Co-innovating tomorrow™

YOKOGAWA

Leading Edge Controller

FA-M3V

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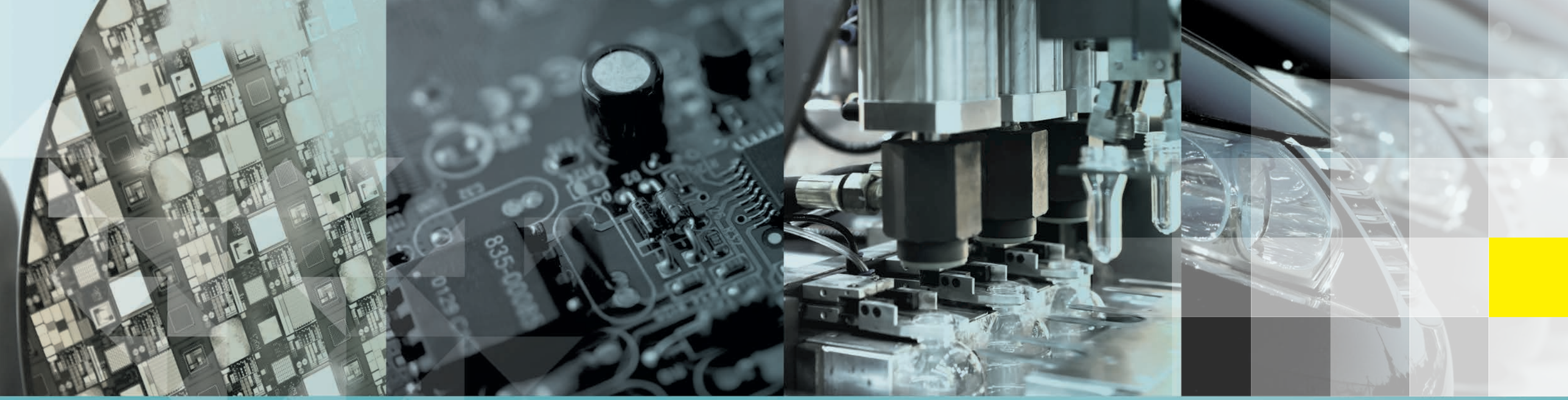
Bulletin 34M06A11-01E

FA-M3V VITESSE™



FA-M3V VITESSE™

Leading edge controllers

Stress-free solution from development through maintenance

Speed

Quadruple speed quest powered by two core technologies

to deliver stable control at the highest speed

Extensibility

Extended functionality at high speed

Network support, large volume data processing and easy data handling

Reliability

High reliability enables stable operation

Hardware error check and correction (ECC) and single board design

Fast Scanning **100K** steps within **1ms**

The minimum scan time of 100µs is faster than microcomputer boards.

Compact **All-in-one CPU**

Ethernet, SD card and USB support are all condensed into a compact body.

Smart **Range-free with max. 8,192 digital I/Os and 856K device words**

High performance and advanced functionality with high cost performance.

The new FA-M3V™ series

Created by stretching the High Speed IPRS design concept to new limits.

The FA-M3 is designed and best known for its speed so it's only natural that the new series be named FA-M3V, where V stands for "Vitesse", which means speed in French.
From day one, FA-M3 has relentlessly pursued higher speeds as the most effective means to solving customer challenges.
Over time, this has evolved into the High Speed IPRS (Instruction, Processing, Response and Scan) design concept. Today, we have set a new record in this quadruple speed quest by creating the FA-M3V, which offers extensibility and reliability at incredible speed.
FA-M3V, the leading edge controller for customers who will settle for nothing less than the world's best.

* The "V" in FA-M3V stands for "vitesse," which means speed in French

Leading Edge Controller

FA-M3V VITESSE™

Quadruple Speed Quest using Vitesse Engine & PIPS

Delivering stable control at the highest speed

Featuring ultra high-speed, stable control, link functions and improved network performance, the FA-M3V controller is created by improving every aspect to deliver stable control at the highest speeds.

Sequence CPU module
F3SP71-4S/F3SP76-7S

Stretching the "High-speed IPRS" Design Concept

FA-M3V is the industry's fastest PLC in terms of CPU scanning speed. This incredible speed is made possible by stretching the High-speed IPRS (Instruction, Processing, Response and Scanning) design concept of the FA-M3 family of controllers and harnessing two Yokogawa core technologies, namely, the Vitesse engine and the parallel instruction processing system (PIPS).

High speed

Instruction	Faster processing of both basic and application instructions	▶ **High-speed Instructions**
Processing	Sensor control function enables fast, constant scan of 100µs	▶ **High-speed Processing**
Response	Instantaneous response to interrupts	▶ **High-speed Response**
Scan	Scanning a 100K-step program in 1ms	▶ **High-speed Scan**

The FA-M3 Vitesse Engine

Supreme ladder processing capability

Instruction **Processing**

Fastest! **Scanning a 100K-step program in 1ms**

Basic instructions: **3.75ns min.** Application instructions: **7.5ns min.**

Floating-point Add instruction: **37.5ns** Minimum scan time: **100µs**

Resolution: **10µs** (when using the sensor control block)

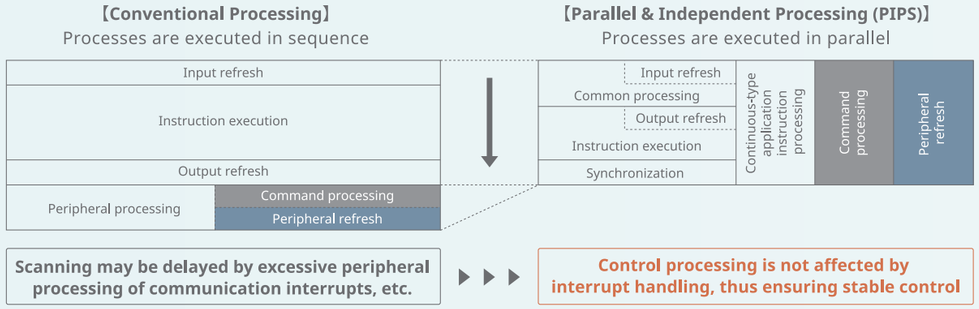
Vitesse Engine
for ladder processing

Parallel & Independent Processing System (PIPS)

Fast, stable control for high quality production

Response **Scan**

With the Parallel & Independent Processing System (PIPS), ladder instruction processing and peripheral processing are carried out independently and in parallel. This ensures fast, stable control under all conditions for achieving high quality production.



Enhanced High-speed IPRS (Instruction, Processing, Response and Scanning)

Quadruple speed quest based on the High-speed IPRS design concept

High-speed Instructions

Unrivalled High-speed Processing

3.75ns for basic instructions, 7.5ns for application instructions and 37.5ns for floating-point Add instruction

Faster processing of basic instructions enables reduced tact time using faster equipment, supports high-speed networking, enhances operability, as well as supports fault diagnosis and other advanced functions. In addition, faster application instructions widen utility to more applications. Floating-point addition instructions can also be speeded up to meet the requirements of high-precision applications.

Basic instructions **4.6x** faster

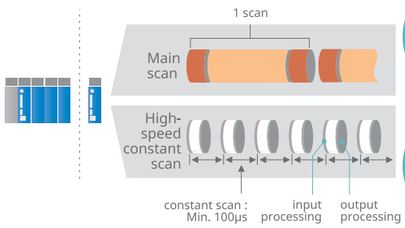
High-speed Processing

Max out Equipment Capability by Tuning

Sensor control function enables fast, constant scan from 100µs (10µs resolution when using SCB)

FA-M3V's sensor control function allows input, computation and output of one program block to be executed at constant intervals as short as 100µs, independently of the main scan, which may have a longer scan time due to advanced functionality of external devices.

The number of PLC units can be reduced since two ladder programs can be executed by one CPU module.



Constant scan time **2x** shorter

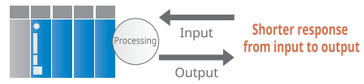
Resolution **10x** better

High-speed Response

Instantaneous Response to Interrupts

Interrupt response time of 85µs and digital filter from 0ms

With input response time of 85µs for interrupts from DC input modules, the FA-M3V can immediately respond to changes in inputs, enabling instantaneous high-speed control. Fast response (circuit delay 100µs min.) is achieved by focusing on total response time (input → program execution (processing) → output) and allowing variable time constants to be set to zero. Moreover, input response time of 10µs can be achieved with the use of a high-speed contact input module (F3XD16-3H).



Interrupt response **1.2x** faster

High-speed Scan

Slashing Tact Time and Improving Quality

Scanning a 100K step ladder program in 1ms

The incredible speed of the FA-M3V of processing 100K ladder program steps within 1ms is achieved by analyzing its internal processes and striving for speed in every aspect. This translates into five times faster scanning for advanced device applications.

Scan time **5x** shorter

* The quoted scan time is achievable under certain conditions. Actual scan time may vary with program processing and system configuration.

Extended Functionality Coupled with Speed

Network support, large volume data processing and easy data handling

Over and above fast, stable control, the FA-M3V delivers extended functionalities, including diverse network support, large file transfer and “PC-less” maintenance for improved productivity.

Truly Range-free Controllers

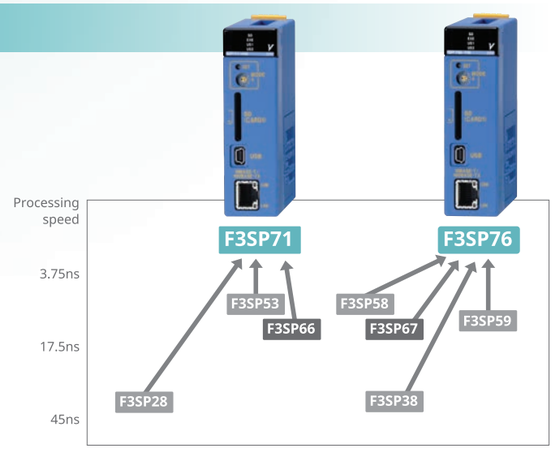
The FA-M3 family of controllers is consolidated into two new CPU models of 60K-step and 260K-step program size so picking your ideal CPU is easy!

Sequence CPU Module(with network functions)

F3SP71
60K ladder steps, basic instruction 3.75ns min., built-in network functions

F3SP76
260K ladder steps, basic instruction 3.75ns min., built-in network functions

* Use FA-M3 Programming Tool WideField3 (SF630-MCW) with these CPU modules.



Built-in Ethernet Network Support

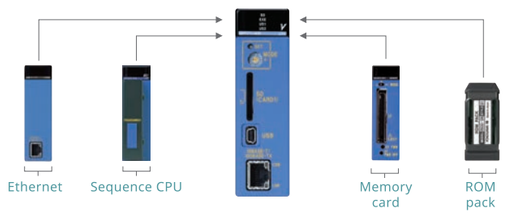
Built-in Ethernet port for easy integration with manufacturing systems

Faster Ethernet Communication Processing

Built-in Ethernet Network Support

The built-in Ethernet port enables fast, stable communication. With a variety of functions condensed into an all-in-one CPU module, the FA-M3V offers cost advantages, a smaller footprint and networking that will not degrade control processing performance.

■ All-in-one CPU module

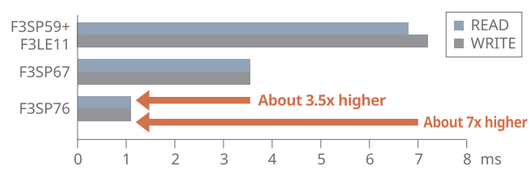


Enhanced Integration with Higher-level Systems

Fast communication response is achieved without compromising stable control.
Scaling up to process large production data is simple.

- Much higher Ethernet throughput
- Large memory and SD memory card (SDHC compliant 32GB max.)
- Cache registers (1MB max.)
- Modbus/TCP Slave (server) function

■ Ethernet throughput comparison

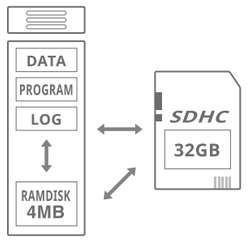


* Comparison with older CPUs based on reading and writing 250 words of data

Handling of Large Data

Built-in SD Memory Card Slot and RAMDISK

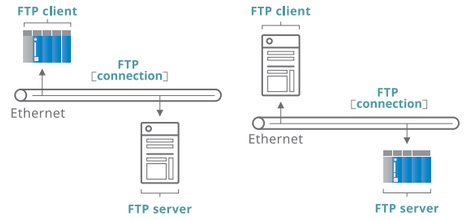
- Up to 32GB SDHC memory cards are supported for storing data, programs and log records as files.
- Redundancy of the file control area (FAT) reduces risk of file system damage due to power outage or card removal during writing.
- 4MB RAMDISK included for storing data and log records as files. (volatile memory)
- Off-the-shelf SD memory cards can be used.



Uses
- Accumulating routine data
- Saving error log
- Saving raw field data

FTP Client and Server Functions

- Data is transferred from CPU to host PC or server autonomously with no need for programming on the host PC or server. (client function)
- Data can be transferred from CPU to host PC by simply specifying parameters using a standard network protocol command interface. FTP server accesses and responses are logged for convenience of debugging and access management (server function).
- Batch file transfer replaces segmented data transmission.

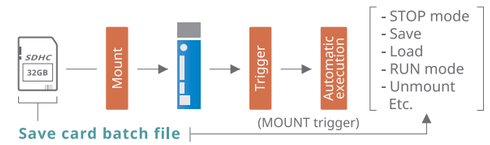


"PC-less" Maintenance

Smart Access Function

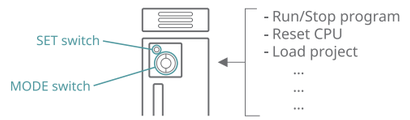
Card Batch File Function

Routine operations such as recipe loading or log acquisition for troubleshooting can be automatically executed simply by inserting an SD memory card. Batch commands coded in auto-execute files stored on a SD memory card can be automatically executed in response to various execution triggers (e.g. card insertion or error events, etc.)



Rotary Switch Function

Maintenance can be performed using the rotary switch and an SD memory card with no need for a PC, by simply turning a rotary switch (MODE switch) and pressing a push button (SET switch) on the front panel of the module.



Easy Network and File Access

Network & File Processing Instructions

Handle large data easily by executing dedicated ladder instructions.

Instructions

- Socket (TCP/IP, UDP/IP) communications instructions
- FTP client instructions
- File access instructions
- File operation instructions
- Disk operation instructions

Virtual Directory Commands

Get data, programs and log data as files from a host PC or server using FTP, without need for a ladder program.

Simply issue a command from a higher-level PC or server as shown below:

Example get ¥virtual¥cmd¥d2fcsv_D101_2_128_0_6_1_0_0_4 data012.csv.
(get 128 words of data starting from device D0101 as a data file in decimal representation and csv format)

Continuous-type Application Instructions

Time-consuming processing does not affect control processing.

Instruction is executed when input condition is TRUE.
Actual processing is done in background without affecting control.

When instruction execution is completed, the output turns on.
You can check the error code stored in device D1.

