Fe Fuji Electric

Innovating Energy Technology

Fuji Integrated Controllers **MICREX−SX** Series
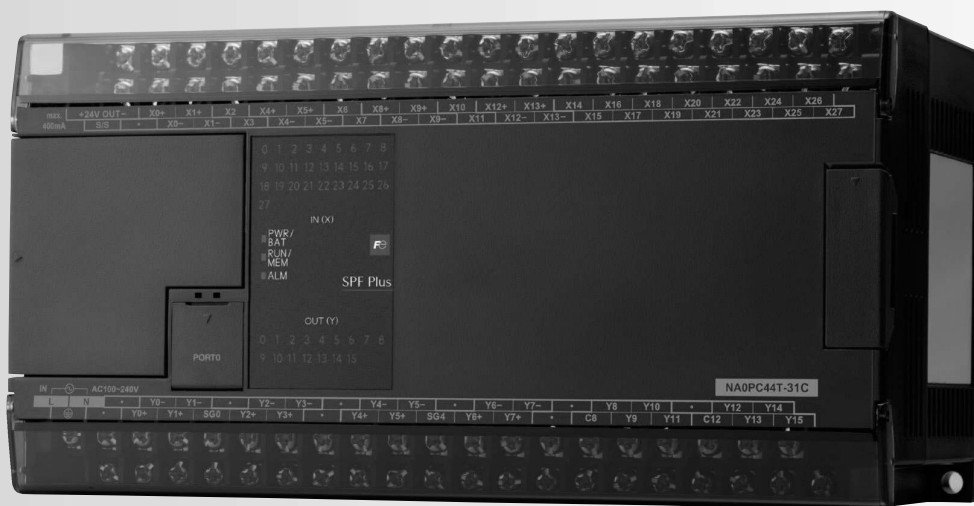
Programmable Controller SPF Plus

SPF Plus
for motion

Achieving Wide Variety of
Motion Controls with High Performance

High-Performance Compact Motion Controller that Flexibly Supports Variety of Machine Systems

