MELSEC-L Multiple Input (Voltage/Current/Temperature) Module FB Library Reference Manual

Applicable module:
L60MD4-G

<CONTENTS>

Reference Manual Revision History

Reference Manual Number	Date	Description
FBM-M115-A	2014/6/30	First edition

1. Overview

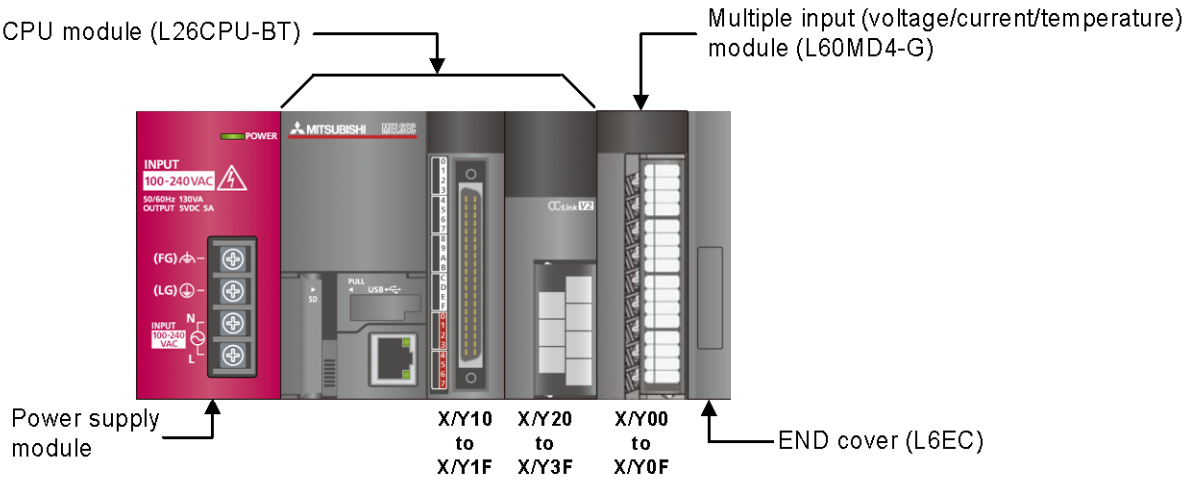
1.1. Overview of the FB Library

This FB Library is for using MELSEC-L Multiple Input (Voltage/Current/Temperature) Module L60MD4-G (hereinafter L60MD4-G).

1.2. Function of the FB Library

Item	Description
M+L60MD4-G_InitialSetting	Sets the following data of the specified channel. • Input type/range setting • Centigrade/Fahrenheit display setting
M+L60MD4-G_SetAverage	Sets the averaging processing of the specified channel.
M+L60MD4-G_SetScaling	Sets the scaling of the specified channel.
M+L60MD4-G_SetDisconnect	Sets the disconnection detection of the specified channel.
M+L60MD4-G_SetInputSignalErr	Sets the input signal error detection of the specified channel.
M+L60MD4-G_SetProcessAlarm	Sets the process alarm of the specified channel.
M+L60MD4-G_SetRateAlarm	Sets the rate alarm of the specified channel.
M+L60MD4-G_RequestSetting	Validates the settings of each function.
M+L60MD4-G_ReadVal	Reads the conversion data of the specified channel.
M+L60MD4-G_ReadAllVal	Reads the conversion data of all channels.
M+L60MD4-G_ReadScalingVal	Reads the scaling value of the specified channel.
M+L60MD4-G_ReadAllScalingVal	Reads the scaling value of all channels.
M+L60MD4-G_ErrorOperation	Monitors error codes and resets errors.
M+L60MD4-G_ShiftOperation	Adds the shift amount to the digital value.
M+L60MD4-G_DiffOperation	Outputs the difference obtained by subtracting the standard value from the digital value.
M+L60MD4-G_ClipOperation	Limits a digital value at the digital clipping upper and lower limit values.

1.3. System Configuration Example



1.4. Relevant Manuals

- MELSEC-L Multiple Input (Voltage/Current/Temperature) Module User's Manual
- MELSEC-L CPU Module User's Manual (Hardware Design, Maintenance and Inspection)
- GX Works2 Version 1 Operating Manual (Common)
- GX Works2 Version 1 Operating Manual (Simple Project, Function Block)

1.5. Note

Please make sure to read user's manuals for the corresponding products before using the products.