Data Creation

Creation of transmission text and file data is made easy using the Constant Definition function (header file), which allows constant names to be defined with assigned numeric and string values separately from programs, and then coded in programs, and using the M3 Escape Sequence function, which allows binary representation codes to be included in character strings.

High Reliability Enables Stable Operation

Hardware ECC, single board design and enhanced security

High-precision calculation capability plus enhanced security with user management and operation log means even better reliability.

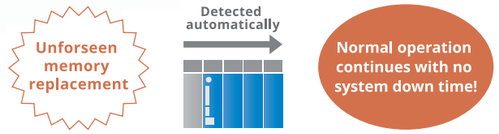
High Precision, High Reliability
Formidable computation power, user-friendly high-reliability design

Higher precision with more data digits, better reliability with built-in ECC

High-reliability Design for Reducing Failure Rate

SRAM Hardware Error Check and Correction (ECC)

- Hardware error check and correction (ECC) for the program execution area (within ASIC and external SRAM)
- ECC does not impair performance
- Improved reliability through patrol check* (only for backup SRAM)



Use of Flash Memory

- Flash memory is used for storing programs. This minimizes the impact of memory data loss at power off.

Pursuit of Fundamental Reliability

Single board design

- Reducing the number of components fundamentally reduces the sources of failures.

High-precision Calculations

Operations preserving 32-bit significant digits

64-bit integer arithmetic

- No need to convert all the way to floating point data for calculation

Double-precision floating point operations

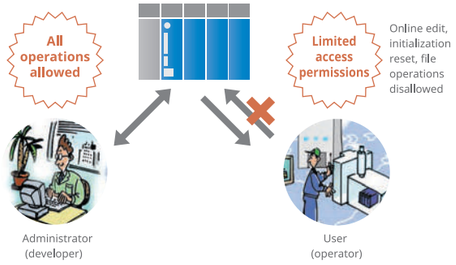
- Built-in floating-point unit (FPU) for floating-point operations
- No precision loss even if converted to floating-point data for calculations

Security
for protecting program assets and efficient fault analysis

Safeguards important customer assets by preventing unauthorized copying and keeping an operation log.

User management function

Appropriate access permissions can be defined for administrator, service and user personnel so that better security and work efficiency can be achieved concurrently.



Operation log function

The operation log function keeps a historical log of operations performed on the CPU module. With the user authentication function, the user name of the person performing an operation can also be recorded.

Operations performed on CPU can be checked using operation log.

Operation log dialog

Date	Time	Route	Main Message	Sub Message	User Name
2010/06/11	08:53:22	SWL_1	Cpu Reset		User
2010/06/11	10:02:14	USB	Download ypjt	FTPPUT	User
2010/06/12	11:06:20	SIO	Set a date-time		Service
2010/06/12	12:27:37	ETH	Switch Run mode	FTPPUT	Service
		When?	Via?	What?	by whom?

Existing network filter, CPU properties protection and function removal features are still available!

FA-M3V Offers a Stress-free Solution

for all process challenges from development through maintenance.

Process Flow from Development through Maintenance

Starting right from CPU model selection all-the-way to maintenance after commissioning, the FA-M3V promises a stress-free experience by enabling development according to design and reducing development effort from ladder program design to engineering.

Speed / Extensibility / Reliability

	Challenge		FA-M3V Solution
Speed	Picking the right CPU from so many models in the product line up is not easy!	Model selection	**Truly range-free controllers** • Only two streamlined models of 60K or 260K program size • CPU selection is easy!
Speed	Coding complex arithmetic expressions in ladder programming is a pain!	Design and development	**Formidable computation power** • Advanced operation instructions for positioning parameter calculations, etc. • Built-in cache registers as high-speed memory for storing calculation tables
Extensibility	With existing PLCs, sequence processing is delayed by network load so the device does not move as expected.	Evaluation	**Easy networking with production control systems** • All models have built-in Ethernet port • Fast, stable control even during production data transmission • Large memory and SD memory card (SDHC compliant, 32GB max.)
Reliability	I demand stable operation under all circumstances!	Operation	**User-friendly high-reliability design** • More robust internal memory - Hardware error check and correction - Use of flash memory • Pursuit of fundamental reliability - Single board design
Reliability	I want to protect my software assets but implementing a password affects operability.	Maintenance	**Protection of development resources and efficient problem diagnosis** • Enhanced security functions - User management function - Operation log • Enhanced sampling trace

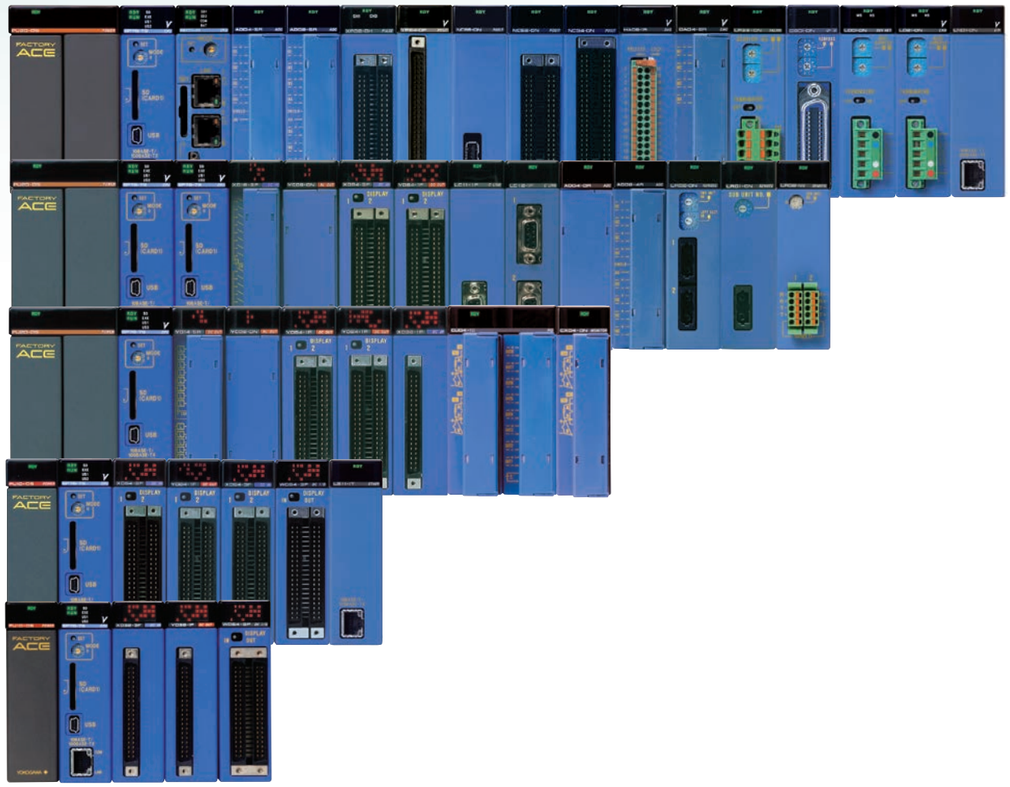
Stress-free

Range Free

Simply combine modules to suit your applications!

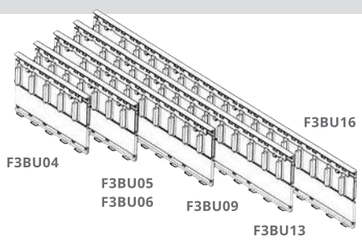
Range-free controller covers versatile range of system in single model

The FA-M3 provides system expandability, unlimited by system size, and also allows the use of common spare parts. To expand the system, simply add desired modules, all of the same size. The installation leaves ample room within the control panel for standardization and efficiency improvement through panel design. With the FA-M3 PLC, a developer can give full rein to his creativity to build systems and realize control that fits his applications.



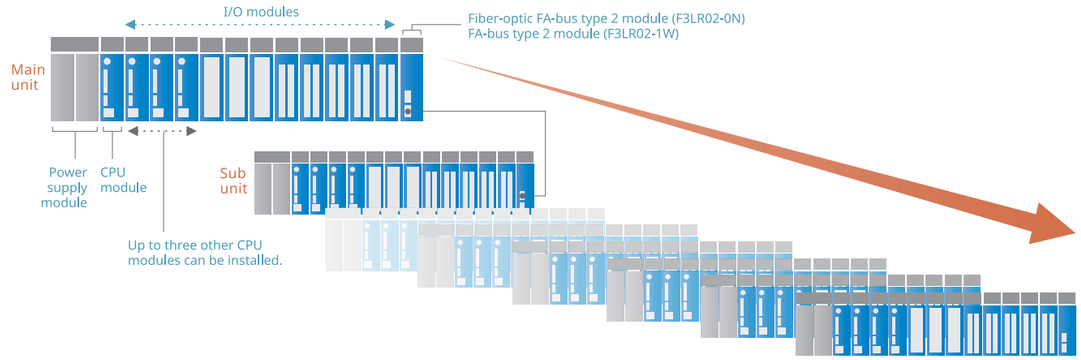
Base Module — F3BU04 / F3BU05 / F3BU06 / F3BU09 / F3BU13 / F3BU16

The FA-M3 offers six types of base modules, which allows flexible installation: 4-slot, 5-slot, 6-slot, 9-slot, 13-slot and 16-slot types.



Main Unit and Sub-Unit

The main unit accommodates up to seven sub-units for installing additional I/O modules. This provides up to 8,192 range-free I/O points.



Multi-CPU

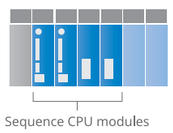
Up to 4 CPU modules can be combined in a single unit

This capability to intermix different CPU module types in a single unit expands the existing PLC concept to offer greater versatility for system expansion.
Up to four CPU can be accommodated. This feature is convenient when improving operating ratios of selected system components, integrating basic program data and other program data, dividing processing control, or selecting CPUs according to system scale or program size.

Sequence CPU module

F3SP71-4S / F3SP76-7S / F3SP22-0S

The FA-M3 accommodates up to four sequence CPU modules. This feature is convenient when improving operating ratios of selected system components, integrating basic program data and other program data, dividing processing control, or selecting CPUs according to system scale or program size. What's more, you can freely intermix sequence CPU modules with other types of CPU modules.



Advanced Programming Support

Efficient program design from development to maintenance

FA-M3 Programming Tool WideField3 SF630-MCW

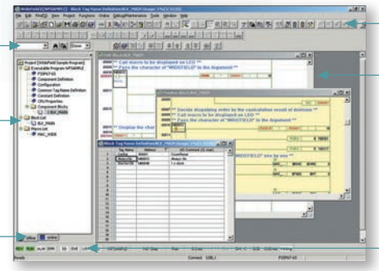
Windows10 support

New, useful functional enhancements based on user requirements

Improving program development efficiency is a common concern of all PLCs. The latest FA-M3 Programming Tool WideField3 is designed to harness the incredible power and speed of the FA-M3V. Its new features include balloon comment and monitor for more convenient programming, as well as the cross reference and script functions for more efficient programming. Besides engineering support function is added for efficient debugging.

* Ladder program created with WideField and WideField2, as well as sequence CPU modules running these programs can be used as-is with WideField3
* Windows10 (x86/x64) is supported from WideField3 R4.01 or later

Various functions are provided to facilitate easier program reuse, debugging and maintenance



Script Coding and Monitoring

Complex calculation processing made easy!

Computations and text manipulations can be programmed using script code, which is converted automatically into ladder code before execution. Moreover, used devices can be monitored within script code for efficient debugging, and mnemonics can be entered in script code for even more powerful programming!

Script monitoring simplifies online debugging

Efficient programming using script instructions and functions!

Operators and reserved words

Arithmetic	+,-,*,/,MOD
Comparison	</<=.>/>=.==.<>
Logical	NOT, AND, OR, XOR
String	&,==,<>

Script functions

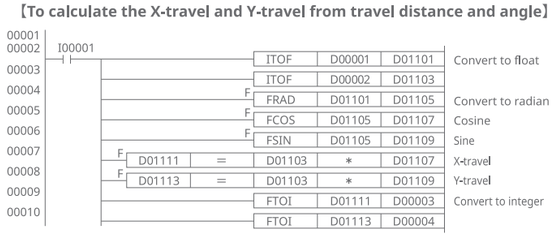
Basic	Rising bit
Calculation	Trigonometric, logical, exponential functions, etc.
Data processing	Rotate, move, convert, byte operations, etc.
String manipulation	Search, insert, replace, concatenate, etc.

Inline mnemonic

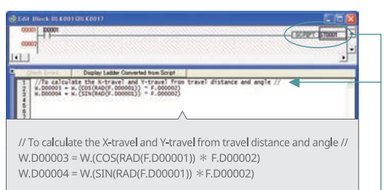
B : Bit, S: character string
W : word, L: long word, D: double long word
F : single-precision floating point, E: double-precision floating point

Coding of complex computations and data processing made easy!

【To calculate the X-travel and Y-travel from travel distance and angle】



【To calculate the X-travel and Y-travel from travel distance and angle 】

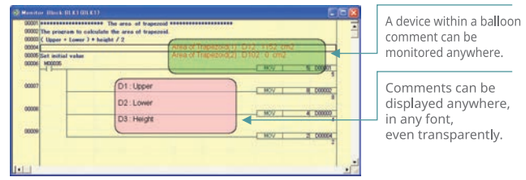


Scripting improves programming efficiency and program readability!

Balloon Comment and Device Monitoring

Place balloon comments and monitors anywhere like post-it notes

Operation history, handover memos, etc. can be written as comments and placed on circuits freely like post-it notes in any specified font, color and size, even transparently so that underlying circuits are visible. Devices can even be specified within comments to allow device monitoring anywhere!

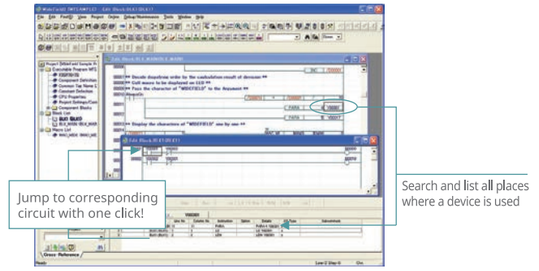


Cross Reference

Cut debug man-hours! Prevent regressive programming

The cross reference function enables real-time display of devices used in a program. Moreover, by simplifying the search for used devices, it saves time and prevents missed-out amendments during programming and program modification.

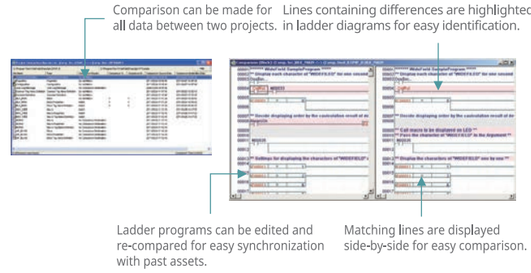
Cross reference search object
Address, tag name, constant definition, structure name (including structure member names), block/macro name and label



File Comparison

Better use of design assets

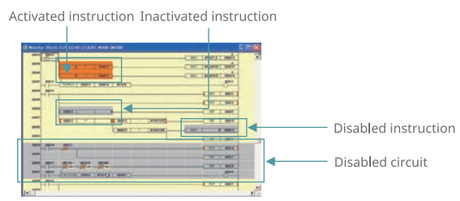
The file comparison function enables offline comparison of data between two projects. It is useful for reuse management and revision control by comparing against past design assets, as well as for maintenance by comparing against field programs. Program comparison results are displayed on ladder diagrams with circuit lines containing differences highlighted for easy identification.



