC61131-3 programming languages.
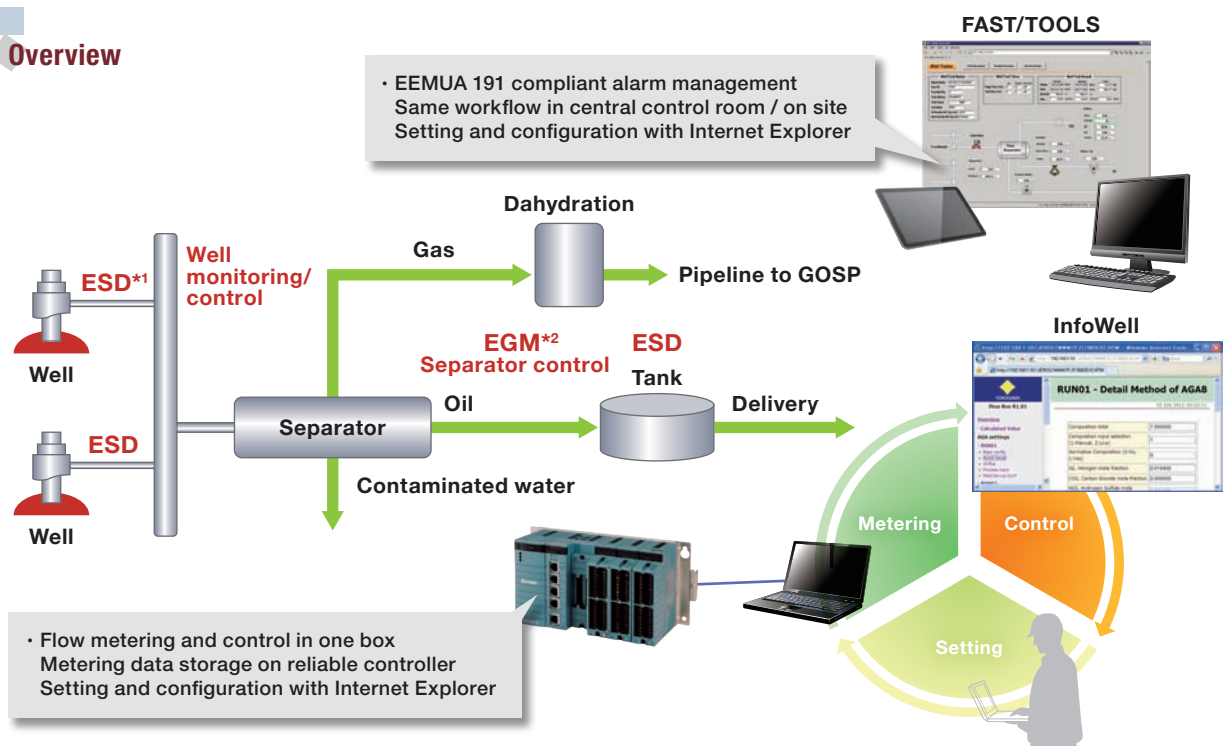2. Gas and oil vary in pressure, temperature, and composition, and the control method and utilities during the operation years due to well condition changes. Such modifications can be done remotely, without interfering with site operations.
3. Yokogawa's FAST/TOOLS SCADA has a web-based HMI that can be accessed from mobile devices. Whether working in a central control room or on site, the workflow processes are the same. The FCN-RTU controller also is able to keep logs on flow rates and other types of data that can be viewed on a web browser such as Internet Explorer using embedded web server functions.

## Overview



**FAST/TOOLS**

· EEMUA 191 compliant alarm management
Same workflow in central control room / on site
Setting and configuration with Internet Explorer

**InfoWell**

RUN01 - Detail Method of AGA8

· Flow metering and control in one box
Metering data storage on reliable controller
Setting and configuration with Internet Explorer

**Dahydration**

**Gas**

**Pipeline to GOSP**

**Well monitoring/control**

**ESD*1**

**Well**

**ESD**

**Well**

**Separator**

**EGM*2 Separator control**

**ESD**

**Tank**

**Oil**

**Delivery**

**Contaminated water**

Metering    Control

Setting

*1 ESD: Emergency shutdown  *2 EGM: Electronic gas measurement

# Furnace control

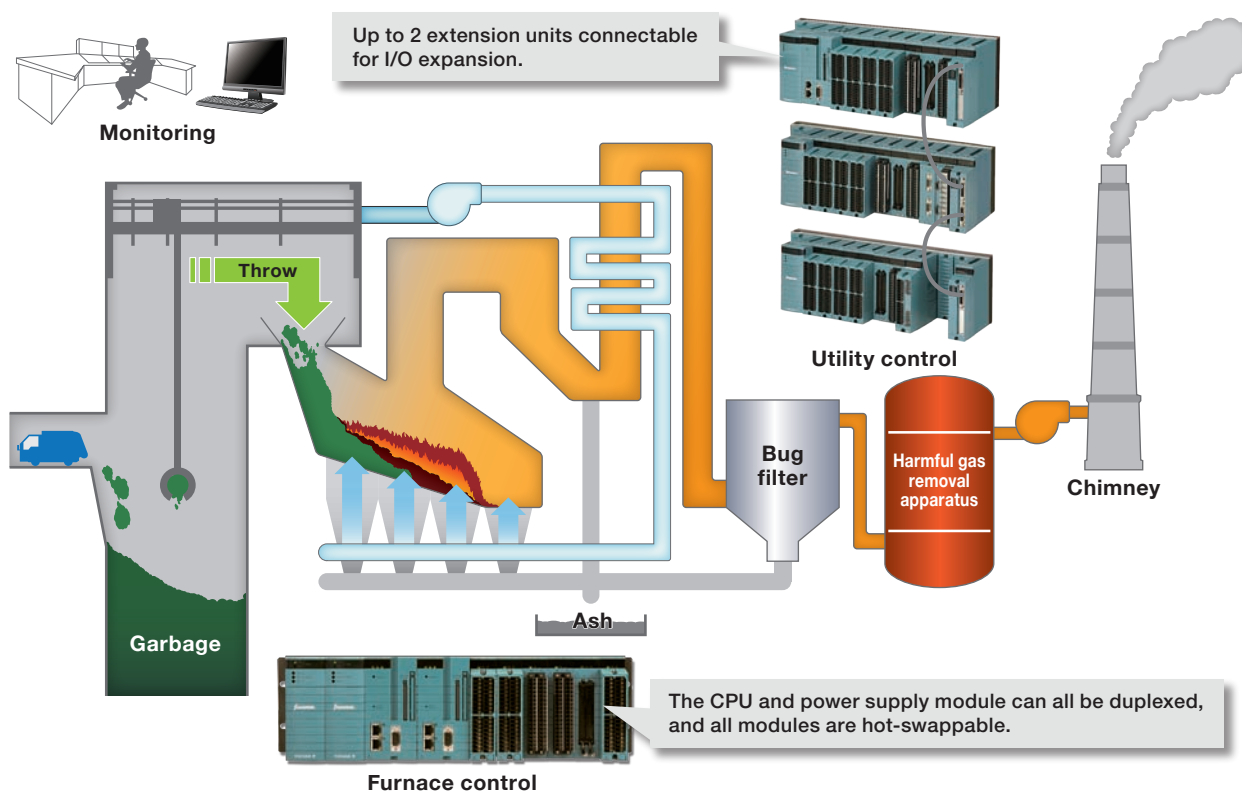## Application

Waste garbage operation

## Challenges

1. Achieving high reliability by using a mixture of single and redundant configurations, depending on the utility importance
2. Speeding up process control programming with IEC61131-3 languages
3. Connecting to different types of field devices using a variety of network protocols

## Solution

1. Yokogawa FCN controllers offer great flexibility by supporting both single and redundant CPUs, networks, power supplies, and communications buses. All programs can run with single and redundant settings. In addition, the CPU modules can be used in either configuration. This allows seamless changes between the two configurations and reduces the number of types of items that must be kept in stock. Consequently, systems can be freely configured based on critical level and initial costs can be kept to a minimum.
2. Writing PID control programs from scratch using IEC61131-3 languages is time consuming. With its long experience in the DCS field, Yokogawa has built up process control libraries that allow engineers to easily create high quality process control programs in less time.
3. The FCN controller supports a variety of field network protocols, giving users a wide selection of field devices to choose from Modbus TCP (server/client), Modbus RTU (server/client), CANopen, Profibus-DP, and FOUNDATION ™ fieldbus are all supported.

## Overview

Up to 2 extension units connectable for I/O expansion.

Monitoring

Throw

Utility control

Garbage

Ash

Bug filter

Harmful gas removal apparatus

Chimney

Furnace control

The CPU and power supply module can all be duplexed, and all modules are hot-swappable.

## FCN/FCJ CPU SPECIFICATIONS

| Items | | FCN CPU MODULE | FCN-RTU CPU MODULE | FCJ CPU MODULE | |
|---|---|---|---|---|---|
| Model | | NFCP100 | NFCP050 | NFJT100-S10 | NFJT100-H10 |
| Processor | | MMX-Pentium 166MHz | SH-4A (SH7730) 256 MHz | MMX-Pentium 166MHz | |
| Memory | Main | 128MB with ECC | 128MB with ECC | 128MB with ECC | |
| | Static RAM | 1MB with ECC, battery backup | 1MB with ECC, battery backup | 1MB with ECC, battery backup | |
| System card | | 1slot (128MB or 512MB) | 128MB on-board flash memory | 1slot (128MB or 512MB) | |
| Serial port (*1) | | 1 RS-232-C port D-Sub 9 pins (male) | 3 RS-232 ports (SERIAL: 1, 2, 3), non-isolated, RJ45 1 RS-422/RS-485 port (SERIAL: 4), non-isolated, RJ45 | 2 RS-232-C ports D-Sub 9 pins (male) | |
| | Method | Full duplex | RS-232: Full/Half duplex (software settings) RS-422/RS-485: Full/Half duplex (DIP switch settings) | Full duplex | |
| | Synchronization | Asynchronous | Asynchronous | Asynchronous | |
| | Baud rate | 0.3, 1.2, 2.4, 4.8, 9.6, 14.4, 19.2, 28.8, 38.4, 57.6, or 115.2kbps | SERIAL1,4 : 1.2, 2.4, 4.8, 9.6, 14.4, 19.2, 28.8, 38.4, 57.6, or 115.2 kbps SERIAL2, 3: 1.2, 2.4, 4.8, 9.6, 14.4, 19.2, 28.8, or 38.4 kbps | 0.3, 1.2, 2.4, 4.8, 9.6, 14.4, 19.2, 28.8, 38.4, 57.6, or 115.2kbps | |
| | Terminating resistance | – | RS-422/RS-485: 120 Ω built-in, ON/OFF (DIP switch settings) | – | |
| Network interface | | 2 Ethernet ports: 100/10 Mbps, 10BASE-T or 100BASE-TX, RJ45 | 1 Ethernet port: 100/10 Mbps, 10BASE-T or 100BASE-TX, RJ45 with network power switch (ON/OFF) | 2 Ethernet ports: 100/10 Mbps, 10BASE-T or 100BASE-TX, RJ45 | |
| I/O interface | | SB bus (duplex) | SB bus (Single) | – | |
| RAS features | | Watchdog timer, temperature monitor, etc. | Watchdog timer, temperature monitor, etc. | Watchdog timer, temperature monitor, etc. | |
| Battery | | 2700 mAH lithium battery | 2700 mAH lithium battery (*2) | 2700 mAH lithium battery | |
| LED | | 3 LEDs for CPU status 2 LEDs for each LAN status | 3 LEDs for CPU status 2 LEDs for LAN status, 2 LEDs for each serial port status | 3 LEDs for CPU status 2 LEDs for each LAN status | |
| Switches | | RESET, SHUTDOWN | RESET, SHUTDOWN, ON/OFF (NETWORK) | RESET, SHUTDOWN | |
| Power Supply | Supply voltage | 5V DC ± 5% | 5V DC ± 5% | 24V DC ± 10% | |
| | Current Consumption | Max. 1800mA | 1.16 to 2.30 W | Max. 800mA | Max. 1000mA |
| Weight | | 0.7 kg | 0.57kg | 1.7 kg | 1.8kg |
| Size | Dimensions (W/H/D) | 65.8 × 132 × 145.7 mm | 65.8 x 130 x 142.5 mm | 213.8 × 156 × 95 mm | |
| | Slot | Occupy 2 slots | Occupy 2 slots | – | |
| Duplex Configuration | | Power, CPU, SB Bus repeat modules, and Network enabled | Power supply modules enabled (NFBU200 with NFPW444) | Network enabled | |
| Built-in I/O | | None | 16 DI, 8 DO, 12 AI (1-5 V), 2 AO (4-20 mA), 2 PI, 1 AI (0-32 V) for solar power battery monitoring (*3) | 16 DI, 16 DO, 6 AI(1-5 V), 2 AO(4-20 mA) | 16 DI, 16 DO, 6 AI(1-5 V), 2 AO(4-20 mA), 2 FOUNDATION Fieldbus ports |

*1 : A serial port cannot be used when CPU modules are configured in redundancy.
*2 : With battery exhaustion detecting function.
*3 : MIL 40-pin x 2 (KMS40 cable and TAS40 terminal block can be used.)

