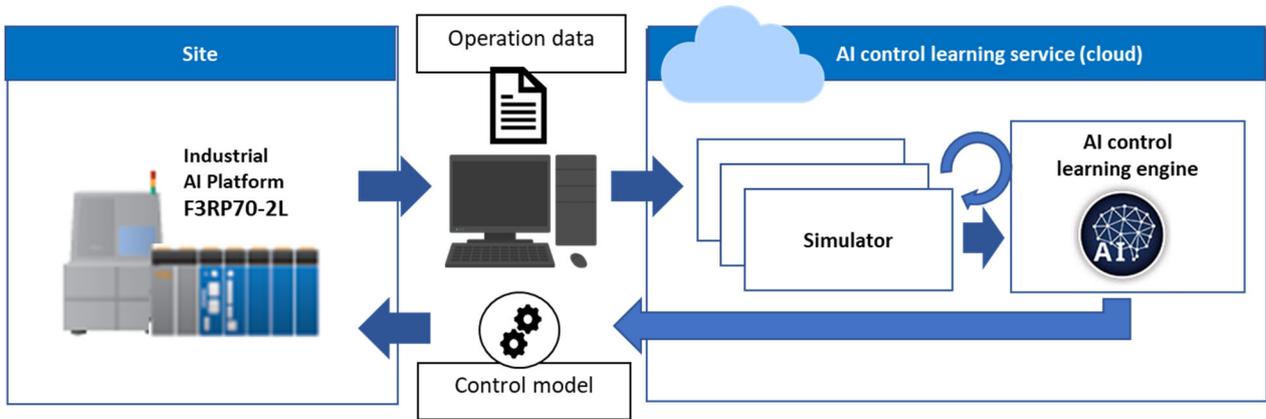


### Overview

In AI control learning, the operating data of the equipment is uploaded to the cloud, a simulator is created, and AI control learning is performed using the simulator to generate a control model. AI (Artificial Intelligence) control can be achieved by installing the program with the generated control model into a compatible device<sup>\*1</sup>.



AI control learning requires an application for the AI control learning service and a license/device /software package to execute the AI control model.

\*1 AI control learning does not guarantee the generation of the best control model. As control models are data dependent, the performance of a control model varies depending on the characteristics of the equipment and the quality of the data provided.

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# General Specifications

## SFRL18-MPC AI control learning service



GS 34M06M52-15EN

### ■ Overview

The AI control learning service is provided as a cloud service.

AI control is AI that performs control by learning causal relationships between conditions such as the input to the equipment and the surrounding environment, and control variables such as the output of the equipment. This learning service provides a model generation (learning) environment on the cloud.

Generation of the simulator is data-driven based on the equipment operation data. The AI control learning function uses the generated simulator to train, and then efficiently generates control models.

To use the AI control learning service, it is necessary to create an account on the cloud.

### ■ Features

The AI control learning service consists of a simulator generator and a learning function.

- Generation of simulator  
It is data-driven based on the equipment operation data.
- Learning  
It uses the generated simulator to train, and then efficiently generates control models.

### ■ Simulator generator

The main functions of the simulator generator are as follows.

Function	Description
Identification condition automatic setting function	Automatically determines the conditions for simulator identification.
Simulator accuracy check function	Check the accuracy of the simulator graphically.

The specifications of the simulator generation function are as follows.

Item	Specifications	
Simulator type	System identification ARX model 1st to 4 <sup>th</sup> -order lag	
Simulator condition setting mode	Automatic mode	
Simulator accuracy check	Impulse response display Step response display Data fitting rate for comparison	
Input data	Type	1 input 1 output
	Samples	Up to 100,000
	Format	Proprietary format

### ■ AI control learning

The main functions of AI control learning are as follows.

Function	Description
Automatic learning condition setting	Automatically determines conditions for AI control learning.
Control model response performance check function	Graphically displays the response performance of the control model.
Control model download function	Download to PC the generated control model.
PID switching simulation function	Simulate switching from AI-control to PID-control.

The specifications of the AI control learning function are as follows.