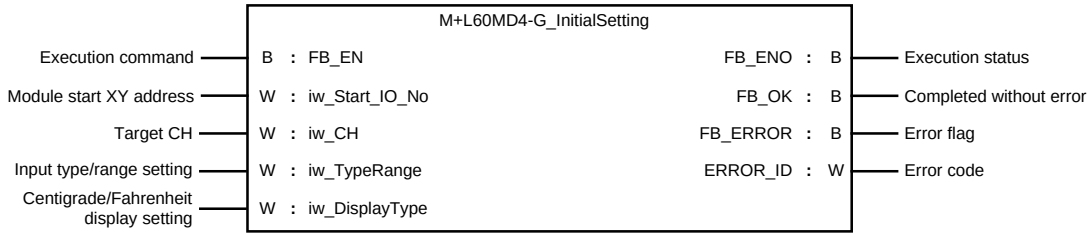
2. Details of the FB Library

2.1. M+L60MD4-G_InitialSetting (Initial setting)

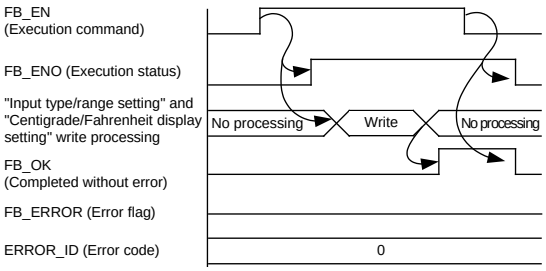
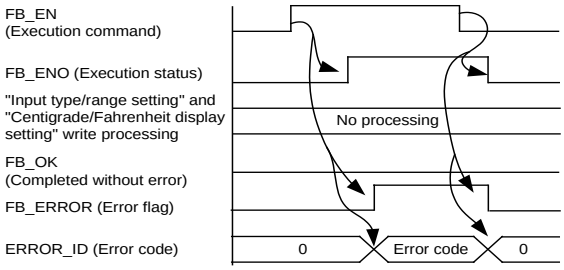
FB Name

M+L60MD4-G_InitialSetting

Function Overview

Item	Description	
Function overview	Sets the following data of the specified channel. • Input type/range setting • Centigrade/Fahrenheit display setting	
Symbol		
Applicable hardware and software	Multiple input (voltage/current/ temperature) module	L60MD4-G
	CPU module	Series: MELSEC-L Series; Model: LCPU
	Engineering software	GX Works2 *1 Language: English version — Software version: Version1.24A or later Language: Chinese version — Software version: Version1.49B or later *1 For software versions applicable to the modules used, refer to "Relevant manuals".
Programming language	Ladder	
Number of steps	301 steps (for MELSEC-L series CPU) *The number of steps of the FB in a program depends on the CPU model that is used and input and output definition.	

Item	Description
Function description	1) By turning ON FB_EN (Execution command), the input type/range setting and Centigrade/Fahrenheit display setting of the specified channel are set. 1) FB operation is one-shot only, triggered by the FB_EN signal. 2) The setting value is validated when the Operating condition setting request signal (Yn9) is turned OFF → ON → OFF or the Operating condition setting request FB (M+L60MD4-G_RequestSetting) is executed. 3) When the setting value of iw_CH (Target CH) is out of range, the FB_ERROR output turns ON and processing is interrupted, and the error code 10 (Decimal) is stored in ERROR_ID (Error code). Refer to the error code explanation section for details.
Compiling method	Macro type
Restrictions and precautions	1) The FB does not include error recovery processing. Program the error recovery processing separately in accordance with the required system operation. 2) The FB cannot be used in an interrupt program. 3) Please ensure that the FB_EN signal is capable of being turned OFF by the program. Do not use this FB in programs that are only executed once such as a subroutine, FOR-NEXT loop because it is impossible to turn OFF. 4) When two or more of these FBs are used, precaution must be taken to avoid repetition of iw_CH (Target CH). 5) This FB uses index registers Z7 to Z9. Please do not use these index registers in an interrupt program. 6) Every input must be provided with a value for proper FB operation. 7) In either of the following cases 1) and 2), no errors occur in this FB; however an error occurs in the module at an operating condition setting request. Please read the MELSEC-L Multiple Input (Voltage/Current/Temperature) Module User's Manual for the errors on the module. 1) When a value set for iw_TypeRange (Input type/range setting) or iw_DisplayType (Centigrade/Fahrenheit display setting) is out of the setting range 2) When a value within 2 to 4 is set for iw_CH and a thermocouple input value is set for iw_TypeRange while a value other than the thermocouple setting is set for CH1 Input type/range setting (Un¥G500)
FB operation type	Pulsed execution (1 scan execution type)
Application example	Refer to "Appendix 1 FB Library Application Examples".