NA0PC44T-31C

Fuji Integrated Controllers MICREX-SX Series

SPF Plus

POINT

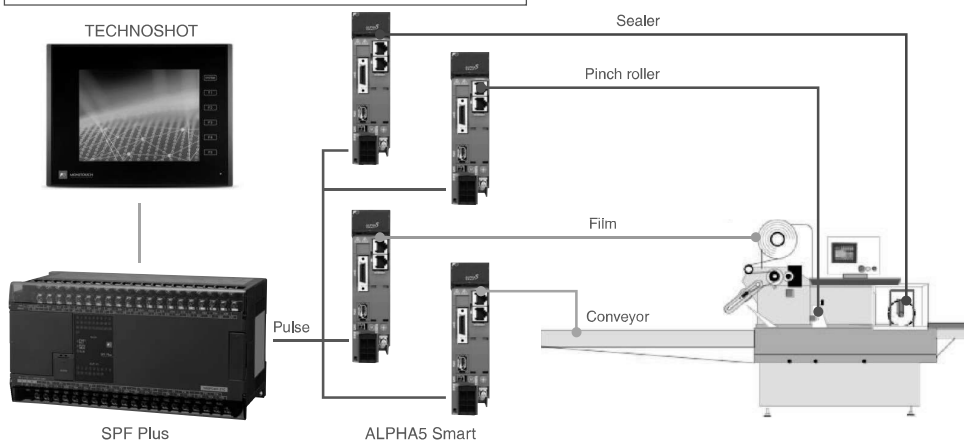## Covers high-computation motion control such as synchronous control and interpolation control
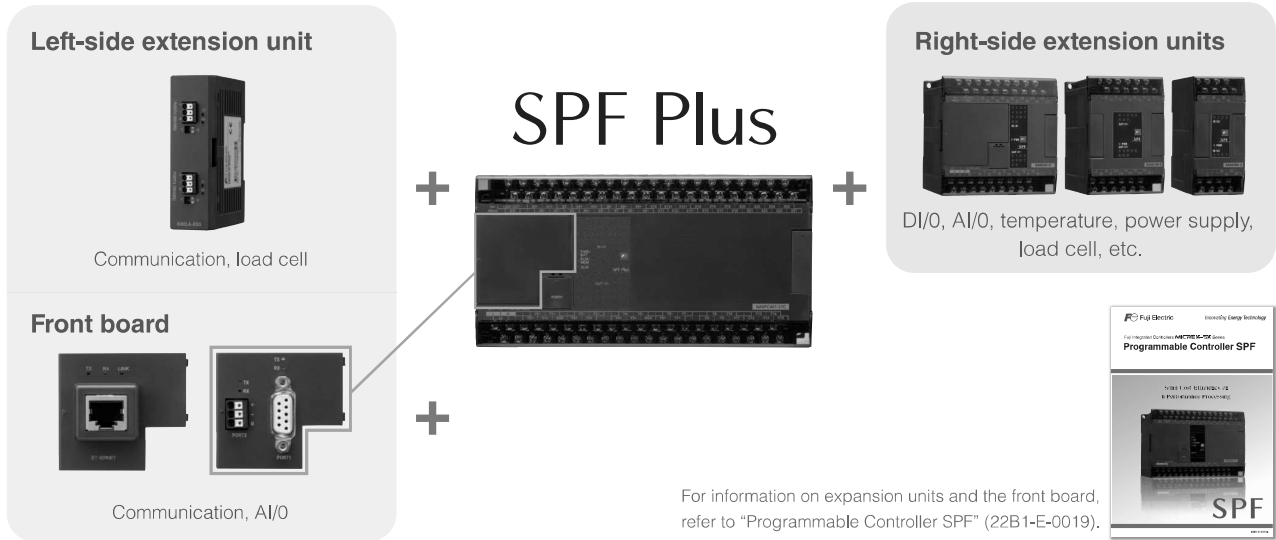
The furnishing of function blocks that can be utilized in various applications enables higher precise machine control.

Application example for a packaging machine

The film, conveyor, pinch roller and sealer operate synchronously with the operational pattern being automatically calculated from the length of the cut.

System Configuration

Left-side extension unit

Communication, load cell

Front board

Communication, AI/0

+

SPF Plus

+

Right-side extension units

DI/0, AI/0, temperature, power supply, load cell, etc.

+

Fuji Electric — *Innovating Energy Technology*
Fuji Integrated Controller MICREX-SX Series
Programmable Controller SPF

For information on expansion units and the front board, refer to "Programmable Controller SPF" (22B1-E-0019).

Type

Type	Power supply
NA0PC44T-34C	24V DC
NA0PC44T-31C	100-240V AC

I/O Specifications

	Rated Voltage	Input/Output type	Speed		Point
Input	5V DC	Differential input	Ultra-High-speed	500kHz*1	8 points
	24V DC	Source, sink common	Medium-speed	20kHz	8 points
			Low-speed	0.83kHz	12 points
Output	—	Differential output	Ultra-High-speed	500kHz*1	8 points
	12 to 24V DC	Sink output	Low-speed	—	8 points

*1 In A/B mode, maximum frequency becomes half.

Motion function block
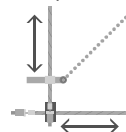
FB name	Function
VM00_VM	Virtual main axis
VM01_PTP	PTP positioning
VM02_INTP	2-axis linear interpolation 2-axis arc interpolation (radius) 2-axis arc interpolation (center point)
VM03_PSYNC	Ratio synchronization
VM04_RSYNC	Interval synchronization (rotation operation)
VM05_FSYNC	Interval synchronization (reciprocating operation)
VM06_CAM	Electronic cam operation
VM07_CAMPTN	Creation of cam pattern
VMP101_MARK	Mark detection
VMP102_PHADJ	Phase adjustment

Examples of controls using motion function blocks
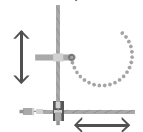
Interpolation control

Linear interpolation and circular arc interpolation are available. This consists of the mechanisms of 2 axes, with movement being made according to the movement method (linear, circular arc) determined for each mechanism, and operation taking place until the target position is finally obtained.

