MITSUBISHI ELECTRIC

FA Application Package
iQ Monozukuri FACEMASK

Instruction Manual

- AP20-FMK006AA-MA
- AP20-FMK003AA-MA

iQ Monozukuri

SAFETY PRECAUTIONS

(Read these precautions before using this product.)

Before using this product, please read this manual and the relevant manuals carefully and pay full attention to safety to handle the product correctly.

The precautions given in this manual are concerned with this product only. Refer to the user's manual of the CPU module to use for a description of the PLC system safety precautions.

In this manual, the safety precautions are classified into two levels: "⚠WARNING" and "⚠CAUTION".

⚠ **WARNING**	Indicates that incorrect handling may cause hazardous conditions, resulting in death or severe injury.
⚠ **CAUTION**	Indicates that incorrect handling may cause hazardous conditions, resulting in minor or moderate injury or property damage.

Under some circumstances, failure to observe the precautions given under "⚠ CAUTION" may lead to serious consequences.

Observe the precautions of both levels because they are important for personal and system safety.

Make sure that the end users read this manual and then keep the manual in a safe place for future reference.

[Design Precautions]

⚠WARNING

- Configure safety circuits external to the programmable controller to ensure that the entire system operates safely even when a fault occurs in the external power supply or the programmable controller. Failure to do so may result in an accident due to an incorrect output or malfunction.
  (1) Configure external safety circuits, such as an emergency stop circuit, protection circuit, and protective interlock circuit for forward/reverse operation or upper/lower limit positioning.
  (2) The programmable controller stops its operation upon detection of the following status, and the output status of the system will be as shown below.
    • Turned off if the overcurrent or overvoltage protection of the power supply module is activated.
    • Held or turned off according to the parameter setting if the self-diagnostic function of the CPU module detects an error such as a watchdog timer error.
  (3) Also, all outputs may be turned on if an error occurs in a part, such as an I/O control part, where the CPU module cannot detect any error. To ensure safety operation in such a case, provide a safety mechanism or a fail-safe circuit external to the programmable controller. For a fail-safe circuit example, refer to the user's manual of the CPU module to use.
  (4) Outputs may remain on or off due to a failure of a component such as a relay and transistor in an output circuit. Configure an external circuit for monitoring output signals that could cause a serious accident.
- In an output circuit, when a load current exceeding the rated current or an overcurrent caused by a load short-circuit flows for a long time, it may cause smoke and fire. To prevent this, configure an external safety circuit, such as a fuse.
- Configure a circuit so that the programmable controller is turned on first and then the external power supply. If the external power supply is turned on first, an accident may occur due to an incorrect output or malfunction.
- For the operating status of each station after a communication failure, refer to manuals relevant to the network. Incorrect output or malfunction due to a communication failure may result in an accident.

⚠WARNING

- When connecting an external device with a CPU module or intelligent function module to modify data of a running programmable controller, configure an interlock circuit in the program to ensure that the entire system will always operate safely. For other forms of control (such as program modification, parameter change, forced output, or operating status change) of a running programmable controller, read the relevant manuals carefully and ensure that the operation is safe before proceeding. Improper operation may damage machines or cause accidents.
- Especially, when a remote programmable controller is controlled by an external device, immediate action cannot be taken if a problem occurs in the programmable controller due to a communication failure. To prevent this, configure an interlock circuit in the program, and determine corrective actions to be taken between the external device and CPU module in case of a communication failure.
- Do not write any data to the "system area" and "write-protect area" of the buffer memory in the module. Also, do not use any "use prohibited" signals as an output signal from the CPU module to each module. Doing so may cause malfunction of the programmable controller system. For the "system area", "write-protect area", and the "use prohibited" signals, refer to the user's manual for the module used.
- If a communication cable is disconnected, the network may be unstable, resulting in a communication failure of multiple stations. Configure an interlock circuit in the program to ensure that the entire system will always operate safely even if communications fail. Failure to do so may result in an accident due to an incorrect output or malfunction.
- To maintain the safety of the programmable controller system against unauthorized access from external devices via the network, take appropriate measures. To maintain the safety against unauthorized access via the Internet, take measures such as installing a firewall.
- Configure safety circuits external to the programmable controller to ensure that the entire system operates safely even when a fault occurs in the external power supply or the programmable controller. Failure to do so may result in an accident due to an incorrect output or malfunction.
  (1) Machine home position return is controlled by two kinds of data: a home position return direction and a home position return speed. Deceleration starts when the near-point dog signal turns on. If an incorrect home position return direction is set, motion control may continue without deceleration. To prevent machine damage caused by this, configure an interlock circuit external to the programmable controller.
  (2) When the module detects an error, the motion slows down and stops or the motion suddenly stops, depending on the stop group setting in parameter. Set the parameter to meet the specifications of a positioning control system. In addition, set the home position return parameter and positioning data within the specified setting range.
  (3) Outputs may remain on or off, or become undefined due to a failure of a component such as an insulation element and transistor in an output circuit, where the module cannot detect any error. In a system that the incorrect output could cause a serious accident, configure an external circuit for monitoring output signals.
- If safety standards (ex., robot safety rules, etc.,) apply to the system using the module, servo amplifier and servomotor, make sure that the safety standards are satisfied.
- Construct a safety circuit externally of the module or servo amplifier if the abnormal operation of the module or servo amplifier differs from the safety directive operation in the system.
- Do not remove the SSCNETⅢ cable while turning on the control circuit power supply of Multiple CPU system and servo amplifier. Do not see directly the light generated from SSCNETⅢ connector of the module or servo amplifier and the end of SSCNETⅢ cable. When the light gets into eyes, you may feel something wrong with eyes. (The light source of SSCNETⅢ complies with class1 defined in JISC6802 or IEC60825-1.)

[Design Precautions]

⚠CAUTION

- Do not install the control lines or communication cables together with the main circuit lines or power cables. Keep a distance of 100 mm or more between them. Failure to do so may result in malfunction due to noise.
- During control of an inductive load such as a lamp, heater, or solenoid valve, a large current (approximately ten times greater than normal) may flow when the output is turned from off to on. Therefore, use a module that has a sufficient current rating.
- After the CPU module is powered on or is reset, the time taken to enter the RUN status varies depending on the system configuration, parameter settings, and/or program size. Design circuits so that the entire system will always operate safely, regardless of the time.
- Do not power off the programmable controller or do not reset the CPU module during the setting registration. Doing so will make the data in the flash ROM undefined. The data need to be set in the buffer memory and to be written to the flash ROM again. Doing so may cause malfunction or failure of the module.
- Reset the CPU module after changing the parameters. Failure to do so may cause malfunction because the previous parameter settings remain in the module.
- When changing the operating status of the CPU module from external devices (such as remote RUN/STOP), select "Do Not Open by Program" for "Opening Method" in the module parameters. If "Open by Program" is selected, an execution of remote STOP causes the communication line to close. Consequently, the CPU module cannot reopen the communication line, and external devices cannot execute the remote RUN.

[Installation Precautions]

⚠WARNING

- Shut off the external power supply (all phases) used in the system before mounting or removing the module. Failure to do so may result in electric shock or cause the module to fail or malfunction.

[Installation Precautions]

⚠CAUTION

- Use the programmable controller in an environment that meets the general specifications in the manual "Safety Guidelines" included in the base unit. Failure to do so may result in electric shock, fire, malfunction, or damage to or deterioration of the product.
- To mount a module, place the concave part(s) located at the bottom onto the guide(s) of the base unit, and push in the module until the hook(s) located at the top snaps into place. Incorrect mounting may cause malfunction, failure, or drop of the module.
- When using the programmable controller in an environment of frequent vibrations, fix the module with a screw.
- Tighten the screws within the specified torque range. Undertightening can cause drop of the screw, short circuit, or malfunction. Overtightening can damage the screw and/or module, resulting in drop, short circuit, or malfunction.
- When using an extension cable, connect it to the extension cable connector of the base unit securely. Check the connection for looseness. Poor contact may cause incorrect input or output.
- When using an SD memory card, fully insert it into the memory card slot. Check that it is inserted completely. Poor contact may cause malfunction.
- Securely insert an extended SRAM cassette into the cassette connector of a CPU module. After insertion, close the cassette cover and check that the cassette is inserted completely. Poor contact may cause malfunction.
- Do not directly touch any conductive parts and electronic components of the module, SD memory card, extended SRAM cassette, or connector. Doing so may cause malfunction or failure of the module.

[Wiring Precautions]

⚠WARNING

- Shut off the external power supply (all phases) used in the system before installation and wiring. Failure to do so may result in electric shock or damage to the product.
- After installation and wiring, attach the included terminal cover to the module before turning it on for operation. Failure to do so may result in electric shock.

[Wiring Precautions]

⚠CAUTION

- Individually ground the FG and LG terminals of the programmable controller with a ground resistance of 100 ohm or less. Failure to do so may result in electric shock or malfunction.
- Use applicable solderless terminals and tighten them within the specified torque range. If any spade solderless terminal is used, it may be disconnected when the terminal screw comes loose, resulting in failure.
- Check the rated voltage and signal layout before wiring to the module, and connect the cables correctly. Connecting a power supply with a different voltage rating or incorrect wiring may cause fire or failure.
- Connectors for external devices or coaxial cables must be crimped or pressed with the tool specified by the manufacturer, or must be correctly soldered. Incomplete connections may cause short circuit, fire, or malfunction.
- Securely connect the connector to the module. Poor contact may cause malfunction.
- Do not install the control lines or communication cables together with the main circuit lines or power cables. Keep a distance of 100 mm or more between them. Failure to do so may result in malfunction due to noise.
- Place the cables in a duct or clamp them. If not, dangling cable may swing or inadvertently be pulled, resulting in damage to the module or cables or malfunction due to poor contact. Do not clamp the extension cables with the jacket stripped.
- Check the interface type and correctly connect the cable. Incorrect wiring (connecting the cable to an incorrect interface) may cause failure of the module and external device.
- Tighten the terminal screws or connector screws within the specified torque range. Undertightening can cause drop of the screw, short circuit, fire, or malfunction. Overtightening can damage the screw and/or module, resulting in drop, short circuit, fire, or malfunction.
- When disconnecting the cable from the module, do not pull the cable by the cable part. For the cable with connector, hold the connector part of the cable. For the cable connected to the terminal block, loosen the terminal screw. Pulling the cable connected to the module may result in malfunction or damage to the module or cable.
- Prevent foreign matter such as dust or wire chips from entering the module. Such foreign matter can cause a fire, failure, or malfunction.
- A protective film is attached to the top of the module to prevent foreign matter, such as wire chips, from entering the module during wiring. Do not remove the film during wiring. Remove it for heat dissipation before system operation.
- Mitsubishi programmable controllers must be installed in control panels. Connect the main power supply to the power supply module in the control panel through a relay terminal block. Wiring and replacement of a power supply module must be performed by qualified maintenance personnel with knowledge of protection against electric shock. For wiring, refer to the MELSEC iQ-R Module Configuration Manual.
- For Ethernet cables to be used in the system, select the ones that meet the specifications in the MELSEC iQ-R Ethernet/CC-Link IE User's Manual (Startup). If not, normal data transmission is not guaranteed.

[Startup and Maintenance Precautions]

⚠WARNING

- Do not touch any terminal while power is on. Doing so will cause electric shock or malfunction.
- Correctly connect the battery connector. Do not charge, disassemble, heat, short-circuit, solder, or throw the battery into the fire. Also, do not expose it to liquid or strong shock. Doing so may cause the battery to generate heat, explode, ignite, or leak, resulting in injury or fire.
- Shut off the external power supply (all phases) used in the system before cleaning the module or retightening the terminal screws, connector screws, or module fixing screws. Failure to do so may result in electric shock or cause the module to fail or malfunction.

[Startup and Maintenance Precautions]

⚠CAUTION

- When connecting an external device with a CPU module or intelligent function module to modify data of a running programmable controller, configure an interlock circuit in the program to ensure that the entire system will always operate safely. For other forms of control (such as program modification, parameter change, forced output, or operating status change) of a running programmable controller, read the relevant manuals carefully and ensure that the operation is safe before proceeding. Improper operation may damage machines or cause accidents.
- Especially, when a remote programmable controller is controlled by an external device, immediate action cannot be taken if a problem occurs in the programmable controller due to a communication failure. To prevent this, configure an interlock circuit in the program, and determine corrective actions to be taken between the external device and CPU module in case of a communication failure.
- Do not disassemble or modify the modules. Doing so may cause failure, malfunction, injury, or a fire.
- Use any radio communication device such as a cellular phone or PHS (Personal Handyphone System) more than 25 cm away in all directions from the programmable controller. Failure to do so may cause malfunction.
- Shut off the external power supply (all phases) used in the system before mounting or removing the module. Failure to do so can cause the module to fail or malfunction.
- Tighten the screws within the specified torque range. Undertightening can cause drop of the component or wire, short circuit, or malfunction. Overtightening can damage the screw and/or module, resulting in drop, short circuit, or malfunction.
- After the first use of the product, do not mount/remove the module to/from the base unit, and the terminal block to/from the module, and do not insert/remove the extended SRAM cassette to/from the CPU module more than 50 times (IEC 61131-2 compliant) respectively. Exceeding the limit of 50 times may cause malfunction.
- After the first use of the product, do not insert/remove the SD memory card to/from the CPU module more than 500 times. Exceeding the limit may cause malfunction.
- Do not touch the metal terminals on the back side of the SD memory card. Doing so may cause malfunction or failure.
- Do not touch the integrated circuits on the circuit board of an extended SRAM cassette. Doing so may cause malfunction or failure.
- Do not drop or apply shock to the battery to be installed in the module. Doing so may damage the battery, causing the battery fluid to leak inside the battery. If the battery is dropped or any shock is applied to it, dispose of it without using.

⚠CAUTION

- Startup and maintenance of a control panel must be performed by qualified maintenance personnel with knowledge of protection against electric shock. Lock the control panel so that only qualified maintenance personnel can operate it.
- Before handling the module, touch a conducting object such as a grounded metal to discharge the static electricity from the human body. Failure to do so may cause the module to fail or malfunction.
- Before testing the operation, set a low speed value for the speed limit parameter so that the operation can be stopped immediately upon occurrence of a hazardous condition.
- Confirm and adjust the program and each parameter before operation. Unpredictable movements may occur depending on the machine.
- When using the absolute position system function, on starting up, and when the module or absolute value motor has been replaced, always perform a home position return.
- Before starting the operation, confirm the brake function.
- Do not perform a megger test (insulation resistance measurement) during inspection.
- After maintenance and inspections are completed, confirm that the position detection of the absolute position detection function is correct.
- Lock the control panel and prevent access to those who are not certified to handle or install electric equipment.

[Operating Precautions]

⚠CAUTION

- When changing data and operating status, and modifying program of the running programmable controller from an external device such as a personal computer connected to an intelligent function module, read relevant manuals carefully and ensure the safety before operation. Incorrect change or modification may cause system malfunction, damage to the machines, or accidents.
- Do not power off the programmable controller or reset the CPU module while the setting values in the buffer memory are being written to the flash ROM in the module. Doing so will make the data in the flash ROM undefined. The data need to be set in the buffer memory and to be written to the flash ROM again. Doing so may cause malfunction or failure of the module.
- Note that when the reference axis speed is specified for interpolation operation, the speed of the partner axis (2nd, 3rd, or 4th axis) may exceed the speed limit value.
- Do not go near the machine during test operations or during operations such as teaching. Doing so may lead to injuries.

[Disposal Precautions]

⚠CAUTION

- When disposing of this product, treat it as industrial waste.
- When disposing of batteries, separate them from other wastes according to the local regulations. For details on battery regulations in EU member states, refer to the MELSEC iQ-R Module Configuration Manual.

[Transportation Precautions]

⚠CAUTION

- When transporting lithium batteries, follow the transportation regulations. For details on the regulated models, refer to the MELSEC iQ-R Module Configuration Manual.
- The halogens (such as fluorine, chlorine, bromine, and iodine), which are contained in a fumigant used for disinfection and pest control of wood packaging materials, may cause failure of the product. Prevent the entry of fumigant residues into the product or consider other methods (such as heat treatment) instead of fumigation. The disinfection and pest control measures must be applied to unprocessed raw wood.

[PRECAUTIONS ON INTRODUCTION OF USER PROGRAMS]

⚠CAUTION

- To utilize the application program (example) and the screens (example) for an actual system, sufficiently confirm that the program and the screens will not cause system control problems on user's own responsibility. Examine the positions where interlock conditions are required in a target system and add them.
- Mitsubishi Electric Corporation cannot be held responsible for any damages or problems which may occur as a result of using the application program and the screens.
- The application program and screens provided by Mitsubishi Electric Corporation may be changed without any notice.

CONDITIONS OF USE FOR THE PRODUCT

(1) Mitsubishi programmable controller ("the PRODUCT") shall be used in conditions;
i) where any problem, fault or failure occurring in the PRODUCT, if any, shall not lead to any major or serious accident; and
ii) where the backup and fail-safe function are systematically or automatically provided outside of the PRODUCT for the case of any problem, fault or failure occurring in the PRODUCT.

(2) The PRODUCT has been designed and manufactured for the purpose of being used in general industries.
MITSUBISHI SHALL HAVE NO RESPONSIBILITY OR LIABILITY (INCLUDING, BUT NOT LIMITED TO ANY AND ALL RESPONSIBILITY OR LIABILITY BASED ON CONTRACT, WARRANTY, TORT, PRODUCT LIABILITY) FOR ANY INJURY OR DEATH TO PERSONS OR LOSS OR DAMAGE TO PROPERTY CAUSED BY the PRODUCT THAT ARE OPERATED OR USED IN APPLICATION NOT INTENDED OR EXCLUDED BY INSTRUCTIONS, PRECAUTIONS, OR WARNING CONTAINED IN MITSUBISHI'S USER, INSTRUCTION AND/OR SAFETY MANUALS, TECHNICAL BULLETINS AND GUIDELINES FOR the PRODUCT.
("Prohibited Application")
Prohibited Applications include, but not limited to, the use of the PRODUCT in;
- Nuclear Power Plants and any other power plants operated by Power companies, and/or any other cases in which the public could be affected if any problem or fault occurs in the PRODUCT.
- Railway companies or Public service purposes, and/or any other cases in which establishment of a special quality assurance system is required by the Purchaser or End User.
- Aircraft or Aerospace, Medical applications, Train equipment, transport equipment such as Elevator and Escalator, Incineration and Fuel devices, Vehicles, Manned transportation, Equipment for Recreation and Amusement, and Safety devices, handling of Nuclear or Hazardous Materials or Chemicals, Mining and Drilling, and/or other applications where there is a significant risk of injury to the public or property.

Notwithstanding the above, restrictions Mitsubishi may in its sole discretion, authorize use of the PRODUCT in one or more of the Prohibited Applications, provided that the usage of the PRODUCT is limited only for the specific applications agreed to by Mitsubishi and provided further that no special quality assurance or fail-safe, redundant or other safety features which exceed the general specifications of the PRODUCTs are required. For details, please contact the Mitsubishi representative in your region.

INTRODUCTION

Thank you for using the "iQ Monozukuri" product.
This manual describes the design, procedures before operation, functions, and programming required for constructing a system using this application. Before using this product, please read this manual and the relevant manuals carefully and develop familiarity with the functions and performance of this application to design the product correctly.
To utilize the program introduced in this manual for an actual system, sufficiently confirm that the program will not cause system control problems.