Item	Description
Timing chart	[When operation completes without error]  [When an error occurs] 
Relevant manuals	• MELSEC-L Multiple Input (Voltage/Current/Temperature) Module User's Manual • MELSEC-L CPU Module User's Manual (Hardware Design, Maintenance and Inspection) • GX Works2 Version 1 Operating Manual (Common) • GX Works2 Version 1 Operating Manual (Simple Project, Function Block)

Error codes

●Error code list

Error code	Description	Action
10 (Decimal)	The specified channel is not valid. iw_CH (Target CH) is not within the range of 1 to 4.	Please try again after confirming the setting.

Labels

●Input labels

Name (comment)	Label name	Data type	Setting range	Description
Execution command	FB_EN	Bit	ON, OFF	ON: The FB is activated. OFF: The FB is not activated.
Module start XY address	iw_Start_IO_No	Word	Depends on the I/O point range of the CPU. For details, refer to the CPU user's manual.	Specify the starting XY address (in hexadecimal) where the L60MD4-G is connected. (For example, enter H10 for X10.)
Target CH	iw_CH	Word	1 to 4	1 to 4: Specify the channel number.
Input type/range setting	iw_TypeRange	Word	0000_H 0010_H to 0012_H 0020_H to 0024_H 0030_H 0040_H to 0045_H 0050_H to $005B_H$	0000_H: Conversion disabled
				[Current] 0010_H: 4 to 20 mA 0011_H: 0 to 20 mA 0012_H: 4 to 20 mA (Expansion)
				[Voltage] 0020_H: 1 to 5 V 0021_H: 0 to 5 V 0022_H: -10 to 10 V 0023_H: 0 to 10 V 0024_H: 1 to 5 V (Expansion)
				[Low voltage] 0030_H: -100 to 100 mV

Name (comment)	Label name	Data type	Setting range	Description
				[Thermometric resistor] 0040_H: Pt100 (-20 to 120 Centigrade) 0041_H: Pt100 (-200 to 850 Centigrade) 0042_H: JPt100 (-20 to 120 Centigrade) 0043_H: JPt100 (-200 to 600 Centigrade) 0044_H: Pt1000 (-200 to 850 Centigrade) 0045_H: Pt50 (-200 to 650 Centigrade)
				[Thermocouple] 0050_H: B thermocouple 0051_H: R thermocouple 0052_H: S thermocouple 0053_H: K thermocouple 0054_H: E thermocouple 0055_H: J thermocouple 0056_H: T thermocouple 0057_H: N thermocouple 0058_H: U thermocouple 0059_H: L thermocouple $005A_H$: PLII thermocouple $005B_H$: W5Re/W26Re thermocouple
Centigrade/Fahrenheit display setting	iw_DisplayType	Word	0, 1	0: Centigrade display 1: Fahrenheit display

●Output labels

Name (comment)	Label name	Data type	Initial value	Description
Execution status	FB_ENO	Bit	OFF	ON: Execution command is ON. OFF: Execution command is OFF.
Completed without error	FB_OK	Bit	OFF	When ON, it indicates that the initial setting is completed.
Error flag	FB_ERROR	Bit	OFF	When ON, it indicates that an error has occurred.
Error code	ERROR_ID	Word	0	FB error code output.

FB Version Upgrade History

Version	Date	Description
1.00A	2014/6/30	First edition

Note

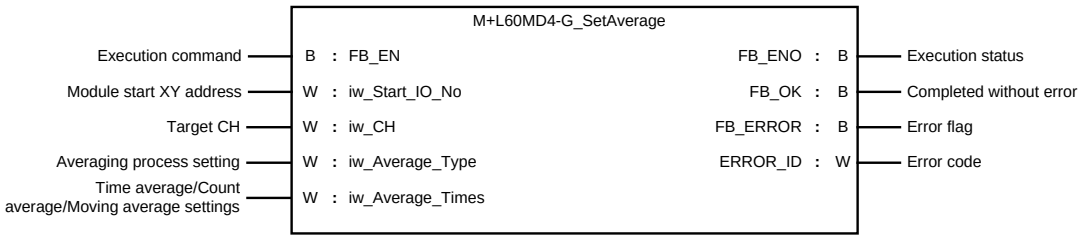
This chapter includes information related to the function block.
It does not include information on restrictions of use such as combination with modules or programmable controller CPUs.
Please make sure to read user's manuals for the corresponding products before using the products.