Other convenient functions

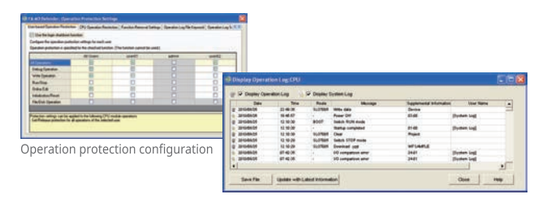
Circuit comment-out

Selected instructions or circuits can be short-circuited or disabled temporarily.



Operation protection, operation log

Operation protection function enables to set CPU operation available user and to store operation log.



Live Logic Analyzer function

* for WideField3 R3.01 or later
* for F3SP71-4S/F3SP76-7S only (R4.01 or later)

User-friendly engineering feature to leapfrog your debugging

The live logic analyzer stores the status and contents of devices designated for sampling in the trace buffer memory, as the sampling trace tool does, and immediately displays the trace results.
Trace results can be displayed in scan chart format while ladder program running high speed application concurrently.

Upgraded trace function by high-speed communication

- Up to 96 data points (64 relays and 32 registers) can be traced concurrently.
  Large sampling capacity up to 1M samples per channel
- Even advanced-function I/O devices can be traced.
- Once started, trace result can be displayed anytime, allowing concurrent program debugging even during tracing.

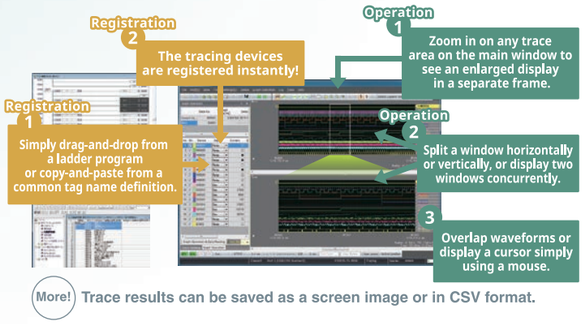
Traces equal to actual production performance

- Minimized trace execution impact on the CPU scan.
- The trace runs with minimal impact on the CPU scan and thus reflects actual production performance.
- USB and Ethernet peripheral processing run in parallel independently without affecting the CPU scan.

High degree of usability by powerful HMI

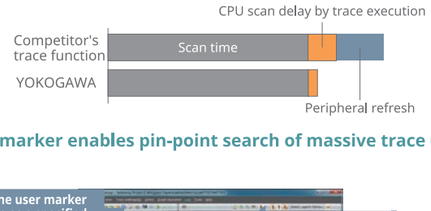
- Easy registration, configuration and operation.
- User marker enables pin-point search of massive trace data.
- Zoom in on any trace area on the main window, split a window horizontally or vertically.

Easy registration, configuration and operation

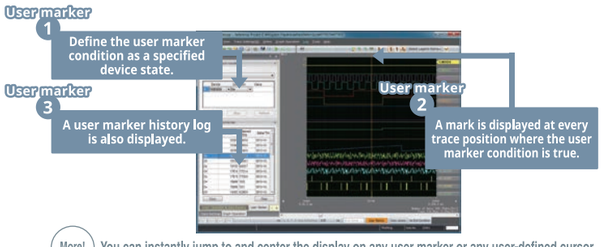


More! Trace results can be saved as a screen image or in CSV format.

No impact on CPU scan with parallel processing



User marker enables pin-point search of massive trace data



More! You can instantly jump to and center the display on any user marker or any user-defined cursor

Sampling Trace

Advanced analysis environment with oscilloscope-like view

The sampling trace function collects the device data of the sequence CPU module and the advanced I/O module, and displays all collected data at a time after the completion of the data collection, and confirms the change of the device data. It is effective for a data trace with fixed starting timing, and for a trace that has to wait the expected phenomenon for a long time.

Comparison of Trace Functions

Function	Live Logic Analyzer	Sampling Trace
CPU connection I/F	Ethernet/USB	Ethernet/USB/FL-net
Toolless trace	N/A	Card batch/virtual directory
Sampling method	Scan/periodic/TRC instruction	Scan/periodic/TRC instruction
Save destination of trace results	CPU module: N/A WideField3: Dedicated file format/CSV file	CPU module: CPU memory/SD card WideField3: Dedicated file format/CSV file
Trace start condition setting	None	Available
Trace end condition setting	Can be enabled or disabled (Disabled by default)	Can be enabled or disabled (Enabled by default)
Number of devices to be traced	Relay: 64 points Register: 32 points	Relay: 64 points Register: 128 points
Data display timing	During a trace	After a trace is completed
Data display method	Dynamic chart	Static chart
Data display format	Bit/decimal/hexadecimal/float/double precision float	Bit/decimal/hexadecimal
Zoom in	Available	Available
Trace start by configuration settings	N/A	Available

* It is not possible to perform both sampling trace and live logic analyzer simultaneously on a CPU.

Realistic Debugging Environment

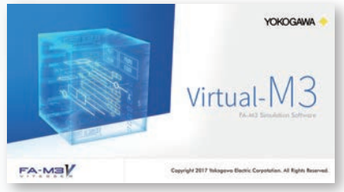
Dynamic and flexible simulation

FA-M3 Simulation Software Virtual-M3 SF681-MDW

Great performance for debugging and troubleshooting

The Virtual-M3 is a simulation software which runs ladder sequences on a PC and debugs programs without any real machine. The I/O module simulation function, link function with HMI, step operation function, and link function with Live Logic Analyzer drastically reduce the debugging time.

* This supports WideField3 R4.01 or later.



Realistic Debugging Environment Supporting Simulated External Devices

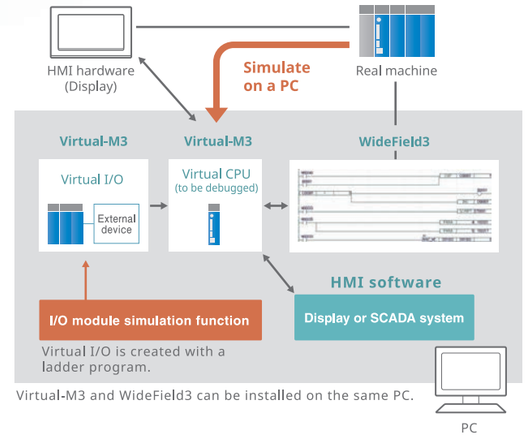
I/O module simulation function

- Two Virtual-M3 windows are opened. One works as a virtual CPU to be debugged and the other works as a virtual I/O that simulates I/O modules and external devices. The virtual CPU can be debugged while the virtual I/O is running.
- The simulation is not only for a CPU module but also for I/O (virtual I/O), and therefore can result in a more realistic debugging environment.
- Programs for the virtual I/O module can be created by the WideField3.
- The I/O module simulation function can work with (manually) simulated input.

Connection with HMI

- The higher-level link function can be used to connect with an HMI (display) or a SCADA system.
- The program of HMI (display) and SCADA system can be debugged with Virtual-M3.
- The Virtual-M3 can connect to HMI software through a routing connection inside PC and HMI hardware through a LAN port on the PC.

Debugging environment



Virtual-M3 and WideField3 can be installed on the same PC.

Flexible Debug Operation and High-speed Performance

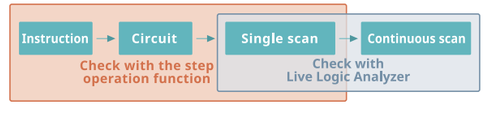
Step operation functions

- Check the program performance per instruction, circuit, and scan.
- The high performance step operation can respond to continuous operations without delay.
- The concentrated point can be debugged repeatedly.
- The [Restore to Previous State] action can undo up to 128 steps or the previous status of the execution during the debugging. And it allows users to skip some steps and restart from the preferred position.
- The data can be changed during the step operation and it enables the check of the performance under various conditions.

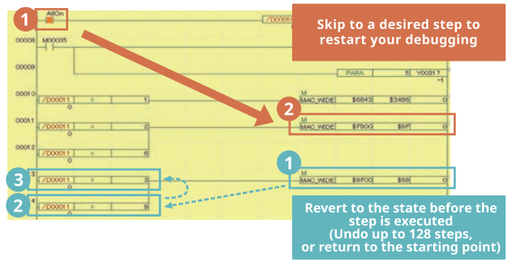
Connection with Live Logic Analyzer

- Live Logic Analyzer in WideField3 can be used for simulation.
- The signal behavior of one scan or a number of continue scans can be checked by the waves in LLA.
- The change within one scan can be checked by waves using the combination of step execution.

Check by each instruction, circuit, and scan



The step operation can repeat a desired section to debug



Open Network

Compliant with a diverse range of open networks

Information Network

Ethernet Interface Module

F3LE01-1T / F3LE11-1T / F3LE12-1T

Automatic response to request Emails (F3LE11-1T)

With the Ethernet interface module, remote maintenance and engineering (OME) is only an Email away. When equipment failure occurs, an Email is automatically transmitted to the user. From a host computer, the user sends request Emails to read or write various statuses, read user logs and system logs, or uses the trace function to obtain up-to-date information on the system status. This significantly shortens the time required to resolve field problems. By using this module with FA-M3 Programming Tool WideField3 and other software, building an OME environment becomes a simple task. This module not only supports 10Mbps communications, but also high speed communications at 100Mbps, compliant to the 100BASE-TX standard.

Item	Specifications		
	F3LE01-1T	F3LE11-1T	F3LE12-1T
Protocol	TCP/IP, UDP/IP, ICMP, ARP	TCP/IP, UDP/IP, ICMP, ARP, SMTP/POP3, HTTP1.0	TCP/IP, UDP/IP, ICMP, ARP
Access control method	CSMA/CD		
Transmission rate	10Mbps	100Mbps, 10Mbps	
Transmission mode	Baseband		
Max. segment length	100m*		
Functions	Event transmission	Email response, automatic transmission of alarm emails, password function	Messaging (UDP/IP) function

* The length between the HUB and the module

Easy Remote Equipment Maintenance by Emails Ethernet-based Remote OME

The remote OME (Remote Operation, Maintenance & Engineering) function utilizes communications via the Ethernet, the de-facto standard for open networks, to deliver a wealth of solutions. Information such as images and audio can be captured and transmitted to allow efficient verification of the system status. This relieves developers of headaches such as excessive man-hours required for minor problems, frequent system support trips and delayed system failure information.

* Remote OME (Remote Operation, Maintenance & Engineering) refers to a mechanism that enables remote maintenance of equipment at distant sites. It is a concept proposed by Yokogawa and is a registered trademark of Yokogawa Electric Corporation.

NX Interface Module

F3NX01-2N

Support for Autonomous Distribution Protocol

The NX Interface Module enables connection to a NeXUS Autonomous Distribution*1 system.
By supporting the Autonomous Distribution Protocol, it enables information interchange between FA-M3 systems and connections to PC, FA computers and other external devices that support the Autonomous Distribution protocol.

*1: "Autonomous Distribution" is a registered trademark of Hitachi Ltd.

Item	Specifications
Protocol	UDP/IP, ICMP, ARP
Access control method	CSMA/CD
Transmission rate	100Mbps, 10Mbps
Transmission method	Baseband
Maximum segment length	100m *2

*2: Maximum distance between the module and a hub.

Control Network

EtherNet/IP Interface Module

F3LN01-0N

Global Industrial Ethernet

This interface module conforms to "EtherNet/IP" (Ethernet Industrial Protocol) which is an open standard of industrial Ethernet promoting by ODVA (ODVA, Inc)
It is part of the IEC61158 international standard and approved as SEMI standard E54.13.
Highly-extensible system configuration allows devices ranging from simple sensors and actuators to complex information systems to be connected in a multi-vendor environment.Multiple EtherNet/IP modules can be mounted on one system to separate control and information networks , or implement network redundancy.

ODVA CONFORMANT

Item	Specifications
Protocol	CIP Protocol
Physical Layer	100BASE-TX,10BASE-T
Transmission speed	100Mbps,10Mbps
Maximum segment length	100m*
No. of sessions / connections	128
Functions	EtherNet/IP scanner,adapter

*Maximum distance between the module and a hub.

FL-net Interface Module

F3LX02-2N

Build a multi-vendor system with ease

The FL-net interface module is compliant with FL-net (OPCN2) version 2.00, an open FA network standard defined by Japan Electrical Manufacturers' Association (JEMA). It allows a user to easily build a multi-vendor system, and communicate using cyclic transmission and/or message transmission.
Moreover, by connecting a PC running the WideField3 software, a user can perform maintenance and debugging by using WideField3 functions to monitor ladder programs, read/write devices, read log files and trace program execution.

Item	Specifications
Protocol	UDP/IP FA link,ICMP,ARP
Access control method	IEEE802.3 (CSMA/CD) compliamt
Transmission rate/medium	100Mbps,10Mbps/IEEE 802.3 compliant
No. of nodes	254 max.
Transmission method	Base band
Cyclic transmission	512 words for area 1 8,192 words for area 2
Messaging	1,024 bytes max.

Device Network

DeviceNet Interface Module

F3LD01-0N

Improve productivity using multi-vendor network

This interface module conforms to "DeviceNet", which is a global standard of open field networks promoting the spread of ODVA (ODVA,Inc).
It is also adopted by SEMI (Semiconductor Equipment and Materials Institute) as the standardized sensor bus. The module transfers ON/OFF data, analog data, tens of bytes of data or setup/maintenance information, and allows connection of up to 63 compatible devices of worldwide manufacturers with a maximum transfer rate of 500kbps and a maximum transmission distance of 500 meters (at 125kbps). It supports a wide range of applications with flexibility and brings dramatic improvements in productivity and maintainability.

Item	Specifications
Interface	DeviceNet compliant
Transmission rate	125/250/500kbps (selectable by switch)
Transmission medium	5-wire cable (2 for signals, 1 for SHIELD and 2 for power)
Transmission distance	Maximum cable length for main line: 500m (Transmission rate: 125kbps when using only thick cables)
Connection method	Multi-drop, T-junction
No. of nodes	64 (including master)

CAN 2.0B Interface Module

F3LD21-0N

Support for CAN2.0B protocol

This module is an interface module for connecting to CAN* (Controller Area Network).
CAN is the communication standard designed for noise resistance and used for data communication between interconnected devices. It was developed as a means of communication between in-vehicle devices, but now it is recognized for its reliability, sophisticated fault detection function, etc., and is drawing attention in a wide range of fields.

*CAN was proposed by Bosch of Germany and later standardized as ISO 11898 and ISO 11511 by the International Organization for Standardization (ISO).