## CPU Function Specification

### Common CPU Specifications

#### TASK EXECUTION

Execution Speed : Approx. 50 $\mu$ sec/Ksteps in IL language
Number of Tasks : Max. 16 tasks
Task Priority : Possible in 16 levels
Task Execution Cycle : 10 ms or longer (by 10 msec. increments)

#### PROGRAM CAPACITY ON CPU

Control Application : Max. 3 MB (approx. 400 Ksteps in an IL language)(*3)
Java Application : Max. 32 MB
Data Area (*1) : Max. 8 MB
Retained Data Area (*2) : Max. 410 KB

*1 : The data is not retained when the power is off.
*2 : The data is retained even if the power is off. It can be used for tuning parameter storage.
*3 : In case of FCN-RTU, it is approx. 360 Ksteps.

### Guideline of Control Application Capacity

As a guideline, the capacity of the control application is a total of the following:

- Function blocks (POUs) : Up to 512
  - Regulator control blocks (e.g., indicator blocks, controller blocks, and manual loaders): Up to 128
  - Others (e.g., calculation blocks, switch instrument blocks, and communication POUs): Up to 384
- Sequence program : Up to 180 kilosteps in Ladder

### Network (Ethernet) Specification

- Compliant with IEEE802.3
- Communicate with up to 15 FCN/FCJ per FCN/FCJ
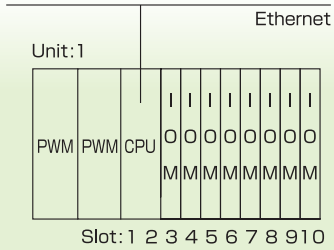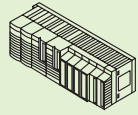- Communicate with up to 4 upper systems(*1) per FCN/FCJ

*1: Total number of VDS, FCN/FCJ OPC Server and FAST/TOOLS

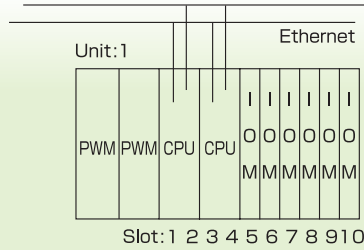## ◆ FCN Configuration (Redundant CPU, Power Supply and SB bus are all enabled)

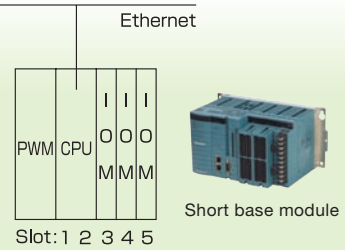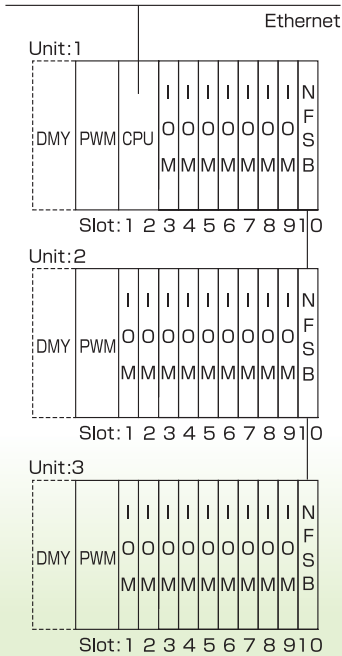### Single Configuration
(One control unit)

Ethernet
Unit:1

PWM | PWM | CPU | I O M | I O M | I O M | I O M | I O M | I O M | I O M | I O M

Slot: 1 2 3 4 5 6 7 8 9 10

### Redundant Configuration
(One control unit)

Ethernet
Unit:1

PWM | PWM | CPU | CPU | I O M | I O M | I O M | I O M | I O M | I O M

Slot: 1 2 3 4 5 6 7 8 9 10

### Short Base Configuration
(One control unit: extension unit not available)
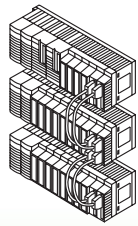
Ethernet

PWM | CPU | I O M | I O M | I O M

Slot: 1 2 3 4 5


Short base module

### Single Configuration
(One control unit + 2 extension Units)

Ethernet
Unit:1

DMY | PWM | CPU | I O M | I O M | I O M | I O M | I O M | I O M | I O M | NFSB

Slot: 1 2 3 4 5 6 7 8 9 10

Unit:2

DMY | PWM | I O M | I O M | I O M | I O M | I O M | I O M | I O M | I O M | I O M | NFSB

Slot: 1 2 3 4 5 6 7 8 9 10

Unit:3

DMY | PWM | I O M | I O M | I O M | I O M | I O M | I O M | I O M | I O M | I O M | NFSB

Slot: 1 2 3 4 5 6 7 8 9 10

### Redundant Configuration
(One control unit + 2 extension units)

Ethernet
Unit:1

PWM | PWM | CPU | CPU | I O M | I O M | I O M | I O M | NFSB | NFSB

Slot: 1 2 3 4 5 6 7 8 9 10

Unit:2

PWM | PWM | I O M | I O M | I O M | I O M | I O M | I O M | I O M | I O M | NFSB | NFSB

Slot: 1 2 3 4 5 6 7 8 9 10

Unit:3

PWM | PWM | I O M | I O M | I O M | I O M | I O M | I O M | I O M | I O M | NFSB | NFSB

Slot: 1 2 3 4 5 6 7 8 9 10
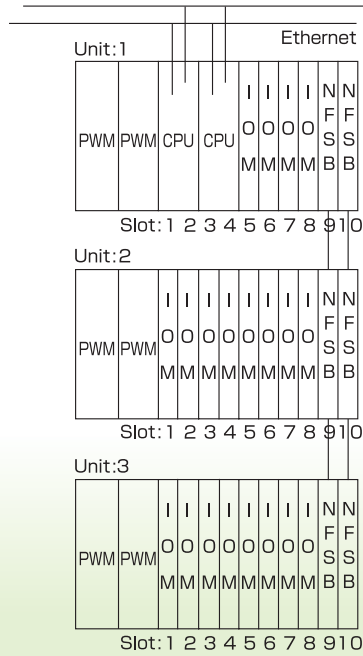
■ Common modules for single and redundant configuration.

■ Common modules for single and extension unit

### Occupied slot width

2 slots for CPU

1 slot for I/O

| Abbr. | Description | Redundant |
|-------|-------------|-----------|
| PWM | Power supply module | ✓ |
| CPU | CPU module | ✓ |
| IOM | I/O module | N/A |
| NFSB | SB bus repeat module | ✓ |
| DMY | Dummy cover | - |

### Maximum numbers of I/O modules

| Base Module | Unit Configuration | Standard Configuration | Redundant (*1) Configuration |
|-------------|--------------------|-----------------------|------------------------------|
| Base Module (NFBU200) | Control unit only | Max. 8 | Max. 6 |
| | With one extension unit | Max. 16 | Max. 12 |
| | With two extension units | Max. 25 | Max. 20 |
| Base Module (NFBU050) | Control unit only | Max. 3 | N/A |

*1: When CPU and SB bus repeat modules are duplexed.

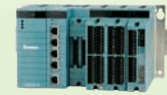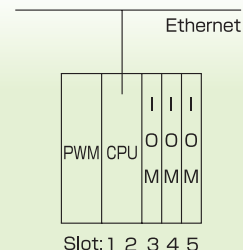## ◆ FCN-RTU Configuration (CPU redundancy and extension unit are not applicable.)

### Long Type Configuration
(Redundant Power Supply is enabled)

Ethernet
Unit:1

PWM | PWM | CPU | I O M | I O M | I O M | I O M | I O M | I O M | I O M | I O M

Slot: 1 2 3 4 5 6 7 8 9 10
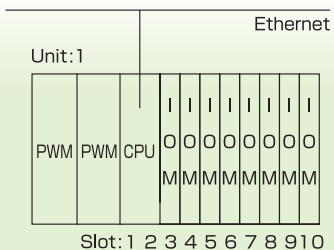


### Short Type Configuration

Ethernet

PWM | CPU | I O M | I O M | I O M

Slot: 1 2 3 4 5


Short base module

## FCN/FCN-RTU BASIC SPECIFICATIONS

### CPU MODULES  FCN : Use with FCN   RTU : Use with FCN-RTU

| Model | Name | FCN* | RTU* | Specification | Embedded I/O |
|---|---|---|---|---|---|
| NFCP100 | CPU module | ✓ | | • Duplex configuration: Possible<br>• Hot-Swap: Possible<br>• CPU Status LED: HRDY (Hardware Ready), RDY (System Ready), CTRL (Control Ready)<br>• LAN Status LED: LINK (Connection Normal), ACT (Sending/Receiving)<br>• Max current consumption: 1800 mA (5 V DC)<br>• Weight: 0.7 kg<br>• Operation temperature: 0℃ to 55 ℃ | • Ethernet: 2 ports<br>• RS-232-C: 1 port |
| NFCP050 | CPU module | | ✓ | • Duplex configuration: Not applicable<br>• CPU Status LED: HRDY (Hardware Ready), RDY (System Ready), CTRL (Control Ready)<br>• LAN Status LED:<br>   NETWORK ON/OFF (ON in normal, OFF in power down mode)<br>   LINK & ACT (ON for communication established, BLINK for Sending/Receiving)<br>• RS Status LED: RCV (Receiving), SND (Sending)<br>• Power consumption:<br>   1.6 W to 2.9 W depending on network and embedded I/O configuration<br>• Weight: 0.57 kg<br>• Operation temperature: -40℃ to 70 ℃ | • Ethernet: 1 port<br>• RS-232: 3 ports<br>• RS-422/RS-485: 1 port<br>• AI (1 to  5 V): 12 ch.<br>• AI (0 to 32 V): 1 ch.<br>• AO (4 to 20 mA): 2 ch.<br>• DI (24 V DC): 16 ch.<br>• DO (24 V DC): 8 ch.<br>• PI: 2 ch. |

### BASE MODULES   FCN : Use with FCN   RTU : Use with FCN-RTU

| Model | Name | FCN* | RTU* | Specification | |
|---|---|---|---|---|---|
| NFBU200-S0 | Base module<br>(19-inch rack-mounted) | ✓ | ✓ | • Max current consumption: 0.4 A (5 V) (Self-consumption)<br>• Operation temperature: -20℃ to 70 ℃ | Weight: 1.9kg |
| NFBU200-S1 | Base module<br>(DIN rail-mounted) | ✓ | ✓ | | Weight: 1.0kg |
| NFBU050-S1 | Short base module<br>(DIN rail-mounted) | ✓ | ✓ | • Max current consumption: 0.025 A (5 V) (Self-consumption)<br>• Operation temperature: -40℃ to 70 ℃ | Weight: 0.58kg |