2-axis linear interpolation

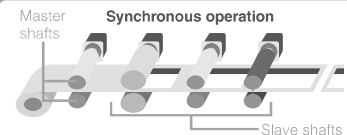Movement is made in a linear line shape synchronizing the 2 orthogonal axes.

2-axis circular arc interpolation

Movement is made in a circular arc shape synchronizing the 2 orthogonal axes.

Synchronous control

The other mechanisms (slaves) follow and move in accordance with the movement of the reference (master) mechanisms.

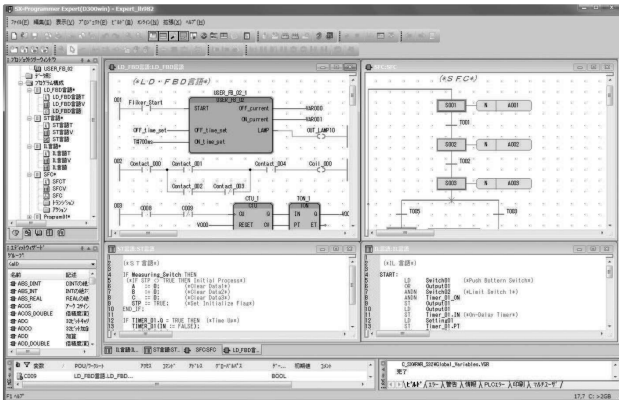**Synchronous operation**

Master shafts

Slave shafts

The slave shafts operate in conjunction with the movement of the master shafts.

Programming Environment

The programming support tool Expert is to further improve programming development efficiency.

This is a Windows-compatible programming support tool conforming to the IEC61131-3 International Standard.

SX Programmer Expert

Improvement in software development efficiency

Programming in units of POU or worksheets allows structured design method by dividing it by function and process. This method enables multiple designers to divide the program design among them so that a substantial reduction in the program creation time can be achieved.

Programming using the same techniques as those of microcomputers and personal computers

The ST language is similar to the C language with which programs can be created using the same techniques as those of microcomputers and personal computers for complex calculations that are hard to implement using the Ladder language. Programs and circuits that are frequently used can easily be reused by making them into FB (function blocks).

Writing in multiple languages

● This tool completely supports 5 types of program representations specified by the standards.

● It allows the programmer to combine multiple program representations appropriate for the control target.

Supported representations

IL (Instruction List)

LD (Ladder Diagram)

FBD (Function Block Diagram)

ST (Structured Text)

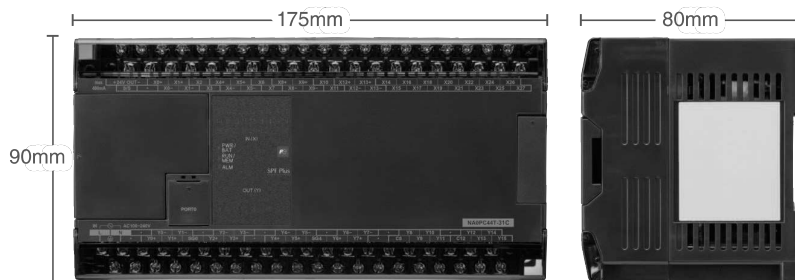SFC (Sequential Function Chart)

Excellent documentation function

● The documentation preparation function has been substantially improved. Not only can it print drawing numbers, dates, pages, and drawing borders, but also company logos and comments.

POD cooperation function

● This tool has implemented function module support and POD cooperation support functions as common support tools.

Note) The SPF Plus is not compatible with the programming support tool - "SX Programmer Standard".