Item	Specifications
Interface	CAN2.0B format
Support frame	Only data-frame supported
No. of channels	1 channel
Transmission speed	125k/250k/500k/1Mbps
Transmission media	5 dedicated lines (2signal, 1shield, 2 power lines)
Connection configuration	Multidrop or T-Branch system
Functions	Automatic periodic transmission Manual transmissions Automatic reception data storage
No. of available IDs	For automatic periodic transmissions：15 IDs max. For manual transmissions：No limit For reception：320 IDs max.

Serial Communications

Personal Computer Link Module

F3LC11-1F / F3LC12-1F / F3LC11-2F

Ideal for connecting to PCs or displays

This communications module implements PC link functions to a display or host computer, such as a personal computer via an RS-232-C or RS-422-A/485 interface. It allows reading from and writing to all FA-M3 devices, even when no ladder program is executing. You may also read various program-related information and error logs. With the F3LC11-2F, up to 32 FA-M3 units may be connected to host computer.

Item	Specifications		
	F3LC11-1F	F3LC12-1F	F3LC11-2F
Interface	EIA RS-232-C compliant		EIA RS-422-A / EIA RS-485 compliant
Transmission mode	Half-duplex		Half-duplex, 4-wire/2-wire
Transmission distance	Total distance: 15m		Total distance: 1,200m
Transmission rate	300 / 600 / 1,200 / 2,400 / 4,800 / 9,600 / 14,400 /19,200 / 28,800 / 38,400 / 57.6k / 76.8k / 115.2kbps		
No. of units	—		32 max.
No. of ports	1 (non-isolated)	2 (non-isolated)	1 (isolated)

* Usable with YHLS cable(KM80/KM81)

Modbus Interface Module

F3LC31-2F

Support for Modbus protocol

This module is an interface module for Modbus* RTU/Modbus ASCII communication.
This module has the master functions of Modbus communication and enables to communicate with various slave devices in the market. It also supports slave functions that realize to communicate with other brand's master devices.

*"MODBUS" is a registered trademark of Schneider Automation Inc.

Item		Specifications
Interface		EIA RS-422-A / EIA RS-485 standards.
Transmission mode		Half-duplex, 4- or 2-wire system
Transmission speed		300/600/1200/2400/4800/9600/14400/ 19200/28800/38400/57.6k/115.2kbps
Transmission media		Shielded twisted-pair cable (AWG20-16)
Transmission distance		1200m Max.
No. of ports		1 (isolated)
Communication protocol		Modbus RTU/Modbus ASCII

Ladder Communications Module

F3RZ81-0F / F3RZ82-0F / F3RZ91-0F

High-speed serial communications up to 115.2kbps

This module enables control of remote devices by ladder programs of a sequence CPU module using RS-232-C, RS-422-A or RS-485 communications. The F3RZ81-0F/F3RZ82-0F module uses a D-sub 9-pin connector and allows transmission up to 15m, while the F3RZ91-0F module uses a terminal block and allows transmission up to 1,200m.

Item	Specifications		
	F3RZ81-0F	F3RZ82-0F	F3RZ91-0F
Interface	EIA RS-232-C compliant		EIA RS-422-A / EIA RS-485 compliant
Connection	Point-to-point		Point-to-point (also supports multi-point connection)
Transmission mode	Full/half duplex		Full/half duplex, 4-wire/2-wire
Synchronization mode	Start-stop synchronization		
Communications protocol	None		
Transmission rate	300 / 600 / 1,200 / 2,400 / 4,800 / 9,600 /14,400 / 19,200 / 28,800 / 38,400 / 57.6k / 76.8k / 115.2kbps		
Transmission distance	15m max.		1,200m max
No. of ports	1 (non-isolated)	2 (non-isolated)	1 (isolated)

* Usable with YHLS cable(KM80/KM81)

GP-IB Communications Module

F3GB01-0N

Ideal for automation of inspection system

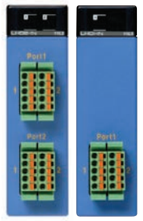
- Performs both measurement and control within a compact body.
- Delivers a high-speed inspection system.
- Enables simple, high-speed communications with GP-IB devices.
- Enables communications with GP-IB devices using only ladder sequences.

Item		Specifications
Interface		ANSI/IEEE Standard 488
Transmission mode		8-bit parallel, half-duplex
Connection type		Star, multidrop
No. of devices		15 Max.
Handshaking system		3-wire handshaking
Transmission distance	Total cable length	20m max.
	Between devices	4m max.
	Total distance by devices	2m max. (x number of devices)
Interface		24-pin receptacle connector (IEEE-488)
Setting	Device address	0 to 30
	Delimiter code	CR+LF, CR, EOI or Others
	Controller	Yes or No

High-speed Remote I/O

YHLS Master Module

F3LH01-1N / F3LH02-1N



Fast, stress-free remote I/O with reduced wiring

YHLS (Yokogawa Hi-speed Link system) is a high-speed 1:N remote I/O communication system. It supports up to 63 connected slaves for processing data of up to 2,016 I/O points (1,008 inputs and 1,008 outputs) at high-speed scan of 243μs per 256 I/O points. Moreover, complex communication protocols are transparent to the programmer, simplifying system implementation.

Item	Specifications	
	F3LH01-1N	F3LH02-1N
No. of systems	1	2
Transmission mode	4-wire full duplex or 2-wire half duplex	
Transmission format	HLS compliant	
Transmission rate	3Mbps, 6Mbps or 12Mbps	
Synchronization mode	Bit synchronization	
Error control	CRC-12	
Transmission distance per system	300m (at 3Mbps), 200m (at 6Mbps), or 100m (at 12Mbps)	
Connector type	European connector	
No. of slaves per module	63	126
No. of I/O points per module	1,008 inputs 1,008 outputs	2,016 inputs 2,016 outputs

Fast

- Up to 12Mbps. Scans 63 slave units in just 0.96ms.

Immune to Noise

- Adopts HLS protocol with excellent noise immunity
- Even more reliable when used with YHLS cables (KM80/KM81)

Open

- Open design rules allows customers to develop proprietary slave units

YHLS (YOKOGAWA Hi-speed Link System) adopts a HLS-compliant open protocol, enhanced to allow easy monitoring of transmission line quality during development and operation using RDY, ALM and LNK LED indicators.

YHLS Slave Units

TAH Series

With hot swapping

These slave units offer 32 I/O points in a compact body comparable to 16-point slave units from other competitors, and are equipped with short-circuit protection for the I/O power supply and output circuits.

Model		Specifications
TAHWD32	-3PAM	16 DC inputs (positive common), 24V DC, MIL 16 TR outputs (sink-type, with short-circuit protection), 24V DC 0.1A, MIL
	-3NBM	16 DC inputs (negative common), 24V DC, MIL 16 TR outputs (source-type, with short-circuit protection), 24V DC 0.1A, MIL
TAHXD16	-3PEM	16 DC inputs (positive common), 24V DC, MIL
	-3NEM	16 DC inputs (negative common), 24V DC, MIL
TAHYD16	-3EAM	16 TR outputs (sink-type, with short-circuit protection), 24V DC 0.1A, MIL
	-3EBM	16 TR outputs (source-type, with short-circuit protection), 24V DC 0.1A, MIL

YHLS Cables

KM80 / KM81

Two cable types for different purposes

These YHLS high-speed wire-saving cables have double shields against external noise, and can be used as generic serial cables for standard RS-422A/485 communications.

Model		Cable Length	Model		Cable Length
KM80 (Fixed cables)	-010	10m	KM81 (Flexible cables)	-010	10m
	-050	50m		-050	50m
	-100	100m		-100	100m
	-200	200m		-200	200m
	-300	300m			

Usable with modules: F3LH01-1N, F3LH02-1N, F3LP32-0N, F3LR02-1W, F3LC11-2F, F3LC31-2F,F3LC51-2N, F3RZ91-0F

Superior, Easy Temperature Control

Superior temperature control with easy setup

Temperature Control and PID Modules

F3CU04-0S / F3CU04-1S

Versatile control at high speed, accuracy and resolution

Up to **144** loops

Sampling **0.1**s | Accuracy **±0.1**% | Resolution **0.1**°C

This module enables fine control at high speed, accuracy and resolution. Its built-in "SUPER" function suppresses overshooting using fuzzy theory to deliver improved manufacturing quality. Its superior functions and performance can be easily harnessed using its "dynamic auto-tuning" function or setup tool.

Item		Specifications	
		F3CU04-0S	F3CU04-1S
No. of loops/channels		4 loops	
Isolation method		Between input terminals and internal circuit: Isolation by photocouplers and transformers Between input terminals: Independent circuits for different channels	
Input type		Universal input (individual inputs configurable separately by software or collectively by hardware): 15 thermocouples, 9 RTDs, 2 DC mV ranges, and 4 DC V ranges	
Input sampling cycle		100ms for 2 channels or 200ms for 4 channels	
Input impedance		1MΩ or more	
Allowable signal impedance		250Ω max. for thermocouple and DC mV, 100Ω max. for RTD (with same wire resistance), and 2kΩ max. for DC V	
Burnout detection function		Yes	
Output type	Time proportioning PID (Open collector output)	Yes (ON/OFF control, forward/reverse)	
	Continuous PID (4-20mA output)	No	Yes
Control section	Control function	ON/OFF, PID, heating/cooling, setting output, dynamic auto-tuning, and "Super"	
	Control cycle	Same as input sampling cycle	

High Speed, High Accuracy, High Resolution

- Input sampling cycle: 100ms/2CH, 200ms/4CH
- Input accuracy: ±0.1% of F.S.
- Input resolution: 0.1°C (5-digit display)

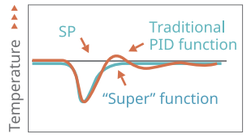
Universal Input

A single module can be used to support a variety of inputs (thermocouple, RTD, DC mV and DC V), selectable for each channel. By configuring individual channels to separate inputs, it delivers high efficiency at low cost.

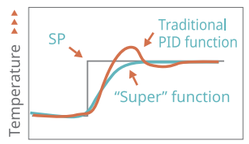
Dynamic Auto-tuning Function

- With a user setting the minimum number of parameters (such as input/output range and control set point), this module automatically calculates the optimal PID parameters to simplify startup preparation, saving tuning effort and cost.
- It even recalculates the PID parameters automatically when there is a major change in the control condition (i.e. change in control set point) during operation.

Overshoot Suppression Function SUPER



When a disturbance occurs



When a setting is changed

Temperature Monitoring Module

F3CX04-0N

Easy temperature monitoring with superior cost-performance

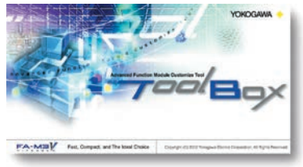
Up to **144** channels

- Input sampling cycle: 100ms/2CH, 200ms/4CH
- Input accuracy: ±0.1% of F.S.
- Input resolution: 0.1°C (5-digit display)
- Universal input
  Up to 144 channels (4 channels x 36 modules)

Item	Specifications
	F3CX04-0N
No. of loops/channels	4 channels
Isolation method	Between input terminals and internal circuit: Isolation by photocouplers and transformers Between input terminals: Independent circuits for different channels
Input type	Universal input (individual inputs configurable separately by software or collectively by hardware): 15 thermocouples, 9 RTDs, 2 DC mV ranges, and 4 DC V ranges
Input sampling cycle	100ms for 2 channels or 200ms for 4 channels
Input impedance	1MΩ or more
Allowable signal impedance	250Ω max. for thermocouple and DC mV, 100Ω max. for RTD (with same wire resistance), and 2kΩ max. for DC V
Burnout detection function	Yes

ToolBox for Temperature Control and Monitoring Modules

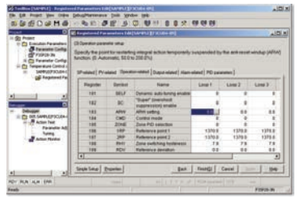
SF661-MCW



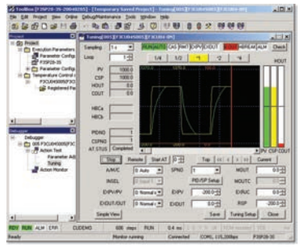
Easy Setup of Operation Parameters

This software is a parameter setup tool for use with the FA-M3 Temperature Control and PID Modules and the Temperature Monitoring Module. It supports a range of functions from initial setup to action testing, and simplifies the tedious tuning process by enabling graphical display of monitored values.

Detailed setup



Tuning



User-friendly setup screens

On-line help information on module parameters simplifies parameter setup. Setup screens can be customized with the required parameters displayed in the appropriate order to match user operation.

Powerful debugging and data logging

Display of preset values, action monitoring and display of error information are available during action testing. Input field data can be logged, and exported (in CSV format) as external data to be used in subsequent reporting, analysis or processing.

Integrated development environment

ToolBox provides a convenient, integrated development environment, which does not require a user to run each tool separately when using the ToolBox for Temperature Control and Monitoring Module (SF661-MCW) concurrently with the ToolBox for Positioning Modules (SF662-MCW/SF663-MCW).

Concurrent use of ToolBox and FA-M3 Programming Tool WideField3

The ToolBox software can be executed concurrently with WideField3, and even allows concurrent editing and communications using both programs.

* Use ToolBox R6.01 or a later version with F3SP22, F3SP71 and F3SP76 sequence CPU modules.

Drastically Reduced Tact Time

Versatile positioning control using efficient setup tool

Positioning Module (with multi-channel pulse output) — F3YP22-0P / F3YP24-0P / F3YP28-0P

8-axis max. for single module, Pursuit higher speed and shorter control period

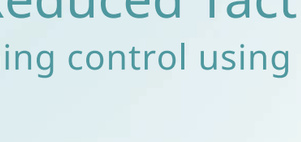
This positioning module enables up to 8 axes control by one module and reduces the cost per an axis.
It can be used to configure positioning systems for up to 128 axes, by using 16 modules.
Various trigger functions enable quick and accurate startup and stop from external devices with preset destination and speed.

- Short startup time of 40µs min. for 1 axis, 90µs min. for 4 axes and 150µs min. for 8axes.
  A trigger start allows 1µs min. enables to start operation faster.
- A short control cycle of 0.125ms for 8 axes allows smoother positioning commands and enables faster movement on the work.
  In addition, response for changing variables and positioning status becomes quicker.
- Max. 7.996Mpps output of high-speed positioning command provides comfortable margin for driving linear, DD, and other high-speed, high-precision motors.
- Built-in pulse counter can accept max 8Mpps for detecting the position of external devices, like the position on an index table or the travel distance of a conveyor, and allows faster and more precise positioning control.