### POWER SUPPLY MODULES   FCN : Use with FCN   RTU : Use with FCN-RTU

| Model | Name | FCN* | RTU* | Specification |
|---|---|---|---|---|
| NFPW441 | Power supply module<br>(100-120 V AC input) | ✓ | | • Duplex configuration: Possible<br>• Hot-Swap: Possible<br>• Rated output: + 5.1 V DC, 7.8 A<br>• Analog field power supply: Input: 24 V DC ± 10 %, 4 A, Duplexed (matching-diode)<br>• LED: SYS (5 V system power output ON), FLD (24 V field power supply ON)<br>• Checking terminals: + 5 V, + 24 V<br>• Weight: 0.6 kg<br>• Operation temperature: 0℃ to 55 ℃ (-20℃ to 70 ℃ for NFPW444) |
| NFPW442 | Power supply module<br>(220-240 V AC input) | ✓ | | |
| NFPW444 | Power supply module<br>(24 V DC input) | ✓ | ✓ | |
| NFPW426 | Power supply module<br>(12 V DC input<br>or 24 V DC input) | | ✓ | • Duplex configuration: Not applicable<br>• Hot-Swap: Not applicable<br>• Rated output: +5.1 V DC (2.4 A) and +24 V DC (0.54 A)<br>• LED: SYS (5 V system power output ON), FLD (24 V field power supply ON)<br>• Checking terminals: + 5 V, + 24 V<br>• Weight: 0.61 kg<br>• Operation temperature: -40℃ to 70 ℃ |

### SB BUS REPEAT MODULES   FCN : Use with FCN   RTU : Use with FCN-RTU

| Model | Name | FCN* | RTU* | Specification |
|---|---|---|---|---|
| NFSB100 | SB bus repeat module | ✓ | | • Duplex configuration: Possible<br>• Hot-Swap: Possible<br>• Method: Serial communication (128 Mbps)<br>• Distance: Max. 8 m per segment<br>• LED: STATUS (Hardware Ready), SND (Sending), RCV (Receiving)<br>• Max current consumption: 500mA (5 V DC)<br>• Weight: 0.2 kg<br>• Operation temperature: 0℃ to 55 ℃ |

Operation temperature range of the total component is decided by the narrowest range of each module (CPU, power supply, base, and I/O).

## FCJ BASIC SPECIFICATIONS

### CPU MODULES

| Model | Name | Specification |
|---|---|---|
| NFJT100 | Autonomous Controller<br>FCJ<br>(DIN rail or panel mounted) | • Network redundant configuration applicable<br>• CPU Status LED:HRDY (Hardware Ready), RDY (System Ready), CTRL(Control Ready)<br>• LAN Status LED: LINK (Connection Normal), ACT (Sending/Receiving)<br>• Power supply: 24 V DC ± 10%<br>• Max current consumption:800mA (24 V DC), 1000mA (24 V DC) FOUNDATION fieldbus in use<br>• Weight: 1.7 kg, 1.8 kg FOUNDATION fieldbus in use<br>• Operation temperature: 0℃ to 55 ℃ |

# FCN MODULE SPECIFICATIONS

## DIGITAL I/O MODULES

**RTU** : Use with FCN-RTU   **WTR** : Wider temperature range (-40℃ to +70℃ or -20℃ to +70℃ )   **PCT** : Pressure Clamp Terminal available

| Model | Description | RTU* | WTR* | PCT* | MIL | Basic Specification | Specification | Common |
|---|---|---|---|---|---|---|---|---|
| NFDV141 | Digital Input<br>• 16 ch.<br>• 100V to 120 V AC<br>• Isolated | N/A | N/A | √ | N/A | • Function<br>Status a<br>• Max cur<br>500 mA (5 V DC)<br>• Weight: 0.3 kg | • Input response time: 160 ms or less (for status input)<br>• Min. ON detection time: 200 ms (for push button input)<br>• Max. ON/OFF cycle: 2.5 Hz (for push button input) | per 8 ch. |
| NFDV142 | Digital Input<br>• 16 ch.<br>• 200 V to 240 V AC<br>• Isolated | N/A | N/A | √ | N/A | • Functions:<br>Status and Push button (edge count)<br>• Max current consumption:<br>500 mA (5 V DC)<br>• Weight: 0.3 kg | • Input response time: 160 ms or less (for status input)<br>• Min. ON detection time: 200 ms (for push button input)<br>• Max. ON/OFF cycle: 2.5 Hz (for push button input) | per 8 ch. |
| NFDV151 | Digital Input<br>• 32 ch.<br>• 24 V DC<br>• Isolated | √ | √<br>-20 | √ | √<br>50 pins | • Functions:<br>Status and Push button (edge count)<br>• Max current consumption:<br>500 mA (5 V DC)<br>• Weight: 0.3 kg | • Input response time: 8 ms or less (for status input)<br>• Min. ON detection time: 20 ms (for push button input)<br>• Max. ON/OFF cycle: 25 Hz (for push button input) | per 16 ch. (Plus or Minus) |
| NFDV157 | Digital Input<br>• 32 ch.<br>• 24V DC<br>• Isolated | √ | N/A | √ | N/A | • Functions:<br>Status<br>• Max current consumption:<br>350 mA (5 V DC)<br>• Weight: 0.4 kg | • Input response time: 8 ms or less (for status input)<br>• Min. ON detection time: 20 ms (for push button input)<br>• Max. ON/OFF cycle: 25 Hz (for push button input) | per 16 ch. (Plus or Minus) |
| NFDV161 | Digital Input<br>• 64 ch.<br>• 24V DC<br>• Isolated | N/A | N/A | N/A | √<br>50 pins 2 sets | • Functions:<br>Status and Push button (edge count)*1<br>• Max current consumption:<br>550 mA (5 V DC)<br>• Weight: 0.3 kg | • Input response time: 8 ms or less (for status input)<br>• Min. ON detection time: 20 ms (for push button input)<br>• Max. ON/OFF cycle: 25 Hz (for push button input) | per 16 ch. (Plus or Minus) |
| NFDV551 | Digital Output<br>• 32 ch.<br>• 24 V DC<br>• Isolated | √ | √<br>-20 | √ | √<br>50 pins | • Output fallback: Set to all channels<br>• Max current consumption:<br>700 mA (5 V DC), 60 mA (24V DC)<br>• Weight: 0.2 kg | • Output response time: 3 ms or less (for status output) | per 16 ch. (Minus) |
| NFDV557 | Digital Output<br>• 32 ch.<br>• 24V DC<br>• Isolated | √ | N/A | √ | N/A | • Output fallback: Set to all channels<br>• Max current consumption:<br>550mA (5 V DC), 60 mA (24V DC)<br>• Weight: 0.3 kg | • Output response time: 3 ms or less (for status output) | per 16 ch. (Minus) |
| NFDV561 | Digital Output<br>• 64 ch.<br>• 24V DC<br>• Isolated | N/A | N/A | N/A | √<br>50 pins 2 sets | • Output fallback: Set to all channels<br>• Max current consumption:<br>780 mA (5 V DC), 120 mA (24V DC)<br>• Weight: 0.3 kg | • Output response time: 3 ms or less (for status output) | per 16 ch. (Minus) |
| NFDV532 | Pulse Width Output<br>• 4 ch. :<br>UP/DOWN Pulse<br>• 24 V DC<br>• Isolated | N/A | N/A | √ | √<br>50 pins | • Output fallback: Set to all channels<br>• Max current consumption:<br>550mA (5 V DC), 25 mA (24V DC)<br>• Weight: 0.2 kg | • Pulse output accuracy:<br>Min. 2 ms, 2 ms increments (error: Max. ± 1 ms) | for all ch. (Minus) |
| NFDR541 | Relay Output<br>• 16 ch.<br>• 24 to 110 V DC or 100 to 240 V AC<br>• Isolated | √ | √<br>-20 | √ | N/A | • Rated applied voltage:<br>24 to 110 V DC, 100 to 240 V AC<br>• Output fallback:<br>Set to all channels<br>• Max current consumption:<br>780 mA (5 V DC)<br>• Weight: 0.3 kg | • Output response time: 12 ms or less (for status output) | per 8 ch. (Plus or Minus) |

Common Specification   • LED: STATUS(Hardware normal), ACT(Operating)   • Hot-Swap: Possible

*1: Channels from 1 to 32 can be push button inputs.

## COMMUNICATION MODULES

**RTU** : Use with FCN-RTU   **WTR** : Wider temperature range (-40 to +70℃ )

| Model | Description | RTU* | WTR* | Basic Specification | Specification | Remarks |
|---|---|---|---|---|---|---|
| NFLR111 | RS-232-C communication module (2 ports, 300 bps to 115.2 kbps) | N/A | N/A | • Max current consumption: 500 mA (5 V DC)<br>• Weight: 0.3 kg | • Port: RS-232-C (2 ports)<br>• Speed: 0.3 to 115.2kbps | D-sub 9 pins (female x 2) |
| NFLR121 | RS-422/RS-485 communication module (2 ports, 300 bps to 115.2 kbps) | N/A | N/A | Max current consumption: 500 mA (5 V DC)<br>• Weight: 0.3 kg | • Port: RS-422/485 (2 ports)<br>• Speed: 0.3 to 115.2kbps | Clamp terminal with M4 screws (5 poles x 2) |
| NFLF111 | FOUNDATION fieldbus communication module | √ | √<br>-40 | • Max current consumption: 500 mA (5 V DC)<br>• Weight: 0.4 kg | • Port: 4 ports   • 16 devices per port<br>• Speed: 31.25kbps<br>• Link Active Scheduler (LAS) | Clamp terminal |
| NFLP121 | PROFIBUS-DP communication module | √ | N/A | • Max current consumption: 700 mA (5 V DC)<br>• Weight: 0.3 kg | • Port: 1 port<br>• 123 devices per module (if repeaters used) | D-sub 9 pins (female) |
| NFLF121 | CANopen communication module | √ | N/A | • Max current consumption: 700 mA (5 V DC)<br>• Weight: 0.3 kg | • Port: 1 port   • CiA 301 compliant<br>• 126 devices per module | D-sub 9 pins (male) |

Common Specification   • LED: STATUS(Hardware normal), ACT(Operating), RCV(Receiving), SND(Sending)

