

General Specifications

GS 33P03K10-31E

Model LFS1500 Control Function for Basic Field Control Unit (for FIO, for Vnet/IP)
Model LFS1530 Application Capacity Expansion Package (for AFV10□)



■ GENERAL

Model LFS1500, Control Function for Basic Field Control Unit (for FIO, for Vnet/IP), is installed and runs in any of the following FCS models: AFV10S, AFV10D

Moreover, the number of the connectable node units and the application capacity can be expanded if LFS1530 Application Capacity Expansion Package (for AFV10□) is purchased in addition to control Function for Basic Field Control Unit.

■ FUNCTION SPECIFICATIONS

● Structure of Control Functions

The basic control functions are implemented as a two-level hierarchy, described below. Such a hierarchical model facilitates engineering and modification/addition of functions.

Function Blocks

These are the smallest elements used to perform control and calculation, and are at the bottom of the hierarchy.

Control Drawing

A control drawing represents the control instruments responsible for overall control of a small section of the plant, and typically contains several function blocks. A control drawing may be used to implement cascade control or combustion fuel/air ratio control, for example.

● Function Blocks

The function blocks are divided into regulatory and sequence control blocks, calculation blocks, faceplate blocks and unit instruments. These function blocks may be combined to configure a control drawing.

Regulatory Control Blocks

These function blocks are mainly used for feedback control.

Input Indicator Blocks: Input indicator, Input indicator with deviation alarm

Controller Blocks: PID controller, Sampling PI controller, PID controller with batch switch, Two-/Three-position ON/OFF controllers, Time-proportioning ON/OFF controller, PD controller with manual reset, Blending PI controller, Self-tuning PID controller

Manual Loader Blocks: Manual loader, Manual loader with input indicator, Manual loader with Auto/Man SW, Two-/Three-position motor control

Signal Setter Blocks: Ratio set, 13-zone program set, Flow-totalizing batch set, Weight-totalizing batch set

Signal Limiter Block: Velocity limiter

Signal Selector Blocks: Autoselector, Signal selector, Dual-redundant signal selector

Signal Distributor Blocks: Cascade signal distributor, Feedforward signal summing, Non-interference control output, Control signal splitter

Pulse Count Input Block: Pulse count input

YS Instrument Blocks: YS controller, YS programmable controller, YS programmable controller with pulse-width output, YS manual station with SV output, YS manual station with MV output lever, YS ratio set station, YS batch set station, YS blending controller, YS batch controller, YS totalizer

Sequence Blocks

These function blocks are mainly used for interlock and batch control sequences.

Sequence Table Blocks: Table type sequence

Sequence Table:

Total of 64 input and output signals and 32 rules

Rule extension table: Each one adds 32 rules to sequence table

Logic Chart Block: Interlock block diagram to describe the relationship between input and output signals with logical operators. It consists of 32 inputs, 32 outputs and 64 logical operators. The following logical operators are available: AND, OR, NOT, Set-/Reset-dominant flip-flop with 1 or 2 outputs, Wipeout, ON-/OFF-delay timers, One-shot, Comparator (>, ≥, =)

Switch Instrument Blocks: Mainly used to operate and monitor motors and valves.

1 input, 2 inputs, 1 output, 2 outputs, 1 input 1 output, 1 input 2 outputs, 2 inputs 1 output, 2 inputs 2 outputs, 1 input 2 one-shot outputs, 2 inputs 2 one-shot outputs

Sequence Element Blocks: Mainly used to generate input signals for sequence tables.

Sequence Elements 1: Timer, Software counter, Pulse train counter, Code input, Code output.

Sequence Elements 2: Relational expression, Resource scheduler, Representative alarms, Valve monitor

SFC Blocks: Describe sequences in SFC Graphical Language.

Three-position switch SFC, Pushbutton SFC, Analog SFC.