MEMO

CONTENTS

RELEVANT MANUALS

Manual name [manual number]	Description	Available form
iQ Monozukuri CONVERTING Instruction Manual [BCN-B62005-740]	Functions and programming for the converting control of iQ Monozukuri	PDF
iQ Monozukuri PACKAGING Instruction Manual (For MELSEC iQ-R) [BCN-B62005-762]	Functions and programming for the packaging machine control of iQ Monozukuri	PDF
iQ Monozukuri PACKAGING Instruction Manual (For MELSEC iQ-F) [BCN-B62005-808]	Functions and programming for the packaging machine control of iQ Monozukuri	PDF
MELSEC iQ-R Simple Motion Module User's Manual (Startup) [IB-0300245]	Specifications, procedures before operation, system configuration, wiring, and operation examples of the Simple Motion module	Print book e-Manual PDF
MELSEC iQ-R Simple Motion Module User's Manual (Application) [IB-0300247]	Functions, input/output signals, buffer memory addresses, parameter settings, programming, and troubleshooting of the Simple Motion module	Print book e-Manual PDF
MELSEC iQ-R Simple Motion Module User's Manual (Advanced Synchronous Control) [IB-0300249]	Functions and programming for the synchronous control of the Simple Motion module	Print book e-Manual PDF
MELSEC iQ-R Simple Motion Module User's Manual (Network) [IB-0300307]	Functions, parameter settings, troubleshooting, and buffer memory of CC-Link IE Field Network	Print book e-Manual PDF
MELSEC iQ-F FX5 Simple Motion Module User's Manual (Startup) [IB-0300251]	Specifications, procedures before operation, system configuration, wiring, and operation examples of the Simple Motion module	Print book e-Manual PDF
MELSEC iQ-F FX5 Simple Motion Module User's Manual (Application) [IB-0300253]	Functions, input/output signals, buffer memories, parameter settings, programming, and troubleshooting of the Simple Motion module	Print book e-Manual PDF
MELSEC iQ-F FX5 Simple Motion Module User's Manual (Advanced Synchronous Control) [IB-0300255]	Functions and programming for the synchronous control of the Simple Motion module	Print book e-Manual PDF

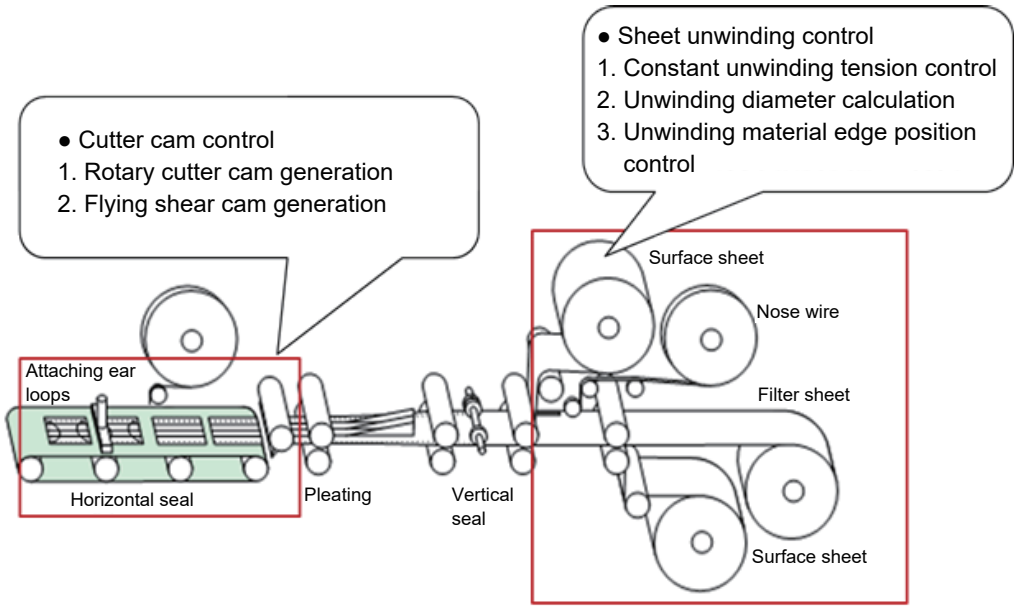
This manual does not include information on restrictions of use such as combination with modules or PLC CPUs.
Please make sure to read the user's manual of the corresponding products before using this application package.

1 OVERVIEW

1.1 FACEMASK Application

This application package provides a library (function blocks) of the functions for mask production equipment extracted from the Mitsubishi Electric FA application packages "iQ Monozukuri CONVERTING" and "iQ Monozukuri PACKAGING", and application examples of the library (programs and GOT screens).
Applications can be easily created by programming necessary libraries according to the system, or by utilizing screen examples.

1.2 Application Example



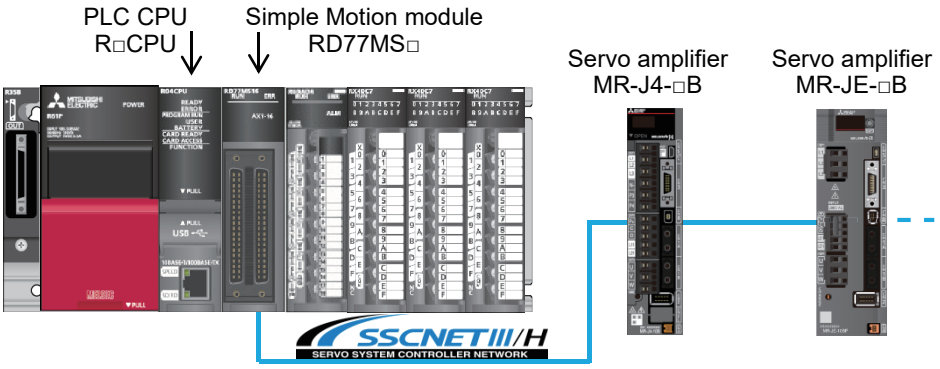
Outline drawing of mask production equipment

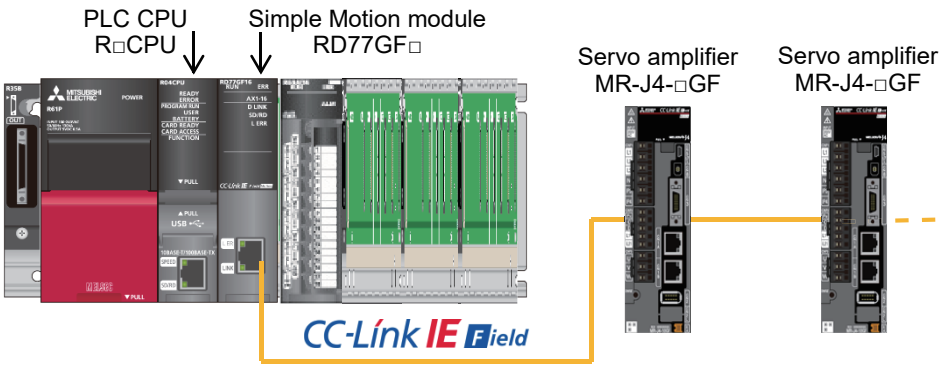
1.3 Applicable System

The following shows the applicable devices and functions.

MELSEC iQ-R series

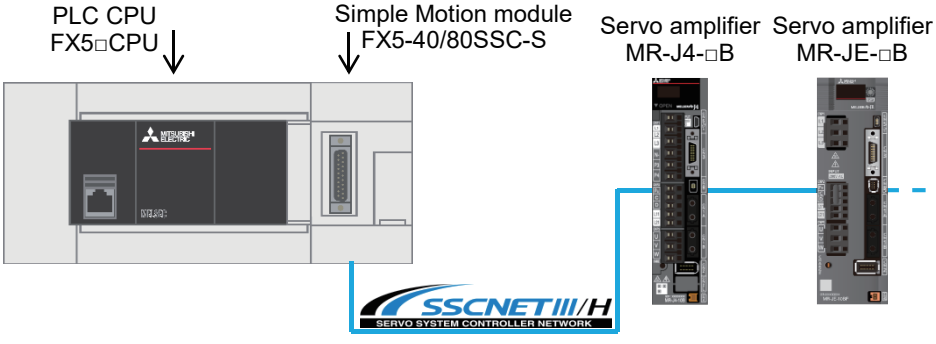
PLC CPU module	Function		Supported network	Simple Motion module	Servo amplifier
	Sheet unwinder control	Cutter cam control			
R□CPU R□ENCPU	○	○	SSCNETⅢ/H	RD77MS□	MR-J4-□B MR-JE-□B
			CC-Link IE Field	RD77GF□	MR-J4-□GF





MELSEC iQ-F series

CPU module	Function		Supported network	Simple Motion module	Servo amplifier
	Sheet unwinder control	Cutter cam control			
FX5UCPU, FX5UCCPU	-	○	SSCNETⅢ/H	FX5-40SSC-S FX5-80SSC-S	MR-J4-□B MR-JE-□B



1.4 Precautions for Use

For the setting procedure before operation and the system construction, refer to iQ Monozukuri CONVERTING Instruction Manual and iQ Monozukuri PACKAGING Instruction Manual included in this package.
It is not necessary to activate the license to use the FBs described in this document.
Customers can change the FBs used in this package.
Please make sure to read the user's manual of the applicable product before using this application package.
Before using the FBs described in this document, please understand the following.

- Before applying the FBs to the actual system, sufficiently verify that there is no problem in the control of the target system.
- Consider where to add interlock conditions in the target system.
- Mitsubishi Electric Corporation will not compensate for any damage caused by using FBs.
- The contents may be deleted or changed without prior notice.

1.5 Library Registration Procedure

Unzip the downloaded application package and register the library (*.mslm) in Package root/Lib. For the contents of the libraries, refer to the following.
☞ Page 17 FB Library List
☞ Page 51 FB Library List
For the library registration procedure, refer to "Registering the FB Library" in the following manuals.
📖iQ Monozukuri PACKAGING Instruction Manual (For MELSEC iQ-R)
📖iQ Monozukuri PACKAGING Instruction Manual (For MELSEC iQ-F)

2 APPLICATION FOR MELSEC iQ-R

2.1 Application Model

AP20-FMK006AA-MA

2.2 Application File Structure

Folder			File name*1	File type (Extension)	Description	Application to be used
AP20-FMK006AA/ Package root	manual	English	bcnb62005973eng*	PDF file (.pdf)	iQ Monozukuri FACEMASK Instruction Manual	Adobe Reader
			bcnb62005762eng*		iQ Monozukuri PACKAGING Instruction Manual (For MELSEC iQ-R)	
			bcnb62005740eng*		iQ Monozukuri CONVERTING Instruction Manual	
		Japanese	bcnb62005972*		iQ Monozukuri FACEMASK Instruction Manual	
			bcnb62005761*		iQ Monozukuri PACKAGING Instruction Manual (For MELSEC iQ-R)	
			bcnb62005739*		iQ Monozukuri CONVERTING Instruction Manual	
		Simplified Chinese	bcnb62005974chn*		iQ Monozukuri FACEMASK Instruction Manual	
			bcnb62005763chn*		iQ Monozukuri PACKAGING Instruction Manual (For MELSEC iQ-R)	
			bcnb62005741chn*		iQ Monozukuri CONVERTING Instruction Manual	
	Lib		FMK_Control_R_****	Application library (.mslm)	Function block library for implementing the FACEMASK application	MELSOFT GX Works3
	Project		AP20-FMK006AA-R04-77MS16_****	GX Works3 project file (.gx3)	Application program examples for mask production equipment	MELSOFT GX Works3
			AP20-FMK006AA-GT27nnV_****	GT Designer3 project file (.GTX)	Screen examples for mask production equipment application	MELSOFT GT Works3
	-		AP20-FMK006AA	Text file (.txt)	Version information	-

1 "" indicates their versions.

2.3 FB Library List

The following table lists the FBs in the FB library (FMK_Control_R).

No.	Item	FB name	Description	Reference
01	Cam auto-generation	STD_MakeRotaryCutterCam+RD77MS	Cam auto-generation for rotary cutter	Page 18
		STD_MakeRotaryCutterCam+RD77GF		Page 22
		STD_MakeFlyingShearCam	Cam auto-generation for flying shear	Page 26
02	Synchronous control	CtrlOutputAxisSync	Output axis synchronization control	Page 32
03	Tension control	CNV_WinderTensionSensorlessCtrl	Tension sensorless torque control	Page 37
04	Roll diameter calculation	CNV_DiaCalcThickness	Roll diameter calculation (Web thickness integration method)	Page 40
05	Additional function	CNV_EdgePositionCtrl	Edge position control	Page 43
06	Tuning function	PIDControl*1	PID control (without tension PI gain auto tuning function)	Page 46
07	Filters	STD_Limiter	Limiter	Page 49

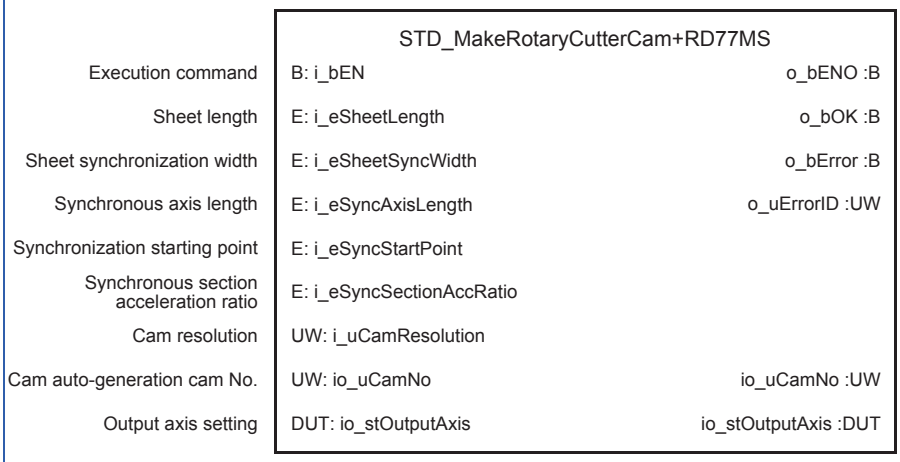
*1 For the specifications, refer to CNV_PIDControl. This FB is not enabled when the auto tuning value of the input label is enabled.

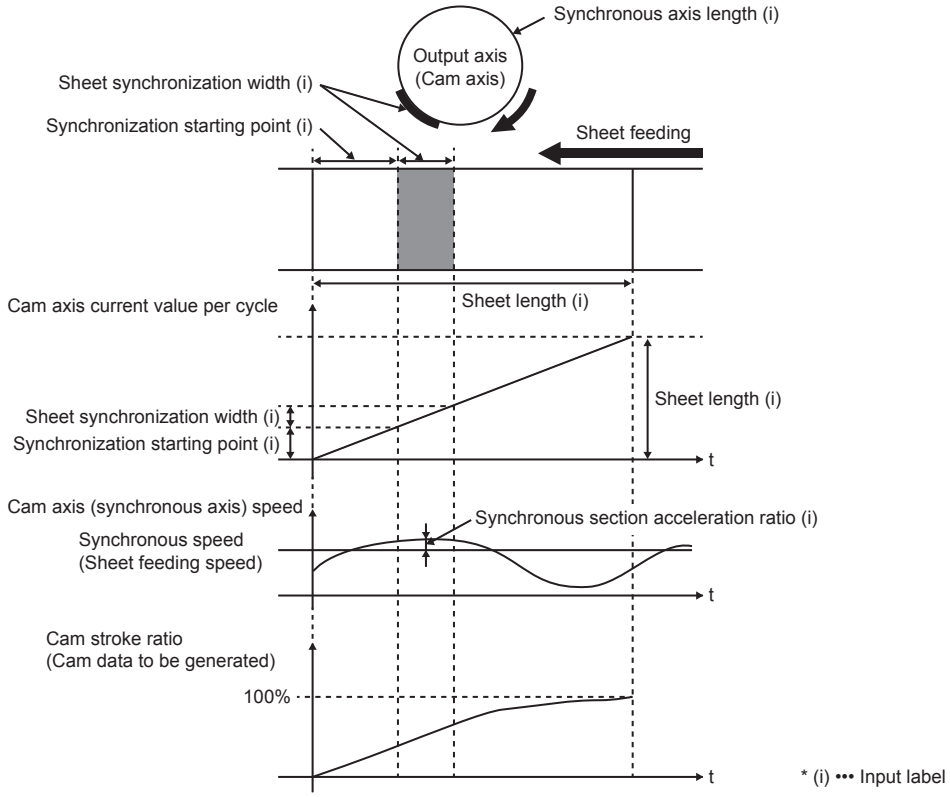
STD_MakeRotaryCutterCam (Cam auto-generation for rotary cutter (front end reference))

Name

STD_MakeRotaryCutterCam+RD77MS

Function overview

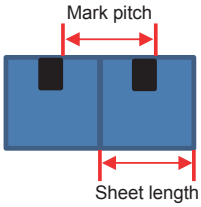
Item	Description		
Function overview	This FB automatically generates cam data for rotary cutter (front end reference).		
Symbol			
Applicable hardware and software	Applicable module	RD77MS	
	Applicable CPU	MELSEC iQ-R series	
	Engineering software	GX Works3	
Number of steps	947 steps		
FB dependence	—		

Item	Description
Function description	This FB automatically generates cam data for driving the rotary cutter (front end reference). • Turning on i_bEN (Execution command) starts generating cam data based on the set data. • When the cam generation is normally completed, o_bOK (Normal completion) turns on.  • i_eSyncSectionAccRatio (Synchronous section speed acceleration ratio) changes the speed in the synchronous section. • If a warning related to the cam data operation occurs in the Simple Motion module during cam generation, an error (ErrorID: 2203H) is stored. • If an error has occurred in the FB, Error turns on and the error code is stored in ErrorID. • For details of error codes, refer to "List of Error Codes" in the following manual. 📖 iQ Monozukuri PACKAGING Instruction Manual (For MELSEC iQ-R)
Restrictions and precautions	• If a value other than 0 to 3 has been set in "[Pr.1] Unit setting", this FB is executed with the unit [mm]. • The cam to be automatically generated is in the stroke ratio data format. • The cam data to be automatically generated will be saved in the cam open area. • If i_bEN (Execution command) turns off during cam generation, the cam may not be normally generated. • When generating multiple cams at the same time, input o_bOK (Normal completion) of the cam auto-generation FB as an interlock condition so that the generation of the next cam starts after the generation of one cam is successfully completed. • If the cam generation fails, the cam data may be undefined. Try the cam auto-generation again. Check that normal cam is generated and then perform the operation. • Since cam operation control data ([Cd.608] to [Cd.611]) is set in this FB, do not use user programs to set or change the data.*1 • Use the FB CtrlOutputAxisSync or create a user program for the operation of the cutter axis.
Compiling method	Macro type, subroutine type
FB operation type	Pulsed execution (multiple scan execution type)

*1 For details of control data, refer to the following.
📖 MELSEC iQ-R Simple Motion Module User's Manual (Advanced Synchronous Control)

Labels

■Input labels

Name	Label name	Data type	Read timing*1	Setting range	Initial value	Description
Execution command	i_bEN	Bit	⎍	On, off	—	On: The FB is activated. Off: The FB is not activated.
Sheet length	i_eSheetLength	Single precision real number	↑	Refer to the description.	200.0	Set the sheet length. Set this value for the cam axis length per cycle.  • 0.01 ≤ Sheet length ≤ 10000.00 [(Optional) Same unit (with two digits after the decimal point (fixed))]
Sheet synchronization width	i_eSheetSyncWidth	Single precision real number	↑	Refer to the description.	50.0	Set the length of the section where the output axis is synchronized with the sheet. • 0.01 ≤ Sheet synchronization width < Sheet length and synchronous axis length [(Optional) Same unit (with two digits after the decimal point (fixed))]
Synchronous axis length	i_eSyncAxisLength	Single precision real number	↑	Refer to the description.	200.0	Set the cycle length of the output axis (rotary cutter). • 0.01 ≤ Synchronous axis length ≤ 10000.00 [(Optional) Same unit (with two digits after the decimal point (fixed))]
Synchronization starting point	i_eSyncStartPoint	Single precision real number	↑	Refer to the description.	50.0	Set the synchronization starting point of the output axis to the sheet. • 0.00 ≤ Synchronization starting point < Sheet length [(Optional) Same unit (with two digits after the decimal point (fixed))]
Synchronous section acceleration ratio	i_eSyncSectionAccRatio	Single precision real number	↑	-50.00 ≤ Synchronous section acceleration ratio ≤ 50.00 [%]	0.00	Set this item when the fine adjustment of the synchronous speed in the synchronous section is required. Synchronous section speed = Synchronous speed × (100% + Synchronous section acceleration ratio)
Cam resolution	i_uCamResolution	Word [Unsigned]	↑	256/512/1024/2048/4096/8192/16384/32768	256	Set the cam resolution of the cam to be generated.

*1 ⎍: Always, ↑: When the FB is started (cannot be changed)

■Output labels

Name	Label name	Data type	Value to be held*1	Description
Execution status	o_bENO	Bit	—	On: Execution command is on. Off: Execution command is off.
Normal completion	o_bOK	Bit	—	This label indicates that the cam auto-generation has been completed and the FB has been normally completed.
Error completion	o_bError	Bit	—	On: An error has occurred in the FB. Off: No error has occurred.
Error code	o_uErrorID	Word [Unsigned]	—	The error code of the error that has occurred in the FB is stored.

*1 ○: The value will be held after the FB stops. —: The value will be cleared after the FB stops.

■I/O labels

Name	Label name	Data type	Read timing*1	Setting range	Initial value	Description
Cam auto-generation cam No.	io_uCamNo	Word [Unsigned]	↑	1 ≤ Cam auto-generation cam No. ≤ 256	1	Set the cam No. to be automatically generated for the cutter axis.
Output axis setting	io_stOutputAxis	AXIS_REF	—	—	—	Refer to the output axis setting below.