# SPECIFICATIONS │ MODULE

## ◆ FCN MODULE SPECIFICATIONS

**ANALOG I/O MODULES**   **RTU** : Use with FCN-RTU   **WTR** : Wider temperature range (-40℃ to +70℃ or -20℃ to +70℃ )   **PCT** : Pressure Clamp Terminal available

| Model | Description | HART | RTU* | WTR* | PCT* | MIL | Basic Specification | Specification |
|---|---|---|---|---|---|---|---|---|
| NFAI135 | Analog Input<br>• 4 to 20 mA<br>• 8 ch.<br>• Isolated ch. | ✓ | ✓ | ✓<br>-20 | ✓ | ✓<br>40 pins | • Withstanding voltage:<br>  500 V AC between input and system,<br>  500 V AC between channels<br>• Transmitter power supply: 20.2 to 29.3 V<br>  (Output current limit: 25 mA)<br>• Two wire and four wire transmitter setting<br>  per channel with connected terminal<br>• Max current consumption: 360 mA<br>  (5 V DC), 450 mA (24 V DC)<br>• Weight: 0.3 kg | • Accuracy: ± 0.1 % of full scale<br>• Data refresh cycle: 10 ms<br>• Input step response time: 100 ms<br>• Temperature drift: Max. ± 0.01 % /℃ |
| NFAI141 | Analog Input<br>• 4 to 20 mA<br>• 16 ch.<br>• Non-Isolated | ✓ | ✓ | ✓<br>-20 | ✓ | ✓<br>40 pins | • Transmitter power supply: 22.8 to 26.4 V<br>  (Output current limit: 27 mA)<br>• Two wire and four wire transmitter setting<br>  per channel with pins<br>• Max current consumption: 310 mA<br>  (5 V DC), 450 mA (24 V DC)<br>• Weight: 0.2 kg | • Accuracy: ± 0.1 % of full scale<br>• Data refresh cycle: 10 ms<br>• Input step response time: 100 ms<br>• Temperature drift: Max. ± 0.01 % /℃ |
| NFAI143 | Analog Input<br>• 4 to 20 mA<br>• 16 ch.<br>• Isolated | ✓ | ✓ | ✓<br>-20 | ✓ | ✓<br>40 pins | • Withstanding voltage:<br>  1500 V AC between input and system<br>• Transmitter power supply: 24.0 to 25.5 V<br>  (Output current limit: 25 mA)<br>• Two wire and four wire transmitter setting<br>  per channel with pins<br>• Max current consumption: 230 mA<br>  (5 V DC), 540 mA (24 V DC)<br>• Weight: 0.3 kg | • Accuracy: ± 0.1 % of full scale<br>• Data refresh cycle: 10 ms<br>• Input step response time: 100 ms<br>• Temperature drift: Max. ± 0.01 % /℃ |
| NFAV141 | Analog Input<br>• 1 to 5 V<br>• 16 ch.<br>• Non-Isolated | N/A | ✓ | N/A | ✓ | ✓<br>40 pins | • Input: Differential input<br>  (allowable common mode viltage ± 1V or less)<br>• Max current consumption: 350 mA<br>  (5 V DC)<br>• Weight: 0.2 kg | • Accuracy: ± 0.1 % of full scale<br>• Data refresh cycle: 10 ms<br>• Input step response time: 100 ms<br>• Temperature drift: Max. ± 0.01 % /℃ |
| NFAV142 | Analog Input<br>• -10 to +10 V<br>• 16 ch.<br>• Non-Isolated | N/A | N/A | N/A | ✓ | ✓<br>40 pins | • Max current consumption: 350 mA (5 V DC)<br>• Weight: 0.2 kg | • Accuracy: ± 0.1 % of full scale<br>• Data refresh cycle: 10 ms<br>• Input step response time: 100 ms<br>• Temperature drift: Max. ± 0.01 % /℃ |
| NFAV144 | Analog Input<br>• -10 to +10 V<br>or 1 to 5 V<br>• 16 ch.<br>• Isolated | N/A | ✓ | ✓<br>-20 | ✓ | ✓<br>40 pins | • Input signal:<br>  1 to 5 V or -10 to +10 V set for all channels<br>• Withstanding voltage:<br>  1500 V AC between input and system<br>• Max current consumption: 500 mA (5 V DC)<br>• Weight: 0.2 kg | • Accuracy: ± 0.1 % of full scale<br>• Data refresh cycle: 10 ms<br>• Input step response time: 100 ms<br>• Temperature drift: Max. ± 0.01 % /℃ |
| NFAT141 | TC/mV Input<br>• 16 ch.<br>• Isolated | N/A | ✓ | N/A | ✓ | ✓<br>40 pins<br>*1 | • Input signal: Thermocouple or mV set for<br>  each channel from CH1 to CH16<br>• Burn out detection: Possible<br>  (all channels together), Detection time: 60 s<br>• Withstanding voltage:<br>  1500 V AC between input and system<br>• Max current consumption: 450 mA (5 V DC)<br>• Weight: 0.2 kg | • TC input accuracy:<br>  ± 0.03 % of full scale (-20 to 80 mV)<br>• mV input accuracy:<br>  ± 0.032 % of full scale (-100 to 150 mV)<br>• Data refresh cycle: 1 s<br>• TC input temperature drift:<br>  Max. ± 30 ppm/℃<br>• mV input temperature drift:<br>  Max. ± 32 ppm/℃ |
| NFAR181 | RTD Input<br>• 12 ch.<br>• Isolated | N/A | ✓ | ✓<br>-40 | ✓ | N/A | • Input signal: Set for each channel<br>• Burn out detection: Possible<br>  (all channels together), Detection time: 60 s<br>• Withstanding voltage:<br>  1500 V AC between input and system<br>• Max current consumption: 450 mA (5 V DC)<br>• Weight: 0.2 kg | • Accuracy: ± 0.03 % of full scale<br>  (0 to 400 Ω )<br>• Data refresh cycle: 1 s<br>• Temperature drift: Max. ± 30 ppm/℃ |

*1: Use a MIL connector cable only for mV input.

# ANALOG I/O MODULES

RTU : Use with FCN-RTU  WTR : Wider temperature range (-40℃ to +70℃ or -20℃ to +70℃ )  PCT : Pressure Clamp Terminal available

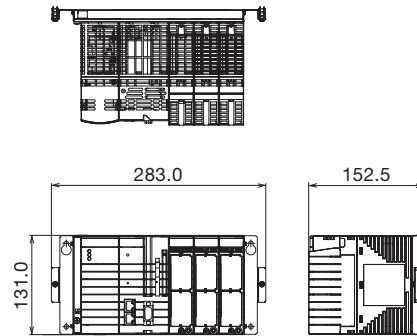| Model | Description | HART | RTU* | WTR* | PCT* | MIL | Basic Specification | Specification |
|---|---|---|---|---|---|---|---|---|
| NFAP135 | Pulse Input<br>• 0 to 10kHz<br>• 8 ch.<br>• Isolated ch. | N/A | ✓ | ✓ -40 | ✓ | ✓ 40 pins | • Withstanding voltage:<br>  500 V AC between input and system,<br>  500 V AC between channels<br>• Transmitter power supply:<br>  24 V (30 mA) / 12 V (40 mA) Selectable<br>• Max current consumption:<br>  300 mA (5 V DC), 400 mA (24 V DC)<br>• Weight: 0.3 kg | • Minimum input pulse width: 40 $\mu$s<br>• Data refresh cycle: 2 ms<br>• Input type:<br>  Dry contact pulse (Open collector contact)<br>  Dry contact pulse (Relay contact)<br>  Voltage pulse<br>  Current pulse (Two-wired transmitter)<br>  Voltage pulse (Three-wired transmitte) |
| NFAF135 | Frequency Input<br>• 0.1Hz to 10kHz<br>• 8 ch.<br>• Isolated ch. | N/A | N/A | N/A | ✓ | ✓ 40 pins | • Withstanding voltage:<br>  500 V AC between input and system,<br>  500 V AC between channels<br>• Transmitter power supply:<br>  24 V (30mA) / 12 V (40mA) Selectable<br>• Max current consumption:<br>  300 mA(5 V DC), 400 mA(24 V DC)<br>• Weight: 0.3 kg | • Minimum input pulse width: 40 $\mu$s<br>• Data refresh cycle: 10 ms<br>• Input type:<br>  Dry contact pulse (Open collector contact)<br>  Dry contact pulse (Relay contact)<br>  Voltage pulse |
| NFAI835 | Analog I/O<br>• 4 ch. input<br>  (4 to 20 mA)<br>• 4 ch. output<br>  (4 to 20 mA)<br>• Isolated ch. | ✓ | ✓ | ✓ -20 | ✓ | ✓ 40 pins | • Withstanding voltage:<br>  500 V AC between input/output and system,<br>  500 V AC between channels<br>• Output fallback: Set for each channel<br>• Transmitter power supply:<br>  20.2 to 29.3 V (Output current limit: 25 mA)<br>• Two wire and four wire transmitter setting<br>  per channel with connected terminal<br>• Max current consumption:<br>  360 mA (5 V DC), 450 mA (24 V DC)<br>• Weight: 0.3 kg | • Input accuracy: ± 0.1 % of full scale<br>• Output accuracy: ± 0.3 % of full scale<br>• Data refresh cycle: 10 ms<br>• Input step response time: 100 ms,<br>  Output step response time: 100 ms<br>• Temperature drift: Max. ± 0.01 % /℃ |
| NFAI841 | Analog I/O<br>• 8 ch. input<br>  (4 to 20 mA)<br>• 8 ch. output<br>  (4 to 20 mA)<br>• Non-Isolated | ✓ | ✓ | ✓ -20 | ✓ | ✓ 40 pins | • Output fallback: Set for each channel<br>• Transmitter power supply:<br>  22.8 to 26.4 V (Output current limit: 27 mA)<br>• Two wire and four wire transmitter setting<br>  per channel with pins<br>• Max current consumption:<br>  310 mA(5 V DC), 500 mA(24 V DC)<br>• Weight: 0.3 kg | • Input accuracy: ± 0.1 % of full scale<br>• Output accuracy: ± 0.3 % of full scale<br>• Data refresh cycle: 10 ms<br>• Input step response time: 100 ms,<br>  Output step response time: 40 ms<br>• Temperature drift: Max. ± 0.01 % /℃ |
| NFAB841 | Analog I/O<br>• 8 ch. Input<br>  (1 to 5 V)<br>• 8 ch. Output<br>  (4 to 20 mA)<br>• Non-Isolated | N/A | ✓ | N/A | ✓ | ✓ 40 pins | • Input: Differential input (allowable common<br>  mode voltage is ± 1 V or less)<br>• Output fallback: Set for each channel<br>• Max current consumption:<br>  310 mA(5 V DC), 250 mA(24 V DC)<br>• Weight: 0.3 kg | • Input accuracy: ± 0.1 % of full scale<br>• Output accuracy: ± 0.3 % of full scale<br>• Data refresh cycle: 10 ms<br>• Input step response time: 100 ms,<br>  Output step response time: 40 ms<br>• Temperature drift: Max. ± 0.01 % /℃ |
| NFAV542 | Analog Output<br>• -10 to +10 V<br>• 16 channels<br>• Non-Isolated | N/A | N/A | N/A | ✓ | ✓ 40 pins | • Output fallback: Set for each channel<br>• Max current consumption: 450 mA(5 V DC)<br>• Weight: 0.2 kg | • Output accuracy: ± 0.3 % of full scale<br>• Data refresh cycle: 10 ms<br>• Output step response time: 40 ms<br>• Temperature drift: Max. ± 0.01 % /℃ |
| NFAI543 | Analog Output<br>• 4 to 20 mA<br>• 16 ch.<br>• Isolated | ✓ | ✓ | ✓ -20 | ✓ | ✓ 40 pins | • Withstanding voltage:<br>  1500 V AC between output and system<br>• Output fallback: Set for each channel<br>• Max current consumption:<br>  230 mA(5 V DC), 540 mA(24 V DC)<br>• Weight: 0.4 kg | • Output accuracy: ± 0.3 % of full scale<br>• Data refresh cycle: 10 ms<br>• Output step response time: 100 ms<br>• Temperature drift: Max. ± 0.01 % /℃ |
| NFAV544 | Analog Output<br>• -10 to +10 V<br>• 16 ch.<br>• Isolated | N/A | N/A | N/A | ✓ | ✓ 40 pins | • Withstanding voltage:<br>  1500 V AC between output and system<br>• Output fallback: Set for each channel<br>• Max current consumption: 860mA (5 V DC)<br>• Weight: 0.2 kg | • Output accuracy: ± 0.3 % of full scale<br>• Data refresh cycle: 10 ms<br>• Output step response time: 40 ms<br>• Temperature drift: Max. ± 0.01 % /℃ |

Common Specification    • LED: STATUS(Hardware normal), ACT(Operating)   • Hot-Swap: Possible