Item	Specifications	
AI control learning condition setting mode	Automatic mode	
AI control learning conditions	Control period	10 msec to 60000 msec (1 msec unit)
	Target output	-999999~999999
Control model response performance check	list	Settling time Rise time Overshoot Offset Stability
	graph	Simulator output AI Control output
Input data	Type	1 input 1 output
	Samples	Up to 100,000
Output data (AI control model)	Format	Proprietary format (binary)
	Viable device	F3RP70-2L* F3RP70-2L/L09
PID switching control method	Derivative type (output bumpless)	

\*AI control license (SFRL19-MPC) is required.

### ■ Model and suffix codes

Model	Suffix Code	Style Code	Option Code	Description
SFRL18	-MPC	...		Account on the cloud AI control learning service Valid for 12 months

# General Specifications

## SFRL19-MPC AI Control License



GS 34M06M52-15EN

### ■ Overview

The AI Control License is a license to run the AI control model.  
One license is required per viable device for AI control model.

### ■ Activate the control model

When you purchase this license, you will receive a license code.  
When generating a control model with the AI control learning service, activation is possible by embedding an authentication key (automatically generated from the license number) in the control model.

### ■ Model and suffix code

Model	suffix code	Style code	Option code	Description
SFRL19	-MPC	...		AI control model execution license for F3RP70

# General Specifications

## F3RP70-2L/L09 OS-Free CPU Module with AI Control License



GS 34M06M52-15EN

### ■ Overview

OS-Free CPU module with AI control license can execute AI control model output by AI control learning without AI control license (SFRL19-MPC).

This CPU module prepared for repeatedly using the same AI control model.

### ■ Features

Refer to GS 34M06T02-02 eMbedded Machine Controller e-RT3 (for F3RP70-2L).

### ■ Model and suffix codes

Model	Suffix Code	Style code	Option Code	Description
F3RP70	-2L	...	/L09	With AI control license

# General Specifications

## SFRM19-MDW AI control software package



GS 34M06M52-15EN

### ■ Overview

The AI control software package is required to create and use AI control applications that run on Ubuntu images for the OS-Free CPU module (model: F3RP70-2L) of the e-RT3. The software package provide an execution library and data acquisition application.

The execution library contains APIs for creating programs using control models generated by AI control learning services. You can create an AI control program with the I/O access library provided in the Ubuntu image.

The data acquisition application acquires equipment operation data that is input to the AI control learning service. The I/O module to be used and the data acquisition interval are set in a file, and the relay of the PLC device starts and stops the data acquisition.

### ■ Features

- By using the execution library, you can program AI control by using the control model generated by the AI control learning service.
- For the control functions of the execution library, an API is provided for PID calculations in addition to AI control calculations. You can switch between calculation methods during transient response and settling time, and use the PID calculator as a feedback circuit.
- Provides high-performance libraries for the C language environment.
- Data acquisition applications enable data acquisition without programming. The acquired data is output in a format compatible with the AI control learning service.

### ■ Precautions

- The open source software included in this product is redistributed in accordance with the license of each software.
- The warranty of the open source software part, including our modified part, follows the license of each software. For example, in the case of the GPL, there is no warranty. We provide no warranty for redistributed open source software.

### ■ Trademark

- Linux is a registered trademark and is used under license from the Linux Mark Institute (LMI), which has an exclusive license from the worldwide trademark owner Linus Torvalds.

### ■ Execution library specifications

Item		Specifications
Library type		C language static library C language shared libraries
Control function	Calculation method	AI control PID
	Input	Analog value*1
	Output	Analog value*2 Time proportional DO value*3

\*1: An analog input module can be used for analog input of current and voltage, and a temperature monitor module or PID control module can be used for temperature input.

\*2: Analog output modules and PID control modules can be used for analog output of current and voltage.

\*3: An output relay module and PID control module can be used for time-proportional numeric output.

### ■ Data acquisition application specifications

Item		Specifications
Operating CPU modules		OS-Free CPU Module
Supported OS		Ubuntu 18.04 (Supplied with Ubuntu image)
Available I/O modules	Digital input	F3XD32-□□ F3XD64-□□ F3WD64-□□
	Analog input	F3AD04-5R F3AD08-6R F3AD08-4R
	Temperature input	F3CX04-0H F3CU04-□H
Minimum scan interval		1 msec
Maximum acquisitions		100000
Output file		Proprietary format

### ■ Model and suffix code

Model	Basic suffix code	Style code	Option code	Description
SFRM19	-MDW	...		AI control software package