Output axis setting (AXIS_REF structure)

Name	Label name	Data type	Read timing*1	Setting range	Initial value	Description
Axis No.	AxisNo	Word [Unsigned]	↑	1 ≤ Axis No. ≤ Maximum number of axes of the module used	—	Set the axis No. of the output axis to be used for the cutter axis. This FB uses the unit set in "[Pr.1] Unit setting" of the axis No.
Start I/O number	StartIO	Word [Unsigned]	↑	0H ≤ Start I/O number ≤ FEH	0	Installation address of the Simple Motion module (Upper three digits of four digits (hexadecimal))

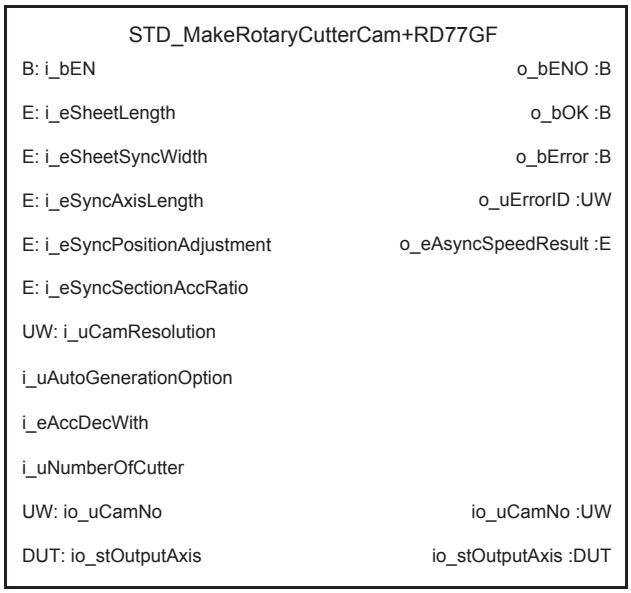
*1 ⎍: Always, ↑: When the FB is started (cannot be changed)

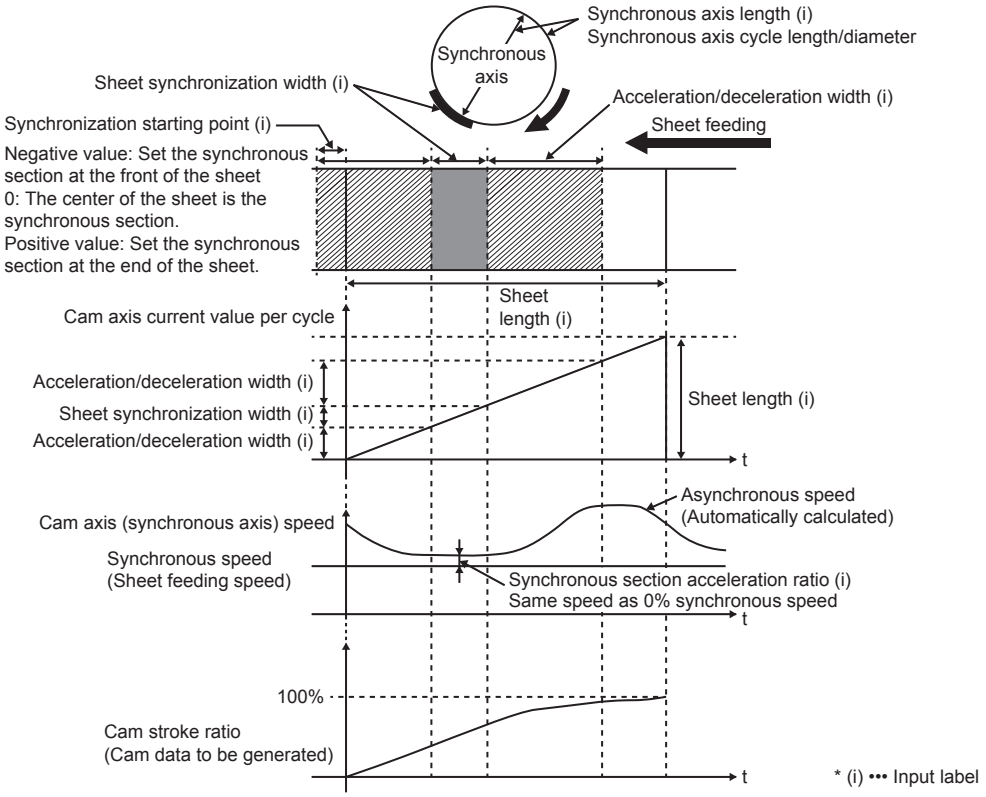
STD_MakeRotaryCutterCam (Cam auto-generation for rotary cutter (central reference))

Name

STD_MakeRotaryCutterCam+RD77GF

Function overview

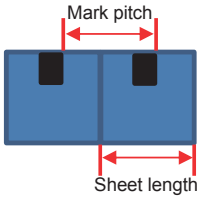
Item	Description	
Function overview	This FB automatically generates cam data (central reference) for rotary cutter.	
Symbol		
Applicable hardware and software	Applicable module	RD77GF
	Applicable CPU	MELSEC iQ-R series
	Engineering software	GX Works3
Number of steps	1135 steps	
FB dependence	—	

Item	Description
Function description	This FB automatically generates cam data for driving the rotary cutter (central reference). • Turning on i_bEN (Execution command) starts generating cam data based on the set data. • When the cam generation is normally completed, o_bOK (Normal completion) turns on.  • i_eSyncSectionAccRatio (Synchronous section speed acceleration ratio) changes the speed in the synchronous section. • If a warning related to the cam data operation occurs in the Simple Motion module during cam generation, an error (ErrorID: 2203H) is stored. • If an error has occurred in the FB, Error turns on and an error code is stored in ErrorID. • For details of error codes, refer to "List of Error Codes" in the following manual. 📖 iQ Monozukuri PACKAGING Instruction Manual (For MELSEC iQ-R)
Restrictions and precautions	• If a value other than 0 to 3 has been set in "[Pr.1] Unit setting", this FB is executed with the unit [mm]. • The cam to be automatically generated is in the stroke ratio data format. • The cam data to be automatically generated will be saved in the cam open area. • If i_bEN (Execution command) turns off during cam generation, the cam may not be normally generated. • When generating multiple cams at the same time, input o_bOK (Normal completion) of the cam auto-generation FB as an interlock condition so that the generation of the next cam starts after the generation of one cam is successfully completed. • If the cam generation fails, the cam data may be undefined. Try the cam auto-generation again. Check that normal cam is generated and then perform the operation. • Since cam operation control data ([Cd.608] to [Cd.611]) is set in this FB, do not use user programs to set or change the data.*1 • Use the FB CtrlOutputAxisSync or create a user program for the operation of the cutter axis.
Compiling method	Macro type, subroutine type
FB operation type	Pulsed execution (multiple scan execution type)

*1 For details of control data, refer to the following.
📖 MELSEC iQ-R Simple Motion Module User's Manual (Advanced Synchronous Control)

Labels

■Input labels

Name	Label name	Data type	Read timing*1	Setting range	Initial value	Description
Execution command	i_bEN	Bit	⎍	On, off	—	On: The FB is activated. Off: The FB is not activated.
Sheet length	i_eSheetLength	Single precision real number	↑	Refer to the description.	200.0	Set the sheet length. Set this value for the cam axis length per cycle.  • 0.01 ≤ Sheet length ≤ 10000.00 [(Optional) Same unit (with two digits after the decimal point (fixed))]
Sheet synchronization width	i_eSheetSyncWidth	Single precision real number	↑	Refer to the description.	50.0	Set the length of the section where the output axis is synchronized with the sheet. • 0.01 ≤ Sheet synchronization width < Sheet length • 0.01 ≤ Sheet synchronization width < Synchronous axis length/Number of cutter [(Optional) Same unit (with two digits after the decimal point (fixed))]
Synchronous axis length	i_eSyncAxisLength	Single precision real number	↑	Refer to the description.	200.0	Set the cycle length of the output axis (rotary cutter). If the auto-generation option is set to diameter, the calculation is "circumference = set value × π". If the auto-generation option is set to circumference, the calculation is "circumference = set value". • 0.01 ≤ Circumference ≤ 10000.00 [(Optional) Same unit (with two digits after the decimal point (fixed))]
Synchronous position adjustment	i_eSyncPositionAdjustment	Single precision real number	↑	Refer to the description.	0.0	Set the position adjustment of the synchronous section of the sheet and output axis. • Absolute value of synchronous position adjustment ≤ Half of the sheet length Negative value: Set the synchronous section at the front of the sheet. 0: The center of the sheet is the synchronous section. Positive value: Set synchronous section to back end of sheet.
Synchronous section acceleration ratio	i_eSyncSectionAccRatio	Single precision real number	↑	-50.00 ≤ Synchronous section acceleration ratio ≤ 50.00 [%]	0.00	Set this item when the fine adjustment of the synchronous speed in the synchronous section is required. Synchronous section speed = Synchronous speed × (100% + Synchronous section acceleration ratio)
Cam resolution	i_uCamResolution	Word [Unsigned]	↑	256/512/1024/2048/4096/8192/16384/32768	256	Set the cam resolution of the cam to be generated.
Auto-generation option	i_uAutoGenerationOption	Word [Unsigned]	↑	0 ≤ Auto-generation option ≤ 3	3	• Bit 0: Acceleration/deceleration method 0: Trapezoidal acceleration/deceleration 1: S-curve acceleration/deceleration • Bit 1: Synchronous axis length setting 0: Diameter 1: Circumference

Name	Label name	Data type	Read timing*1	Setting range	Initial value	Description
Acceleration/ deceleration width	i_eAccDecWidth	Single precision real number	↑	Refer to the description.	25	Set the sheet width (one side) of the acceleration/deceleration area. • 2 × Acceleration/deceleration width ≤ Sheet length - Sheet synchronization width When a negative value is set, the acceleration/deceleration width is calculated to become the maximum value.
Number of cutter	i_uNumberOfCutter	Word [Unsigned]	↑	1 ≤ Number of cutter ≤ 256	1	Set the number of rotary cutters.

*1 ⎍: Always, ↑: When the FB is started (cannot be changed)

■Output labels

Name	Label name	Data type	Value to be held*1	Description
Execution status	o_bENO	Bit	—	On: Execution command is on. Off: Execution command is off.
Normal completion	o_bOK	Bit	—	This label indicates that the cam auto-generation has been completed and the FB has been normally completed.
Error completion	o_bError	Bit	—	On: An error has occurred in the FB. Off: No error has occurred.
Error code	o_uErrorID	Word [Unsigned]	—	The error code of the error that has occurred in the FB is stored.
Asynchronous speed result	o_eAsyncSpeedResult	Single precision real number	○	When cam auto-generation is normal, the asynchronous speed is stored as a ratio of synchronous speed. [multiplier]

*1 ○: The value will be held after the FB stops. —: The value will be cleared after the FB stops.

■I/O labels

Name	Label name	Data type	Read timing*1	Setting range	Initial value	Description
Cam auto-generation cam No.	io_uCamNo	Word [Unsigned]	↑	1 ≤ Cam auto-generation cam No. ≤ 256	1	Set the cam No. to be automatically generated for the cutter axis.
Output axis setting	io_stOutputAxis	AXIS_REF	—	—	—	Refer to the output axis setting below.

Output axis setting (AXIS_REF structure)

Name	Label name	Data type	Read timing*1	Setting range	Initial value	Description
Axis No.	AxisNo	Word [Unsigned]	↑	1 ≤ Axis No. ≤ Maximum number of axes of the module used	—	Set the axis No. of the output axis to be used for the cutter axis. This FB uses the unit set in "[Pr.1] Unit setting" of the axis No.
Start I/O number	StartIO	Word [Unsigned]	↑	0H ≤ Start I/O number ≤ FEH	0	Installation address of the Simple Motion module (Upper three digits of four digits (hexadecimal))

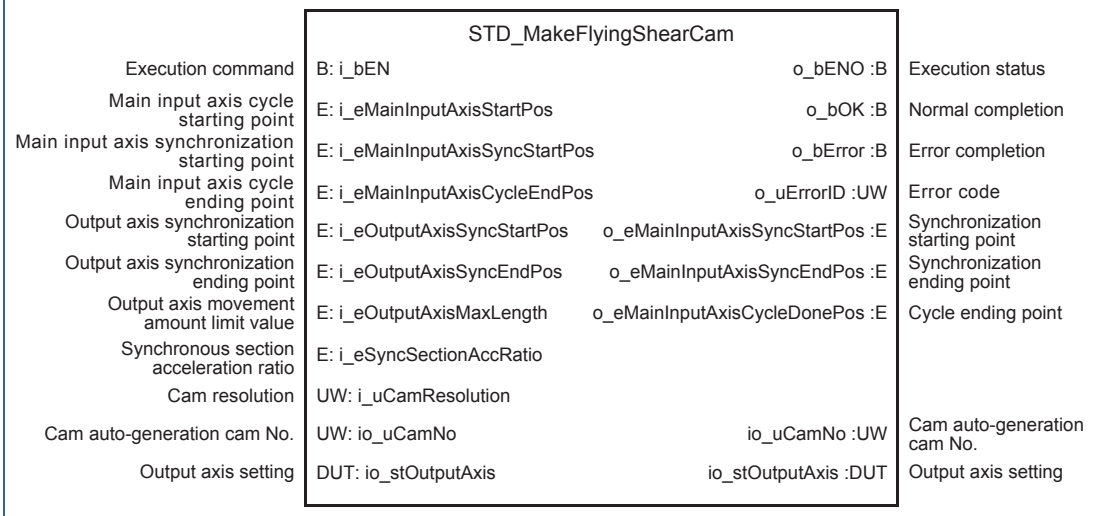
*1 ⎍: Always, ↑: When the FB is started (cannot be changed)

STD_MakeFlyingShearCam (Cam auto-generation for flying shear)

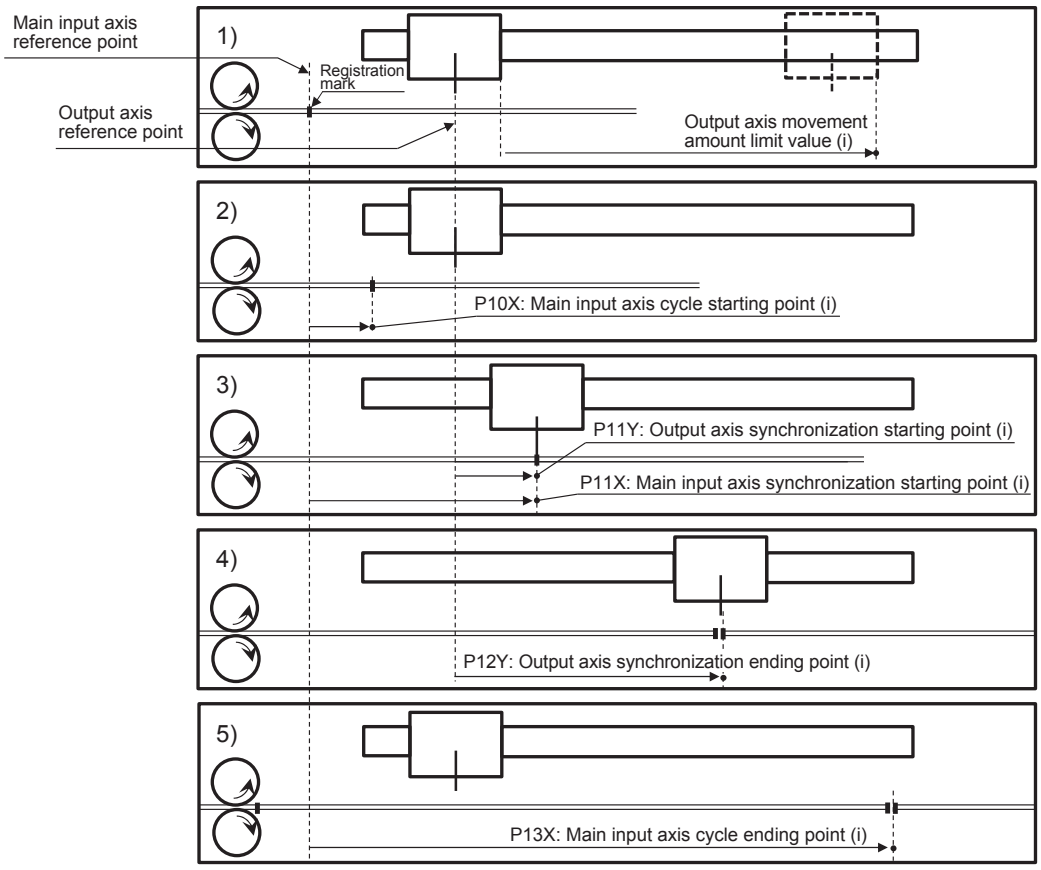
Name

STD_MakeFlyingShearCam

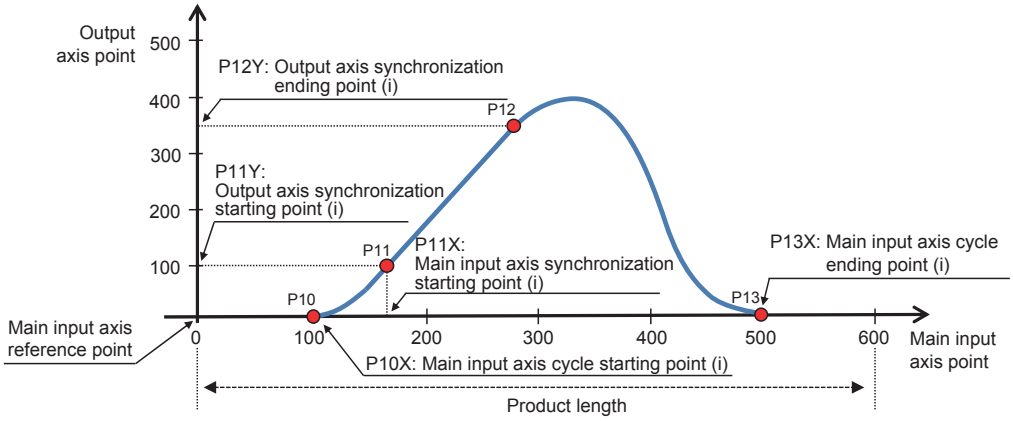
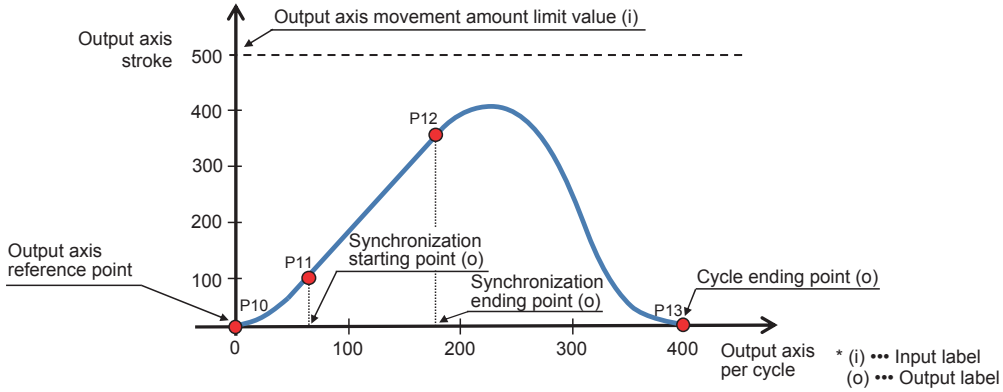
Function overview

Item	Description	
Function overview	This FB automatically generates a cam for flying shear.	
Symbol		
Applicable hardware and software	Applicable module	RD77MS, RD77GF
	Applicable CPU	MELSEC iQ-R series
	Engineering software	GX Works3
Number of steps	2449 steps	
FB dependence	—	

Item	Description
Function description	This FB automatically generates a cam for driving a flying shear. • Turning on i_bEN (Execution command) starts generating cam data based on the set data. • Calculate the main input axis length per cycle as the product length. • Specify the main input axis cycle starting point, synchronization starting point, cycle ending point of the flying shear (output axis) to the main input axis, and specify the synchronization starting point and synchronization ending point to the flying shear (output axis) to generate a cam pattern.*1



* (i) ••• Input label

Item	Description
Function description	• The cam pattern to be generated is a reciprocated cam pattern. • After the cam generation is normally completed and the following output data is updated, o_bOK (Normal completion) turns on. "o_eMainInputAxisSyncStartPos (Synchronization starting point)" "o_eMainInputAxisSyncEndPos (Synchronization ending point)" "o_eMainInputAxisCycleDonePos (Cycle ending point)" Even though i_bEN (Execution command) turns off, the above output data will be held. The above output data will be cleared when i_bEN (Execution command) turns on.   • When performing the synchronous control with the FB CtrlOutputAxisSync, set the main input axis cycle starting point for i_eWaitingPos (Waiting position). • If the calculated output axis movement amount exceeds the value of i_eOutputAxisMaxLength (Output axis movement amount limit value), the error (ErrorID: 2200H) is stored.*2 • i_eSyncSectionAccRatio (Synchronous section speed acceleration ratio) changes the speed in the synchronous section. • If a warning related to the cam data operation occurs in the Simple Motion module during cam generation, an error (ErrorID: 2203H) is stored. • If a value other than "0" has been set in "[Cd.600] Cam data operation request" at the cam generation, an error (ErrorID: 2205H) is stored. • If an error has occurred in the FB, Error turns on and the error code is stored in ErrorID. • For details of error codes, refer to "List of Error Codes" in the following manual. 📖 iQ Monozukuri PACKAGING Instruction Manual (For MELSEC iQ-R)
Restrictions and precautions	• If a value other than 0 to 3 has been set in "[Pr.1] Unit setting", this FB is executed with the unit [mm]. • The cam to be automatically generated is in the coordinate data format. • The cam data that has been automatically generated is saved in the cam storage area. • If i_bEN (Execution command) turns off during cam generation, the cam may not be normally generated. • When generating multiple cams at the same time, input o_bOK (Normal completion) of the cam auto-generation FB as an interlock condition so that the generation of the next cam starts after the generation of one cam is successfully completed. • If the cam generation fails, the cam data may be undefined. Try the cam auto-generation again. Check that normal cam is generated and then perform the operation. • Since cam operation control data ([Cd.600] to [Cd.607]) is set in this FB, do not use user programs to set or change the data.*3 • Use the FB CtrlOutputAxisSync or create a user program for the operation of the flying shear axis.
Compiling method	Macro type, subroutine type
FB operation type	Pulsed execution (multiple scan execution type)

*1 By setting the main input axis cycle starting point to "0" and the cycle ending point to the "product length", a cam pattern is generated at the main input axis per cycle = cam axis per cycle.
By setting the main input axis cycle starting point to "a value larger than 0" or the cycle ending point to "a value smaller than product length", a cam pattern is generated at the main input axis per cycle ≠ cam axis per cycle.

*2 By setting i_eOutputAxisMaxLength to "0", the movement amount limit is ignored.