## ◆ FCN/FCN-RTU (Long type, DIN rail-mounted)

444.0

172.3

131.0
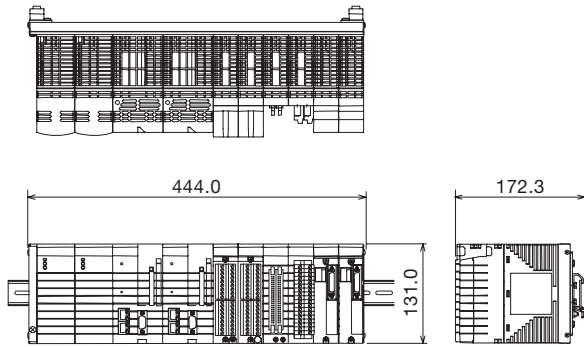
## ◆ FCN/FCN-RTU (Short type, DIN rail-mounted)

283.0

152.5

131.0

## ◆ FCN/FCN-RTU (Long type, 19 inch rack-mounted)

482.6

170.8

132.5

## ◆ CPU module

<FCN model: NFCP100>

65.8

145.7

132.0

## ◆ CPU module

<FCN-RTU model: NFCP050>

65.8

142.5

129.0

13.5

132.0
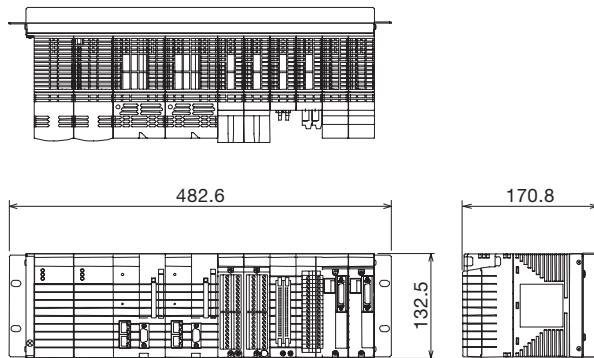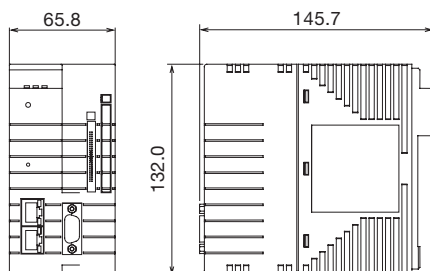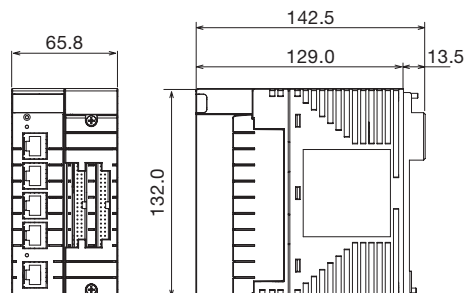
## Power supply module

<Model: NFPW441/NFPW442/
NFPW444/NFPW426>

49.7   146.45

130.0

## SB bus repeat module

<Model: NFSB100>

32.8   142.5

130.0
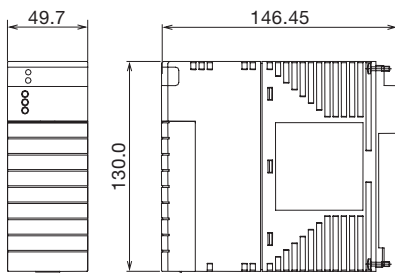
## Analog I/O module

<Model:
NFAI135/NFAI141/NFAI143/
NFAV141/NFAV142/NFAV144/
NFAT141/NFAR181/NFAP135/
NFAF135/NFAI835/NFAI841/
NFAB841/NFAV542/NFAI543/
NFAV544>

32.8   107.5

130.0
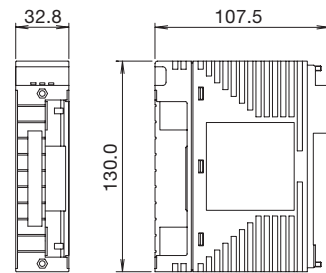
## Digital I/O module

<Model: NFDV151/
NFDV551/NFDV532>

32.8   107.5

130.0
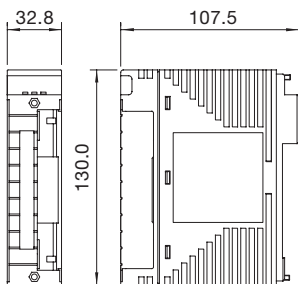
<Model: NFDV141/
NFDV142/NFDR541>

32.8   107.5

130.0
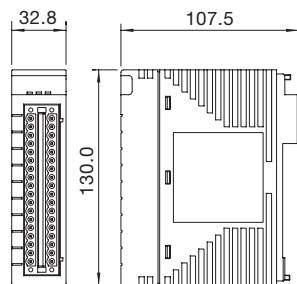
<Model: NFDV157/
NFDV557>

32.8   130.9

130.0

<Model: NFDV161/
NFDV561>

32.8   119.9

130.0

## Terminal block

32.6   60.5

114.0

-0q: ⌀   -1q: ◎

24.9
12.2   12.2
31.8
5.08
91.44
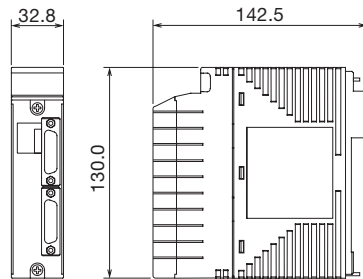5.08

32.6   31.8
20.0
73.0
113.1   114.0
21.0
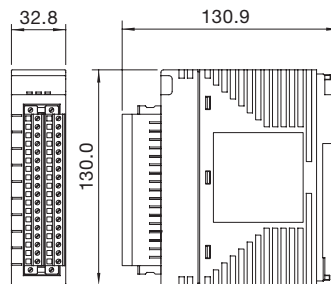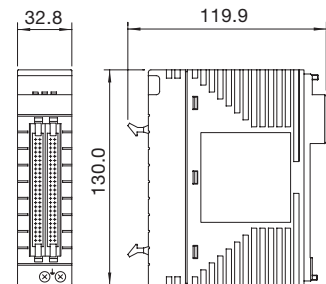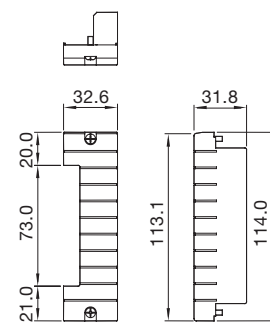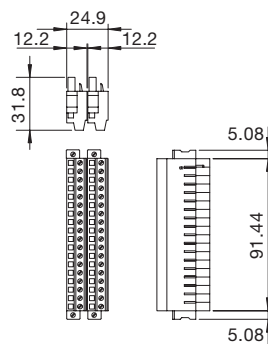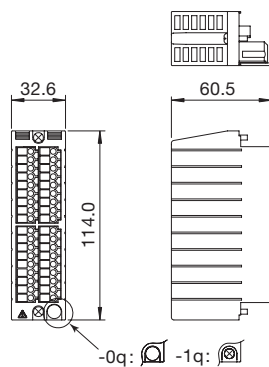
Pressure clamp terminal block for
analog module
Pressure clamp terminal block for
digital module
(NFDV151, NFDV532, NFDV551)

Pressure clamp terminal block for
NFDV141, NFDV142, NFDV157,
NFDV557, NFDR541

MIL cable connector cover for ana-
log and digital module

### RS-232-C communication module

<Model: NFLR111>
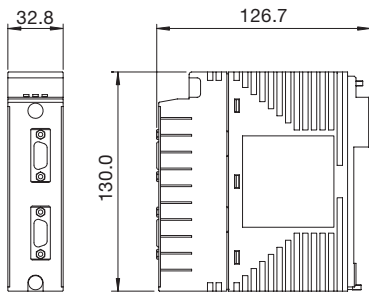
### RS-422/RS-485 communication module

<Model: NFLR121>
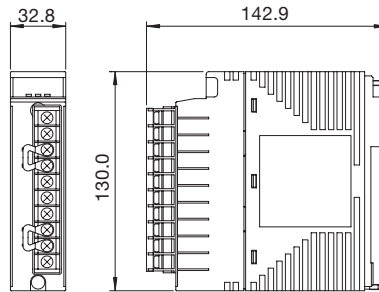
### PROFIBUS-DP communication module

<Model: NFLP121>

### CANopen communication module

<Model: NFLC121>

### FOUNDATION fieldbus communication module

<Model: NFLF111>

### FCJ (panel mounted)

### FCJ (DIN rail mounted)
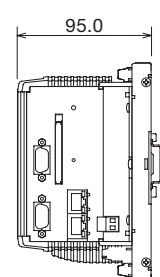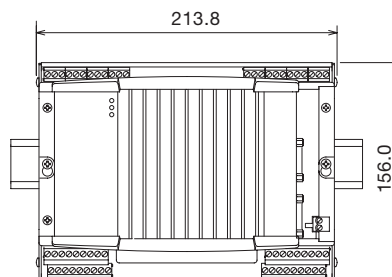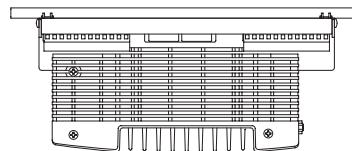
### ◆ Software Selection

| Name | | Model | Suffix Codes/Options Codes | | | | |
|---|---|---|---|---|---|---|---|

**Software media**

| Name | Model | | | |
|---|---|---|---|---|
| FCN/FCJ software media | NT203AJ | PC11E | | |
| Application portfolio license software media | NT205AJ | PC11E | | |

**FCN/FCJ Basic Software License (*1)**

| | Java functions | Without | With | | Software Media | |
|---|---|---|---|---|---|---|
| | System card | 128MB | 512MB | 128MB | NT205AJ | NT203AJ |
| FCN/FCJ basic software license (System Card attached) | Single CPU | NT711AJ | LS05E | LM04E | LM05E | | ✓ |
| FCN basic software license (Two system card attached ) | Duplexed CPU | NT712AJ | LM05E | N/A | N/A | | ✓ |
| Additional FCN/FCJ Java function license | For NT711AJ-LS05E | NT719AJ | LW11A | N/A | N/A | | ✓ |