Outline drawing

General specifications

Item		Specifications
Physical environment	Operating ambient temperature	0 to +55 °C
	Storage (transportation) temperature	-25 to +70 °C
	Relative humidity	20 to 95% RH (there should be no condensation) (5 to 95% RH during transport, there should be no condensation)
	Pollution degree	Pollution degree 2 [Note 1]
	Corrosion resistance	There should be no corrosive gas There should be no adhesion of organic solvents
	Usage altitude	Altitude of 2,000 m or less (air pressure 70kPa or higher during transport)
Mechanical operating conditions	Vibration resistance	Half amplitude: 0.15 mm, constant acceleration: 19.6 m/s^2 2 hours in each direction, total of 6 hours [Note 2] [Note 3]
	Shock resistance	Peak acceleration: 98 m/s^2 three times in each direction
Electrical operating conditions	Electrostatic discharge	±4 kV: contact discharge method ±8 kV: aerial discharge method
	Radioactive radiofrequency electromagnetic field	80 to 1,000MHz 10 V/m 1.4 to 2.0GHz 3 V/m, 2.0 to 2.7GHz 1 V/m
	EFT burst waves	Power lines, input/output signal lines (AC unshielded wire): ±2 kV Communication lines, input/output signal lines (excl. AC unshielded wire): ±1 kV
	Lightning surge	AC power supply: common mode ±2 kV, normal mode ±1 kV DC power supply: common mode ±0.5 kV, normal mode ±0.5 kV
	Radiofrequency electromagnetic field conduction interference	150kHz to 80MHz, 10 V
	Power frequency magnetic field	50Hz, 30A/m
Construction		Open equipment built into panel
Cooling system		Natural cooling

Note 1) Pollution degree 2 Normally, this is the state in which non-conductive pollution occurs. However, there are circumstances stipulated in which condensation may produce a state of temporary conductivity.
Note 2) This is a mounted state in which the unit is fixed to the control panel with fixing screws. Make sure that there are no vibrations or shocks during DIN rail mounting.
Note 3) Be sure to implement vibration countermeasures for environments in which there is repeated or continuous vibrations.

Power supply specifications

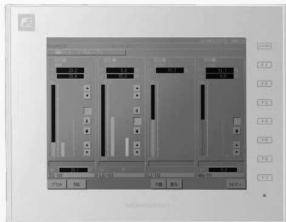| Item	NA0PC44T-31C (AC power supply type)	NA0PC44T-34C (DC power supply type)
Rated voltage	100 to 240 V AC	24 V DC
Permissible voltage range	85 to 264 V AC	20.4 to 28.8 V DC
Rated frequency	50/60Hz	–
Permissible frequency range	47 to 63Hz	–
Permissible momentary power failure time	20 ms or less	10 ms or less
Rated output voltage (service power supply 24 V DC output)	24 V DC ±10%	
Inrush current	20A at 264 V AC	20A at 24 V DC
Dielectric strength	1500 V DC, 1 minute	500 V DC, 1 minute
Insulation method	Insulation with transformer, photocoupler	
Insulation resistance	10MΩ or more with 500 V DC megger	