*3 For details of control data, refer to the following.
MELSEC iQ-R Simple Motion Module User's Manual (Advanced Synchronous Control)

Labels

■Input labels

Name	Label name	Data type	Read timing*1	Setting range	Initial value	Description
Execution command	i_bEN	Bit	⎍	On, off	—	On: The FB is activated. Off: The FB is not activated.
Main input axis cycle starting point	i_eMainInputAxisStartPos	Single precision real number	↑	Refer to the description.	200.0	Set the main input axis point where the one cycle operation starts. • 0.0 ≤ Main input axis cycle starting point ≤ 100000.0 [mm] • 0.00 ≤ Main input axis cycle starting point ≤ 10000.00 [inch] • 0.00 ≤ Main input axis cycle starting point ≤ 10000.00 [degree] • 0 ≤ Main input axis cycle starting point ≤ 9999999 [pulse] [The unit setting depends on the axis No. setting value in the output axis setting.]
Main input axis synchronization starting point	i_eMainInputAxisSyncStartPos	Single precision real number	↑	Refer to the description.	300.0	Set the main input axis point at the start of the synchronous section. • 0.1 ≤ Main input axis synchronization starting point ≤ 100000.0 [mm] • 0.01 ≤ Main input axis synchronization starting point ≤ 10000.00 [inch] • 0.01 ≤ Main input axis synchronization starting point ≤ 10000.00 [degree] • 1 ≤ Main input axis synchronization starting point ≤ 9999999 [pulse] [The unit setting depends on the axis No. setting value in the output axis setting.]
Main input axis cycle ending point	i_eMainInputAxisCycleEndPos	Single precision real number	↑	Refer to the description.	900.0	Set the end point of the main input axis per cycle. • 0.1 ≤ Main input axis cycle ending point ≤ 100000.0 [mm] • 0.01 ≤ Main input axis cycle ending point ≤ 10000.00 [inch] • 0.01 ≤ Main input axis cycle ending point ≤10000.00 [degree] • 1 ≤ Main input axis cycle ending point ≤ 9999999 [pulse] [The unit setting depends on the axis No. setting value in the output axis setting.]
Output axis synchronization starting point	i_eOutputAxisSyncStartPos	Single precision real number	↑	Refer to the description.	50.0	Set the output axis point at the start of the synchronous section. • 0.1 ≤ Output axis synchronization starting point ≤ 100000.0 [mm] • 0.01 ≤ Output axis synchronization starting point ≤ 10000.00 [inch] • 0.01 ≤ Output axis synchronization starting point ≤ 10000.00 [degree] • 1 ≤ Output axis synchronization starting point ≤ 9999999 [pulse] [The unit setting depends on the axis No. setting value in the output axis setting.]

Name	Label name	Data type	Read timing*1	Setting range	Initial value	Description
Output axis synchronization ending point	i_eOutputAxisSyncEndPos	Single precision real number	↑	Refer to the description.	350.0	Set the output axis point at the end of the synchronous section. • 0.1 ≤ Output axis synchronization ending point ≤ 100000.0 [mm] • 0.01 ≤ Output axis synchronization ending point ≤ 10000.00 [inch] • 0.01 ≤ Output axis synchronization ending point ≤ 10000.00 [degree] • 1 ≤ Output axis synchronization ending point ≤ 9999999 [pulse] [The unit setting depends on the axis No. setting value in the output axis setting.]
Output axis movement amount limit value	i_eOutputAxisMaxLength	Single precision real number	↑	Refer to the description.	0.0	Set the movement amount limit value of the output axis. "0" = Limit value invalid, other than "0" = Limit value valid • 0.1 ≤ Output axis movement amount limit value ≤ 100000.0 [mm] • 0.01 ≤ Output axis movement amount limit value ≤ 10000.00 [inch] • 0.01 ≤ Output axis movement amount limit value ≤ 10000.00 [degree] • 1 ≤ Output axis movement amount limit value ≤ 9999999 [pulse] [The unit setting depends on the axis No. setting value in the output axis setting.]
Synchronous section acceleration ratio	i_eSyncSectionAccRatio	Single precision real number	↑	-50.00 ≤ Synchronous section acceleration ratio ≤ 50.00 [%]	0.00	Set this item when the fine adjustment of the synchronous speed in the synchronous section is required. Synchronous section speed = Synchronous speed × (100% + Acceleration ratio)
Cam resolution	i_uCamResolution	Word [Unsigned]	↑	5 ≤ Cam resolution ≤ 2048	256	Set the cam resolution (Number of coordinates) of the cam to be generated.

*1 ⎍: Always, ↑: When the FB is started (cannot be changed)

■Output labels

Name	Label name	Data type	Value to be held*1	Description
Execution status	o_bENO	Bit	—	On: Execution command is on. Off: Execution command is off.
Normal completion	o_bOK	Bit	—	This label indicates that the cam auto-generation has been completed and the FB has been normally completed.
Error completion	o_bError	Bit	—	On: An error has occurred in the FB. Off: No error has occurred.
Error code	o_uErrorID	Word [Unsigned]	—	The error code of the error that has occurred in the FB is stored.
Synchronization starting point	o_eMainInputAxisSyncStartPos	Single precision real number	○	The main input axis point at the start of the synchronization is stored. [The unit setting depends on the axis No. setting value in the output axis setting.]
Synchronization ending point	o_eMainInputAxisSyncEndPos	Single precision real number	○	The main input axis point at the end of the synchronization is stored. [The unit setting depends on the axis No. setting value in the output axis setting.]
Cycle ending point	o_eMainInputAxisCycleDonePos	Single precision real number	○	The main input axis point at the end of the operation is stored. [The unit setting depends on the axis No. setting value in the output axis setting.]

*1 ○: The value will be held after the FB stops. —: The value will be cleared after the FB stops.

■I/O labels

Name	Label name	Data type	Read timing*1	Setting range	Initial value	Description
Cam auto-generation cam No.	io_uCamNo	Word [Unsigned]	↑	1 ≤ Cam auto-generation cam No. ≤ 256	1	Set the cam No. to be automatically generated for the flying shear.
Output axis setting	io_stOutputAxis	AXIS_REF	↑	—	—	Refer to the output axis setting below.

Output axis setting (AXIS_REF structure)

Name	Label name	Data type	Read timing*1	Setting range	Initial value	Description
Axis No.	AxisNo	Word [Unsigned]	↑	1 ≤ Axis No. ≤ Maximum number of axes of the module used	—	Set the axis No. of the output axis to be used for the flying shear axis. This FB uses the unit set in "[Pr.1] Unit setting" of the axis No.
Start I/O number	StartIO	Word [Unsigned]	↑	0H ≤ Start I/O number ≤ FEH	0	Installation address of the Simple Motion module (Upper three digits of four digits (hexadecimal))

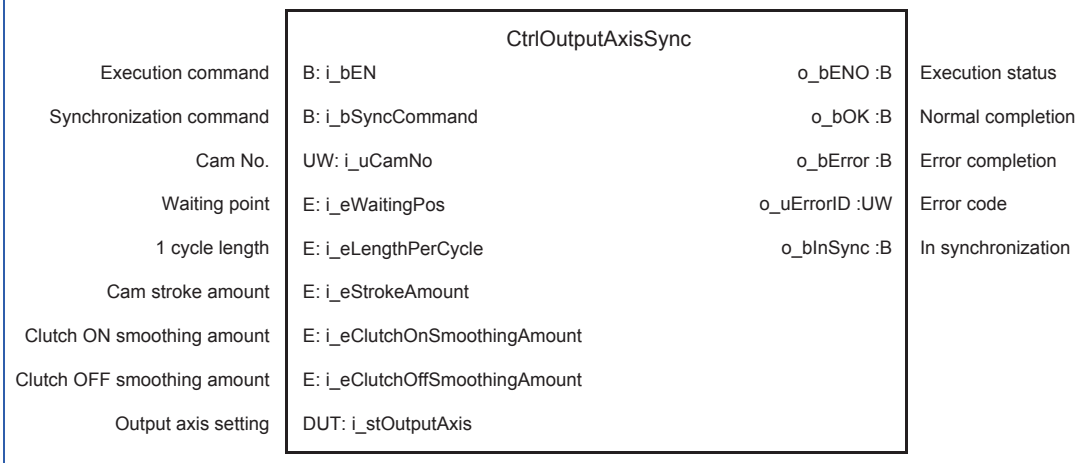
*1 ⎍: Always, ↑: When the FB is started (cannot be changed)

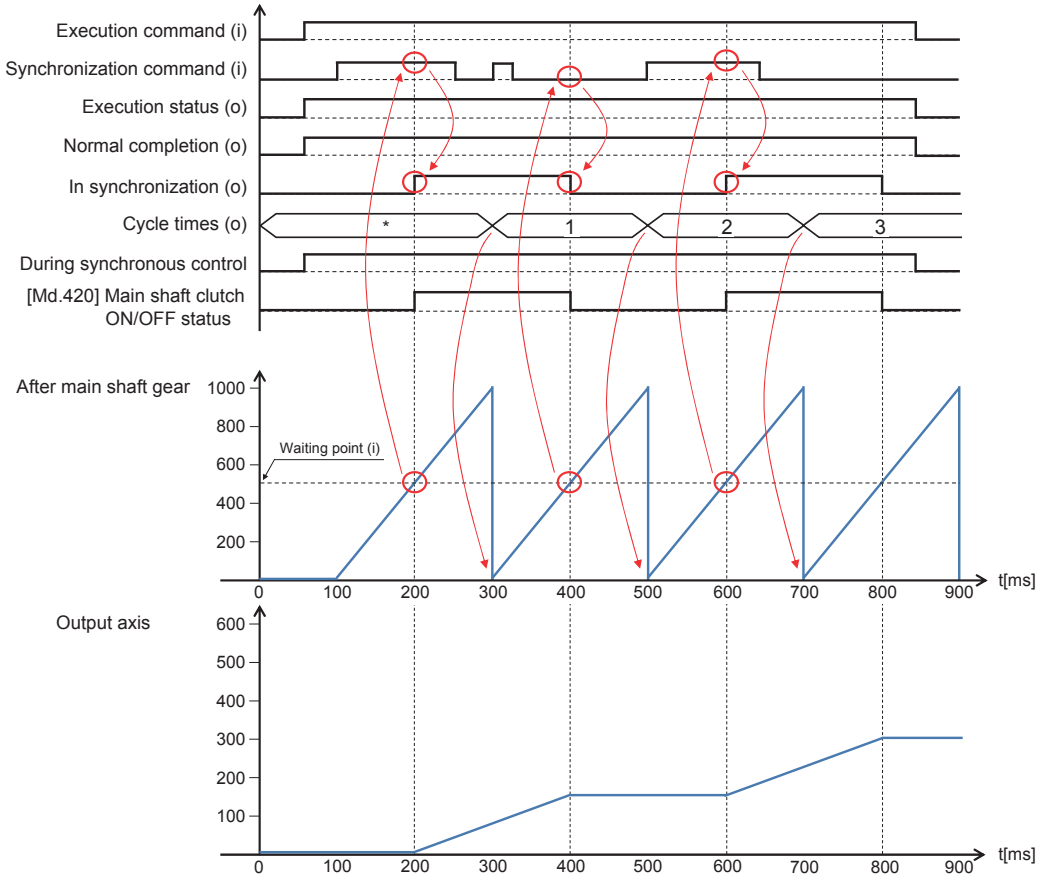
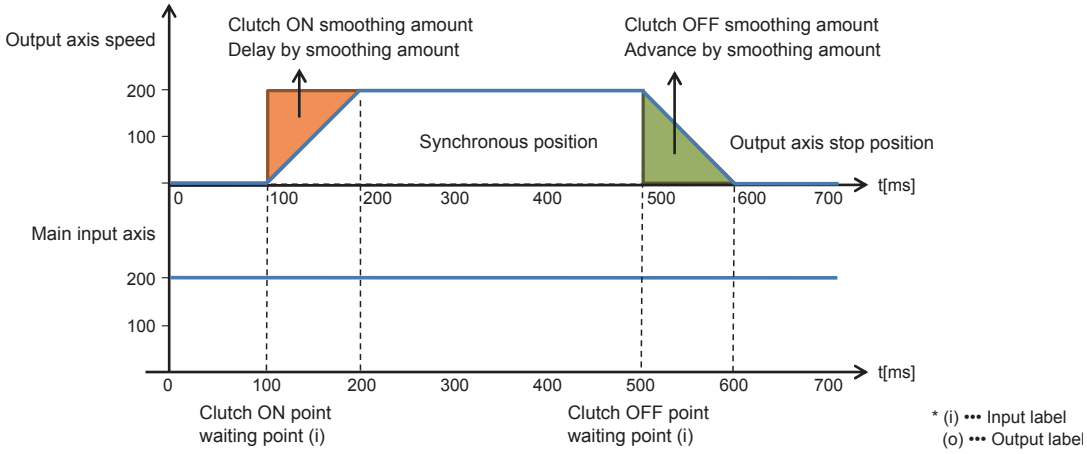
CtrlOutputAxisSync (Output axis synchronous control)

Name

CtrlOutputAxisSync

Function overview

Item	Description		
Function overview	This FB controls the output axis synchronized with the master axis.		
Symbol			
Applicable hardware and software	Applicable module	RD77MS, RD77GF	
	Applicable CPU	MELSEC iQ-R series	
	Engineering software	GX Works3	
Number of steps	1581 steps		
FB dependence	—		

Item	Description
Function description	This FB controls the output axis by synchronizing the cam created by the cam generation FB with the main input axis. • When the current value of the main input axis per cycle is equal to the value of i_eWaitingPos (Waiting position) and i_bSyncCommand (Synchronization command) is on, the clutch turns on from i_eWaitingPos (Waiting position). • When the current value of the main input axis per cycle is equal to the value of i_eWaitingPos (Waiting position) and i_bSyncCommand (Synchronization command) is off, the clutch turns off from i_eWaitingPos (Waiting position). • The output axis movement amount delays from the main input axis movement amount by i_eClutchOnSmoothingAmount (Clutch ON smoothing amount) and moves by i_eClutchOffSmoothingAmount (Clutch OFF smoothing amount). Change the waiting position as needed. • When the clutch turns on during synchronous control, o_bInSync (In synchronization) turns on. ■ Sample data Cam axis current value per cycle: 1000 Cam stroke amount: 200 Cam type: Straight cam  ■ Clutch ON/OFF timing  • If an error has occurred in the FB, Error turns on and an error code is stored in ErrorID. • For details of error codes, refer to "List of Error Codes" in the following manual. 📖 iQ Monozukuri PACKAGING Instruction Manual (For MELSEC iQ-R)

Item	Description
Restrictions and precautions	• Execute this FB in the Simple Motion calculation cycle event task (I44: Inter-module synchronization). • If parameters have been set as below, this FB is executed with the unit [mm]. "[Pr.1] Unit setting": Other than 0 to 3 "[Pr.300] Servo input axis type": Other than 1 to 4 Control unit of "[Pr.321] Synchronous encoder axis unit setting": Other than 0 to 3 "[Pr.400] Main input axis type": 1 to the maximum number of module axes (servo input axis), other than 801 to 800 + maximum number of module axes (synchronous encoder) • Set the parameters of the "input axis module" used in the synchronous control according to the machine mechanism. Servo input axis parameters: [Pr.300] to [Pr.304] Synchronous encoder axis parameters: [Pr.320] to [Pr.329] • Since the following synchronous parameters used in the synchronous control are set in this FB, input labels, or structure, do not use user programs to set or change them. "[Pr.405] to [Pr.407], [Pr.409], [Pr.411], [Pr.413], [Pr.414], [Pr.439] to [Pr.441]" • To use synchronous parameters in a mechanism, set synchronous encoder axis control data ([Cd.320] to [Cd.325]) by users. • This FB performs the main axis clutch control in the address mode and switches the on/off state of the main clutch by changing "[Pr.405] Main shaft clutch control setting". Setting value of [Pr.405] at clutch ON: H0004 Setting value of [Pr.405] at clutch OFF: H0042 • This FB uses the slippage method (Linear: Input value follow up) as the clutch smoothing method ([Pr.411] = 5). • Create "[Cd.380] Synchronous control start" with user programs.*1 • When Execution command turns off while o_bInSync (In synchronization) is on, the FB turns off the output of o_bInSync while holding the on state of the clutch. • Set i_eWaitingPos (Waiting position) not to overlap the synchronous section of the main input axis and output axis.
Compiling method	Macro type, subroutine type
FB operation type	Real-time execution

*1 For details of the synchronous control parameters and control data, refer to the following.
MELSEC iQ-R Simple Motion Module User's Manual (Advanced Synchronous Control)

Labels

■Input labels

Name	Label name	Data type	Read timing*1	Setting range	Initial value	Description
Execution command	i_bEN	Bit	⎍	On, off	—	On: The FB is activated. Off: The FB is not activated.
Synchronization command	i_bSyncCommand	Bit	⎍	On, off	—	Enable the main axis clutch control. On: The clutch turns on from the waiting position. Off: The clutch turns off to stop at the waiting position.
Cam No.	i_uCamNo	Word [Unsigned]	↑	0 ≤ Cam No. ≤ 256	1	Set the cam No. of the cam to be used for the output axis. 0: Straight cam 1 to 256: Generation cam
Waiting position	i_eWaitingPos	Single precision real number	⎍	Refer to the description.	0.0	Set the position where the address clutch turns on or off to the current value per cycle after main axis gear. • 0.0 ≤ Waiting position ≤ 100000.0 [mm] • 0.00 ≤ Waiting position ≤ 10000.00 [inch] • 0.00 ≤ Waiting position ≤ 10000.00 [degree] • 0 ≤ Waiting position ≤ 9999999 [pulse] [The unit setting depends on the axis No. setting value in the output axis setting.]
1 cycle length	i_eLengthPerCycle	Single precision real number	↑	Refer to the description.	200.0	Set the 1 cycle length of the cam axis. • 0.1 ≤ 1 cycle length ≤ 100000.0 [mm] • 0.01 ≤ 1 cycle length ≤ 10000.00 [inch] • 0.01 ≤ 1 cycle length ≤ 10000.00 [degree] • 1 ≤ 1 cycle length ≤ 9999999 [pulse] [The unit setting depends on the axis No. setting value in the output axis setting.]

Name	Label name	Data type	Read timing*1	Setting range	Initial value	Description
Cam stroke amount	i_eStrokeAmount	Single precision real number	↑	Refer to the description.	200.0	Set the cam stroke amount corresponding to 100% of the stroke ratio in units of the output axis for the cam control in the stroke ratio data format. (For the cam data in the coordinate data format, an output value of coordinate data will be a cam stroke position.) • 0.1 ≤ Cam stroke amount ≤ 100000.0 [mm] • 0.01 ≤ Cam stroke amount ≤ 10000.00 [inch] • 0.01 ≤ Cam stroke amount ≤ 10000.00 [degree] • 1 ≤ Cam stroke amount ≤ 9999999 [pulse] [The unit setting depends on the axis No. setting value in the output axis setting.]
Clutch ON smoothing amount	i_eClutchOnSmoothingAmount	Single precision real number	↑	Refer to the description.	0.0	Set the smoothing amount when the clutch is on. • 0.0 ≤ Clutch ON smoothing amount ≤ 100000.0 [mm] • 0.00 ≤ Clutch ON smoothing amount ≤ 10000.00 [inch] • 0.00 ≤ Clutch ON smoothing amount ≤ 10000.00 [degree] • 0 ≤ Clutch ON smoothing amount ≤ 9999999 [pulse] [The unit setting depends on the axis No. setting value in the output axis setting.]
Clutch OFF smoothing amount	i_eClutchOffSmoothingAmount	Single precision real number	↑	Refer to the description.	0.0	Set the smoothing amount when the clutch is off. • 0.0 ≤ Clutch OFF smoothing amount ≤ 100000.0 [mm] • 0.00 ≤ Clutch OFF smoothing amount ≤ 10000.00 [inch] • 0.00 ≤ Clutch OFF smoothing amount ≤10000.00 [degree] • 0 ≤ Clutch OFF smoothing amount ≤ 9999999 [pulse] [The unit setting depends on the axis No. setting value in the output axis setting.]
Output axis setting	i_stOutputAxis	AXIS_REF	—	—	—	Refer to the output axis setting below.

Output axis setting (AXIS_REF structure)

Name	Label name	Data type	Read timing *1	Setting range	Initial value	Description
Axis No.	AxisNo	Word [Unsigned]	↑	1 ≤ Axis No. ≤ Maximum number of axes of the module used	—	Set the axis No. of the output axis. The unit setting of the main input axis that drives the output axis is also used for the 1 cycle length and the clutch ON/OFF smoothing amount. The unit setting of the set axis No. is also used for the cam stroke amount.
Start I/O number	StartIO	Word [Unsigned]	↑	0H ≤ Start I/O number ≤ FEH	0	Installation address of the Simple Motion module (Upper three digits of four digits (hexadecimal))

*1 ⎍: Always, ↑: When the FB is started (cannot be changed)

■Output labels

Name	Label name	Data type	Value to be held*1	Description
Execution status	o_bENO	Bit	—	On: Execution command is on. Off: Execution command is off.
Normal completion	o_bOK	Bit	—	This label indicates that the FB has normally started.
Error completion	o_bError	Bit	—	On: An error has occurred in the FB. Off: No error has occurred.
Error code	o_uErrorID	Word [Unsigned]	—	The error code of the error that has occurred in the FB is stored.
In synchronization	o_bInSync	Bit	—	On: The clutch turns on during synchronous control. Off: The clutch turns off during synchronous control.