**FCN/FCJ application portfolio license (*1)**

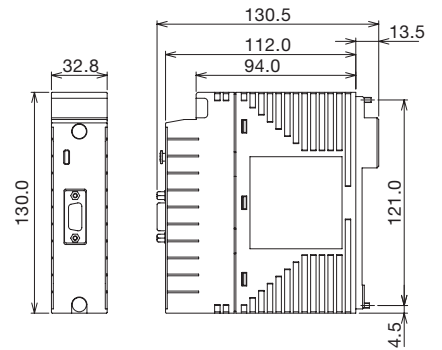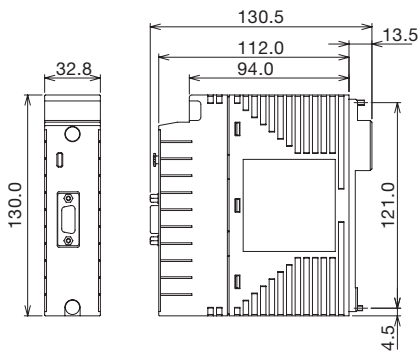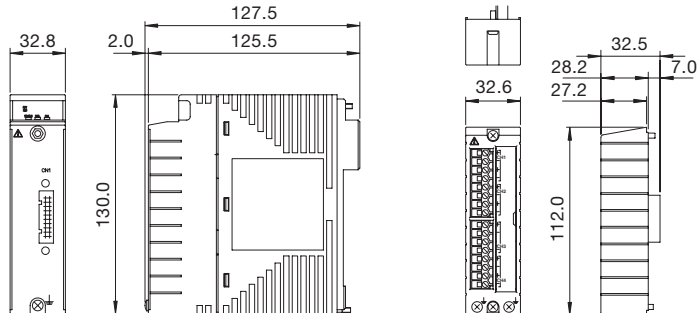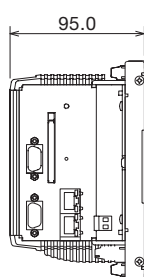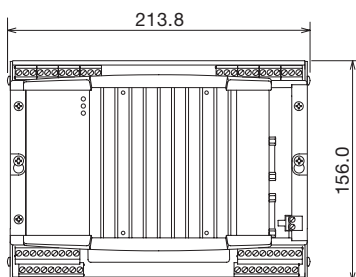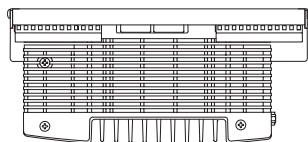| Name | Model | Suffix | With | Media |
|---|---|---|---|---|
| PAS portfolio license | NT8001J | LW11A | | ✓ |
| SAMA portfolio license | NT8002J | LW11A | ✓ | |
| Webmetry basic library portfolio license (*2) | NT8010J | LW11A | ✓ | |
| Web application portfolio license (*2) | NT8012J | LW11A | ✓ | |
| E-mail application portfolio license (*2) | NT8013J | LW11A | ✓ | |
| Graphic portoflio license (*2) | NT8014J | LW11A | ✓ | |
| Logging portfolio license (*2) | NT8016J | LW11A | ✓ | |
| InfoWell license package (*2,3) | NT8017J | LW11A | ✓ | |
| FA-M3 communication portfolio license | NT8020J | LW11A | ✓ | |
| MELSEC communication portfolio license | NT8021J | LW11A | ✓ | |
| SYSMAC communication portfolio license | NT8022J | LW11A | ✓ | |
| Power monitor communication portfolio license | NT8030J | LW11A | ✓ | |
| Temperature controller communication portfolio license | NT8031J | LW11A | ✓ | |
| Modbus communication portfolio license | NT8035J | LW11A | ✓ | |
| DNP3 communication portfolio license | NT8036J | LW11A | ✓ | |
| Time synchronization server portfolio license (*4) | NT8040J | LW11A | | ✓ |
| Boiler control portfolio license | NT8101J | LW11A | ✓ | |
| Boiler auxiliary control portfolio license | NT8102J | LW11A | ✓ | |
| Gas Flow Calculation portfolio license | NT8105J | LW11A | ✓ | |

**FOUNDATION fieldbus related license**

| Name | | Model | Suffix |
|---|---|---|---|
| Software license for duplexed field network module | | NT730AJ | LW11A |

**FCN/FCJ engineering tool license**

| Name | | Model | Suffix | | | Media |
|---|---|---|---|---|---|---|
| Logic Designer license | Run on PC | NT751FJ | LW11A | | | ✓ |
| FCN/FCJ simulator license (USB module) | Run on PC | NT752AJ | LW11A | | | ✓ |
| FCN/FCJ Java application development kit license | Run on PC | NT755FJ | LW11A | | | ✓ |

**FCN/FCJ OPC sever license**

| Name | | Model | Suffix | | | Media |
|---|---|---|---|---|---|---|
| FCN/FCJ OPC server for Windows | Run on PC | NT781AJ | LW11A | | | ✓ |
| Duplexed network function license for FCN/FCJ OPC Server | Run on PC | NT783AJ | LW11A | | | ✓ |

*1: Each controller requires a license.
*2: It requires FCN/FCJ basic software license with Java functions.
*3: It includes NT8102J, NT8013J, NT8014J, and NT8016J.
*4: It is only required for controller working as time synchronzation server.
(SNTP client function is included in controller basic function.)

## ◆ Hardware Selection

### FCN Common Modules

| Name | Model | Standard | with ISA standard G3 option |
|---|---|---|---|
| CPU module for FCN | NFCP100 - | S05 | S06 |
| Power supply module 100 to 120VAC | NFPW441 - | 50 | 51 |
| Power supply module 220 to 240VAC | NFPW442 - | 50 | 51 |
| Power supply module 24VDC | NFPW444 - | 50 | 51 |

| Name | Model | Installation | | | |
|---|---|---|---|---|---|
| | | 19inch rack | DIN rail | 19inch rack | DIN rail |
| Base module (long) | NFBU200 - | S05 | S15 | S06 | S16 |
| Base module (short) | NFBU050 - | N/A | S15 | N/A | S16 |

| Name | Model | Attachment | | | |
|---|---|---|---|---|---|
| | | T-joint | T-joint with built-in terminator | T-joint | T-joint with built-in terminator |
| SB bus repeat module for FCN | NFSB100 - | S50/SBT01 | S50/SBT02 | S51/SBT01 | S51/SBT02 |

| Name | Model | Cable Length | | | | |
|---|---|---|---|---|---|---|
| | | 0.3m | 1m | 2m | 4m | 8m |
| SB bus cable | NFCB301 - | C030 | C100 | C200 | C400 | C800 |

### FCN-RTU Common Modules

| Name | Model | Standard | | with ISA standard G3 option | | Included Licenses |
|---|---|---|---|---|---|---|
| | CPU Type | Basic | Extended | Basic | Extended | |
| CPU module for FCN-RTU | NFCP050 - | S05 | | S06 | | NT711AJ-LM*, NT8001J, NT8035J, NT8036J |
| | NFCP050 - | | S15 | | S16 | Standard model + NT8017J, NT8105J |
| Power supply module 10-30VDC | NFPW426 - | 50 | | 51 | | |
| Power supply module 24VDC | NFPW444 - | 50 | | 51 | | |

| Name | Model | Installation | | | |
|---|---|---|---|---|---|
| | | 19inch rack | DIN rail | 19inch rack | DIN rail |
| Base module (long) | NFBU200 - | S05 | S15 | S06 | S16 |
| Base module (short) | NFBU050 - | N/A | S15 | N/A | S16 |

### Input Output Modules (*1)(*2)

| Name | Model | Standard | | | with ISA standard G3 option | | | with FCN-RTU |
|---|---|---|---|---|---|---|---|---|
| Terminal Block — Surge Absorber (SA) | | Pressure Clamp Terminal non SA | SA | MIL with cover | Pressure Clamp Terminal non SA | SA | MIL with cover | |
| Analog Input module (4 to 20mA, 8-channels, Isolated channels) | NFAI135 - | S50/13S00 | S50/13S10 | S50/CCC01 | S51/13S00 | S51/13S10 | S51/CCC01 | ✓ |
| Analog Input module (4 to 20mA, 16-channels, Non-Isolated) | NFAI141 - | S50/A4S00 | S50/A4S10 | S50/CCC01 | S51/A4S00 | S51/A4S10 | S51/CCC01 | ✓ |
| Analog Input module (4 to 20mA, 16-channels, Isolated) | NFAI143 - | S50/A4S00 | S50/A4S10 | S50/CCC01 | S51/A4S00 | S51/A4S10 | S51/CCC01 | ✓ |
| Analog Input module (1 to 5V, 16-channels, Non-Isolated) | NFAV141 - | S50/A4S00 | S50/A4S10 | S50/CCC01 | S51/A4S00 | S51/A4S10 | S51/CCC01 | ✓ |
| Analog Input module (–10 to +10V, 16-channels, Non-Isolated) | NFAV142 - | S50/A4S00 | S50/A4S10 | S50/CCC01 | S51/A4S00 | S51/A4S10 | S51/CCC01 | N/A |
| Analog Input module (–10 to +10V, 16-channels, Isolated) | NFAV144 - | S50/A4S00 | S50/A4S10 | S50/CCC01 | S51/A4S00 | S51/A4S10 | S51/CCC01 | ✓ |
| TC/mV Input module (16-channels, Isolated) | NFAT141 - | S50/T4S00 | S50/T4S10 | S50/CCC01 | S51/T4S00 | S51/T4S10 | S51/CCC01 | ✓ |
| RTD Input module (12-channels, Isolated) | NFAR181 - | S50/R8S00 | S50/R8S10 | N/A | S51/R8S00 | S51/R8S10 | N/A | ✓ |
| Pulse Input module (Pulse Count, 0 ~ 10kHz, 8-channels, Isolated channels) | NFAP135 - | S50/13S00 | S50/13S10 | S50/CCC01 | S51/13S00 | S51/13S10 | S51/CCC01 | ✓ |
| Frequency Input module (Pulse Count, 0.1Hz to 10kHz, 8-channels, Isolated channels) | NFAF135 - | S50/13S00 | S50/13S10 | S50/CCC01 | S51/13S00 | S51/13S10 | S51/CCC01 | N/A |
| Analog I/O module (4 to 20mA input/output, 4-channels input/output, Isolated channels) | NFAI835 - | S50/13S00 | S50/13S10 | S50/CCC01 | S51/13S00 | S51/13S10 | S51/CCC01 | ✓ |
| Analog I/O module (4 to 20mA input/output, 8-channels input/output, Non-Isolated) | NFAI841 - | S50/A4S00 | S50/A4S10 | S50/CCC01 | S51/A4S00 | S51/A4S10 | S51/CCC01 | ✓ |
| Analog I/O module (1 to 5V input, 4 to 20mA output, 8-channels input/output, Non-Isolated) | NFAB841 - | S50/A4S00 | S50/A4S10 | S50/CCC01 | S51/A4S00 | S51/A4S10 | S51/CCC01 | ✓ |
| Analog Output module (–10 to +10V, 16-channels, Non-Isolated) | NFAV542 - | S50/A4S00 | S50/A4S10 | S50/CCC01 | S51/A4S00 | S51/A4S10 | S51/CCC01 | N/A |
| Analog Output module (4 to 20mA, 16-channels, Isolated) | NFAI543 - | S50/A4S00 | S50/A4S10 | S50/CCC01 | S51/A4S00 | S51/A4S10 | S51/CCC01 | ✓ |
| Analog Output module (–10 to +10V, 16-channels, Isolated) | NFAV544 - | S50/A4S00 | S50/A4S10 | S50/CCC01 | S51/A4S00 | S51/A4S10 | S51/CCC01 | N/A |
| Digital Input module (16-channels, 100V to 120VAC, Isolated) | NFDV141 - | P50/C4S50 | N/A | N/A | P51/C4S50 | N/A | N/A | N/A |
| Digital Input module (16-channels, 200V to 240VAC, Isolated) | NFDV142 - | P00/C4S60 | N/A | N/A | P01/C4S60 | N/A | N/A | N/A |
| Digital Input module (32-channels, 24VDC, Isolated) | NFDV151 - | P60/B5S00 | P60/B5S10 | P60/CCC01 | P61/B5S00 | P61/B5S10 | P61/CCC01 | ✓ |
| Digital Input module (32-channels, 24VDC, Isolated, Pressure Clamp Terminal only) | NFDV157 - | S50 | N/A | N/A | S51 | N/A | N/A | ✓ |
| Digital Input module (64-channels, 24VDC, Isolated) | NFDV161 - | N/A | N/A | P50 | N/A | N/A | P51 | N/A |
| Digital Output module (32-channels, 24VDC, Isolated) | NFDV551 - | P60/D5S00 | P60/D5S10 | P60/CCC01 | P61/D5S00 | P61/D5S10 | P61/CCC01 | ✓ |
| Digital Output module (32-channels, 24VDC, Isolated, Pressure Clamp Terminal only) | NFDV557 - | S50 | N/A | N/A | S51 | N/A | N/A | ✓ |
| Digital Output module (64-channels, 24VDC, Isolated) | NFDV561 - | N/A | N/A | P50 | N/A | N/A | P51 | N/A |
| Pulse Width Output module (4-channels, Up Pulse/Down Pulse, 24VDC, Isolated) | NFDV532 - | P10/D5S00 | P10/D5S10 | P10/CCC01 | P11/D5S00 | P11/D5S10 | P11/CCC01 | N/A |
| Relay Output module (16-channels, 24 to 110VDC/100 to 240VAC, Isolated) | NFDR541 - | P50/C4S70 | N/A | N/A | P51/C4S70 | N/A | N/A | ✓ |