Item		Specifications		
		F3YP22-0P	F3YP24-0P	F3YP28-0P
Control	No. of axes	2	4	8
	Control method	Open-loop control with positioning command pulse output		
	Pulse output method	RS-422A compliant differential line driver (ISL32172E equivalent) Pulse type selectable for each axis: CW/CCW pulse, travel/direction pulse, and phase A/B pulse		
	Output pulse rates	7,996,000 (pulse/s)max. - Using a servomotor 1,999,000 (pulse/s) max. - Using a stepper motor		
	Control period	0.125ms		
External contact input		4 inputs per axis (origin input, forward and reverse limit inputs, and Z-phase input)		
External contact output		1 output per axis (deviation pulse clear signal)		
Positioning functions	Control unit	pulse		
	Control mode	Position control (PTP control, multi-axis linear interpolation), speed control, and speed control to position control switchover		
	Operation method	Direct operation, position data record operation (10 data/axis)		
	Command position	Absolute/incremental positioning command, -2,147,483,648 to 2,147,483,647 (pulse/s)		
	Command speed	1 to 7,996,000 (pulse/s) - Using a servomotor 1 to 1,999,000 (pulse/s) - Using a stepper motor		
	Acceleration/deceleration system	Automatic trapezoidal acceleration/deceleration (startup speed programmable) Automatic S-shape acceleration/deceleration (startup speed fixed)		
	Acceleration/deceleration time	0 to 32,767(ms) (configurable for acceleration and deceleration separately)		
	Origin search	Two types of automatic origin search Manual origin search (user-definable using a combination of external contact inputs)		
	Manual control	Jog and manual pulse generator mode		
	Startup time	0.04ms for 1 axis, 0.09ms for 4 axes, 0.15ms for 8 axes		
Counter	No. of channels	1 channel		
	Pulse input method	Pulse type selectable: CW/CCW pulse, travel/direction pulse, and phase A/B pulse		
	Input pulse rate	8,000,000 (pulse/s) max. (x4)		
	Operation mode	Linear counter, ring counter		
	Counter functions	Counter enable function, counter preset function, counter coincidence detection function, cam-operated switch function, counter latch function, speed measurement function, positioning start/stop by an external trigger or counter coincidence		
	Counter Z-phase input	1 input (latch input, present input, and so on can be assigned)		
	Counter external contact input	3 inputs (latch input, present input, enable input, trigger condition of the positioning function, and so on can be assigned)		
	Counter external contact output	2 outputs (counter coincidence output, cam-operated switch output, and so on can be assigned)		
Data backup		Flash ROM (100,000 times rewritable)		

■ F3SP6□+F3YP1□

■ F3SP7□+F3YP2□



ToolBox for Positioning Modules (for F3NC32/34) — SF662-MCW

ToolBox for Positioning Modules (for F3YP22/24/28) — SF663-MCW

Total development support from configuration through maintenance

This Window-based software tool for configuring positioning modules (F3NC32-0N and F3NC34-0N) and positioning modules (F3YP22-0P/F3YP24-0P/F3YP28-0P)can be used to set up parameters, as well as perform action test and monitoring. With ToolBox, configuration and debugging of positioning modules becomes an easy job.

* Use ToolBox R4.01 or a later version with F3SP22, F3SP71 and F3SP76 sequence CPU modules.

Positioning Module (with MECHATROLINK-III Interface) — F3NC97-0N

Positioning Module (with MECHATROLINK-II Interface) — F3NC96-0N

With the latest open motion-control network interface

This positioning module supports MECHATROLINK-III*1*2, the latest Ethernet-based, high-performance, advanced, open field network standard published by the MECHATROLINK Members Association. It is the top choice for configuring a system involving many controlled axes.

- Positioning control for up to 15 axes from a single slot
- Easy connection using connectors, saving wiring between motors and controllers
- Fast transmission at 100 Mbps*2 transmission rate and 0.25ms cycle time for 4 axes*2 enables a shorter tact time and higher productivity.
- Up to 8 monitor data per axis*2 can be read simultaneously for better monitoring of external devices.
- In addition to AC servo motors, stepping motors, I/O devices and inverters from more manufacturers will be supported in future.

*1: MECHTROLINK is a trademark of the MECHATROLINK Members Association.
*2: Available with F3NC97-0N only.

Item		Specifications	
		F3NC97-0N	F3NC96-0N
Interface		MECHATROLINK-III compliant	MECHATROLINK-II compliant
Physical layer		Ethernet	RS-485 equivalent
Transmission rate		100Mbps	10Mbps
Cycle time / no. of stations		0.25ms for 4 axes 0.5ms for 8 axes 1.0ms for 15 axes (multislave function compliant*3)	1.0ms for 8 axes 2.0ms for 15 axes
Transmission bytes		16, 32, 48, or 64 bytes (intermixing allowed)	32 bytes (including subcommand)
Communications method		Cyclic communication	Master/slave synchronous
Network topology		Cascade or star	Bus
Transmission media		Ethernet STP Cat5e (dedicated cable)	2-wire shielded twisted pair cable (dedicated cable)
Max. transmission distance		100m (between stations)	50m (total length)
Min. distance between stations		0.2m	0.5m
Compatible slave devices		- Standard servo profile - Standard I/O profile*4 - Standard stepping motor drivers profile*3 - Standard inverter profile*3	- Communication commands for servo drives - Communication commands for stepping motor drives
Positioning functions	Position reference	-2,147,483,648 to 2,147,483,647 (reference unit)	
	Functions	- Independent axis movement using MECHATROLINK-II/III commands (availability depends on connected equipment and supported MECHATROLINK-II/III commands) - Linear interpolation movement (simultaneous starting and stopping), speed/target position change during motion	
	Others	- Status monitoring of external devices (target position, current position, speed, and torque) - Reading and writing parameters of external devices - Inverter control by standard inverter profile commands*3,*5 - External device I/O using standard I/O profile commands*5	

*3: Supported from the revision REV: 01:□□ of the module
*4: Synchronous communication is supported and commands are added from the revision REV: 01:□□ of the module
*5: For F3NC97-0N only

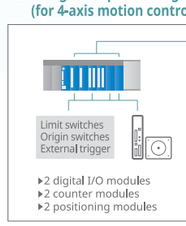
Positioning Module (with Pulse Output) — F3NC32-0N / F3NC34-0N

For fast, accurate, high-resolution and versatile position control

This positioning module is equipped with a pulse counter for each axis. It is amply powered to control high-speed, high-precision and high resolution devices and motors.

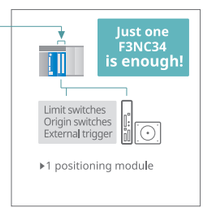
- Output pulse rate of 5Mpps max. gives ample power for driving direct-drive and linear motors.
- Its range of positioning control functions enables a much shorter tact time, higher productivity and better product quality.
- Using its built-in pulse counters and contact I/O, wiring is simpler and less modules are needed.

■ Using older positioning modules (for 4-axis motion control)



1/6 size
1/3 cost

■ Using F3NC34



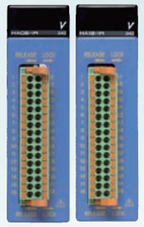
Item		Specifications	
		F3NC32-0N	F3NC34-0N
Control	No. of axes	2	4
	Control method	Open-loop control using position reference pulse output	
	Output pulse type	RS-422A compliant differential line driver; 5Mpps for servomotors, 1Mpps for stepping motors Pulse type selectable for each axis: CW/CCW pulse, travel/direction pulse, and phase A/phase B pulse	
Counter	No. of channels	2	4
	Input pulse type	Incremental encoder (phase A/B), absolute encoder; 5Mpps input pulse rate (after 4x multiplication)	
External contact input		6 inputs per axis (origin, forward limit, reverse limit, driver alarm input, external trigger, general-purpose input); emergency stop	
External contact output		3 outputs per axis (one deviation pulse clear signal and two general-purpose outputs), and 1 SEN signal per axis	
Positioning functions	Units of measurement	mm, degrees, and pulses	
	Control modes	Position control, speed control, position-control ↔ speed-control switchover	
	Interpolation modes	2-axis linear interpolation 2-axis circular interpolation	2-, 3-, and 4-axis linear interpolation 2-axis circular and helical interpolation
	Operation modes	Pattern operation and direct operation	
	Pattern operation	PTP movement, CP normal movement, CP pass-by movement, and CP pass-through movement; No. of action pattern records: 2,000 max. (500 actions x 4 patterns); No. of position data records: 2,000 max per axis	
	Position reference	Absolute/incremental position reference -2,147,483,648 to 2,147,483,647 (pulses)	
	Speed reference	1 to 5,000,000pps	
	ACC/DCC curve	Automatic trapezoidal acceleration/deceleration Automatic S-shape acceleration/deceleration	
	ACC/DCC time	0 to 32,767ms (configurable independently for acceleration and deceleration)	
	Others	Change in target position during movement Change in specified speed during movement	
Origin search		Two types of automatic origin search; Manual origin search (any combination of external contact inputs may be used)	
Manual operation		Jog operation and manual pulse generator mode	
Other functions		Electronic gear, teaching, current position setup, M code output, override, software limit switch, Counter coincidence or zone coincidence detection	
Data backup		Flash ROM (100,000 times rewritable)	

A Wide Selection of Modules

To suit every application need

High-speed data acquisition module

F3HA06-1R / F3HA12-1R



Stable, fast data sampling, without affecting scan time

This analog module enables large data acquisition and analysis by pursuit of high-speed and high-accuracy. It contributes to optimize for customers instruments.

High-speed, high-resolution

5µs conversion period coupled with 16bit ADC enables highly accurate tracing of signal changes. About 50µs response allows monitoring current values even during data acquisition.

Long memory

2M words of large data buffer size. Sampling period is configurable as a multiple(1 to 4,000) of the A/D conversion period.

Concurrent, synchronous operation

A/D conversion can be synchronized with an internal counter or external signal.
Concurrent A/D conversion for up to 12 channels: 5µs for one to 12 channels.
Supports A/D conversion associated with the encoder input for position or angular information.

Various functions

Built-in FFT function calculates for up to 16,384 data points. Fast, stable data sampling according to configuration from the CPU module. Enables signal range restriction by combining low-pass and high-pass filter.

Item	Specifications	
	F3HA06-1R	F3HA12-1R
No. of inputs	6	12
Input signal range	-10 to 10V (-11 to 11V, default), 0 to 10V (-0.5 to 10.5V) 1 to 5V (-0.25 to 5.25V), -5 to 5V (-5.5 to 5.5V), -2.5 to 2.5V (-2.75 to 2.75V)	
Isolation	Analog input terminals/internal circuit: Isolated Analog input channel/analog input channel: Not isolated Auxiliary input terminals/internal circuit: Isolated Auxiliary input terminal/auxiliary input terminal: Not isolated Analog input terminal/auxiliary input terminal: Isolated	
Resolution (16 bit ADC)	Approx. 1/58,000, Approx. 0.35mV (-10 to 10V range) Approx. 1/29,000, Approx. 0.35mV (0 to 10V range) Approx. 1/23,000, Approx. 0.18mV (1 to 5V range) Approx. 1/58,000, Approx. 0.18mV (-5 to 5V range) Approx. 1/29,000, Approx. 0.18mV (-2.5 to 2.5V range)	
Overall accuracy	±0.1% of full scale (23±2°C) ±0.`01% of full scale /K, ±0.3% of full scale (0 to 55°C)	
A/D conversion operation mode	Periodic sampling: 5µs period External signal synchronized: interval 5µs min, response 0.2µs max. Counter synchronized: interval 5µs min, response 0.2µs max.	
Input response time	Approx. 50µs max. (at 0-to-1 V step input) (analog circuit stabilization time + conversion time + calculation time)	
Data buffer	1M words max. double buffer (2M words max.)	
Data buffer sampling period	Sampling period x n, where n is a natural number from 1 to 4,000	
Scaling	Configurable within -30,000 to 30,000 using scale high limit and scale low limit	
Auxiliary input filter	Filtering of counter and general input signals	
Post-data processing	Averaging (over 512 frames max.) FFT (16,384 data points max., averaging over 16 frames max.)	

Conversion period 5µs (200kS/s) | **Data buffer 2M words**

A/D conversion Counter-synchronized | **for up to 16,384 data points Built-in FFT function**

FA Link H2 Module

F3LP32-0N

Easy PLC expansion and distribution using twisted-pair cables

This interface module uses shielded twisted-pair cables to achieve maximum transmission rate of 1.25Mbps and is ideal for connecting machines.

Item	Specifications
No. of stations	Max.32
Link relays	2,048
Link registers	2,048
Communication method	Token bus
Transmission media	Shielded twisted-pair cable (KM80/KM81 recommended)
Transmission distance	1km/500m/250m/100m
Transmission rate	125k/250k/625k/1.25Mbps

Fiber-optic FA Bus Type 2 Module

F3LR02-0N

FA Bus Type 2 Module

F3LR02-1W

Establishes instantaneous remote I/O

These interface modules can be used to build a remote I/O system on a (fiber-optic or elecrtic wire) FA bus. The high transmission rate of 10 Mbps eliminates any concerns about I/O refresh time in ladder programming. Moreover, star, daisy-chain and loop connections are all supported, allowing for flexible configuration.

Item	Specifications	
	F3LR02-0N	F3LR02-1W
Transmission method	Star, daisy chain, loop	
Transmission media	2-wire fiber-optic cable	two-pair (4-wire) shielded cable (KM80/KM81 recommended)
Transmission distance	Total distance: 1.4km max. (with 3 stations)*1	80m max. (for loop configuration)
Transmission rate	10Mbps	

*1 It is necessary to confirm with Sumitomo Electric Industries, Ltd about the production of cables that are compliant with the module specifications.

Analog Output Module

F3DA04-6R / F3DA08-5R

Fast, accurate, advanced conversion with excellent noise immunity

The analog output modules feature built-in 16-bit high-resolution D/A conversion with fast conversion speed of 2µs per channel and real-time output response of 2µs + 2µs x (number of channels to be updated). Moreover, it supports synchronous update for up to 8 output channels.

Real-time output response of 4µs per channel | **Synchronous update for up to 8 output channels**

Item	Specifications	
	F3DA04-6R	F3DA08-5R
No. of outputs	4	8
Output signal range	Voltage output: -10 to 10V (-11 to 11V) 0 to 10V (-0.5 to 10.5V) 0 to 5V (-0.25 to 5.25V) 1 to 5V (0.1 to 5.25V) Current output: 4 to 20mA (1.25 to 21mA) 0 to 20mA (-1 to 21mA) -20 to 20mA (-21 to 21mA)	Voltage output: -10 to 10V (-11 to 11V) 0 to 10V (-0.5 to 10.5V) 0 to 5V (-0.25 to 5.25V)1 to 5V (0.1 to 5.25V)
Isolation	Between output terminals and internal circuitry: Isolated (capacitance coupling) Between output terminals and external power supply: Not isolated, common negative	
Allowable load resistance	Voltage output: 1kΩ min. (for -10 to 10V or 0 to 10V range) 500Ω min. (for 0 to 5V or 1 to 5V range) Current output: 600Ω min.	Voltage output: 1kΩ min.(for -10 to10 V or 0 to 10V range) 500Ω min. (for 0 to 5V or 1 to 5V range).
Resolution(16-bit DAC)	Voltage output: ≈0.5mV (for -10 to 10V or 0 to 10V range) ≈0.2mV (for 0 to 5V or 1 to 5V range). Current output: ≈0.5µA (for 4 to 20mA range) ≈1µA (for 0 to 20mA or -20 to 20mA range)	Voltage output: ≈0.5mV (for -10 to 10V or 0 to 10V range) ≈0.2mV (for 0 to 5V or 1 to 5V range).
Overall accuracy	Voltage output: ± 0.1% of FS (23±2°C) ± 0.3% of FS (0 to 55°C) Current output: ± 0.2% of FS (23±2°C) ± 0.3% of FS (0 to 55°C)	Voltage output: ± 0.1% of FS (23±2°C) ± 0.3% of FS (0 to 55°C)
Output update time *1	2µs + 2µs x (number of channels to be updated)	
Synchronous output *2	DAC of all active channels of the same module can be updated synchronously	
Output response time	Voltage output: ≈20µs (for -10 to 10V range with 2kΩ load) Current output: ≈10µs (for 4 to 20mA range with 250Ω load)	Voltage output: ≈ 20µs (for -10 to 10V range with 2kΩ load)
Scaling	Output signal range can be set to any digital range within -30,000 and 30,000	
External power supply	Rated voltage: 24V DC; Allowable voltage range: 19.2 to 30V DC Current consumption: 200mA (inrush current: 1A)	

*1: The given output update time is applicable under certain conditions.
*2: The synchronous output update period depends on the number of channels used and the application.