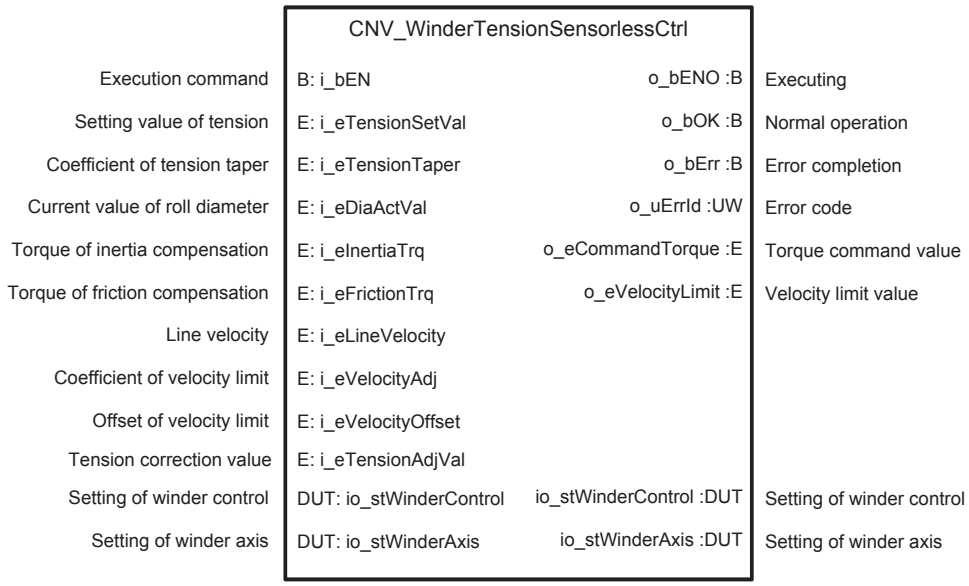
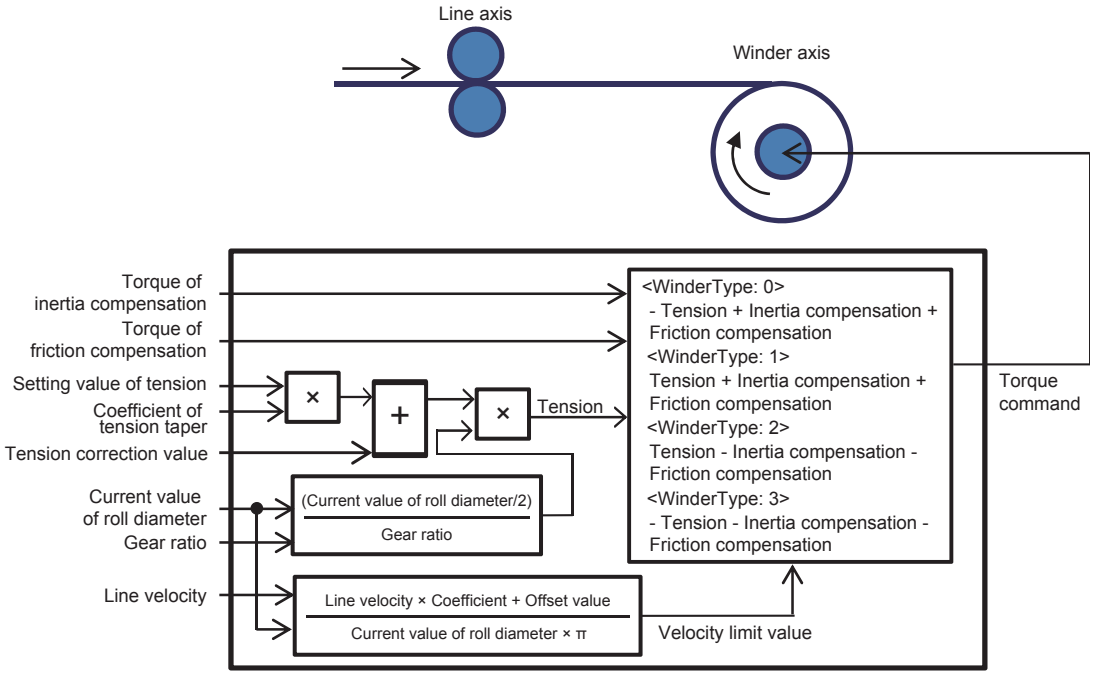
*1 ○: The value will be held after the FB stops. —: The value will be cleared after the FB stops.

CNV_WinderTensionSensorlessCtrl (Tension sensorless torque control)

Name

CNV_WinderTensionSensorlessCtrl

Function overview

Item	Description	
Function overview	This FB performs the torque control without sensors to control the tension in unwinding and rewinding.	
Symbol		
Applicable hardware and software	Applicable module	RD77MS, RD77GF
	Applicable CPU	MELSEC iQ-R series CPU module
	Engineering software	GX Works3
Number of steps	1716 steps (For the macro type)	
FB dependence	None	
Function description	The command torque is calculated from the roll diameter and compensation torque/tension correction value so that the tension reaches the set tension in unwinding and rewinding, and it is output to the servo amplifier. 	

Item	Description
Compiling method	Macro type, subroutine type
FB operation type	Real-time execution
Restrictions and precautions	Execute this FB in a fixed cycle. (Motion calculation cycle event task (I44: Inter-module synchronization) is recommended.)

Labels

■Input labels

Name	Label name	Data type	Read timing*1	Setting range	Initial value	Description
Execution command	i_bEN	Bit	⎍	—	—	On: The FB is activated. Off: The FB is stopped.
Setting value of tension	i_eTensionSetVal	Single precision real number	⎍	0.0<=	—	Input the target value of tension [N].
Coefficient of tension taper	i_eTensionTaper	Single precision real number	⎍	0.0<=	1.0	Taper coefficient of the set tension value (1.0 = 100%)
Current value of roll diameter	i_eDiaActVal	Single precision real number	⎍	0.0 <	—	Input the current value of the roll diameter [mm].
Torque of inertia compensation	i_eInertiaTrq	Single precision real number	⎍	—	—	Torque of inertia compensation [N·m] (Motor axis conversion)
Torque of friction compensation	i_eFrictionTrq	Single precision real number	⎍	0.0<=	—	Torque of friction compensation [N·m] (Motor axis conversion)
Line velocity	i_eLineVelocity	Single precision real number	⎍	—	—	Input the current value of the line velocity [m/min].
Coefficient of velocity limit	i_eVelocityAdj	Single precision real number	⎍	0.0<=	1.0	Coefficient of velocity limit (1.0 = Line velocity × 100%)
Offset of velocity limit	i_eVelocityOffset	Single precision real number	⎍	0.0<=	—	Offset of velocity limit [m/min]
Tension correction value	i_eTensionAdjVal	Single precision real number	⎍	—	—	Input the correction value of the tension deviations from free roller [N]

*1 ⎍: Always, ↑: Only when the FB is started

■Output labels

Name	Label name	Data type	Value to be held*1	Description
Execution status	o_bENO	Bit	—	Turns on while Execution command is on.
Normal operation	o_bOK	Bit	—	Turns on while the FB is normally operating.
Error completion	o_bErr	Bit	—	Turns on when an error has occurred in the FB.
Error code	o_uErrId	Word [Unsigned]	—	The error code of the error that has occurred in the FB is stored. • Refer to "List of Error Codes" in the following manual. 📖 iQ Monozukuri CONVERTING Instruction Manual
Torque command value	o_eCommandTorque	Single precision real number	—	Torque command value of the FB calculation results [N·m] (Motor axis conversion)
Velocity limit value	o_eVelocityLimit	Single precision real number	—	Velocity limit value of FB calculation results [r/min] (Motor axis conversion)

*1 ○: The value is held after the FB stops. —: The value is cleared after the FB stops.

■I/O labels

Name	Label name	Data type	Setting range	Description
Setting of winder control	io_stWinderControl	WINDER_REF	—	Refer to the following.
Setting of winder axis	io_stWinderAxis	AXIS_REF	—	

Setting of winder control (WINDER_REF structure)

Name	Label name	I/O	Data type	Read timing*1	Setting range	Initial value	Description
Winding method	wWinderType	IN	Word [Signed]	⎍	0 to 3	—	Rewinding/unwinding setting 0: Forward unwinding 1: Forward rewinding 2: Backward unwinding 3: Backward rewinding • Refer to "Rotation Direction Setting" in the following manual. 📖 iQ Monozukuri CONVERTING Instruction Manual
Gear ratio	eWinderGearRatio	IN	Single precision real number	↑	0.0 <	—	Gear ratio (Motor side/load side)
Rated torque	eWinderRatedTrq	IN	Single precision real number	↑	0.0 <	—	Rated torque of motor [N·m]

Setting of winder axis (AXIS_REF structure)

Name	Label name	I/O	Data type	Read timing*1	Setting range	Initial value	Description
Axis No.	AxisNo	IN	Word [Unsigned]	↑	0 to the maximum number of axes of the module used	—	Axis number (0: Only the command operation. The Simple Motion module does not send output to the servo amplifier.)
Start I/O number	StartIO	IN	Word [Unsigned]	↑	0H to FEH	—	Installation address of the Simple Motion module (Upper three digits of four digits (hexadecimal))

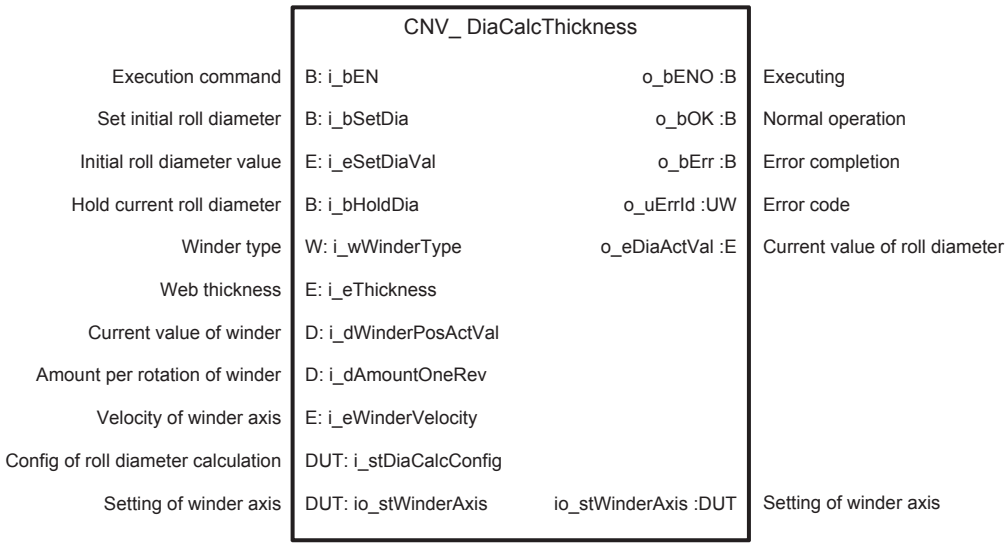
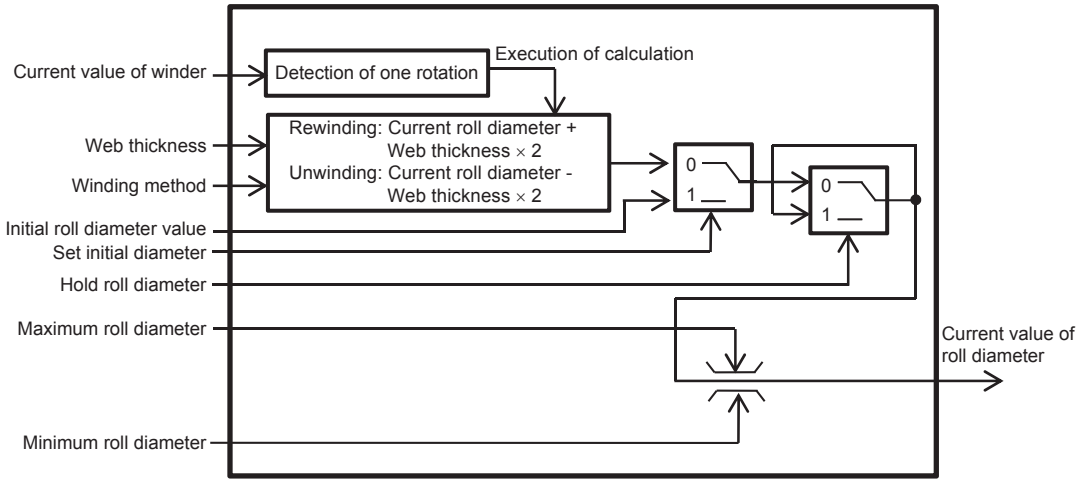
*1 ⎍: Always, ↑: Only when the FB is started

CNV_DiaCalcThickness (Roll diameter calculation (web thickness integration method))

Name

CNV_DiaCalcThickness

Function overview

Item	Description	
Function overview	This FB calculates the roll diameter from the web thickness and the rotation amount of the winder axis.	
Symbol		
Applicable hardware and software	Applicable module	RD77MS, RD77GF
	Applicable CPU	MELSEC iQ-R series CPU module
	Engineering software	GX Works3
Number of steps	1958 steps (For the macro type)	
FB dependence	STD_Limiter	
Function description	The roll diameter is calculated by adding/subtracting (Web thickness × 2) to/from the initial roll diameter for the first rotation. From the second rotation, the roll diameter is calculated by adding/subtracting (Web thickness × 2) to/from the current roll diameter every time the winder axis rotates. 	
Compiling method	Macro type, subroutine type	
FB operation type	Real-time execution	
Restrictions and precautions	—	

Labels

■Input labels

Name	Label name	Data type	Read timing*1	Setting range	Initial value	Description
Execution command	i_bEN	Bit	⎍	—	—	On: The FB is activated. Off: The FB is stopped.
Set initial roll diameter	i_bSetDia	Bit	⎍	—	—	On: Initial roll diameter → Current value of roll diameter Off: Cumulative value of web thickness → Current value of roll diameter
Initial roll diameter value	i_eSetDiaVal	Single precision real number	⎍	Refer to the right description.	—	Initial value of roll diameter [mm] (Minimum roll diameter to maximum roll diameter)
Hold current roll diameter	i_bHoldDia	Bit	⎍	—	—	On: The cumulative calculation of web thickness stops. (The current value is held.) Off: Cumulative value of web thickness → Current value of roll diameter
Winding method	i_wWinderType	Word [Signed]	⎍	0 to 3	—	Rewinding/unwinding setting 0: Forward unwinding 1: Forward rewinding 2: Backward unwinding 3: Backward rewinding • Refer to "Rotation Direction Setting" in the following manual. 📖 iQ Monozukuri CONVERTING Instruction Manual
Web thickness	i_eThickness	Single precision real number	⎍	0.0 <	—	Web thickness [mm]
Current value of winder	i_dWinderPosActVal	Double word [Signed]	⎍	—	—	Current rotational position of the winder axis (Input a value only when the axis number is 0.)
Amount per rotation of winder	i_dAmountOneRev	Double word [Signed]	↑	0 <	—	Travel distance per rotation of winder axis (Input a value only when the axis number is 0.)
Velocity of winder axis	i_eWinderVelocity	Single precision real number	⎍	—	—	Current value of winder velocity [r/min] (Input a value only when the axis number is 0.)
Config of roll diameter calculation	i_stDiaCalcConfig	DIA_CALC_REF	—	—	—	Refer to the following.

Setting of roll diameter calculation (DIA_CALC_REF structure)

Name	Label name	Data type	Read timing*1	Setting range	Initial value	Description
Maximum roll diameter	MaxDia	Single precision real number	↑	Refer to the right description.	—	Maximum value and minimum value of roll diameter (0.0 < Minimum diameter < Maximum diameter)
Minimum roll diameter	MinDia	Single precision real number	↑		—	
Minimum winder velocity	MinWinderVelocity	Single precision real number	↑	0.0<=	—	Minimum winder velocity for roll diameter calculation [r/min]

*1 ⎍: Always, ↑: Only when the FB is started

■Output labels

Name	Label name	Data type	Value to be held*1	Description
Execution status	o_bENO	Bit	—	Turns on while Execution command is on.
Normal operation	o_bOK	Bit	—	Turns on while the FB is normally operating.
Error completion	o_bErr	Bit	—	Turns on when an error has occurred in the FB.

Name	Label name	Data type	Value to be held*1	Description
Error code	o_uErrId	Word [Unsigned]	—	The error code of the error that has occurred in the FB is stored. • Refer to "List of Error Codes" in the following manual. 📖 iQ Monozukuri CONVERTING Instruction Manual
Current value of roll diameter	o_eDiaActVal	Single precision real number	○	The calculation result of the roll diameter [mm] is stored.

*1 ○: The value is held after the FB stops. —: The value is cleared after the FB stops.

■I/O labels

Name	Label name	Data type	Setting range	Description
Setting of winder axis	io_stWinderAxis	AXIS_REF	—	Refer to the following.

Setting of winder axis (AXIS_REF structure)

Name	Label name	I/O	Data type	Read timing*1	Setting range	Initial value	Description
Axis No.	AxisNo	IN	Word [Unsigned]	↑	0 to the maximum number of axes of the module used	—	Axis number (Set "0" for using an axis other than the motion control axis.)
Start I/O number	StartIO	IN	Word [Unsigned]	↑	0H to FEH	—	Installation address of the Simple Motion module (Upper three digits of four digits (hexadecimal))

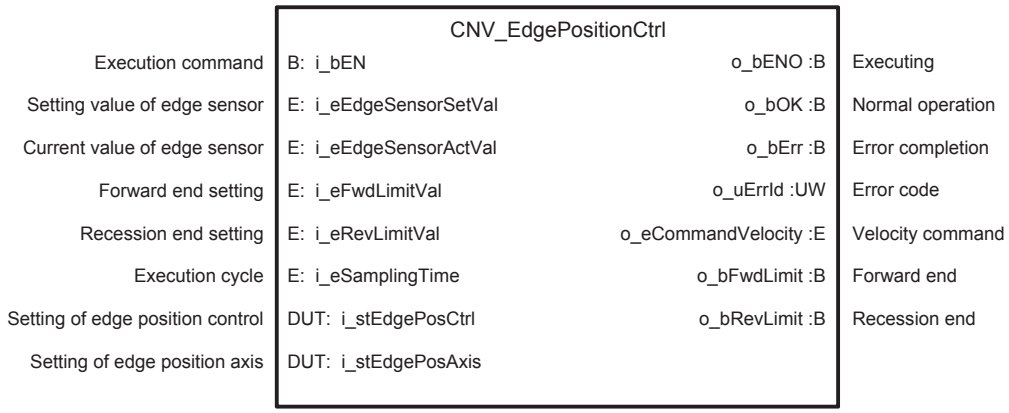
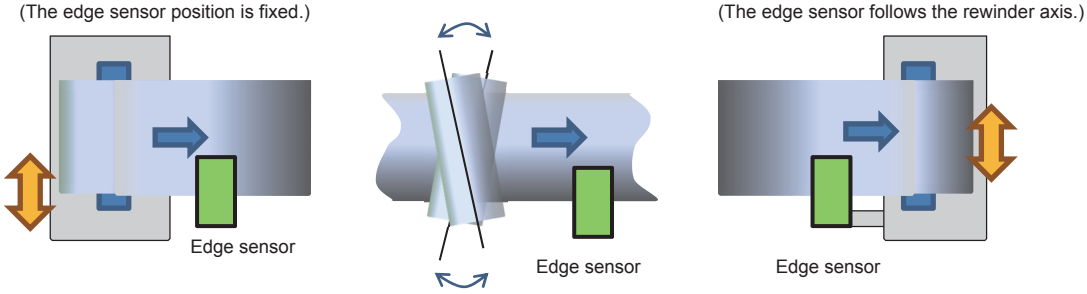
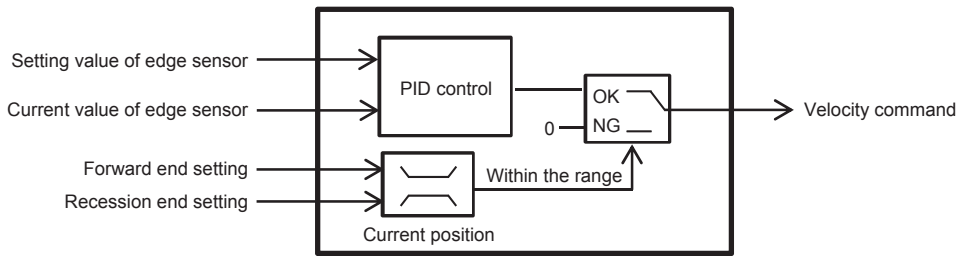
*1 ⎍: Always, ↑: Only when the FB is started

CNV_EdgePositionCtrl (Edge position control)

Name

CNV_EdgePositionCtrl

Function overview

Item	Description	
Function overview	This FB detects the position of the edge sensor and controls the velocity to reach the target position.	
Symbol		
Applicable hardware and software	Applicable module	RD77MS, RD77GF
	Applicable CPU	MELSEC iQ-R series CPU module
	Engineering software	GX Works3
Number of steps	4558 steps (For the macro type)	
FB dependence	CNV_PIDControl	
Function description	This FB calculates the velocity for the position correction with the PID control so that an edge position of a web material will be the intermediate value (target value) of the edge sensor, and outputs the velocity as a velocity command in the velocity mode to the servo amplifier. ● When the unwinder axis moves (The edge sensor position is fixed.) ● When the intermediate axis moves*1 ● When the rewinder axis moves (The edge sensor follows the rewinder axis.)   *1 To correct the position according to a roller angle of the intermediate axis, set the electric gear unit setting to "0:mm". (Example) Rotating 45 degree per rotation of the motor (4194304 pulse) → Pr.2: No. of pulse per rotation: 4194304 pulse, Pr.3: Movement amount per rotation: 45000.0 μm	
Compiling method	Macro type, subroutine type	
FB operation type	Real-time execution	
Restrictions and precautions	Execute this FB in a fixed cycle. (Motion calculation cycle event task (I44: Inter-module synchronization) is recommended.)	