Non Explosion Model

| Name | Model | Suffix Codes/Options Codes | | | | | |
|---|---|---|---|---|---|---|---|

## Communication Modules (*2)

Pressure clamp terminal block with surge absorber (SA)

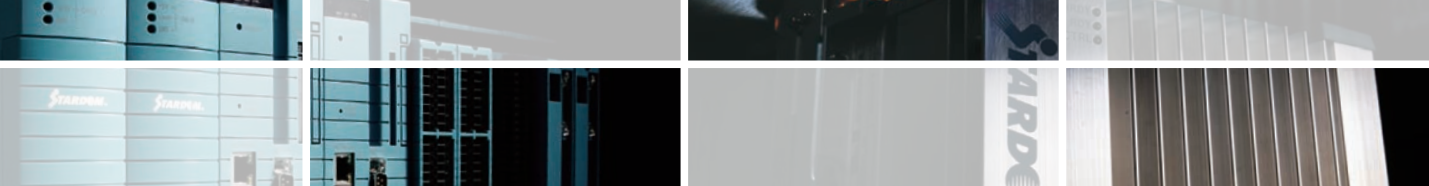| Name | Model | Standard | | with ISA standard G3 option | | with FCN-RTU |
|---|---|---|---|---|---|---|
| | | non SA | SA | non SA | SA | |
| Foundation Fieldbus communication module (4-ports) | NFLF111 - | S50 | S50/F9S00 | S51 | S51/F9S00 | ✓ |
| RS-232-C communication module (2-ports, 300bps to 115.2kbps) | NFLR111 - | S50 | N/A | S51 | N/A | N/A |
| RS-422/RS-485 communication module (2-ports, 300bps to 115.2kbps） | NFLR121 - | S50 | N/A | S51 | N/A | N/A |
| PROFIBUS-DP communication module | NFLP121 - | S00 | N/A | S01 | N/A | ✓ |
| CANopen communication module | NFLC121 - | S00 | N/A | S01 | N/A | ✓ |

## MIL connector cables

| Name | Model | Cable Length | | | | | |
|---|---|---|---|---|---|---|---|
| | | 0.5m | 1.0m | 1.5m | 2.0m | 2.5m | 3.0m(*5) |
| MIL connector cable for analog, NFCP050 built-in I/O (40 pole plug types) (*3) | KMS40 - | 005 | 010 | 015 | 020 | 025 | 030 |
| MIL connector cable (50 pole plug types) (*4) NFDV151,NFDV161,NFDV532, NFDV551, NFDV561 | KMS50 - | 005 | 010 | 015 | 020 | 025 | 030 |

## MIL connector terminal blocks

| Name | Model | Standard |
|---|---|---|
| MIL connector terminal block for analog I/O modules except for NFAR181 and NFCP050 built-in I/O (40 pole plug types, M3.5) (*3) | TAS40 - | 0N |
| MIL connector terminal block for digital I/O modules (50 pole plug types, M3.5) (*4) | TAS50 - | 0N |

## Pressure clamp terminal blocks

| Name | Model | Surge Absorber (SA) | |
|---|---|---|---|
| | | non SA | SA |
| Pressure clamp terminal block for analog (16-channels): NFAI141,NFAV141,NFAV142,NFAI143,NFAI841,NFAB841,NFAV542,NFAI543 | NFTA4S - | 00 | 10 |
| Pressure clamp terminal block for thermocouple/mV (16-channels) NFAT141 | NFTT4S - | 00 | 10 |
| Pressure clamp terminal block for RTD (12-channels) NFAR181 | NFTR8S - | 00 | 10 |
| Pressure clamp terminal block for digital input (32-channels) NFDV151 | NFTB5S - | 00 | 10 |
| Pressure clamp terminal block for digital output (32-channels) NFDV532, NFDV551 | NFTD5S - | 00 | 10 |
| Pressure clamp terminal block for analog isolated channels (8-channels): NFAI135,NFAP135,NFAI835 | NFTI3S - | 00 | 10 |
| Pressure clamp terminal block for digital (16-channels) NFDV141 | NFTC4S - | 50 | N/A |
| Pressure clamp terminal block for digital (16-channels) NFDV142 | NFTC4S - | 60 | N/A |
| Pressure clamp terminal block for relay output (16-channels) NFDR541 | NFTC4S - | 70 | N/A |
| Pressure clamp terminal block for digital (32-channels) NFDV157,NFDV557 | NFTC5S - | 00 | N/A |
| Pressure clamp terminal block for FOUNDATION fieldbus NFLF111 | NFTF9S - | 00 | N/A |

*1: Suffix Code for the following HART module is changed from "S □□ " to "H □□ ": NFAI135, NFAI835, NFAI141, NFAI143, NFAI543, NFAI841
*2: Suffix code for extended temperature model is prepared for the following models: NFAR181, NFAP135, NFLF111
*3: mV input is only applicable for NFAT141.
*4: Two terminal blocks can be connected with NFDV161 or NFDV561 (64-channels type).
*5: Cable length to 25.0m is available. Extension unit is 1m.
*6: As for NFDV161, cable(A1417WL) is required and two sets of switches are required when all channels (1 to 32ch and 33 to 64ch) are used at the same time. As for NFDV151, it can be directly mounted or connected with cable (A1417WL).
*7: As for NFDV561, cable(A1417WL) is required and two sets of switches are required when all channels (1 to 32ch and 33 to 64ch) are used at the same time. As for NFDV551, it can be directly mounted or connected with cable (A1417WL).

## Cover

| Name | Model |
|---|---|
| Dummy cover for I/O module slots | NFDCV01 |
| Dummy cover for power supply module slots | NFDCV02 |
| MIL cable connector cover | NFCCC01 |

## SB bus T-joint

| Name | Model |
|---|---|
| SB bus T-joint | NFSBT01 |
| SB bus T-joint with built-in terminator | NFSBT02 |

## Test switch and lamp

| Name | Model |
|---|---|
| Test switch for FCN digital input module NFDV151, NFDV161 (*6) | S9105FA |
| Test lamp for FCN digital output module NFDV532, NFDV551, NFDV561 (*7) | S9106FA |
| Cable for test switch / test lamp | A1417WL |

## FCJ

| Name | Model | Standard | with ISA standard G3 option |
|---|---|---|---|
| FCJ autonomous controller without FOUNDATION fieldbus interface | NFJT100 - | S105 | S106 |
| FCJ autonomous controller with FOUNDATION fieldbus interface (2-ports) | NFJT100 - | H105 | H106 |

## ◆ Hardware Selection

### FCN Common Modules

| Name | | Model | Suffix Codes/Options Codes | | | |
|---|---|---|---|---|---|---|
| | | | Standard | | with ISA standard G3 option | |
| CPU module for FCN | | NFCP100 - | S0E | | S0F | |
| Power supply module | 100 to 120VAC | NFPW441 - | E0 | | E1 | |
| Power supply module | 24VDC | NFPW444 - | E0 | | E1 | |
| | | | Installation | 19inch rack | DIN rail | 19inch rack | DIN rail |
| Base module (long) | | NFBU200 - | S0E | S1E | S0F | S1F |
| Base module (short) | | NFBU050 - | N/A | S1E | N/A | S1F |
| | | | Attachment | T-joint | T-joint with built-in terminator | T-joint | T-joint with built-in terminator |
| SB bus repeat module for FCN | | NFSB100 - | SE0/SBT01 | SE0/SBT02 | SE1/SBT01 | SE1/SBT02 |
| | | | Cable Length | 0.3m | 1m | 2m | 4m | 8m |
| SB bus cable | | NFCB301 - | C030 | C100 | C200 | C400 | C800 |

### FCN-RTU Common Modules

| Name | | Model | Standard | | with ISA standard G3 option | | Included Licenses |
|---|---|---|---|---|---|---|---|
| | | CPU Type | Basic | Extended | Basic | Extended | |
| CPU module for FCN-RTU | | NFCP050 - | S0E | | S0F | | NT711AJ-LM*, NT8001J, NT8035J, NT8036J |
| | | NFCP050 - | | S1E | | S1F | Standard model + NT8017J, NT8105J |
| Power supply module | 10-30VDC | NFPW426 - | E0 | | E1 | | |
| Power supply module | 24VDC | NFPW444 - | E0 | | E1 | | |
| | | Installation | 19inch rack | DIN rail | 19inch rack | DIN rail | |
| Base module (long) | | NFBU200 - | S0E | S1E | S0F | S1F | |
| Base module (short) | | NFBU050 - | N/A | S1E | N/A | S1F | |

### Input Output Modules (*1)(*2)

| Name | Model | Standard | | | with ISA standard G3 option | | | with FCN-RTU |
|---|---|---|---|---|---|---|---|---|
| | | Pressure Clamp Terminal | | MIL | Pressure Clamp Terminal | | MIL | |
| Terminal Block / Surge Absorber (SA) | | non SA | SA | with cover | non SA | SA | with cover | |
| Analog Input module (4 to 20mA, 8-channels, Isolated channels) | NFAI135 - | SE0/13S00 | SE0/13S10 | SE0/CCC01 | SE1/13S00 | SE1/13S10 | SE1/CCC01 | ✓ |
| Analog Input module (4 to 20mA, 16-channels, Non-Isolated) | NFAI141 - | SE0/A4S00 | SE0/A4S10 | SE0/CCC01 | SE1/A4S00 | SE1/A4S10 | SE1/CCC01 | ✓ |
| Analog Input module (4 to 20mA, 16-channels, Isolated) | NFAI143 - | SE0/A4S00 | SE0/A4S10 | SE0/CCC01 | SE1/A4S00 | SE1/A4S10 | SE1/CCC01 | ✓ |
| Analog Input module (1 to 5V, 16-channels, Non-Isolated) | NFAV141 - | SE0/A4S00 | SE0/A4S10 | SE0/CCC01 | SE1/A4S00 | SE1/A4S10 | SE1/CCC01 | ✓ |
| Analog Input module (-10 to +10V, 16-channels, Non-Isolated) | NFAV142 - | SE0/A4S00 | SE0/A4S10 | SE0/CCC01 | SE1/A4S00 | SE1/A4S10 | SE1/CCC01 | N/A |
| Analog Input module (-10 to +10V, 16-channels, Isolated) | NFAV144 - | SE0/A4S00 | SE0/A4S10 | SE0/CCC01 | SE1/A4S00 | SE1/A4S10 | SE1/CCC01 | ✓ |
| TC/mV Input module (16-channels, Isolated) | NFAT141 - | SE0/T4S00 | SE0/T4S10 | SE0/CCC01 | SE1/T4S00 | SE1/T4S10 | SE1/CCC01 | ✓ |
| RTD Input module (12-channels, Isolated) | NFAR181 - | SE0/R8S00 | SE0/R8S10 | N/A | SE1/R8S00 | SE1/R8S10 | N/A | ✓ |
| Pulse Input module (Pulse Count, 0 ~ 10kHz, 8-channels, Isolated channels) | NFAP135 - | SE0/13S00 | SE0/13S10 | SE0/CCC01 | SE1/13S00 | SE1/13S10 | SE1/CCC01 | ✓ |
| Frequency Input module (Pulse Count, 0.1Hz to 10kHz, 8-channels, Isolated channels) | NFAF135 - | SE0/13S00 | SE0/13S10 | SE0/CCC01 | SE1/13S00 | SE1/13S10 | SE1/CCC01 | N/A |
| Analog I/O module (4 to 20mA input/output, 4-channels input/output, Isolated channels) | NFAI835 - | SE0/13S00 | SE0/13S10 | SE0/CCC01 | SE1/13S00 | SE1/13S10 | SE1/CCC01 | ✓ |
| Analog I/O module (4 to 20mA input/output, 8-channels input/output, Non-Isolated) | NFAI841 - | SE0/A4S00 | SE0/A4S10 | SE0/CCC01 | SE1/A4S00 | SE1/A4S10 | SE1/CCC01 | ✓ |
| Analog I/O module (1 to 5V input, 4 to 20mA output, 8-channels input/output, Non-Isolated) | NFAB841 - | SE0/A4S00 | SE0/A4S10 | SE0/CCC01 | SE1/A4S00 | SE1/A4S10 | SE1/CCC01 | ✓ |
| Analog Output module (-10 to +10V, 16-channels, Non-Isolated) | NFAV542 - | SE0/A4S00 | SE0/A4S10 | SE0/CCC01 | SE1/A4S00 | SE1/A4S10 | SE1/CCC01 | N/A |
| Analog Output module (4 to 20mA, 16-channels, Isolated) | NFAI543 - | SE0/A4S00 | SE0/A4S10 | SE0/CCC01 | SE1/A4S00 | SE1/A4S10 | SE1/CCC01 | ✓ |
| Analog Output module (-10 to +10V, 16-channels, Isolated) | NFAV544 - | SE0/A4S00 | SE0/A4S10 | SE0/CCC01 | SE1/A4S00 | SE1/A4S10 | SE1/CCC01 | N/A |
| Digital Input module (16-channels, 100V to 120VAC, Isolated) | NFDV141 - | PE0/C4S50 | N/A | N/A | PE1/C4S50 | N/A | N/A | N/A |
| Digital Input module (32-channels, 24VDC, Isolated) | NFDV151 - | PF0/B5S00 | PF0/B5S10 | PF0/CCC01 | PF1/B5S00 | PF1/B5S10 | PF1/CCC01 | ✓ |
| Digital Input module (32-channels, 24VDC, Isolated, Pressure Clamp Terminal only) | NFDV157 - | SE0 | N/A | N/A | SE1 | N/A | N/A | ✓ |
| Digital Output module (32-channels, 24VDC, Isolated) | NFDV551 - | PF0/D5S00 | PF0/D5S10 | PF0/CCC01 | PF1/D5S00 | PF1/D5S10 | PF1/CCC01 | ✓ |
| Digital Output module (32-channels, 24VDC, Isolated, Pressure Clamp Terminal only) | NFDV557 - | SE0 | N/A | N/A | SE1 | N/A | N/A | ✓ |
| Relay Output module (16-channels, 24 to 110VDC/100 to 240VAC, Isolated) | NFDR541 - | PE0/C4S70 | N/A | N/A | PE1/C4S70 | N/A | N/A | ✓ |