Specifications

Performance specifications

Item			Specifications: Base unit
Execution control method			Stored program, cyclic scan method (default task), periodic tasks, event tasks
Input/output connection method			Direct connection input/output method: Local bus
Direct connection input/output control method	Overall		Scan batch refresh method
	Digital input/output		Task synchronization refresh method
MPU			16-bit OS/execution processor (dual use)
Memory type			Program memory, data memory, temporary memory
Programming language <IEC61131-3 compliant>			IL language (Instruction List)
			ST language (Structured Text)
			LD language (Ladder Diagram)
			FBD language (Function Block Diagram)
			SFC element (Sequential Function Chart)
Instruction word length			Variable length (differs with instruction) 1 step = 32 bits
Instruction execution time			LD instruction 0.30 µs
Program memory capacity			20 Ksteps (1 step = 32 bits)
Input/output memory		Fixed	512 words
System memory		Fixed	512 words
Data memory capacity			40 Kwords
	High-speed standard memory	Fixed	4 Kwords
	Standard memory	Variable	4 Kwords
	Retain memory	Variable	4 Kwords
	User FB instance memory	Variable	8 Kwords
	User FB instance memory Initial value setting area	Variable	9 Kwords
	System FB instance memory	Variable	11 Kwords
	Timer	Variable	512 points (4 Kwords)
	Accumulating timer	Variable	0 points (0 Kwords)
	Counter	Variable	512 points (2 Kwords)
	Edge detection	Variable	2048 points (4 Kwords)
	Other	Variable	1 Kwords
ZIP file area			64 Kbyte
Data type			BOOL / INT / DINT / UNIT / UDINT / REAL / TIME / DT / DATE / TOD / WORD / DWORD
Number of tasks	Default task		1
	Fixed-cycle task		15 (total number of fixed cycles, events)
	Event task		
POU	Program		64 / default task 8 / interrupt task
	User FB		128
	User FCT		128
	Number of nested user FB/FCT calls		Total: 64 (User FB/FTC calls from program also included in nesting count.)
Diagnostic function			Program check, watchdog timer, etc.
Confidentiality function			Password
Calendar function			Yes
Backup	Program memory		Flash memory
	System definition		Flash memory
	ZIP file		Flash memory
	Data memory		Built-in battery: SRAM
	Calendar		Built-in battery: RTC
Built-in battery	Backup period		10 years or longer (at product ambient temperature of 55 °C), replacement not possible
Memory pack	External: Installation and removal possible		Backed up content: Programs : System definition : ZIP file : Data

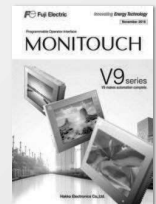# Motion System that Achieves its Best Performance in Combination with the SPF Plus

Programmable Display MONITOUCH

V9 Series

HMI Achieving Industry's Top Class Performance

• User-friendly operation supporting gestures
• Power of expression supported by 16.77 million color display and TrueType font
• Network functions supporting wireless LAN, VNC server, and VPN
• Comes equipped with USB (Ver. 2.0) port, Ethernet port, and SD card slot

Catalog No.: 9031NE4

TECHNOSHOT TS1000 Series

The programmable displays in the TECHNOSHOT series are easy-to-see, and have bright TFT color liquid crystal screens. A high-resolution display and high-speed response display give TECHNOSHOT panels a high power of expression.

Catalog No.: 9027E1

Servo System

ALPHA5 Smart

Fuji Servo System with Enhanced Ease-of-Use

◆ **High Performance**

High-speed, high precision positioning
• Frequency response 1500Hz
• Max motor speed 6000r/min
• High resolation encoder
  18bit ABS/INC 262.144 pulse
  20bit INC 1,048,576 pulse

◆ **High Value**

Higher cost performance with original main feature

◆ **High Usability**

New servo operator offers improved usability

Catalog No.: 24C1-E-0131

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⚠ Safety Precautions

- Before using this product, read the "Instruction Manual" and "User manual" carefully or consult with the retailer you purchased this product from and use this product correctly.
- The product described in this catalog has not been designed and produced to be used for equipment or systems which could endanger human life.
- The product described in this catalog must not be used for any application that requires a high degree of safety and has a large impact on life, the human body, community, important assets, or rights (e.g., for power stations, radiation-related facilities, railways, space/airline facilities, lifeline facilities, or medical equipment).
- Please make sure that the use of the products does not lead to a serious accident in the event that a failure or malfunction occurs in the products described in this catalog. And in cases of failure or malfunction, safety measures should be prepared using external devices in a systematic manner as standard operating conditions for the products.
- For safe use, this product must be connected by those with specialized skills (in electric work, wiring work, etc.).
- Use a power supply which is reinforced and isolated from an AC power supply for an external power supply to connect to DC I/O (such as 24 V DC power supply). (You are recommended to use a power supply that conforms to EN60950.) Otherwise, an accident or breakdown may result.

Before purchasing this product

- For the details, price, and installation fee of the products included in this catalog, contact the retailer or Fuji Electric Co., Ltd.
- Please note that for product improvement, the appearance and specifications may be subject to change without prior notice.
- Please note in advance that printed and actual colors may differ slightly.

● Appearance and specifications are subject to change without prior notice for the purpose of product improvement.

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