Labels

■Input labels

Name	Label name	Data type	Read timing*1	Setting range	Initial value	Description
Execution command	i_bEN	Bit	⎍	—	—	On: The FB is activated. Off: The FB is stopped.
Setting value of edge sensor	i_eEdgeSensorSetVal	Single precision real number	⎍	—	—	Input the target position of the edge sensor [mm].
Current value of edge sensor	i_eEdgeSensorActVal	Single precision real number	⎍	—	—	Input the current value of the edge sensor [mm].
Forward end setting	i_eFwdLimitVal	Single precision real number	⎍	Recession end <	—	Edge position Forward end position [mm] The velocity control in the + direction stops.
Recession end setting	i_eRevLimitVal	Single precision real number	⎍	Forward end >	—	Edge position Recession end position [mm] The velocity control in the - direction stops.
Execution cycle	i_eSamplingTime	Single precision real number	↑	0.0 <	—	Execution cycle [ms] of the program for executing the FB
Setting of edge position control	i_stEdgePosCtrl	EdgePos_REF	—	—	—	Refer to Setting of edge position control.
Setting of edge position axis	i_stEdgePosAxis	AXIS_REF	—	—	—	Refer to Setting of edge position axis.

Setting of edge position control (EdgePos_REF structure)

Name	Label name	I/O	Data type	Read timing*1	Setting range	Initial value	Description
Direction of operation	bDirection	IN	Bit	↑	—	—	Off: Sensor value+ → Command velocity- On: Sensor value+ → Command velocity+
Proportionality gain	eKp	IN	Single precision real number	⎍	0.0 <=	—	PID control Proportionality gain [(mm/s)/mm]
Integral time	eTi	IN	Single precision real number	⎍	0.0 <=	—	PID control Integral time [ms]
Differential time	eTd	IN	Single precision real number	⎍	0.0 <=	—	PID control Differential time [ms]
Upper limit	ePidUpperLimit	IN	Single precision real number	⎍	Lower limit value <	—	PID output Upper limit value [mm/s]
Lower limit	ePidLowerLimit	IN	Single precision real number	⎍	Upper limit value >	—	PID output Lower limit value [mm/s]
Setting of deadband	ePidDeadBand	IN	Single precision real number	⎍	0.0 <=	—	PID control Setting of deadband [mm]

Setting of edge position axis (AXIS_REF structure)

Name	Label name	I/O	Data type	Read timing*1	Setting range	Initial value	Description
Axis No.	AxisNo	IN	Word [Unsigned]	↑	0 to the maximum number of axes of the module used	—	Axis number (0: Only the command operation. The Simple Motion module does not send output to the servo amplifier.)
Start I/O number	StartIO	IN	Word [Unsigned]	↑	0H to FEH	—	Installation address of the Simple Motion module (Upper three digits of four digits (hexadecimal))

*1 ⎍: Always, ↑: Only when the FB is started

■Output labels

Name	Label name	Data type	Value to be held*1	Description
Execution status	o_bENO	Bit	—	Turns on while Execution command is on.
Normal operation	o_bOK	Bit	—	Turns on while the FB is normally operating.
Error completion	o_bErr	Bit	—	Turns on when an error has occurred in the FB.
Error code	o_uErrId	Word [Unsigned]	—	The error code of the error that has occurred in the FB is stored. • Refer to "List of Error Codes" in the following manual. 📖 iQ Monozukuri CONVERTING Instruction Manual
Velocity command	o_eCommandVelocity	Single precision real number	—	Velocity command value of FB calculation results [mm/s]
Forward end	o_bFwdLimit	Bit	—	The edge position axis is at the forward end.
Recession end	o_bRevLimit	Bit	—	The edge position axis is at the recession end.

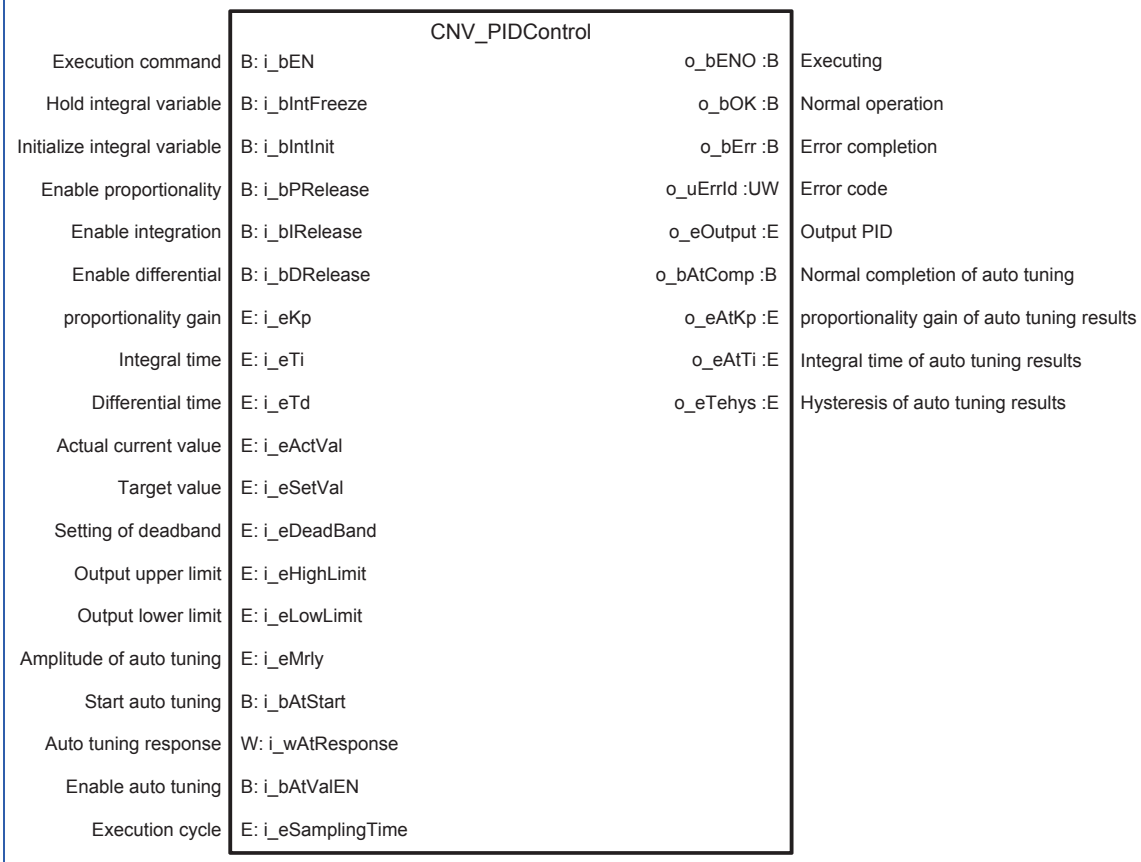
*1 ○: The value is held after the FB stops. —: The value is cleared after the FB stops.

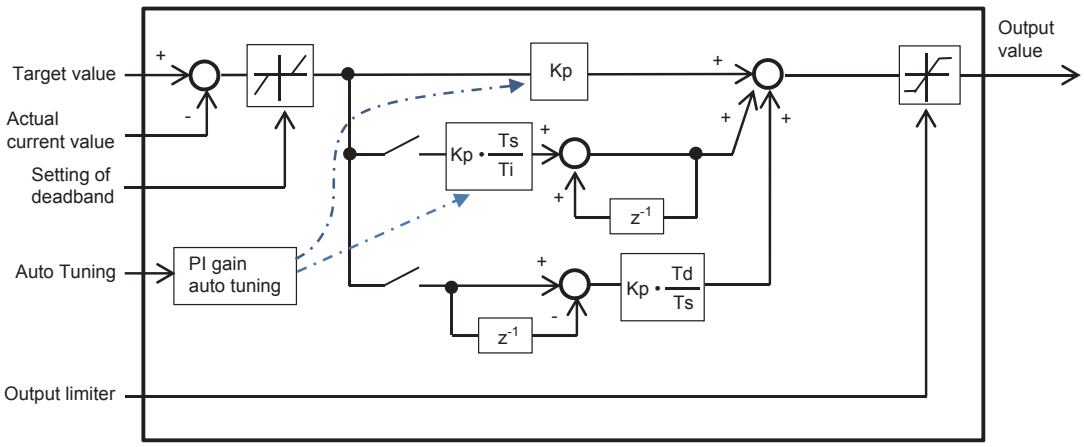
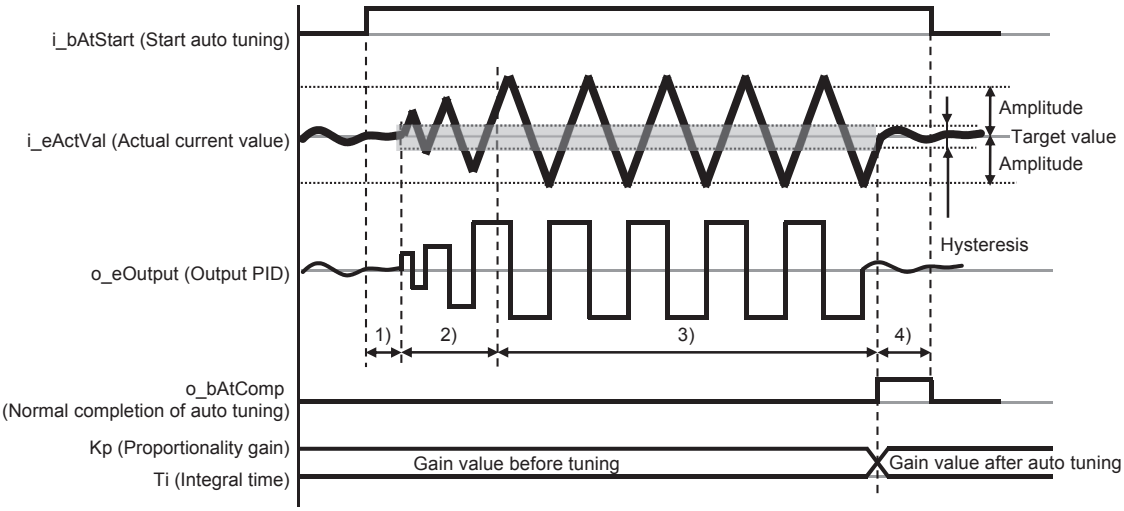
CNV_PIDControl (PID control (with tension PI gain auto tuning))

Name

CNV_PIDControl

Function overview

Item	Description	
Function overview	This FB executes the PID control.	
Symbol		
Applicable hardware and software	Applicable module	RD77MS, RD77GF
	Applicable CPU	MELSEC iQ-R series CPU module
	Engineering software	GX Works3
Number of steps	1479 steps (For the macro type)	
FB dependence	None	

Item	Description
Function description	The PID control shown in the following block diagram is executed.  [Timing to perform auto tuning on the PI control gain]  1) Turning on i_bAtStart (start auto tuning) stops the PID control and calculates the hysteresis width from the noise size of i_eActVal (actual current value). 2) e_Output (output PID) gradually increases so that the amplitude of i_eActVal (actual current value) is equal to i_eMrly (amplitude setting value). 3) Oscillation is generated with the amplitude of i_eMrly (amplitude setting value) and a proper Kp (proportionality gain) and Ti (integral time) are calculated. 4) o_bAtComp (normal completion of auto tuning) turns on and the PID control is restarted with the gain value of auto tuning results. Turning off i_bAtStart (start auto tuning) turns off o_bAtComp (normal completion of auto tuning).
Compiling method	Macro type, subroutine type
FB operation type	Real-time execution
Restrictions and precautions	Execute this FB in a fixed cycle.

Labels

■Input labels

Name	Label name	Data type	Read timing*1	Setting range	Initial value	Description
Execution command	i_bEN	Bit	⎍	—	—	On: The FB is activated. Off: The FB is stopped.
Hold integral variable	i_bIntFreeze	Bit	⎍	—	—	On: The manipulated amount in the integral control is held.
Initialize integral variable	i_bIntInit	Bit	⎍	—	—	Off: The manipulated amount in the integral control is reset.
Enable proportionality	i_bPRelease	Bit	⎍	—	—	On: The proportional control is enabled.
Enable integration	i_bIRelease	Bit	⎍	—	—	On: The integral control is enabled.
Enable differential	i_bDRelease	Bit	⎍	—	—	On: The differential control is enabled.

Name	Label name	Data type	Read timing*1	Setting range	Initial value	Description
Proportionality gain	i_eKp	Single precision real number	⎍	0.0 <=	—	Proportionality gain
Integral time	i_eTi	Single precision real number	⎍	0.0 <=	—	Integral time [ms]
Differential time	i_eTd	Single precision real number	⎍	0.0 <=	—	Differential time [ms]
Current value	i_eActVal	Single precision real number	⎍	—	—	Current value
Target value	i_eSetVal	Single precision real number	⎍	—	—	Target value
Setting of deadband	i_eDeadBand	Single precision real number	⎍	0.0 <=	—	Setting of deadband
Output upper limit	i_eHighLimit	Single precision real number	⎍	Output lower limit <	—	Output upper limit
Output lower limit	i_eLowLimit	Single precision real number	⎍	Output upper limit >	—	Output lower limit
Amplitude of auto tuning	i_eMrly	Single precision real number	⎍	0.0 <	1.0	Amplitude at auto turning
Start auto tuning	i_bAtStart	Bit	⎍	—	—	On: The auto turning is started.
Auto tuning response	i_wAtResponse	Word [Signed]	⎍	1 to 7	3	1 (Weak) ⇔ 7(Strong)
Enable auto tuning	i_bAtValEN	Bit	⎍	—	—	On: The PID control is performed with auto tuning results. Off: The PID control is performed with setting values.
Execution cycle	i_eSamplingTime	Single precision real number	↑	0.0 <	—	Execution cycle [ms] of the program for executing the FB

*1 ⎍: Always, ↑: Only when the FB is started

■Output labels

Name	Label name	Data type	Value to be held*1	Description
Execution status	o_bENO	Bit	—	Turns on while Execution command is on.
Normal operation	o_bOK	Bit	—	Turns on while the FB is normally operating.
Error completion	o_bErr	Bit	—	Turns on when an error has occurred in the FB.
Error code	o_uErrId	Word [Unsigned]	—	The error code of the error that has occurred in the FB is stored. • Refer to "List of Error Codes" in the following manual. 📖 iQ Monozukuri CONVERTING Instruction Manual
PID output	o_eOutput	Single precision real number	—	The output value of PID control is stored.
Normal completion of auto tuning	o_bAtComp	Bit	—	On: Turns on when the auto tuning is normally completed. Off: Turn off when Start auto tuning turns off.
Proportional gain of auto tuning results	o_eAtKp	Single precision real number	○	Proportional gain of auto tuning results
Integral time Auto tuning results	o_eAtTi	Single precision real number	○	Integral time of auto tuning results [ms]
Hysteresis of auto tuning results	o_eTehys	Single precision real number	○	Hysteresis of auto tuning results

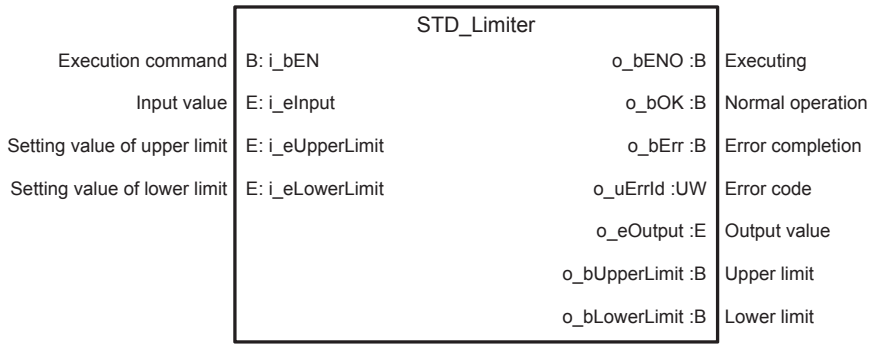
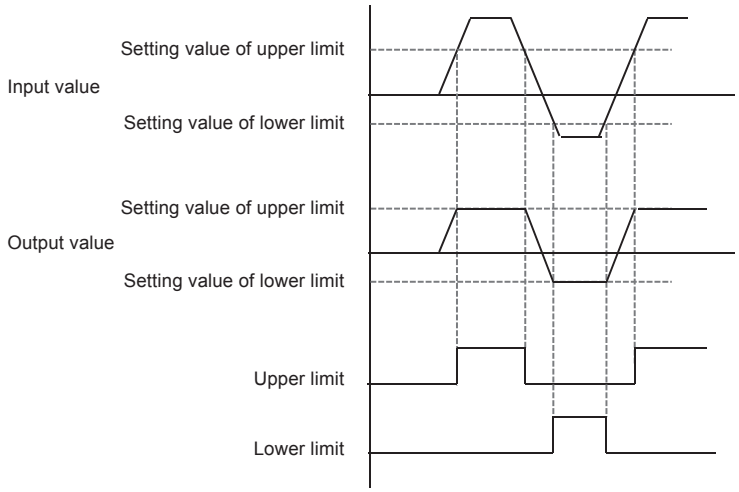
*1 ○: The value is held after the FB stops. —: The value is cleared after the FB stops.

STD_Limiter (Limiter)

Name

STD_Limiter

Function overview

Item	Description	
Function overview	This FB outputs the input value after the upper/lower limit control.	
Symbol		
Applicable hardware and software	Applicable module	RD77MS, RD77GF
	Applicable CPU	MELSEC iQ-R series CPU module
	Engineering software	GX Works3
Number of steps	325 steps (For the macro type)	
FB dependence	None	
Function description	The input value is limited with the setting values of upper/lower limit and output. 	
Compiling method	Macro type, subroutine type	
FB operation type	Real-time execution	
Restrictions and precautions	—	

Labels

■Input labels

Name	Label name	Data type	Read timing*1	Setting range	Initial value	Description
Execution command	i_bEN	Bit	⎍	—	—	On: The FB is activated. Off: The FB is stopped.
Input value	i_eInput	Single precision real number	⎍	—	—	Input value
Setting value of upper limit	i_eUpperLimit	Single precision real number	⎍	Lower limit <	—	Upper limit value
Setting value of lower limit	i_eLowerLimit	Single precision real number	⎍	Upper limit >	—	Lower limit value

*1 ⎍: Always, ↑: Only when the FB is started

■Output labels

Name	Label name	Data type	Value to be held*1	Description
Execution status	o_bENO	Bit	—	On: While Execution command is on Off: Execution command is off.
Normal operation	o_bOK	Bit	—	When this device is on, it indicates that the filter processing is being executed.
Error completion	o_bErr	Bit	—	Turns on when an error has occurred in the FB.
Error code	o_uErrId	Word [Unsigned]	—	The error code of the error that has occurred in the FB is stored. • Refer to "List of Error Codes" in the following manual. 📖 iQ Monozukuri CONVERTING Instruction Manual
Output value	o_eOutput	Single precision real number	—	The input value limited with the upper/lower limit values is stored.
Upper limit	o_bUpperLimit	Bit	—	When this device is on, it indicates that the input value is equal to or larger than the upper limit value.
Lower limit	o_bLowerLimit	Bit	—	When this device is on, it indicates that the input value is equal to or smaller than the lower limit value.

*1 ○: The value is held after the FB stops. —: The value is cleared after the FB stops.

2.4 Error code

For error codes that occurred during FB execution, refer to "List of Error Codes" in each iQ Monozukuri Instruction Manual.

3 APPLICATION FOR MELSEC iQ-F

3.1 Application Model

AP20-FMK003AA-MA

3.2 Application File Structure

Folder			File name*1	File type (Extension)	Description	Application to be used
AP20-FMK003AA/ Package root	manual	English	bcnb62005973eng*	PDF file (.pdf)	iQ Monozukuri FACEMASK Instruction Manual	Adobe Reader
			bcnb62005808eng*		iQ Monozukuri PACKAGING Instruction Manual (For MELSEC iQ-F)	
		Japanese	bcnb62005972*		iQ Monozukuri FACEMASK Instruction Manual	
			bcnb62005807*		iQ Monozukuri PACKAGING Instruction Manual (For MELSEC iQ-F)	
		Simplified Chinese	bcnb62005974chn*		iQ Monozukuri FACEMASK Instruction Manual	
			bcnb62005809chn*		iQ Monozukuri PACKAGING Instruction Manual (For MELSEC iQ-F)	
	Lib		FMK_Control_F_****	Application library (.mslm)	Function block library for implementing the FACEMASK application	MELSOFT GX Works3
	Project		AP20-FMK003AA-FX5U-80SSC****	GX Works3 project file (.gx3)	Application program examples for mask production equipment	MELSOFT GX Works3
			AP20-PAC003AA-GT2105Q_****	GT Designer3 project file (.GTX)	Screen examples for mask production equipment application	MELSOFT GT Works3
	-		AP20-FMK003AA	Text file (.txt)	Version information	-

1 "" indicates their versions.