Analog Input Module

F3AD04-5R / F3AD08-□R

The analog input modules feature built-in 16-bit high-resolution A/D converter including standard 12-bit models. Conversion speed is user-configurable from 50µs to 100ms to suit different applications.

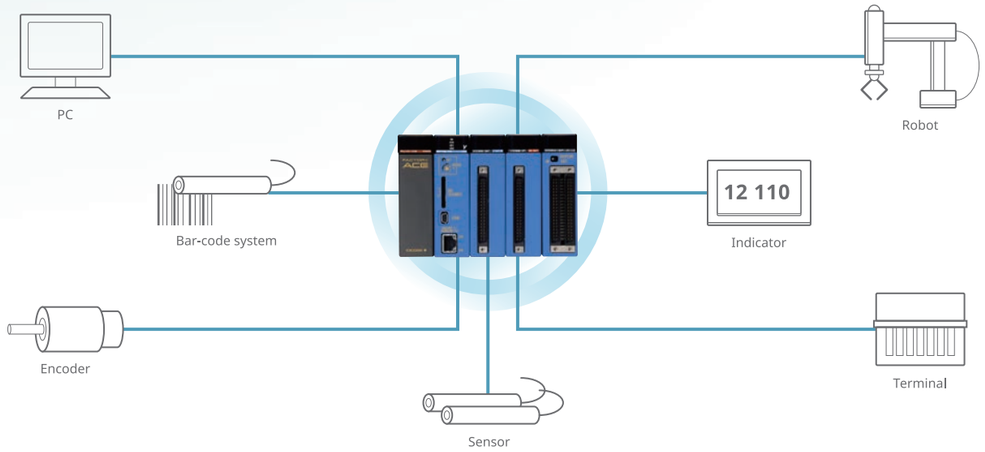
Item	Specifications			
	F3AD04-5R	F3AD08-4R	F3AD08-5R	F3AD08-6R
No. of input	4	8		
Input signal range	Voltage signal only 0 to 5V DC(-0.25 to 5.25V DC) 1 to 5V DC(-0.25 to 5.25V DC) -10 to 10V DC(-11.0 to 11.0V DC) 0 to 10V DC(-0.5 to 10.5V DC)	Current signal only 0 to 20mA DC (-1.0 to 21.0mA DC) 4 to 20mA DC (-1.0 to 21.0mA DC)	Voltage signal only 0 to 5V DC(-0.25 to 5.25V DC) 1 to 5V DC(-0.25 to 5.25V DC) -10 to 10V DC(-11.0 to 11.0V DC) 0 to 10V DC(-0.5 to 10.5V DC)	Voltage signal or current signal 0 to 5V DC(-0.25 to 5.25V DC) 1 to 5V DC(-0.25 to 5.25V DC) -10 to 10V DC(-11.0 to 11.0V DC) 0 to 10V DC(-0.5 to 10.5V DC) 0 to 20mA DC(-1.0 to 21.0mA DC) 4 to 20mA DC(-1.0 to 21.0mA DC)
Isolation method	Across input terminals and internal circuit: Photocoupler isolation Across input terminals: Not isolated			
Resolution(16bitA/D)	0.4mV(0 to 5V/1 to 5V DC/ 0 to 10V DC/-10 to 10V DC)	1.6µA (0 to 20mA DC/4 to 20mA DC)	0.4mV(0 to 5V/1 to 5V DC/0 to 10V DC/-10 to 10V DC)	1.6µA (0 to 20mA DC/4 to 20mA DC)
Overall accuracy	±0.1%ofFS(23±2°C),±0.2%ofFS(0 to 55°C)			
Conversion period	50µs/100µs/250µs/500µs/1ms/16.6ms/20ms/100ms per channel Configurable on module basis			
Scaling	Upper and lower limit values can be set to any value between -30,000 and 30,000			
Offset	Offset value can be set to any value between -5,000 and 5,000			
Filter	Channels can be enabled or disabled individually			
Hold data	Supports recording of peak values and trough values			
Self diagnosis	Hardware self-diagnosis during operation Over-range input detection			

Open Partnership

FA-M3 design rules made open through I/O Open

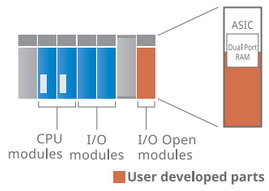
As a customer, would you like to create your own dedicated module?

"I would like to make a direct bus connection to an external image processing controller." "I would like to incorporate an external controller inside our machine to make space." "I would like an economically efficient communication interface with excellent performance." "My cost has ballooned with ever faster obsolescence of board components. What can I do?" The answers to your problems can be found in Yokogawa's new FA-M3 module development environment, named I/O Open.
With I/O Open, customers can now build their own FA-M3 compatible user I/O modules to improve performance and functionality of their devices at dramatically reduced total cost of ownership (TCO).



FA-M3 Design Rules Made Open

The Open Partnership program empowers customers to develop their own I/O modules. By implementing proprietary know-how in the form of an FA-M3-compatible user I/O module, users can achieve increased package density and performance. Moreover, complex data transfer between the CPU module and I/O modules is handled by an ASIC interface, which simply requires data to be written into a Dual Port RAM. Special parts required for module development such as ASIC, module casing and connectors can all be purchased from Yokogawa so customers only need to focus on the design of a printed circuit board.



FA-M3 I/O Open

Seamless System Integration

An FA-M3 compatible user module, which is seamlessly integrated with the FA-M3 system, can demonstrate its unique functionality and also easily exchange data with high-level equipment and other FA-M3 systems through Ethernet.

Low Cost

If the functions of an external controller are built into an FA-M3 user I/O module, it will not only avoid unnecessary investments and space, but also minimize software development effort and yield maximum cost savings.

Flexibility

As an example, consider developing an FA-M3 compatible user I/O module incorporating a program for communicating with an external controller. This approach improves total communication performance. No communication programs for the CPU module need to be written so modification of individual devices is easier.

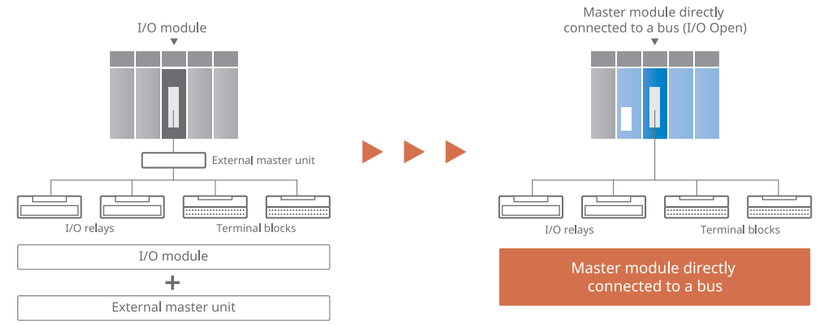
Simple System Configuration

An FA-M3 user I/O module can achieve both control and data processing with no need to purchase extra devices or reconfigure a new system, resulting in a simpler system configuration.

Application Examples

Reduced Wiring

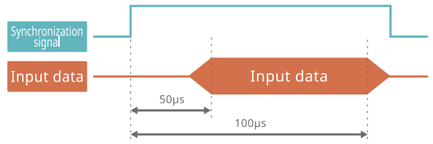
- By minimizing superfluous units, a simpler system configuration, higher speed and lower cost can be achieved.
- By eliminating connector parts, higher reliability is ensured.



Implementing I/O signal processing not achievable with standard I/O modules

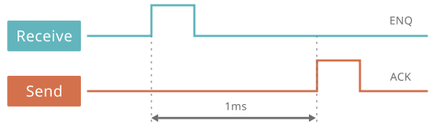
- Control signal-synchronized data input

  A dedicated module is created to acquire input data starting from 50µs until 100µs after the rising edge of a synchronization signal.



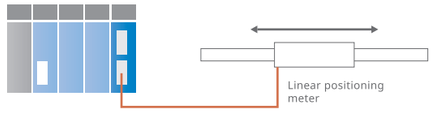
- High-speed handshake

  A dedicated communication module is created to return an ACK signal within 1ms after receiving an ENQ signal without going through the sequence CPU module.



Incorporating special sensor controller functions in a special module

- A dedicated module can be created for use with a high-resolution sensor to enable accurate and fast reading of data and high-accuracy positioning control for a diverse range of industrial machinery.



I/O Open implementation examples

- Wire saving system
- Position sensor input system
- Semi-conductor equipment (chiller control, cleaner, handler)
- Electronic weigher
- Electron accelerator
- Ice thermal storage system
- Automatic vending machine
- Components mounter/inserter
- Molding machine controller
- Car washing machine
- Audio communication system
- Small-power generation system
- Building airconditioning system
- Generator control system
- F/V convertor module
- Govenor control
- AGV

Note: Only some examples are listed above.

Peripherals

For use with FA-M3

Connector Terminal Block

TA50-0N / TA50-2N

A wide range of connector terminal blocks

Connector terminal blocks

- 40-point plug-type terminal block
  Compatible with 32-point and 64-point input/output modules and positioning modules
- Uses a connector terminal block cable for connection between the I/O module and connector terminal block, leading to space savings and reduced wiring within a distribution panel.
- No need for soldering during wiring of connector terminal block.

* To connect to an I/O module using KM55-□□□ cable.

Item	Specifications	
	TA50-0N	TA50-2N
No. of I/O points	40	
Rated voltage	5 to 24V DC	
Operating voltage range	4.5 to 26.4V DC	
Maximum current	0.5A DC/point	
Compatible cable	2mm² max.	1.25mm² max.
Terminal block screw	M3.5	M3
Compatible terminal	Crimp-on terminal with max. diameter of 8mm	Crimp-on terminal with max. diameter of 5.8mm
Connector	HIF3BA-40PA-2.54DSA (compliant to MIL standard)	
Mounting	35mm wide DIN rail or screws	
Mounting screw (When screw-mounted)	M4-size screws (2 places)	
Color	Black	Gray
Weight	300g	162g

* This connector terminal block cannot be used with F3YP22, F3YP24, F3YP28, F3NC32 and F3NC34.

Terminal Block Unit

TA40-0N

- Ultra-thin connector enables space saving with compact panel design.
- Connects directly to input/output module with no need of cables, leading to cost savings.
- Use of European type terminal block eliminates the hassle of soldering or crimping.
- Can be secured directly to an I/O module using screws to ensure reliable connection.

TA40-0N

Item	Specifications
No. of I/O points	40
Rated voltage	5 to 24V DC
Operating voltage range	4.5 to 26.4V DC
Maximum current	0.5A DC/point
Compatible cable	AWG23-28 (0.08 to 0.26mm²)
Terminal block screw	Slotted M2-size screw
Mounting screw	Slotted M2.6-size screw
Color	Black
Weight	50g

* This terminal block unit cannot be used with F3YP22, F3YP24, F3YP28, F3NC32 and F3NC34.

Blank Module

F3BL00-0N

Installs in an empty slot for improved appearance

- Installing a blank module in an empty slot of a base module or a slot reserved for future use improves appearance and prevents collection of dust on the base module and other modules.

Input Simulator Switch

S9307UF

Handy tool for program debugging

- This is a simulator switch for 32-point input terminals compatible with F3XD32-□F, F3XD64-□F and F3WD64-□□.

* Only one switch can be installed on a module.

Cables for Programming Tools

KM13-1S

Connects directly to USB port on PC

- Cable for connecting programming port of sequence CPU (F3SP22) to USB port of PC.

* Download the latest driver software from FA-M3's website for free!

Fiber-optic Cables

KM60 / KM61 / KM62 / KM65/ KM69

Cables for connecting fiber-optic FA bus modules (for F3LR0□)

Fiber-optic cords for wiring inside panel enclosure	Fiber-optic cables for indoor wiring	Fiber-optic cables for outdoor wiring
KM60-S06 (0.6m) KM60-001 (1m) KM60-003 (3m)	Optical connectors requiring bonding & grinding KM61-010 (10m) KM61-100 (100m) Optical connectors requiring crimping & cutting KM65-001 (1m) KM65-010 (10m) KM65-003 (3m) KM65-020 (20m) KM65-005 (5m)	KM62-100 (100m) KM69-□□□ flame-retardant cable(equivalent of VW-1)