Foundation Fieldbus Faceplate Blocks: Fieldbus AI blocks, Fieldbus DI blocks, Fieldbus control selector blocks, Fieldbus PID blocks, Fieldbus ratio set blocks, Fieldbus AO blocks, Fieldbus DO blocks, Fieldbus split-range blocks, Fieldbus signal converter blocks, Fieldbus integrator blocks, Fieldbus input selector blocks, Fieldbus multi-DI blocks, Fieldbus multi-DO blocks, Fieldbus multi-AI blocks, Fieldbus multi-AO blocks, Fieldbus simplified universal blocks

Calculation Blocks

These function blocks are mainly used to perform calculation.

Arithmetic Calculation Blocks: Addition, Averaging, Multiplication, Division.

Analog Calculation Blocks: Square root, Exponential, First-order lag, Integration, Derivative, Ramp, Lead/lag, Dead-time, Dead-time compensation, Moving-average, Cumulative-average, Variable line-segment function, Temperature and pressure correction, ASTM correction: Old JIS, ASTM correction: New JIS

General-Purpose Calculation Blocks: General-purpose calculation, General-purpose calculation with string I/O

Logic Operation Blocks: AND, OR, NOT, Set-/Reset-dominant flip-flop with 1 or 2 outputs, Wipeout, ON-/OFF-delay timers, One-shot, Comparator (>, ≥, =), bitwise AND/OR/NOT.

Auxiliary Blocks: Three-pole three-position selector switch, One-pole nine-position selector switch, Selector switch for 16 data, Selector switch for 16 string data, Data set, Data set with input indicator, Inter-station Connection.

Batch Data Blocks: One-batch data set, One-batch string data set, Two-batch data set, Two-batch string data set, Batch data acquisition, Batch string data acquisition.

Faceplate Blocks

These faceplate blocks have a human-machine interface function that allows several function blocks to be represented by a single tag.

Analog Faceplate Blocks: Groups the control loops of a multi-block configuration as a single tag.

Dual-pointer indicating station: Indicates PVs and sets SVs.

Dual-pointer manual station: Sets SVs and manipulated output values.

Triple-pointer manual station: Indicates PVs and sets SVs and manipulated output values.

Sequence Faceplate Blocks: Used for push-button operation from the HIS, and display and operation of sequence processes as a human-machine interface for sequence control function.

Batch status indicator: Displays sequence processes and lamps of 3-push-button switch, uses for push-button operation.

Extended 5-push-button switch: Displays five lamps and uses for push-button operation.

Extended 10-push-button switch: Displays ten lamps and used for push-button operation.

Hybrid Faceplate Block: Has the functions of analog and sequence faceplate blocks.

Extended hybrid manual station: Has the functions of triple-pointer operating station and 5-push-button switch.

Enhanced MC/Switch Instrument Block

These blocks include enhanced versions of functions incorporated in normal ON/OFF controller blocks, motor control blocks, switch instrument blocks to facilitate migrating from a competitor's control systems, or to allow the control of DO blocks (on/off valve, etc.) in a fieldbus device from ON/OFF controller blocks, MC instruments, or switch instruments. In addition to functions in normal instruments, the following functions are added. Enhanced MC/Switch Instrument blocks are standard functions and need optional memory areas of 64 KB when they are used.

Foundation Fieldbus Faceplate Block Connectivity:

Enhanced function blocks in a field control station for FIO can connect DI and DO blocks in a fieldbus device via a faceplate block.

Individual Wiring: The open/close or open/close/stop signals for 2-position pulsive outputs, or 3-position (pulsive or status) inputs or outputs of a standard function block can only be connected to contiguous terminals on the same module. For an enhanced function block, however, these input and output signals can be independently connected to arbitrary terminals.

For migration from other company's control systems, enhanced ON/OFF controllers, enhanced motor control blocks, and enhanced switch instrument blocks can be connected without needing rewiring even though cards with open and close signals from different cards are connected.