3.3 FB Library List

The following table lists the FBs in the FB library (FMK_Control_F).

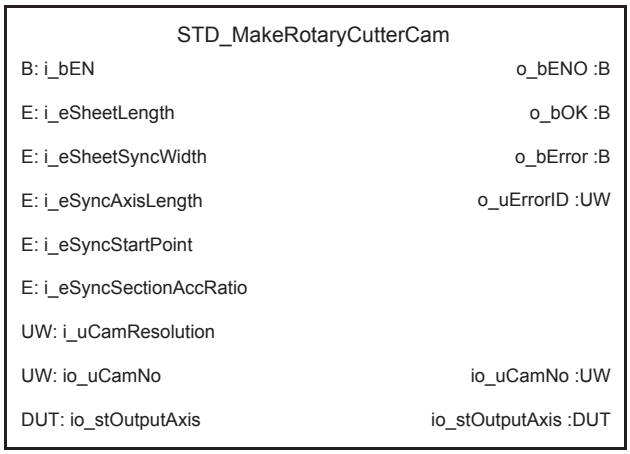
No.	Item	FB name	Description	Reference
01	Cam auto-generation	STD_MakeRotaryCutterCam	Cam auto-generation for rotary cutter	Page 52
		STD_MakeFlyingShearCam	Cam auto-generation for flying shear	Page 56
02	Synchronous control	CtrlOutputAxisSync	Output axis synchronization control	Page 62

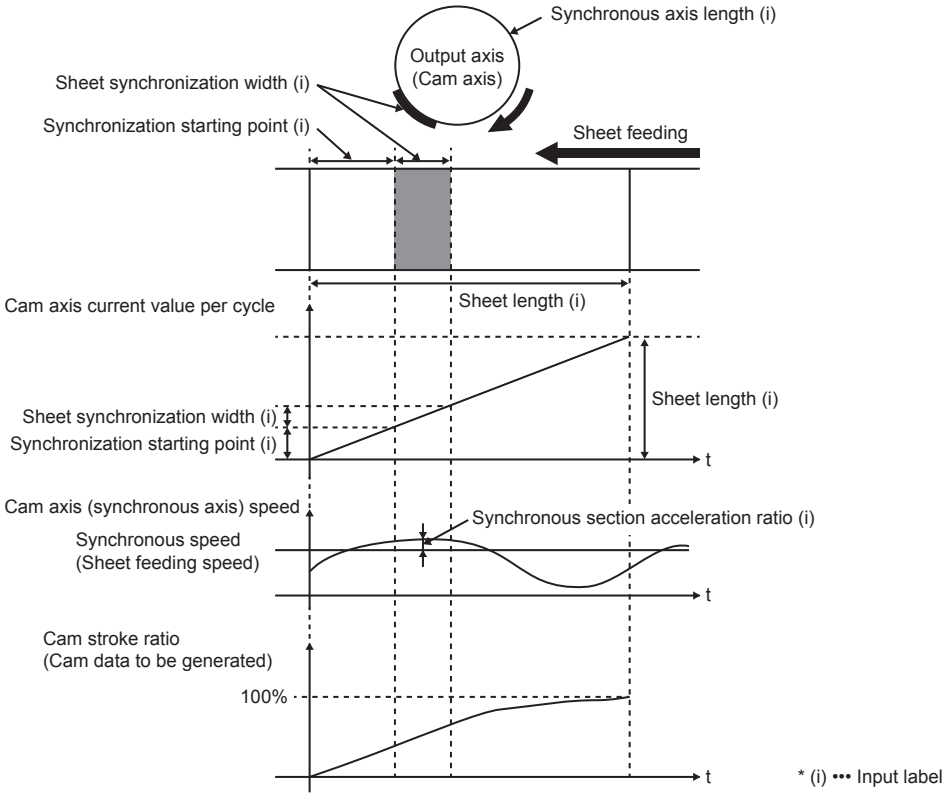
STD_MakeRotaryCutterCam (Cam auto-generation for rotary cutter)

Name

STD_MakeRotaryCutterCam

Function overview

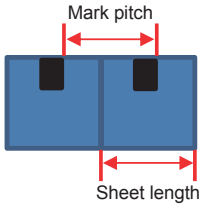
Item	Description	
Function overview	This FB automatically generates cam data for rotary cutter.	
Symbol		
Applicable hardware and software	Applicable module	FX5-40SSC-S, FX5-80SSC-S
	Applicable CPU	MELSEC iQ-F series
	Engineering software	GX Works3
Number of steps	1556 steps	
FB dependence	—	

Item	Description
Function description	This FB automatically generates cam data for rotary cutter. • Turning on i_bEN (Execution command) starts generating cam data based on the set data. • When the cam generation is normally completed, o_bOK (Normal completion) turns on.  • i_eSyncSectionAccRatio (Synchronous section speed acceleration ratio) changes the speed in the synchronous section. • If a warning related to the cam data operation occurs in the Simple Motion module during cam generation, the error (ErrorID: 2203H) is stored. • If an error has occurred in the FB, Error turns on and the error code is stored in ErrorID. • For details of error codes, refer to "List of Error Codes" in the following manual. 📖 iQ Monozukuri PACKAGING Instruction Manual (For MELSEC iQ-F)
Restrictions and precautions	• If a value other than 0 to 3 has been set in "[Pr.1] Unit setting", this FB is executed with the unit [mm]. • The cam to be automatically generated is in the stroke ratio data format. • The cam data to be automatically generated will be saved in the cam open area. • If i_bEN (Execution command) turns off during cam generation, the cam may not be normally generated. • When generating multiple cams at the same time, input o_bOK (Normal completion) of the cam auto-generation FB as an interlock condition so that the generation of the next cam starts after the generation of one cam is successfully completed. • If the cam generation fails, the cam data may be undefined. Try the cam auto-generation again. Check that normal cam is generated and then perform the operation. • Since cam operation control data ([Cd.608] to [Cd.611]) is set in this FB, do not use user programs to set or change the data.*1 • Use the FB CtrlOutputAxisSync or create a user program for the operation of the cutter axis.
Compiling method	Macro type, subroutine type
FB operation type	Pulsed execution (multiple scan execution type)

*1 For details of control data, refer to the following.
📖 MELSEC iQ-F FX5 Simple Motion Module User's Manual (Advanced Synchronous Control)

Labels

■Input labels

Name	Label name	Data type	Read timing*1	Setting range	Description
Execution command	i_bEN	Bit	⎍	On, off	On: The FB is activated. Off: The FB is not activated.
Sheet length	i_eSheetLength	Single precision real number	↑	Refer to the description.	Set the sheet length. Set this value for the cam axis length per cycle.  • 0.01 ≤ Sheet length ≤ 10000.00 [(Optional) Same unit (with two digits after the decimal point (fixed))]
Sheet synchronization width	i_eSheetSyncWidth	Single precision real number	↑	Refer to the description.	Set the length of the section where the output axis is synchronized with the sheet. • 0.01 ≤ Sheet synchronization width < Sheet length and synchronous axis length [(Optional) Same unit (with two digits after the decimal point (fixed))]
Synchronous axis length	i_eSyncAxisLength	Single precision real number	↑	Refer to the description.	Set the cycle length of the output axis (rotary cutter). • 0.01 ≤ Synchronous axis length ≤ 10000.00 [(Optional) Same unit (with two digits after the decimal point (fixed))]
Synchronization starting point	i_eSyncStartPoint	Single precision real number	↑	Refer to the description.	Set the synchronization starting point of the output axis to the sheet. • 0.00 ≤ Synchronization starting point < Sheet length [(Optional) Same unit (with two digits after the decimal point (fixed))]
Synchronous section acceleration ratio	i_eSyncSectionAccRatio	Single precision real number	↑	-50.00 ≤ Synchronous section acceleration ratio ≤ 50.00 [%]	Set this item when the fine adjustment of the synchronous speed in the synchronous section is required. Synchronous section speed = Synchronous speed × (100% + Synchronous section acceleration ratio)
Cam resolution	i_uCamResolution	Word [Unsigned]	↑	256/512/1024/2048/4096/8192/16384	Set the cam resolution of the cam to be generated.

*1 ⎍: Always, ↑: When the FB is started (cannot be changed)

■Output labels

Name	Label name	Data type	Value to be held*1	Description
Execution status	o_bENO	Bit	—	On: Execution command is on. Off: Execution command is off.
Normal completion	o_bOK	Bit	—	This label indicates that the cam auto-generation has been completed and the FB has been normally completed.
Error completion	o_bError	Bit	—	On: An error has occurred in the FB. Off: No error has occurred.
Error code	o_uErrorID	Word [Unsigned]	—	The error code of the error that has occurred in the FB is stored.

*1 ○: The value will be held after the FB stops. —: The value will be cleared after the FB stops.

■I/O labels

Name	Label name	Data type	Read timing*1	Setting range	Description
Cam auto-generation cam No.	io_uCamNo	Word [Unsigned]	↑	1 ≤ Cam auto-generation cam No. ≤ 64	Set the cam No. to be automatically generated for the cutter axis.
Output axis setting	io_stOutputAxis	AXIS_REF	—	—	Refer to the output axis setting below.

Output axis setting (AXIS_REF structure)

Name	Label name	Data type	Read timing*1	Setting range	Description
Axis No.	AxisNo	Word [Signed]	↑	1 ≤ Axis No. ≤ Maximum number of axes of the module used	Set the axis No. of the output axis to be used for the cutter axis. This FB uses the unit set in "[Pr.1] Unit setting" of the axis No.
Unit number	StartIO	Word [Signed]	↑	1H ≤ Unit number ≤ 10H	Simple Motion unit number

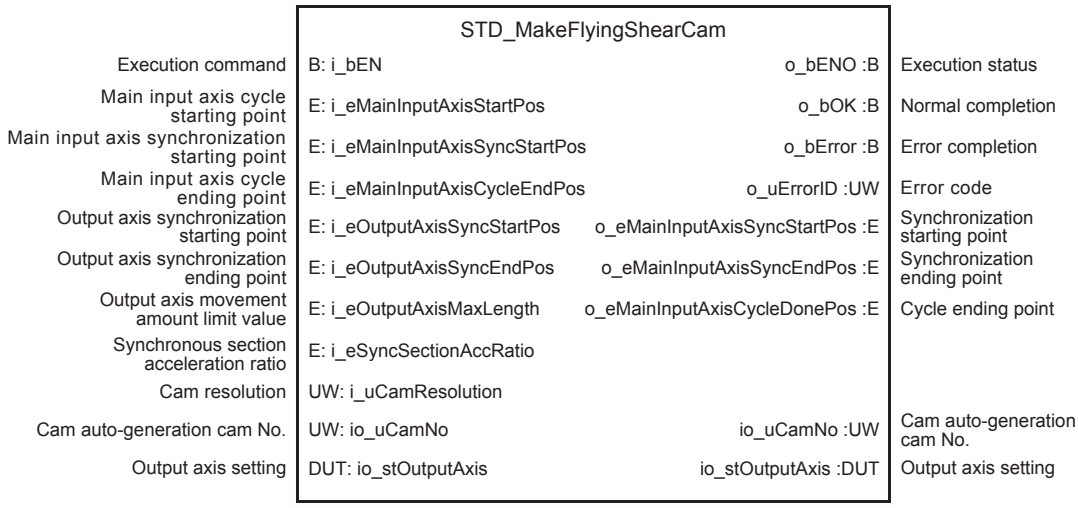
*1 ⎍: Always, ↑: When the FB is started (cannot be changed)

STD_MakeFlyingShearCam (Cam auto-generation for flying shear)

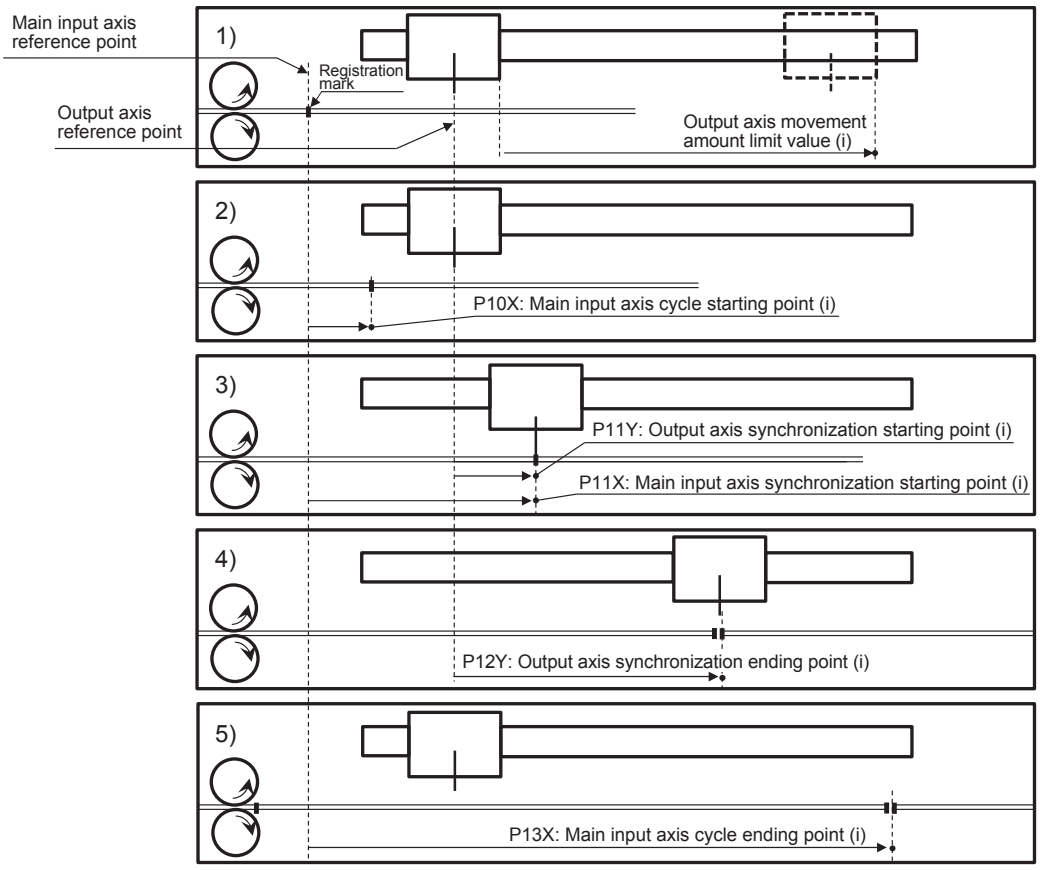
Name

STD_MakeFlyingShearCam

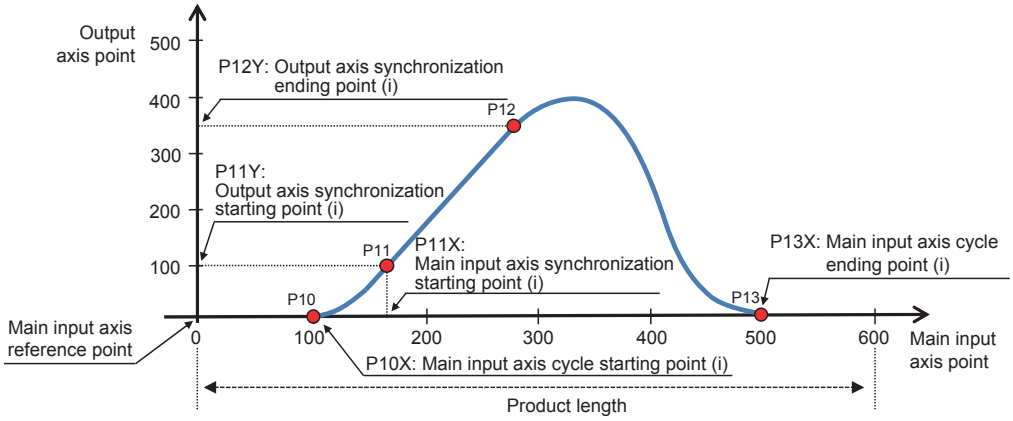
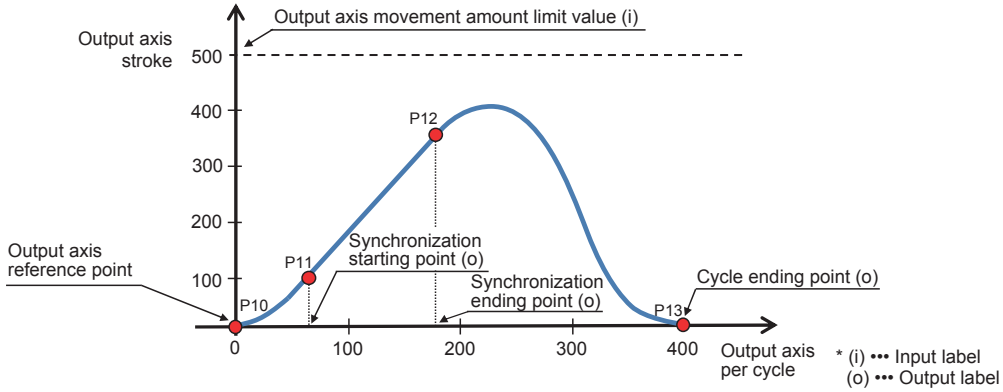
Function overview

Item	Description	
Function overview	This FB automatically generates cam data for flying shear.	
Symbol		
Applicable hardware and software	Applicable module	FX5-40SSC-S, FX5-80SSC-S
	Applicable CPU	MELSEC iQ-F series
	Engineering software	GX Works3
Number of steps	4808 steps	
FB dependence	—	

Item	Description
Function description	This FB automatically generates cam data for flying shear. • Turning on i_bEN (Execution command) starts generating cam data based on the set data. • Calculate the main input axis length per cycle as the product length. • Specify the main input axis cycle starting point, synchronization starting point, cycle ending point of the flying shear (output axis) to the main input axis, and specify the synchronization starting point and synchronization ending point to the flying shear (output axis) to generate a cam pattern.*1



* (i) ••• Input label

Item	Description
Function description	• The cam pattern to be generated is a reciprocated cam pattern. • After the cam generation is normally completed and the following output data is updated, o_bOK (Normal completion) turns on. "o_eMainInputAxisSyncStartPos (Synchronization starting point)" "o_eMainInputAxisSyncEndPos (Synchronization ending point)" "o_eMainInputAxisCycleDonePos (Cycle ending point)" Even though i_bEN (Execution command) turns off, the above output data will be held. The above output data will be cleared when i_bEN (Execution command) turns on.   • When performing the synchronous control with the FB CtrlOutputAxisSync, set the main input axis cycle starting point for i_eWaitingPos (Waiting position). • If the calculated output axis movement amount exceeds the value of i_eOutputAxisMaxLength (Output axis movement amount limit value), the error (ErrorID: 2200H) is stored.*2 • i_eSyncSectionAccRatio (Synchronous section speed acceleration ratio) changes the speed in the synchronous section. • If a warning related to the cam data operation occurs in the Simple Motion module during cam generation, the error (ErrorID: 2203H) is stored. • If a value other than "0" has been set in "[Cd.600] Cam data operation request" at the cam generation, the error (ErrorID: 2205H) is stored. • If an error has occurred in the FB, Error turns on and the error code is stored in ErrorID. • For details of error codes, refer to "List of Error Codes" in the following manual. 📖 iQ Monozukuri PACKAGING Instruction Manual (For MELSEC iQ-F)
Restrictions and precautions	• If a value other than 0 to 3 has been set in "[Pr.1] Unit setting", this FB is executed with the unit [mm]. • The cam to be automatically generated is in the coordinate data format. • The cam data that has been automatically generated is saved in the cam storage area. • If i_bEN (Execution command) turns off during cam generation, the cam may not be normally generated. • When generating multiple cams at the same time, input o_bOK (Normal completion) of the cam auto-generation FB as an interlock condition so that the generation of the next cam starts after the generation of one cam is successfully completed. • If the cam generation fails, the cam data may be undefined. Try the cam auto-generation again. Check that normal cam is generated and then perform the operation. • Since cam operation control data ([Cd.600] to [Cd.607]) is set in this FB, do not use user programs to set or change the data.*3 • Use the FB CtrlOutputAxisSync or create a user program for the operation of the flying shear axis.
Compiling method	Macro type, subroutine type
FB operation type	Pulsed execution (multiple scan execution type)

*1 By setting the main input axis cycle starting point to "0" and the cycle ending point to the "product length", a cam pattern is generated at the main input axis per cycle = cam axis per cycle.
By setting the main input axis cycle starting point to "a value larger than 0" or the cycle ending point to "a value smaller than product length", a cam pattern is generated at the main input axis per cycle ≠ cam axis per cycle.
*2 By setting i_eOutputAxisMaxLength to "0", the movement amount limit is ignored.
*3 For details of control data, refer to the following.
MELSEC iQ-F FX5 Simple Motion Module User's Manual (Advanced Synchronous Control)

Labels

■Input labels

Name	Label name	Data type	Read timing*1	Setting range	Description
Execution command	i_bEN	Bit	⎍	On, off	On: The FB is activated. Off: The FB is not activated.
Main input axis cycle starting point	i_eMainInputAxisStartPos	Single precision real number	↑	Refer to the description.	Set the main input axis point where the one cycle operation starts. • 0.0 ≤ Main input axis cycle starting point ≤ 100000.0 [mm] • 0.00 ≤ Main input axis cycle starting point ≤ 10000.00 [inch] • 0.00 ≤ Main input axis cycle starting point ≤ 10000.00 [degree] • 0 ≤ Main input axis cycle starting point ≤ 9999999 [pulse] [The unit setting depends on the axis No. setting value in the output axis setting.]
Main input axis synchronization starting point	i_eMainInputAxisSyncStartPos	Single precision real number	↑	Refer to the description.	Set the main input axis point at the start of the synchronous section. • 0.1 ≤ Main input axis synchronization starting point ≤ 100000.0 [mm] • 0.01 ≤ Main input axis synchronization starting point ≤ 10000.00 [inch] • 0.01 ≤ Main input axis synchronization starting point ≤ 10000.00 [degree] • 1 ≤ Main input axis synchronization starting point ≤ 9999999 [pulse] [The unit setting depends on the axis No. setting value in the output axis setting.]
Main input axis cycle ending point	i_eMainInputAxisCycleEndPos	Single precision real number	↑	Refer to the description.	Set the end point of the main input axis per cycle. • 0.1 ≤ Main input axis cycle ending point ≤ 100000.0 [mm] • 0.01 ≤ Main input axis cycle ending point ≤ 10000.00 [inch] • 0.01 ≤ Main input axis cycle ending point ≤10000.00 [degree] • 1 ≤ Main input axis cycle ending point ≤ 9999999 [pulse] [The unit setting depends on the axis No. setting value in the output axis setting.]
Output axis synchronization starting point	i_eOutputAxisSyncStartPos	Single precision real number	↑	Refer to the description.	Set the output axis point at the start of the synchronous section. • 0.1 ≤ Output axis synchronization starting point ≤ 100000.0 [mm] • 0.01 ≤ Output axis synchronization starting point ≤ 10000.00 [inch] • 0.01 ≤ Output axis synchronization starting point ≤ 10000.00 [degree] • 1 ≤ Output axis synchronization starting point ≤ 9999999 [pulse] [The unit setting depends on the axis No. setting value in the output axis setting.]