Performance Specifications/Ladder Sequence Devices

Item			Specifications		
			F3SP22-0S	F3SP71-4S	F3SP76-7S
Performance Specifications	Control method		Repeating operation (by stored program)		
	I/O control method		Refresh method / Direct I/O command		
	Programming language		Structured-ladder language, object ladder language, mnemonic language		
	No. of I/O points		Max. 4,096 points		Max. 8,192 points (including remote I/O)
	Program size(ROM resident allowed)		Max. 10K steps	Max. 60K steps	Max. 260K steps
	No. of program blocks		Max. 1,024	Max. 1,024 (program blocks & macro instructions combined: max.1,280)	
	No. of instructions	Basic	37 types	40 types	
		Application	324 types	445 types	
	Instruction execution time	Basic	0.045 to 0.18μs/instruction	0.00375μs/instruction or longer	
		Application	0.18μs/instruction or longer	0.0075μs/instruction or longer	
	Monitored scan time		10 to 200ms (configurable in units of 1ms)		
	Power-on or power recovery after power failure		Auto start, auto restart (automatic logging of power ON/OFF and momentary power failure events)		
	Other functions		- Sensor control function (scan time 200μs to 25ms) - Configuration (device capacities, data lock-up range at power failure, error-time output, etc.) - Constant scan (1 to 190ms, settable on 0.1ms basis) - Debug function (forced set/reset, online edit etc.) - Error log (64 items), user log - Date/clock function (year/month/date/ hour/minute/second/day) - Program protection - Writing program/data to ROM - Sampling trace function - Personal computer link function (transmission rate 115Kbps)	- Sensor control function (scan time 100μs to 25ms) - Configuration (device capacities, error-time output, etc.) - Constant scan (0.1 to 190ms, settable on 0.1ms basis) - Debug function (forced set/reset, online edit etc.) - Error log, user log - Operation log - Date/clock function (year/month/date/hour/minute/second/day) - Personal computer link (Ethernet port only) - Program protection - CPU properties (transmission settings, etc.) - Constant definition - Smart access - Card batch file - Card boot - RAM disk - Built-in Ethernet - TCP/IP, UDP/IP socket communications - FTP client & server - Network filter - Function removal - User LED - Advanced sampling trace - User authentication - User operation permissions - CPU operation permissions - Modbus TCP slave (server)	
Ladder sequence device	Intput relay	X	4,096 points		8,192 points
	Output relay	Y			
	Internal relay	I	16,384 points		65,535 points
	Shared relay	E	2,048 points		
	Extended shared relay		2,048 points		
	Link relay	L	8,192 points		16,384 points
	Special relay	M	9,984 points		
	Timer	100μs timer *1	T	2,048 points	3,072 points
		1ms, 10ms, 100ms timer			
	Continuous	100ms timer			
	Counter		C		
	Data register		D	16,384 points	65,535 points
	File register	latched	B	32,768 points	262,144 points
	Link register		W	8,192 points	16,384 points
	Special register		Z	1,024 points	
	Index register		V	256 points	
	Shared register		R	1,024 points	
	Extended shared register			3,072 points	
	Cache register		F	–	131,072 points	524,288 points
	Label		–	1,024	
	Interrupt handler routine		–	4	
	Constant	Decimal	–	for 16-bit instruction: -32,768 to 32,767 for 32-bit instruction: -2,147,483,648 to 2,147,483,647	Same as specifications on left, plus for 64-bit instruction: -9,223,372,036,854,775,808 to 9,223,372,036,854,775,807
		Hexadecimal	–	for 16-bit instruction: $0 to $FFFF for 32-bit instruction: $0 to $FFFFFFFF	Same as specifications on left, plus for 64-bit instruction: $0 to $FFFFFFFFFFFFFFFF
		String	–	16-bit instruction e.g. "AB" 32-bit instruction e.g. "ABCD"	Same as specifications on left, plus Constant definition (max. 255 char.)
		Binary	–	–	Constant definition (256 contiguous bytes max.)
		IEEE single precision floating-point	–	32-bit instruction e.g. 1.23, -3.21 approx. -3.4x10³⁸ to 3.4x10³⁸	Same as specifications on left, plus Constant definition
		IEEE double precision floating-point	–	–	64-bit instruction e.g. 1.23, -3.21 approx. -1.79x10³⁰⁸ to +1.79x10³⁰⁸ Constant definition
		Constant index	–	0 to 2,047	

*1: Up to 16 points configurable.

Common Specifications

Item		Specifications
Environment	Operating ambient temperature*1	0 to 55°C
	Operating ambient humidity	10 to 90%RH (no condensation allowed)
	Ambient storage temperature	-20 to 75°C
	Ambient storage humidity	10 to 90%RH (no condensation allowed)
	Operating atmosphere	No corrosive gas, no excessive amount of dust
	Grounding	AC Power supply module : Protective earth (Comply with the regulation of each country.) DC Power supply module : Functional earth
	Noise immunity	Noise voltage 1,500Vp-p, measured by noise simulator with noise width of 1μs, rise time of 1ns and repeating frequency of 25 to 60Hz
	Vibration strength	Conforms to JIS C60068-2-6, frequency 10 to 57Hz, amplitude 0.075mm Frequency 57 to 150Hz, acceleration 9.8m/s^2 Swept 10 times in each X, Y and Z direction
	Mechanical shock resistance	Conforms to JIS C60068-2-27, 147m/s^2, 3 times in each of three directions (98m/s^2 when mounted on DIN rail)
Structure/ Appearance	Structure	Built into panel
	Altitude of installation	Max. of 2000 m above sea level
	Cooling method	Natural cooling
	Mounting method	Direct (with 4 or 5 screws (M4, 12mm)), DIN rail (except for F3BU16-0N)
	Paint color	Light cobalt blue: Munsell 6.2 PB4.6/8.8 or equivalent, lamp black: Munsell 0.8 Y2.5/0.4 or equivalent
	Weight	Approx. 2.4kg when 13-slot base module is fully occupied with contact modules

*1: Some FA-M3 modules may have a narrower surrounding temperature range than 0-55℃. A system incorporating such modules must be used within the narrower surrounding temperature range for such modules.

Power Supply Specifications

Item	Specifications					
	F3PU10-0S	F3PU20-0S	F3PU30-0S	F3PU16-0S	F3PU26-0S	F3PU36-0S
Supply voltage range	100to240V AC, single phase 50/60 Hz			24V DC		
Range of supply voltage change	85to264V AC 50/60Hz±3Hz			15.6to31.2V DC		
Power consumption	35VA	85VA	100VA	15.4W	33.1W	46.2W
Insulation resistance	5MΩ min. when tested between a group of external AC terminals and the FG terminal using a 500VDC insulation resistance tester			5MΩ min. when tested across a group of external DC terminals and the FG terminal using a 500VDC insulation resistance tester		
Withstanding voltage	1500V AC for one minute between a group of external AC terminals and the FG terminal			1500V AC for one minute between a group of external DC terminals and the FG terminal		
FAIL-signal contact output	Located on the front terminal block of power supply module; contact ratings: 24V DC, 0.3 A (Equipped with both normally-open and normally-closed terminals)					
Leakage current	3.5mA max.			———		
Allowable momentary power failure time	20ms					

Software

Category	Name	Type Name	Specifications
Development tool	FA-M3 Programming Tool WideField3 *1	SF630-MCW	Windows 7/ 8/ 8.1/ 10 (x86/x64) compatible, multi-lingual version, LiveLogicAnalyzer function*4, CD-ROM
Simulation	FA-M3 Simulation Software Virtual-M3	SF681-MDW	Windows 7/ 8/ 8.1/ 10 (x86/x64) compatible, multi-lingual version, Web download
Package	WideField3 Simulation Package	SF631-MCW	Packaged product composed of FA-M3 Programming Tool WideField3 (SF630-MCW) and FA-M3 Simulation Software Virtual-M3 (SF681-MDW)
Configuration tool	ToolBox for Temperature Control and Monitoring Modules *2	SF661-MCW	Windows 7/ 8/ 8.1/ 10 (x86/x64) compatible, multi-lingual version, CD-ROM (for F3CU04 and F3CX04)
	ToolBox for Positioning Modules *3 (for F3NC3□)	SF662-MCW	Windows 7/ 8/ 8.1/ 10 (x86/x64) compatible, multi-lingual version, CD-ROM (for F3NC3□)
	ToolBox for Positioning Modules (for F3YP2□)	SF663-MCW	Windows 7/ 8/ 8.1/ 10 (x86/x64) compatible, multi-lingual version, CD-ROM (for F3YP2□)
	FA-M3 Configurations Tool for EtherNet/IP Interface Modules	SF673-MDW	Windows7/10 compatible, multi-lingual version, Web download (Free of charge)

*1: R2.01 and later versions are multi-lingual versions.
*2: R6.01 and later versions are multi-lingual versions.
*3: R4.01 and later versions are multi-lingual versions.
*4: For F3SP71-4S/F3SP76-7S Only

Hardware List

Category	Name	Type name	Specifications	
Base	Base module *1	F3BU04-0N	For power supply (F3PU10/F3PU16) + 4 slots (CPU+I/O)	
		F3BU05-0D	For power supply (F3PU20/F3PU30/F3PU26/F3PU36) + 5 slots (CPU+I/O)	
		F3BU06-0N	For power supply (F3PU10/F3PU16) + 6 slots (CPU+I/O)	
		F3BU09-0N	For power supply (F3PU20/F3PU30/F3PU26/F3PU36) + 9 slots (CPU+I/O)	
		F3BU13-0N	For power supply (F3PU20/F3PU30/F3PU26/F3PU36) + 13 slots (CPU+I/O)	
		F3BU16-0N *4	For power supply (F3PU20/F3PU30/F3PU26/F3PU36) + 16 slots (CPU+I/O)	
Power supply	Power supply module	F3PU10-0S	100 to 240V AC, 5V DC/2.0A rated output (for 4 and 6 slots, M4 screws)	
		F3PU20-0S	100 to 240V AC, 5V DC/4.3A rated output (for 5, 9,13 and 16 slots, M4 screws)	
		F3PU30-0S	100 to 240V AC, 5V DC/6.0A rated output (for 5, 9,13 and 16 slots, M4 screws)	
		F3PU16-0S	24V DC, 5V DC/2.0A rated output (for 4 and 6 slots, M4 screws)	
		F3PU26-0S	24V DC, 5V DC/4.3A rated output (for 5, 9, 13 and 16 slots, M4 screws)	
		F3PU36-0S	24V DC, 5V DC/6.0A rated output (for 5, 9, 13 and 16 slots, M4 screws)	
CPU	Sequence CPU module	F3SP22-0S	Ladder 10K steps, basic instruction 0.045μs or longer, with memory	
		F3SP71-4S *8	Ladder 60K steps, basic instruction 0.00375μs or longer, with network and Modbus/TCP slave (server) functions (USB2.0, Ethernet)	
		F3SP76-7S *8	Ladder 260K steps, basic instruction 0.00375μs or longer, with network and Modbus/TCP slave (server) functions (USB2.0, Ethernet)	
Memory	ROM pack	RK33-0N	Ladder 56K steps (for F3SP22)	
		RK73-0N	Ladder 120K steps (for F3SP22)	
Digital I/O	Input module	F3XA08-1N	100-120V AC, 8 points	Terminal block
		F3XA08-2N	200-240V AC, 8 points	Terminal block
		F3XA16-1N	100-120V AC, 16 points	Terminal block
		F3XH04-3N	High-speed input with pulse catch function, 24V DC, 4 points	Terminal block
		F3XC08-0N	No-voltage contact input, 8 points	Terminal block
		F3XC08-0C	No-voltage contact input, 8 points, separate commons	Terminal block
		F3XD08-6F	DC input, 12-24V DC, 8 points	Terminal block
		F3XD16-3F	DC input, 24V DC, 16 points	Terminal block
		F3XD16-4F	DC input, 12V DC, 16 points	Terminal block
		F3XD16-3H	DC input, positive common, 24V DC, 16 points (high-speed input)	Terminal block
		F3XD32-3F	DC input, 24V DC, 32 points	Connector *2
		F3XD32-4F	DC input, 12V DC, 32 points	Connector *2
		F3XD32-5F	TTL input, 5V DC, 32 points	Connector *2
		F3XD64-3F	DC input, 24V DC, 64 points	Connector *2
		F3XD64-4F	DC input, 12V DC, 64 points	Connector *2
		F3XD64-6M	DC input, 12 to 24V DC, 64 points (8x8)	Connector *2
	Pulse input module	F3XS04-3N	Ring-up counter, 0 to 20kHz, 24V DC input, 16-bit channel x 4	Terminal block
		F3XS04-4N	Ring-up counter, 0 to 20kHz, 12V DC input, 16-bit channel x 4	Terminal block
	Output module	F3YA08-2N	Triac output (100 to 240V AC), 1 A, 8 points	Terminal block
		F3YC08-0C *7	Relay output (5 to 24V DC, 100 to 240V AC), 2A, isolated commons, 8 points	Terminal block
		F3YC08-0N *7	Relay output (5 to 24V DC, 100 to 240V AC), 2A, 8 points	Terminal block
		F3YC16-0N *7	Relay output (5 to 24V DC, 100 to 240V AC), 2A, 16 points	Terminal block
		F3YD04-7N	TR output, 24V DC, 2A, isolated commons, 4 points	Terminal block
		F3YD08-6A	TR sink output, 12 to 24V DC, 1A, 8 points	Terminal block
		F3YD08-6B	TR source output, 12 to 24V DC, 1A, 8 points	Terminal block
		F3YD08-7A	TR sink output, 12 to 24V DC, 2A, 8 points	Terminal block