Masking of Answerback Undefined Alarm (PERR):

Checking of the answerback undefined alarm (PERR) is overridden for a preset time after an open or close (or run or stop) action. Where a Foundation fieldbus faceplate block is connected, or where the answerback signals of a field device are input from different modules, the simultaneity of those answerback signals cannot be assured. In these cases, masking the PERR alarm check will prevent unnecessary alarms from occurring.

There are the following as Enhanced MC/switch instrument block.

Enhanced ON/OFF controller: Two-position enhanced ON/OFF controller, Three-position enhanced ON/OFF controller.

Enhanced motor control: Enhanced two-position motor control, Enhanced three-position motor control.

Enhanced switch instrument block: Enhanced 1 input, Enhanced 2 input, Enhanced 1 output, Enhanced 2 output, Enhanced 1 input 1 output, Enhanced 1 input 2 output, Enhanced 2 input 1 output, Enhanced 2 input 2 output, Enhanced 1 input 2 one-shot output, Enhanced 2 input 2 one-shot output.

● Unit Supervisory Function

The devices and instruments used to control a plant can be defined as a single unit for operation and control purposes.

Unit Instruments: analog, 5-push-button switch, 3-position-switch

Operations: SFC, SEBOL, SFC with floating-data parameters, SFC with character-data parameters, SFC with floating/character-data parameters, SFC with integer/character-data parameters, SFC with floating/integer-data parameters

● Internal Switch and Message Output Functions

The control functions have internal switch and message output functions.

Internal Switches

Used as buffers for storing statuses.

Common Status Switches: Accessible within an FCS.

Global Switches: Transmits status data to other stations in the system via V net communication.

Message Output Function

This function notifies events from one FCS to another FCS, HIS or computer. Messages are sent by sequence functions.

Annunciator Message: Has annunciator function of instrument panel.

Sequence Message: Initiates action on HIS or supervisory computer — prints messages, displays operator guide messages, or prompts for data entry.

Event Message: Sends signal event messages, SFC/SEBOL return event messages to other functions within the FCS.

■ APPLICATION CAPACITY

The “application capacity” represents the number of control functions that can be executed simultaneously.

Extended type can be used if LFS1530 Application Capacity Expansion Package (for AFV10□) is purchased in addition to Control Function for Basic Field Control Unit.

Item		Basic type	Extended type
Tag Names	For elements per FCS (*1)	5,800	5,800
	For function blocks (*2)	2,500	2,500
Process I/O	Analog I/O points	480	1,280
	Contact I/O points	1,920	4,096
Communication I/O	Data volume (in 16 bit units)	4,000	4,000
Internal Switches	Common switches	4,000	4,000
	Global switches	256	256
Message Outputs	Annunciator messages	1,000	1,000
	Messages printed	1,000	1,000
	Operator guide messages	500	500
	Request messages	200	200
	Event messages	500	500
Control Functions	Control drawings	200	200
High-speed Trend Acquisition	Acquisition points	256	256

- *1: The number of tag names for elements per FCS indicates the maximum number of a total of contact inputs/outputs (%Z elements), common switches (%SW elements), and communication inputs/outputs (%WB elements) to which tag names can be assigned. However, up to a thousand %WB elements can only be given tag names.
- *2: The number of tag names indicates the maximum number of a total of function blocks (%BL elements) and annunciators (%AN elements) to which tag names can be assigned.

Scan Period

The CPU of the FCS can execute the standard control functions in any of three scan periods. One of the three scan periods can be set for each function block.

Standard Scan Period: 1 sec

Medium Speed Scan Period: Specify 200 or 500 ms. Mainly used for computation and control of analog data.

Fast Scan Period: Specify 50, 100, 200 or 500 ms. Mainly used for sequence control.

The above scan periods does not include I/O signal conversion time for nodes, and bus transmission time.