2.2. M+L60MD4-G_SetAverage (Averaging process setting)

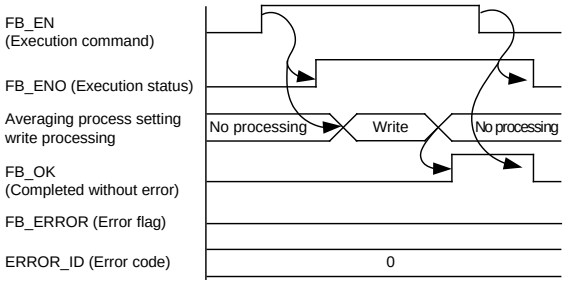
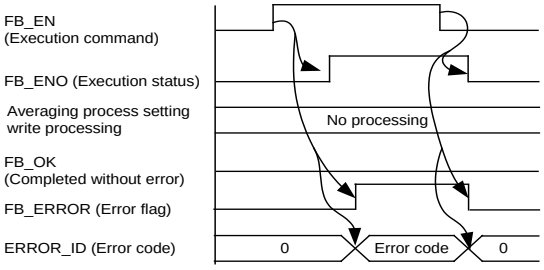
FB Name

M+L60MD4-G_SetAverage

Function Overview

Item	Description	
Function overview	Sets the averaging processing of the specified channel.	
Symbol		
Applicable hardware and software	Multiple input (voltage/current/ temperature) module	L60MD4-G
	CPU module	Series: MELSEC-L Series / Model: LCPU
	Engineering software	GX Works2 *1 Language: English version / Software version: Version1.24A or later Language: Chinese version / Software version: Version1.49B or later *1 For software versions applicable to the modules used, refer to "Relevant manuals".
Programming language	Ladder	
Number of steps	417 steps (for MELSEC-L series CPU) *The number of steps of the FB in a program depends on the CPU model that is used and input and output definition.	

Item	Description
Function description	1) By turning ON FB_EN (Execution command), the averaging processing of the specified channel is set. 2) FB operation is one-shot only, triggered by the FB_EN signal. 3) The setting value is validated when the Operating condition setting request signal (Yn9) is turned OFF → ON → OFF or the Operating condition setting request FB (M+L60MD4-G_RequestSetting) is executed. 4) When the setting value of iw_CH (Target CH) is out of range, the FB_ERROR output turns ON and processing is interrupted, and the error code is stored in ERROR_ID (Error code). Refer to the error code explanation section for details. 5) When the setting value of iw_Average_Type (Averaging process setting) is out of range, the FB_ERROR output turns ON and processing is interrupted, and the error code is stored in ERROR_ID (Error code). Refer to the error code explanation section for details.
Compiling method	Macro type
Restrictions and precautions	1) The FB does not include error recovery processing. Program the error recovery processing separately in accordance with the required system operation. 2) The FB cannot be used in an interrupt program. 3) Please ensure that the FB_EN signal is capable of being turned OFF by the program. Do not use this FB in programs that are only executed once such as a subroutine, FOR-NEXT loop because it is impossible to turn OFF. 4) When two or more of these FBs are used, precaution must be taken to avoid repetition of iw_CH (Target CH). 5) This FB uses index registers Z7 to Z9. Please do not use these index registers in an interrupt program. 6) Every input must be provided with a value for proper FB operation. To operate the L60MD4-G, set the input type/range setting according to the device and system to be connected. Set the proper settings for the device and system with the parameter setting in GX Works2 or the initial setting FB (M+L60MD4-G_InitialSetting). For details on how to use the parameter setting in GX Works2, refer to GX Works2 Version 1 Operating Manual (Common). 7) When a value set for iw_Average_Times (Time average/Count average/Moving average settings) is out of the setting range, no errors occur in this FB; however an error occurs in the module at an operating condition setting request. Please read the MELSEC-L Multiple Input (Voltage/Current/Temperature) Module User's Manual for the errors on the module.
FB operation type	Pulsed execution (1 scan execution type)
Application example	Refer to "Appendix 1 FB Library Application Examples".