Category	Name	Type name	Specifications	
Digital I/O	Output module	F3YD14-5A	TR sink output, 12 to 24V DC, 0.5A, 14 points	Terminal block
		F3YD14-5B	TR source output, 12 to 24V DC, 0.5A, 14 points	Terminal block
		F3YD32-1H	High speed TR sink output, 12 to 24V DC, 0.1A, 32 points, with output short-circuit protection	Connector *2
		F3YD32-1P	TR sink output, 12 to 24V DC, 0.1A, 32 points, with output short-circuit protection	Connector *2
		F3YD32-1R	TR source output, 12 to 24V DC, 0.1A, 32 points, with output short-circuit protection	Connector *2
		F3YD32-1T	TTL output, 5V DC, 16mA, 32 points	Connector *2
		F3YD64-1M	TR output, matrix scan, 12 to 24V DC, 64 points (8x8)	Connector *2
		F3YD64-1P	TR sink output, 12 to 24V DC, 0.1A, 64 points, with output short-circuit protection	Connector *2
		F3YD64-1R	TR source output, 12 to 24V DC, 0.1A, 64 points, with output short-circuit protection	Connector *2
	I/O module	F3WD64-3P	DC Input, TR sink output, 0.1A, 24V DC, 32 points each, with output short-circuit protection	Connector *2
		F3WD64-4P	DC Input, TR sink output, 0.1A, 12V DC, 32 points each, with output short-circuit protection	Connector *2
Analog I/O	Analog input module	F3AD04-5V	0 to 5V DC,1 to 5V DC,-10 to 10V DC,0 to 10V DC, 4 points,12bitA/D Sampling period 1ms	Terminal block
		F3AD04-5R	0 to 5V DC,1 to 5V DC,-10 to 10V DC,0 to 10V DC,Input 4 points,16bitA/D, Sampling period 50μs	Terminal block
		F3AD08-5V	0 to 5V DC,1 to 5V DC,-10 to 10V DC,0 to 10V DC, 8 points,12bitA/D, Sampling period 1ms	Terminal block
		F3AD08-4W	0 to 20mA,4 to 20mA, 8 points,12bitA/D, Sampling period 1ms	Terminal block
		F3AD08-4R	0 to 20mA,4 to 20mA input, 8 points, 16-bit high-res. ADC, sampling at 50μs/point	Terminal block
		F3AD08-5R	0 to 5V,0 to 10V,1 to 5V,-10 to 10V DC input, 8 points, 16-bit high res. ADC, sampling at 50μs/point	Terminal block
		F3AD08-6R	0 to 5V,1 to 5V,-10 to 10V DC,0 to 20mA,4 to 20mA input, 8 points, 16-bit high res. ADC, sampling at 50μs/point	Terminal block
	Analog output module	F3DA04-6R	-10 to 10V, 0 to 10V, 0 to 5V, 1 to 5V, 4 to 20mA, 0 to 20mA and -20 to 20mA DC output, 4 points, 16-bit high-res. DAC	Terminal block
		F3DA08-5R	-10 to 10V, 0 to 10V, 0 to 5V, 1 to 5V DC output, 8 points, 16-bit high-res. DAC	Terminal block
Temperature	Temperature control and PID module	F3CU04-0S	4 universal inputs (TC, RTD or voltage), 100ms for 2 channels or 200ms for 4 channels	Terminal block
		F3CU04-1S	4 to 20mA continuous output in addition to the functions of F3CU04-0N	Terminal block
	Temperature monitoring module	F3CX04-0N	4 universal inputs (TC, RTD or voltage)	Terminal block
Data acquisition	High-speed data acquisition module	F3HA06-1R	-10 to 10V, 0 to 10V, 1 to 5V, -5V to 5V, -2.5 to 2.5V, input 6 points, 5μs, data buffer 2M words	Terminal block
		F3HA12-1R	-10 to 10V, 0 to 10V, 1 to 5V, -5V to 5V, -2.5 to 2.5V, input12 points, 5μs, data buffer 2M words	Terminal block
Communications	Ethernet interface module	F3LE01-1T	10Mbps, 10BASE-T, with higher-level link and event transmission functions	Connector
		F3LE11-1T	10/100Mbps, 10BASE-T/100BASE-TX , with E-mail function	Connector
		F3LE12-1T	10/100Mbps, 10BASE-T/100BASE-TX, with higher-level link, (UDP/IP)messaging function	Connector
	NX Interface module	F3NX01-2N	10/100Mbps, 10BASE-T/100BASE-TX, with Autonomous Distribution*3 protocol	Connector
	EtherNet/IP Interface Module	F3LN01-0N	10/100Mbps,10BASE-T/100BASE-TX,EtherNet/IP scanner/adapter	Connector
	FL-net interface module	F3LX02-2N *5	10/100Mbps, 10BASE-T/100BASE-TX , FL-net (OPCN-2) protocol Ver. 2.00	Connector
	DeviceNet interface module	F3LD01-0N	500kbps max., DeviceNet port x 1, with master/scanner function	Connector
	CAN2.0B Interface Module	F3LD21-0N	CAN2.0B Protcol ,1Mbps max, 1chanel	Connector
	Modbus Interface Module	F3LC31-2F	Modbus RTU/ASCII, 115.2kbps max,1port	Terminal block
	GP-IB communications module	F3GB01-0N	GP-IB port x 1	Connector
	Personal computer link module	F3LC11-1F	115.2kbps max., RS-232-C port x 1, with modem interface function	Connector
		F3LC11-2F	115.2kbps max., RS-422/RS-485 port x 1	Terminal block
		F3LC12-1F	115.2kbps max., RS-232-C port x 2, with modem interface function	Connector
	Ladder communications module	F3RZ81-0F	115.2kbps max., RS-232C port x 1	Connector
		F3RZ82-0F	115.2kbps max., RS-232C port x 2	Connector
		F3RZ91-0F	115.2kbps max., RS-422/RS-485 port x 1	Terminal block
	UT link module	F3LC51-2N	RS-422 / RS-485 port x 1, allows easy connection of digital indicating controller	Terminal block
	FA link H2 module	F3LP32-0N*10	32 stations max., total transmission distance 1km, 1.25Mbps max.	Terminal block

Category	Name	Type name	Specifications	
Remote I/O	YHLS master module	F3LH01-1N	12Mbps max., YHLS port x 1	Terminal block
		F3LH02-1N	10/100Mbps,10BASE-T/100BASE-TX,EtherNet/IP scanner/adapter	Connector
	Fiber-optic FA-bus module	F3LR01-0N	7 stations max., total transmission distance 200m, 10Mbps max.	Connector
	Fiber-optic FA-bus Type 2 module	F3LR02-0N	32 stations max., total transmission distance 1.4km, max. distance betw. stations 500m*9, 10Mbps max.	Connector
	FA-bus Type 2 module	F3LR02-1W	7 stations max., max. transmission distance: 70m for daisy-chain configuration and 80m for loop configuration, max. distance between stations 10m, 10Mbps max., wired	Terminal block
Counter/ positioning	High-speed counter module	F3XP01-0H	Up/down counter, phase difference, pulse + direction, addition/subtraction, 400kpps (for x4), 32-bit channel x 1	Connector *2
		F3XP02-0H	Up/down counter, phase difference, pulse + direction, addition/subtraction, 400kpps (for x4), 32-bit channel x 2	Connector *2
	Positioning module (with multi-channel pulse output)	F3YP22-0P	2-axis control, 7,996kpps max. for servo/DD/Linear motor control, 1,999kpps. for stepping motor control	Connector
		F3YP24-0P	4-axis control, 7,996kpps max. for servo/DD/Linear motor control, 1,999kpps. for stepping motor control	Connector
		F3YP28-0P	8-axis control, 7,996kpps max. for servo/DD/Linear motor control, 1,999kpps. for stepping motor control	Connector
	Positioning module (with pulse output)	F3NC32-0N	2-axis control, 5Mpps max. pulse output, PTP and linear/circular interpolation, direct/pattern operation, counter for ABS encoder input (2ch)	Connector *2
		F3NC34-0N	4-axis control, 5Mpps max. pulse output, PTP and linear/circular/helical interpolation, direct/pattern operation, counter for ABS encoder input (4ch)	Connector *2
	Positioning module (with analog voltage output)	F3NC51-0N	1-axis control with speed reference voltage output type	Connector *2
		F3NC52-0N	2-axis control with speed reference voltage output type	Connector *2
	Positioning module (with MECHATROLINK-II interface)	F3NC96-0N	15-axis control with MECHATROLINK-II *6 interface	Connector
	Positioning module (with MECHATROLINK-III interface)	F3NC97-0N	15-axis control with MECHATROLINK-III *6 interface	Connector

*1: The rail mount kit must be purchased separately.
*2: Connector for external connection and connector cover must be purchased separately.
*3: Autonomous Distribution® is a registered trademark of Hitachi, Ltd.
*4: This unit cannot be used with the rail mount kit.
*5: F3LX02-1N is not compatible with F3LX01-0N. Contact Yokogawa sales office for F3LX01-0N.
*6: MECHTROLINK is a trademark of the MECHATROLINK Members Association.
*7: Relays of relay output modules are not of hermetically sealed type so their service life may be affected by dust or corrosive gases. When switched on/off in an atmosphere containing silicone gases from silicone-based materials, these relays may suffer from poor electrical contact due to SiO2 (silicon dioxide) deposits, especially under load conditions below 24V DC and 500mA for which transistor output or other modules employing semiconductor elements are recommended.
*8: Unlike the older F3SP7□-□N models, F3SP7□-□S models have no special restriction on the number of CPU modules for specific CPU module combinations in a multi-CPU configuration and are compatible with the FA Link H module (F3LP02-0N).
*9: It is necessary to confirm with Sumitomo Electric Industries,Ltd about the production of cables that are compliant with the module specifications. The maximum distance between stations 500m is the specification when using KM67 (discontinued product).
*10: Only F3LP32-0N modules can be connected with each other. F3LP32-0N modules cannot be connected to F3LP01-0N or F3LP02-0N modules.
(Note) For coating treatment, contact Yokogawa's sales office.

Peripheral Devices

Category	Name	Type name	Specifications
Peripheral Devices	CPU port / D-sub 9-pin conversion cable	KM10-0C	D-sub 9-pin, female, cable length approx. 0.5m (for F3SP22-0S)
	Cable for programming tool *1	KM11-2T	DOS/V compatible, cable length approx. 3m
		KM13-1S	USB 1.1 compliant USB-serial converter, cable length approx. 3m
	Monitor cables	KM21-2A *2	CPU port / D-sub 25-pin, male, cable length 3 m (for F3SP22-0S)
		KM21-2B *2	CPU port / D-sub 9-pin, female, cable length 3 m (for F3SP22-0S)
	Cable for fiber-optic FA-bus (for use inside panel)	KM60-S06	For use inside panel, cable length approx. 0.6m
		KM60-001	For use inside panel, cable length approx. 1m
		KM60-003	For use inside panel, cable length approx. 3m
	Cable for fiber-optic FA-bus (for indoor use)	KM61-□□□	For indoor use
		KM65-□□□	For indoor use
	Cable for fiber-optic FA-bus (for outdoor use)	KM62-□□□	For outdoor use
		KM69-□□□	Flame-retardant cable(equivalent of VW-1), For outdoor use
	YHLS slave units (TAH series)	TAHWD32-3PAM	16 DC inputs (positive common), 24V DC, MIL, 16 TR outputs (sink-type, with short-circuit protection), 24V DC 0.1A, MIL
		TAHWD32-3NBM	16 DC inputs (negative common), 24V DC, MIL, 16 TR outputs (source-type, with short-circuit protection), 24V DC 0.1A, MIL
		TAHXD16-3PEM	16 DC inputs (positive common), 24V DC, MIL
		TAHXD16-3NEM	16 DC inputs (negative common), 24V DC, MIL
		TAHYD16-3EAM	16 TR outputs (sink-type, with short-circuit protection), 24V DC 0.1A, MIL
		TAHYD16-3EBM	16 TR outputs (source-type, with short-circuit protection), 24V DC 0.1A, MIL
	YHLS communication cables	KM80-□□□	Flame-retardant cable(equivalent of VW-1), YHLS fixed cable
		KM81-□□□	Flame-retardant cable(equivalent of VW-1), YHLS flexible cable
	Terminal block unit	TA40-0N	Converts 40 point I/O connector to European type terminal block.
	Conector terminal block	TA50-0N	Connector terminal block (40 points), M3.5 screw
		TA50-2N	Connector terminal block (40 points), M3 screw
	Cable for conector terminal block	KM55-□□□	Cable between module and terminal block, length from 0.5m (-005) to 3m (-030) in 0.5m increments
	Blank module	F3BL00-0N	For empty I/O slots
	Input simulator switch	S9307UF	Simulator switch for input terminals (for F3XD32-□F, F3XD64-□F, F3WD64-□□)

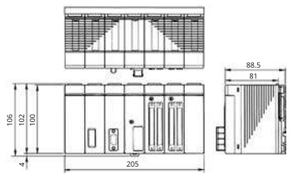
*1: These cables for programming tools cannot be used with F3SP71 and F3SP76 CPU modules.
*2: The cable is to be connected to the programming tool port located on the front panel of F3SP22 for higher-level linkservice (personal computer link functions).
It is not to be used for online connection to FA-M3 programming tool WideField3.

External Dimensions

Unit: mm

Base module	Number of slots	Number of I/O slots*	Total width
F3BU04	4	3	147
F3BU05	5	4	205
F3BU06	6	5	205
F3BU09	9	8	322
F3BU13	13	12	439
F3BU16	16	15	527

* The number of available I/O slots is indicated assuming that one CPU module is installed.



Manuals

Name	Document No.
Hardware Manual	IM 34M06C11-01E
USB-Serial Converter	IM 34M06C91-01E
High-speed Data Acquisition Module (F3HA06-1R, F3HA12-1R)	IM 34M06G02-02E
Analog Input Modules	IM 34M06H11-02E
Analog Output Modules (F3DA04-6R, F3DA08-5R)	IM 34M06H11-03E
Ladder Communication Modules (for F3RZ81-0F, F3RZ82-0F, F3RZ91-0F)	IM 34M06H22-02E
Ethernet Interface Module(F3LE01-1T)	IM 34M06H24-06E
Ethernet Interface Module(F3LE11-1T)	IM 34M06H24-07E
Ethernet Interface Module(F3LE12-1T)	IM 34M06H24-08E
UT Link Module	IM 34M06H25-01E
DeviceNet Interface Module	IM 34M06H28-01E
NX Interface Module (F3NX01-2N)	IM 34M06H29-02E
FL-net (OPCN-2) Interface Module	IM 34M06H32-03E
EtherNet/IP Interface Module	IM 34M06H36-01E
CAN2.0B Interface Module	IM 34M06H37-01E
Personal Computer Link Modules	IM 34M06H41-02E
Modbus Interface Module	IM 34M06H42-01E
FA-Link H2 Module and Fiber-optic FA-Link H Module	IM 34M06H43-02E
Fiber-optic FA-bus Module and Fiber-optic FA-bus Type 2 Module	IM 34M06H45-01E
YHLS Slave Units (TAH Series)	IM 34M06H46-03E
YHLS Master Module (F3LH01-1N, F3LH02-1N)	IM 34M06H46-04E
High-speed Counter Modules	IM 34M06H53-01E
Pulse Input Module	IM 34M06H54-01E
Positioning Modules (with Multi-channel Pulse Output) (F3YP22-0P, F3YP24-0P,F3YP28-0P)	IM 34M06H55-04E
Positioning Modules (with Pulse Output)	IM 34M06H56-02E
Positioning Modules (with Analog Voltage Output)	IM 34M06H58-01E
Positioning Modules (with MECHATROLINK-II Interface)	IM 34M06H60-02E
Positioning Modules (with MECHATROLINK-III Interface)	IM 34M06H60-03E
Temperature Control and PID Module (F3CU04-0S, F3CU04-1S)	IM 34M06H62-02E
Temperature Monitoring Module	IM 34M06H63-01E
Sequence CPU – Instructions	IM 34M06P12-03E
Sequence CPU – Functions (for F3SP22-0S, F3SP28-3N/3S, F3SP38-6N/6S, F3SP53-4H/4S, F3SP58-6H/6S and F3SP59-7S)	IM 34M06P13-01E
Sequence CPU – Functions (for F3SP71-4N/4S, F3SP76-7N/7S)	IM 34M06P15-01E
Sequence CPU – Network Functions (for F3SP71-4N/4S, F3SP76-7N/7S)	IM 34M06P15-02E
Sequence CPU – Modbus /TCP Slave Functions	IM 34M06P15-03E
Personal Computer Link Commands	IM 34M06P41-01E
FA-M3 Programming Tool WideField3 (Introduction and troubleshooting) *1	IM 34M06Q16-01E
FA-M3 Programming Tool WideField3 (Offline) *1	IM 34M06Q16-02E
FA-M3 Programming Tool WideField3 (Online) *1	IM 34M06Q16-03E
FA-M3 Programming Tool WideField3 (Script) *1	IM 34M06Q16-04E
FA-M3V Environment Tool Trace Function*1	IM 34M06Q50-21E
FA-M3 Simulation Software Virtual-M3	IM 34M06Q50-22E
FA-M3 ToolBox Manual *1	IM 34M06Q30-01E
FA-M3 ToolBox for Positioning Modules*1(for F3NC32-0N, F3NC34-0N)	IM 34M06Q31-01E
FA-M3 ToolBox for Positioning Modules*1(for F3YP22-0P, F3YP24-0P, F3YP28-0P)	IM 34M06Q31-03E
FA-M3 ToolBox for Temperature Control and Monitoring Modules *1	IM 34M06Q31-02E

*1: Supplied with the software package as PDF file. Paper documentation can be ordered separately if necessary.

FA-M3 Website

www.yokogawa.com/itc

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[Ed : 08/b] Printed in Japan, 907 (VC)

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