Inter-station Connections

Number of other stations' data that can be read and written: 512

● Database

The number of function blocks for the general-purpose database type is shown below:

Table: Database

Item	Basic type	Extended type
Node	4	15
ALF111 (*1)	30	32
ALR1□1, ALE111, ALP111	8	16
Regulatory Control Blocks Calculation Blocks (*2)	500 (500)	1200 (600)
Sequence Blocks	150	600
General-Purpose Calculations	250	500
SFC Blocks	20	60
Operation Blocks	150	400
Switch Instrument Blocks	300	1,000
Sequence Elements 1	300	700
Faceplate Blocks	120	200
Logic Operation Blocks	80	200
Sequence Elements 2	50	200
Batch Data Blocks	60	400
Unit Instruments	20	60
Offsite Blocks	30	40
Valve Pattern Monitors	0	0
SEBOL Daemon	210	210
SEBOL User Function	70	70
Control Recipe Area	1 MB	1 MB
FCS-C Task/Option Area	200 KB	200 KB

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- *1: Up to 32 ALF111 can be installed; however, for the total number of the Fieldbus devices, take the maximum number of Foundation Fieldbus Faceplate Blocks into consideration.
- *2: Figures in parentheses indicate the maximum numbers of Foundation Fieldbus Faceplate Blocks definable.

OPTIONAL SOFTWARE PACKAGES

The following optional software packages can be used with Control Function for Compact type Field Control Unit (for FIO).

Memory size in option area required by each package is shown inside parentheses (). Items without such descriptions do not need memory.

When optional software packages are used, the sum of the memory sizes necessary for those optional packages shall not exceed the memory size of option areas of databases. In addition, when using enhanced MC/switch instruments as standard functions, which need an optional memory area of 64 KB, add this to the required memory size.

- LFS8620 (80 KB) Off-Site Block Package
- LFS3132 (90 KB) Valve Pattern Monitor Package
- LFS2410 FA-M3 Communication Package (for ALR111, ALR121)
- LFS9162 MELSEC-A Communication Package (for ALR111, ALR121)
- LFS9153 (30 KB) Modbus Communication Package (for ALR111, ALR121) (*1)
- LFS2420 YS Communication Package (for ALR121)
- LFS2421 YS Communication Package with direct connection (for ALR121)
- LFS2430 MELSEC Communication Package (for ALE111)
- LFS2431 FA-M3 Communication Package (for ALE111)
- LFS2432 DARWIN/DAQSTATION Communication Package (for ALE111)
- LFS2433 PLC-5/SLC 500 Communication Package (for ALE111)
- LFS2453 Modbus Communication Package (for ALE111)
- LFS2456 SLC 500 Communication Package (for ALR111, ALR121)
- LFS2457 PLC-5 Communication Package (for ALR111, ALR121)
- LFS2542 PROFIBUS Communication Package (for ALP111)
- LFS2610 Foundation Fieldbus Communication Package (for ALF111)
- LFS2710 HART Communication Package (for AAI□□□-H)

*1: Memory can be used for dual-redundant use only.

OPERATING ENVIRONMENT

Hardware Requirements

Model LFS1500 Control Function for Basic type Field Control Unit (for FIO, for Vnet/IP) and Model LFS1530 Application Capacity Expansion Package (for AFV10□) operate on the following FCS models:

AFV10S, AFV10D

MODELS AND SUFFIX CODES

Control Function for Basic type Field Control Unit (for FIO, for Vnet/IP)

Model	Description
LFS1500	Control Function for Basic type Field Control Unit (for FIO, for Vnet/IP)

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*1: Specify with suffix codes for FCS.

Application Capacity Expansion Package (for AFV10□)

		Description
Model	LFS1530	Application Capacity Expansion Package (for AFV10□) [Media model: LHSKM02-C11]
	-S	Basic software license
Suffix Codes	1	Always 1
	1	English version
Option Code	/N□□□□	The number of FCS

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