Name	Label name	Data type	Read timing*1	Setting range	Description
Output axis synchronization ending point	i_eOutputAxisSyncEndPos	Single precision real number	↑	Refer to the description.	Set the output axis point at the end of the synchronous section. • 0.1 ≤ Output axis synchronization ending point ≤ 100000.0 [mm] • 0.01 ≤ Output axis synchronization ending point ≤ 10000.00 [inch] • 0.01 ≤ Output axis synchronization ending point ≤ 10000.00 [degree] • 1 ≤ Output axis synchronization ending point ≤ 9999999 [pulse] [The unit setting depends on the axis No. setting value in the output axis setting.]
Output axis movement amount limit value	i_eOutputAxisMaxLength	Single precision real number	↑	Refer to the description.	Set the movement amount limit value of the output axis. "0" = Limit value invalid, other than "0" = Limit value valid • 0.1 ≤ Output axis movement amount limit value ≤ 100000.0 [mm] • 0.01 ≤ Output axis movement amount limit value ≤ 10000.00 [inch] • 0.01 ≤ Output axis movement amount limit value ≤ 10000.00 [degree] • 1 ≤ Output axis movement amount limit value ≤ 9999999 [pulse] [The unit setting depends on the axis No. setting value in the output axis setting.]
Synchronous section acceleration ratio	i_eSyncSectionAccRatio	Single precision real number	↑	-50.00 ≤ Synchronous section acceleration ratio ≤ 50.00 [%]	Set this item when the fine adjustment of the synchronous speed in the synchronous section is required. Synchronous section speed = Synchronous speed × (100% + Acceleration ratio)
Cam resolution	i_uCamResolution	Word [Unsigned]	↑	5 ≤ Cam resolution ≤ 2048	Set the cam resolution (Number of coordinates) of the cam to be generated.

*1 ⎍: Always, ↑: When the FB is started (cannot be changed)

■Output labels

Name	Label name	Data type	Value to be held*1	Description
Execution status	o_bENO	Bit	—	On: Execution command is on. Off: Execution command is off.
Normal completion	o_bOK	Bit	—	This label indicates that the cam auto-generation has been completed and the FB has been normally completed.
Error completion	o_bError	Bit	—	On: An error has occurred in the FB. Off: No error has occurred.
Error code	o_uErrorID	Word [Unsigned]	—	The error code of the error that has occurred in the FB is stored.
Synchronization starting point	o_eMainInputAxisSyncStartPos	Single precision real number	○	The main input axis point at the start of the synchronization is stored. [The unit setting depends on the axis No. setting value in the output axis setting.]
Synchronization ending point	o_eMainInputAxisSyncEndPos	Single precision real number	○	The main input axis point at the end of the synchronization is stored. [The unit setting depends on the axis No. setting value in the output axis setting.]
Cycle ending point	o_eMainInputAxisCycleDonePos	Single precision real number	○	The main input axis point at the end of the operation is stored. [The unit setting depends on the axis No. setting value in the output axis setting.]

*1 ○: The value will be held after the FB stops. —: The value will be cleared after the FB stops.

■I/O labels

Name	Label name	Data type	Read timing*1	Setting range	Description
Cam auto-generation cam No.	io_uCamNo	Word [Unsigned]	↑	1 ≤ Cam auto-generation cam No. ≤ 64	Set the cam No. to be automatically generated for the flying shear.
Output axis setting	io_stOutputAxis	AXIS_REF	↑	—	Refer to the output axis setting below.

Output axis setting (AXIS_REF structure)

Name	Label name	Data type	Read timing*1	Setting range	Description
Axis No.	AxisNo	Word [Signed]	↑	1 ≤ Axis No. ≤ Maximum number of axes of the module used	Set the axis No. of the output axis to be used for the flying shear axis. This FB uses the unit set in "[Pr.1] Unit setting" of the axis No.
Unit number	StartIO	Word [Signed]	↑	1H ≤ Unit number ≤ 10H	Simple Motion unit number

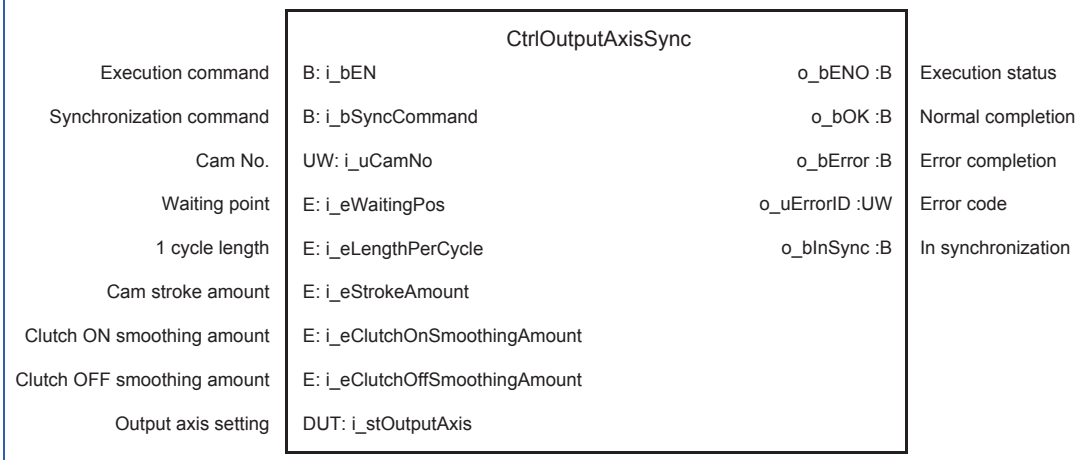
*1 ⎍: Always, ↑: When the FB is started (cannot be changed)

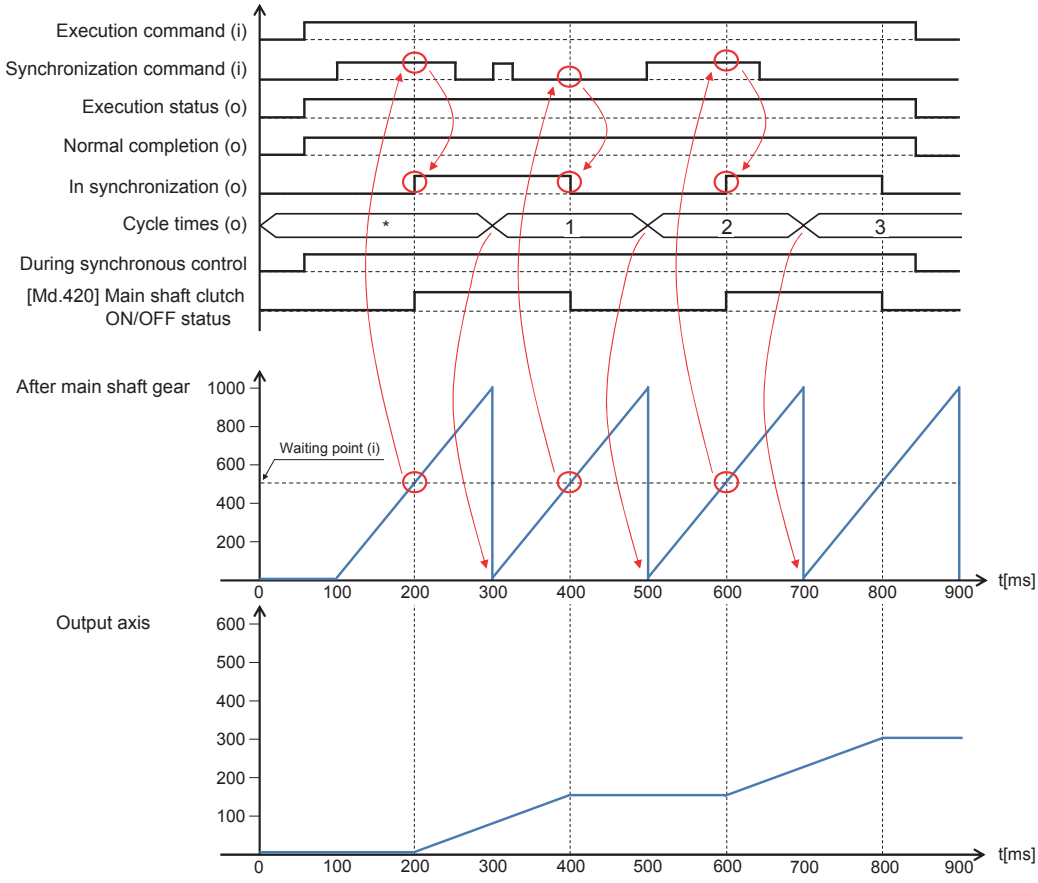
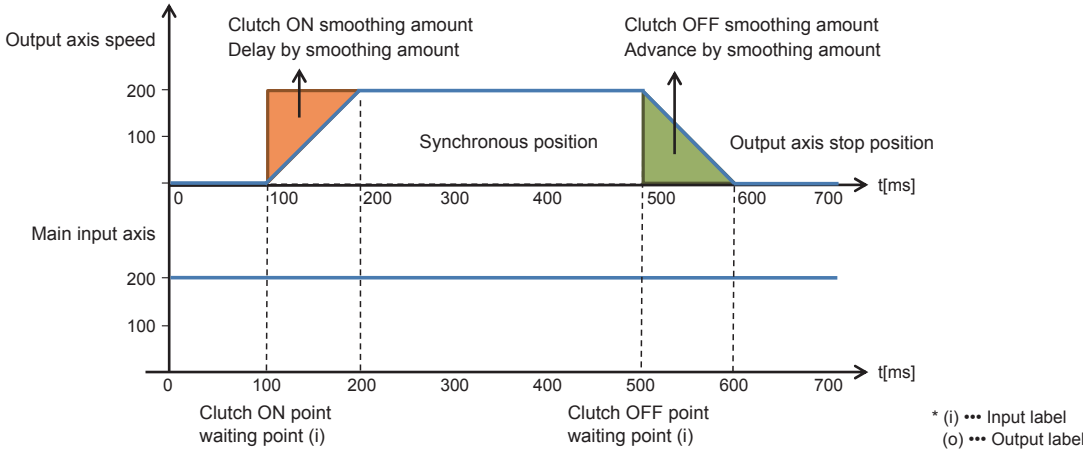
CtrlOutputAxisSync (Output axis synchronous control)

Name

CtrlOutputAxisSync

Function overview

Item	Description	
Function overview	This FB controls the output axis synchronized with the master axis.	
Symbol		
Applicable hardware and software	Applicable module	FX5-40SSC-S, FX5-80SSC-S
	Applicable CPU	MELSEC iQ-F series
	Engineering software	GX Works3
Number of steps	2777 steps	
FB dependence	—	

Item	Description
Function description	This FB controls the output axis by synchronizing the cam created by the cam generation FB with the main input axis. • When the current value of the main input axis per cycle is equal to the value of i_eWaitingPos (Waiting position) and i_bSyncCommand (Synchronization command) is on, the clutch turns on from i_eWaitingPos (Waiting position). • When the current value of the main input axis per cycle is equal to the value of i_eWaitingPos (Waiting position) and i_bSyncCommand (Synchronization command) is off, the clutch turns off from i_eWaitingPos (Waiting position). • The output axis movement amount delays from the main input axis movement amount by i_eClutchOnSmoothingAmount (Clutch ON smoothing amount) and moves by i_eClutchOffSmoothingAmount (Clutch OFF smoothing amount). Change the waiting position as needed. • When the clutch turns on during synchronous control, o_bInSync (In synchronization) turns on. ■ Sample data Cam axis current value per cycle: 1000 Cam stroke amount: 200 Cam type: Straight cam  ■ Clutch ON/OFF timing  • If an error has occurred in the FB, Error turns on and an error code is stored in ErrorID. • For details of error codes, refer to "List of Error Codes" in the following manual. 📖 iQ Monozukuri PACKAGING Instruction Manual (For MELSEC iQ-F)

Item	Description
Restrictions and precautions	• Execute this FB in a fixed cycle execution type program. • When the parameter is set as follows, the FB is executed in units of [mm]. "[Pr.1] Unit setting": Other than 0 to 3 "[Pr.300] Servo input axis type": Other than 1 to 4 Control unit of "[Pr.321] Synchronous encoder axis unit setting": Other than 0 to 3 "[Pr.400] Main input axis type": 1 to the maximum number of module axes (servo input axis), other than 801 to 800 + maximum number of module axes (synchronous encoder)*1 • Set the parameters of the "input axis module" used in the synchronous control according to the machine mechanism. Servo input axis parameters: [Pr.300] to [Pr.304] Synchronous encoder axis parameters: [Pr.320] to [Pr.329] Command generation axis parameters: [Pr.340] and [Pr.346] • Since the following synchronous parameters used in the synchronous control are set in this FB, input labels, or structure, do not use user programs to set or change them. "[Pr.405] to [Pr.407], [Pr.409], [Pr.411], [Pr.413], [Pr.414], [Pr.439] to [Pr.441]" • To use synchronous parameters in a mechanism, set synchronous encoder axis control data ([Cd.320] to [Cd.325]) by users. • This FB performs the main axis clutch control in the address mode and switches the on/off state of the main clutch by changing "[Pr.405] Main shaft clutch control setting". Setting value of [Pr.405] at clutch ON: H0004 Setting value of [Pr.405] at clutch OFF: H0042 • This FB uses the slippage method (Linear: Input value follow up) as the clutch smoothing method ([Pr.411] = 5). • Create "[Cd.380] Synchronous control start" with user programs.*1 • When Execution command turns off while o_bInSync (In synchronization) is on, the FB turns off the output of o_bInSync while holding the on state of the clutch. • Set i_eWaitingPos (Waiting position) not to overlap the synchronous section of the main input axis and output axis.
Compiling method	Macro type, subroutine type
FB operation type	Real-time execution

*1 When 201 to 208 (Command generation axis) is set, the FB is executed in units of [mm].

*2 For details of the synchronous control parameters and control data, refer to the following.

MELSEC iQ-F FX5 Simple Motion Module User's Manual (Advanced Synchronous Control)

Labels

■Input labels

Name	Label name	Data type	Read timing*1	Setting range	Description
Execution command	i_bEN	Bit	⎍	On, off	On: The FB is activated. Off: The FB is not activated.
Synchronization command	i_bSyncCommand	Bit	⎍	On, off	Enable the main axis clutch control. On: The clutch turns on from the waiting position. Off: The clutch turns off to stop at the waiting position.
Cam No.	i_uCamNo	Word [Unsigned]	↑	0 ≤ Cam No. ≤ 256	Set the cam No. of the cam to be used for the output axis. 0: Straight cam 1 to 256: Generation cam
Waiting position	i_eWaitingPos	Single precision real number	⎍	Refer to the description.	Set the position where the address clutch turns on or off to the current value per cycle after main axis gear. • 0.0 ≤ Waiting position ≤ 100000.0 [mm] • 0.00 ≤ Waiting position ≤ 10000.00 [inch] • 0.00 ≤ Waiting position ≤ 10000.00 [degree] • 0 ≤ Waiting position ≤ 9999999 [pulse] [The unit setting depends on the axis No. setting value in the output axis setting.]
1 cycle length	i_eLengthPerCycle	Single precision real number	↑	Refer to the description.	Set the 1 cycle length of the cam axis. • 0.1 ≤ 1 cycle length ≤ 100000.0 [mm] • 0.01 ≤ 1 cycle length ≤ 10000.00 [inch] • 0.01 ≤ 1 cycle length ≤ 10000.00 [degree] • 1 ≤ 1 cycle length ≤ 9999999 [pulse] [The unit setting depends on the axis No. setting value in the output axis setting.]

Name	Label name	Data type	Read timing*1	Setting range	Description
Cam stroke amount	i_eStrokeAmount	Single precision real number	↑	Refer to the description.	Set the cam stroke amount corresponding to 100% of the stroke ratio in units of the output axis for the cam control in the stroke ratio data format. (For the cam data in the coordinate data format, an output value of coordinate data will be a cam stroke position.) • 0.1 ≤ Cam stroke amount ≤ 100000.0 [mm] • 0.01 ≤ Cam stroke amount ≤ 10000.00 [inch] • 0.01 ≤ Cam stroke amount ≤ 10000.00 [degree] • 1 ≤ Cam stroke amount ≤ 9999999 [pulse] [The unit setting depends on the axis No. setting value in the output axis setting.]
Clutch ON smoothing amount	i_eClutchOnSmoothing Amount	Single precision real number	↑	Refer to the description.	Set the smoothing amount when the clutch is on. • 0.0 ≤ Clutch ON smoothing amount ≤ 100000.0 [mm] • 0.00 ≤ Clutch ON smoothing amount ≤ 10000.00 [inch] • 0.00 ≤ Clutch ON smoothing amount ≤ 10000.00 [degree] • 0 ≤ Clutch ON smoothing amount ≤ 9999999 [pulse] [The unit setting depends on the axis No. setting value in the output axis setting.]
Clutch OFF smoothing amount	i_eClutchOffSmoothing Amount	Single precision real number	↑	Refer to the description.	Set the smoothing amount when the clutch is off. • 0.0 ≤ Clutch OFF smoothing amount ≤ 100000.0 [mm] • 0.00 ≤ Clutch OFF smoothing amount ≤ 10000.00 [inch] • 0.00 ≤ Clutch OFF smoothing amount ≤10000.00 [degree] • 0 ≤ Clutch OFF smoothing amount ≤ 9999999 [pulse] [The unit setting depends on the axis No. setting value in the output axis setting.]
Output axis setting	i_stOutputAxis	AXIS_REF	—	—	Refer to the output axis setting below.

Output axis setting (AXIS_REF structure)

Name	Label name	Data type	Read timing *1	Setting range	Description
Axis No.	wAxisNo	Word [Signed]	↑	1 ≤ Axis No. ≤ Maximum number of axes of the module used	Set the axis No. of the output axis. The unit setting of the main input axis that drives the output axis is also used for the 1 cycle length and the clutch ON/OFF smoothing amount. The unit setting of the set axis No. is also used for the cam stroke amount.
Unit number	i_wStartIO	Word [Signed]	↑	1H ≤ Unit number ≤ 10H	Simple Motion unit number

*1 ⎍: Always, ↑: When the FB is started (cannot be changed)

■Output labels

Name	Label name	Data type	Value to be held*1	Description
Execution status	o_bENO	Bit	—	On: Execution command is on. Off: Execution command is off.
Normal completion	o_bOK	Bit	—	This label indicates that the FB has normally started.
Error completion	o_bError	Bit	—	On: An error has occurred in the FB. Off: No error has occurred.
Error code	o_uErrorID	Word [Unsigned]	—	The error code of the error that has occurred in the FB is stored.
In synchronization	o_bInSync	Bit	—	On: The clutch turns on during synchronous control. Off: The clutch turns off during synchronous control.

*1 ○: The value will be held after the FB stops. —: The value will be cleared after the FB stops.

3.4 Error code

For error codes that occurred during FB execution, refer to "List of Error Codes" in each iQ Monozukuri Instruction Manual.

INSTRUCTION INDEX

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REVISIONS

* The manual number is given on the bottom left of the back cover.

Revision date	*Manual number	Description
April 2020	BCN-B62005-973-A	First edition
May 2020	BCN-B62005-973-B	■Added or modified parts SAFETY PRECAUTIONS, CONDITIONS OF USE FOR THE PRODUCT, INTRODUCTION, RELEVANT MANUALS, Section 1.1, 1.2, 2.2, 2.3, 3.2, 3.3

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