Item	Description
Timing chart	[When operation completes without error]  [When an error occurs] 
Relevant manuals	• MELSEC-L Multiple Input (Voltage/Current/Temperature) Module User's Manual • MELSEC-L CPU Module User's Manual (Hardware Design, Maintenance and Inspection) • GX Works2 Version 1 Operating Manual (Common) • GX Works2 Version 1 Operating Manual (Simple Project, Function Block)

Error codes

●Error code list

Error code	Description	Action
10 (Decimal)	The specified channel is not valid. iw_CH (Target CH) is not within the range of 1 to 4.	Please try again after confirming the setting.
11 (Decimal)	The specified averaging processing type is not valid. iw_Average_Type (Averaging process setting) is not within the range of 0 to 3_H.	Please try again after confirming the setting.

Labels

●Input labels

Name (comment)	Label name	Data type	Setting range	Description
Execution command	FB_EN	Bit	ON, OFF	ON: The FB is activated. OFF: The FB is not activated.
Module start XY address	iw_Start_IO_No	Word	Depends on the I/O point range of the CPU. For details, refer to the CPU user's manual.	Specify the starting XY address (in hexadecimal) where the L60MD4-G is connected. (For example, enter H10 for X10.)
Target CH	iw_CH	Word	1 to 4	Specify the channel number.
Averaging process setting	iw_Average_Type	Word	0_H: Sampling processing 1_H: Time average 2_H: Count average 3_H: Moving average	Specify the averaging processing type.
Time average/Count average/Moving average settings	iw_Average_Times	Word	Time average 8 to 18000 (100 ms) Count average 4 to 36000 (times) Moving average 2 to 1000 (times)	Set the time average, count average, and moving average of the specified channel.

●Output labels

Name (comment)	Label name	Data type	Initial value	Description
Execution status	FB_ENO	Bit	OFF	ON: Execution command is ON. OFF: Execution command is OFF.
Completed without error	FB_OK	Bit	OFF	When ON, it indicates that the averaging processing setting is completed.
Error flag	FB_ERROR	Bit	OFF	When ON, it indicates that an error has occurred.
Error code	ERROR_ID	Word	0	FB error code output.

FB Version Upgrade History

Version	Date	Description
1.00A	2014/6/30	First edition

Note

This chapter includes information related to the function block.

It does not include information on restrictions of use such as combination with modules or programmable controller CPUs.

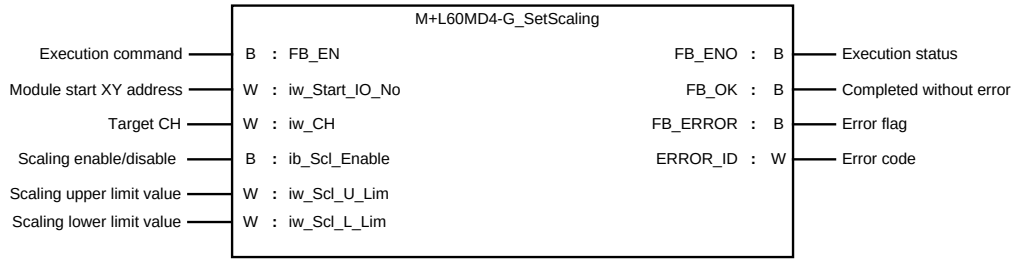
Please make sure to read user's manuals for the corresponding products before using the products.

2.3. M+L60MD4-G_SetScaling (Scaling setting)

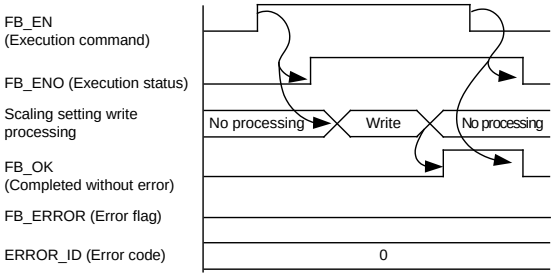
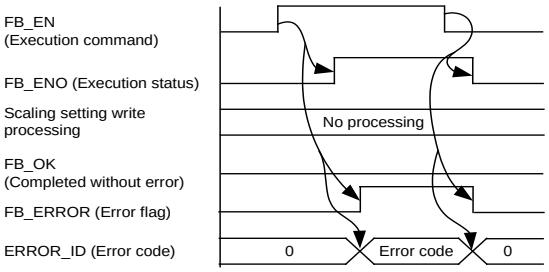
FB Name