Explosion Model

## Communication Modules (*2)

| Name | Model | Standard | | with ISA standard G3 option | | with FCN-RTU |
|---|---|---|---|---|---|---|
| | Pressure clamp terminal block with surge absorber (SA) | non SA | SA | non SA | SA | |
| Foundation Fieldbus communication module (4-ports) | NFLF111 - | SE0 | SE0/F9S00 | SE1 | SE1/F9S00 | ✓ |
| RS-232-C communication module (2-ports, 300bps to 115.2kbps) | NFLR111 - | SE0 | N/A | SE1 | N/A | N/A |
| RS-422/RS-485 communication module (2-ports, 300bps to 115.2kbps) | NFLR121 - | SE0 | N/A | SE1 | N/A | N/A |

## MIL connector cables

| Name | Model (Cable Length) | 0.5m | 1.0m | 1.5m | 2.0m | 2.5m | 3.0m(*5) |
|---|---|---|---|---|---|---|---|
| MIL connector cable for analog, NFCP050 built-in I/O (40 pole plug types) (*3) | KMS40 - | 005 | 010 | 015 | 020 | 025 | 030 |
| MIL connector cable (50 pole plug types) (*4) NFDV151, NFDV161, NFDV532, NFDV551, NFDV561 | KMS50 - | 005 | 010 | 015 | 020 | 025 | 030 |

## MIL connector terminal blocks

| Name | Model | Standard |
|---|---|---|
| MIL connector terminal block for analog I/O modules except for NFAR181 and NFCP050 built-in I/O (40 pole plug types, M3.5) (*3) | TAS40 - | 0N |
| MIL connector terminal block for digital I/O modules (50 pole plug types, M3.5) (*4) | TAS50 - | 0N |

## Pressure clamp terminal blocks

| Name | Model (Surge Absorber (SA)) | non SA | SA |
|---|---|---|---|
| Pressure clamp terminal block for analog (16-channels) NFAI141, NFAV141, NFAV142, NFAI143, NFAI841, NFAB841, NFAV542, NFAI543 | NFTA4S - | 00 | 10 |
| Pressure clamp terminal block for thermocouple/mV (16-channels) NFAT141 | NFTT4S - | 00 | 10 |
| Pressure clamp terminal block for RTD (12-channels) NFAR181 | NFTR8S - | 00 | 10 |
| Pressure clamp terminal block for digital input (32-channels) NFDV151 | NFTB5S - | 00 | 10 |
| Pressure clamp terminal block for digital output (32-channels) NFDV532, NFDV551 | NFTD5S - | 00 | 10 |
| Pressure clamp terminal block for analog isolated channels (8-channels) NFAI135, NFAP135, NFAI835 | NFTI3S - | 00 | 10 |
| Pressure clamp terminal block for digital (16-channels) NFDV141 | NFTC4S - | 50 | N/A |
| Pressure clamp terminal block for digital (16-channels) NFDV142 | NFTC4S - | 60 | N/A |
| Pressure clamp terminal block for relay output (16-channels) NFDR541 | NFTC4S - | 70 | N/A |
| Pressure clamp terminal block for digital (32-channels) NFDV157, NFDV557 | NFTC5S - | 00 | N/A |
| Pressure clamp terminal block for FOUNDATION fieldbus NFLF111 | NFTF9S - | 00 | N/A |

*1: Suffix Code for the following HART module is changed from "S☐☐ " to "H☐☐ ": NFAI135, NFAI835, NFAI141, NFAI143, NFAI543, NFAI841
*2: Suffix code for extended temperature model is prepared for the following models: NFAR181, NFAP135, NFLF111
*3: mV input is only applicable for NFAT141.
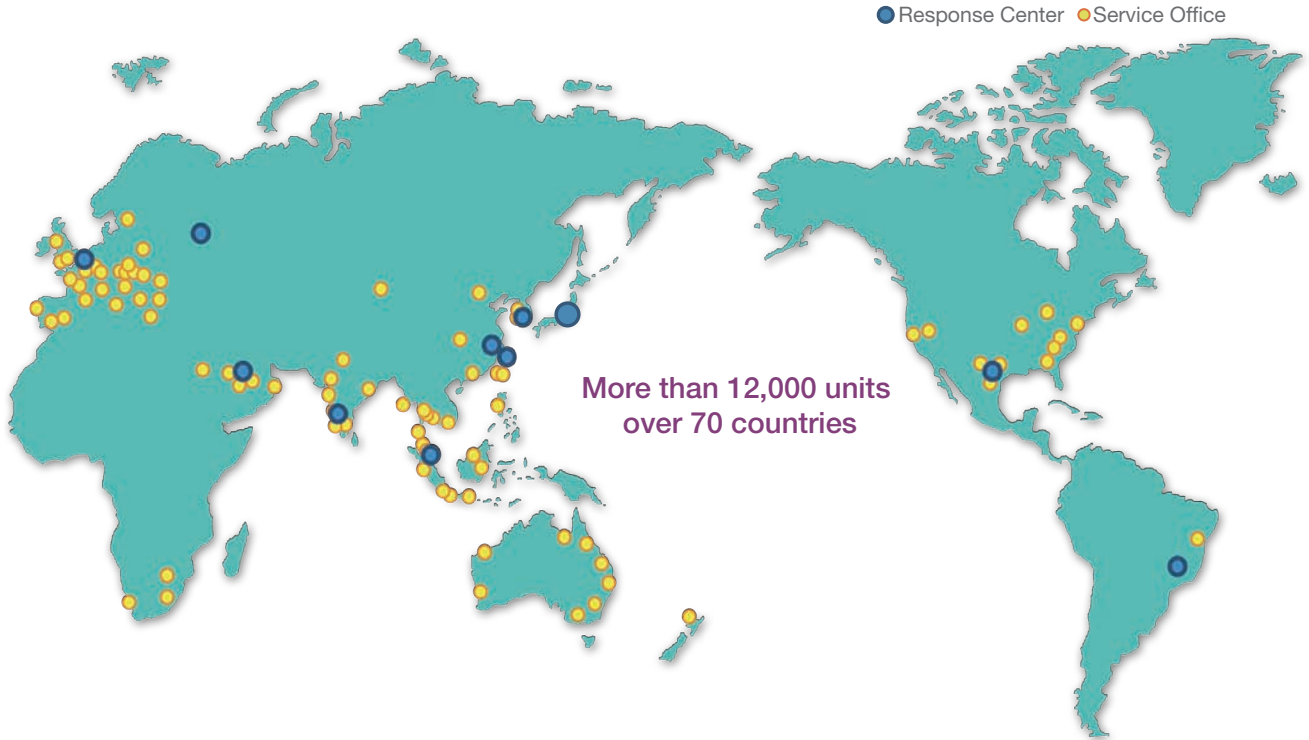*4: Two terminal blocks can be connected with NFDV161 or NFDV561 (64-channels type).
*5: Cable length to 25.0m is available. Extension unit is 1m.

## Cover

| Name | Model |
|---|---|
| Dummy cover for I/O module slots | NFDCV01 |
| Dummy cover for power supply module slots | NFDCV02 |
| MIL cable connector cover | NFCCC01 |

## SB bus T-joint

| Name | Model |
|---|---|
| SB bus T-joint | NFSBT01 |
| SB bus T-joint with built-in terminator | NFSBT02 |

## FCJ

| Name | Model | Standard | with ISA standard G3 option |
|---|---|---|---|
| FCJ autonomous controller without FOUNDATION fieldbus interface | NFJT100 - | S10E | S10F |
| FCJ autonomous controller with FOUNDATION fieldbus interface (2-ports) | NFJT100 - | H10E | H10F |

With the rapid pace of globalization in manufacturing, companies are hard pressed keeping their plants up and running all over the world. Rising to this challenge, Yokogawa continues to expand its global service network, and currently counts 225 service offices all over the world. Our process industry expertise and experience is second to none, and service and engineering personnel provide the same high-quality standard of service worldwide, over every phase of the plant lifecycle. To ensure the availability of your global processes, look to Yokogawa.

● Response Center    ● Service Office

More than 12,000 units
over 70 countries

**vigilantplant.®**
**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.

**YOKOGAWA ELECTRIC CORPORATION**
**World Headquarters**
9-32, Nakacho 2-chome, Musashino-shi, Tokyo 180-8750, Japan
http://www.yokogawa.com/

**YOKOGAWA CORPORATION OF AMERICA**
12530 West Airport Blvd, Sugar Land, Texas 77478, USA
http://www.yokogawa.com/us/

**YOKOGAWA EUROPE B.V.**
Euroweg 2, 3825 HD Amersfoort, The Netherlands
http://www.yokogawa.com/eu/

**YOKOGAWA ENGINEERING ASIA PTE. LTD.**
5 Bedok South Road, Singapore 469270, Singapore
http://www.yokogawa.com/sg/

**YOKOGAWA CHINA CO., LTD.**
3F TowerD Cartelo Crocodile Building
No.568 West Tianshan Road, Shanghai 200335, China
http://www.yokogawa.com/cn/

**YOKOGAWA MIDDLE EAST B.S.C. (c)**
P.O. Box 10070, Manama
Building 577, Road 2516, Busaiteen 225, Muharraq, Bahrain
http://www.yokogawa.com/bh/

**YOKOGAWA ◆**