M+L60MD4-G_SetScaling

Function Overview

<table>
<tr><th>Item</th><th colspan="2">Description</th></tr>
<tr><td>Function overview</td><td colspan="2">Sets the scaling of the specified channel.</td></tr>
<tr><td>Symbol</td><td colspan="2"> 
</td></tr>
<tr><td rowspan="3">Applicable hardware and software</td><td>Multiple input (voltage/current/ temperature) module</td><td>L60MD4-G</td></tr>
<tr><td>CPU module</td><td><table><tr><th>Series</th><th>Model</th></tr><tr><td>MELSEC-L Series</td><td>LCPU</td></tr></table></td></tr>
<tr><td>Engineering software</td><td>GX Works2 *1<table><tr><th>Language</th><th>Software version</th></tr><tr><td>English version</td><td>Version1.24A or later</td></tr><tr><td>Chinese version</td><td>Version1.49B or later</td></tr></table>*1 For software versions applicable to the modules used, refer to "Relevant manuals".</td></tr>
<tr><td>Programming language</td><td colspan="2">Ladder</td></tr>
<tr><td>Number of steps</td><td colspan="2">352 steps (for MELSEC-L series CPU)
*The number of steps of the FB in a program depends on the CPU model that is used and input and output definition.</td></tr>
</table>

Item	Description
Function description	1) By turning ON FB_EN (Execution command), the scaling setting of the specified channel is configured. 2) FB operation is one-shot only, triggered by the FB_EN signal. 3) The setting value is validated when the Operating condition setting request signal (Yn9) is turned OFF → ON → OFF or the Operating condition setting request FB (M+L60MD4-G_RequestSetting) is executed. 4) When the setting value of iw_CH (Target CH) is out of range, the FB_ERROR output turns ON and processing is interrupted, and the error code is stored in ERROR_ID (Error code). Refer to the error code explanation section for details.
Compiling method	Macro type
Restrictions and precautions	1) The FB does not include error recovery processing. Program the error recovery processing separately in accordance with the required system operation. 2) The FB cannot be used in an interrupt program. 3) Please ensure that the FB_EN signal is capable of being turned OFF by the program. Do not use this FB in programs that are only executed once such as a subroutine, FOR-NEXT loop because it is impossible to turn OFF. 4) When two or more of these FBs are used, precaution must be taken to avoid repetition of iw_CH (Target CH). 5) This FB uses index registers Z7 to Z9. Please do not use these index registers in an interrupt program. 6) Every input must be provided with a value for proper FB operation. 7) To operate the L60MD4-G, set the input type/range setting according to the device and system to be connected. Set the proper settings for the device and system with the parameter setting in GX Works2 or the initial setting FB (M+L60MD4-G_InitialSetting). For details on how to use the parameter setting in GX Works2, refer to GX Works2 Version 1 Operating Manual (Common). 8) In either of the following cases 1) and 2), no errors occur in this FB; however an error occurs in the module at an operating condition setting request. Please read the MELSEC-L Multiple Input (Voltage/Current/Temperature) Module User's Manual for the errors on the module. 1) When a value set for iw_Scl_U_Lim (Scaling upper limit value) or iw_Scl_L_Lim (Scaling lower limit value) is out of the setting range 2) When the values set for iw_Scl_U_Lim (Scaling upper limit value) and iw_Scl_L_Lim (Scaling lower limit value) are the same
FB operation type	Pulsed execution (1 scan execution type)
Application example	Refer to "Appendix 1 FB Library Application Examples".

Item	Description
Timing chart	[When operation completes without error]  [When an error occurs] 
Relevant manuals	• MELSEC-L Multiple Input (Voltage/Current/Temperature) Module User's Manual • MELSEC-L CPU Module User's Manual (Hardware Design, Maintenance and Inspection) • GX Works2 Version 1 Operating Manual (Common) • GX Works2 Version 1 Operating Manual (Simple Project, Function Block)

Error codes

●Error code list

Error code	Description	Action
10 (Decimal)	The specified channel is not valid. iw_CH (Target CH) is not within the range of 1 to 4.	Please try again after confirming the setting.

Labels

●Input labels

Name (comment)	Label name	Data type	Setting range	Description
Execution command	FB_EN	Bit	ON, OFF	ON: The FB is activated. OFF: The FB is not activated.
Module start XY address	iw_Start_IO_No	Word	Depends on the I/O point range of the CPU. For details, refer to the CPU user's manual.	Specify the starting XY address (in hexadecimal) where the L60MD4-G is connected. (For example, enter H10 for X10.)
Target CH	iw_CH	Word	1 to 4	Specify the channel number.
Scaling enable/disable	ib_Scl_Enable	Bit	ON, OFF	ON: Enable the scaling. OFF: Disable the scaling.
Scaling upper limit value	iw_Scl_U_Lim	Word	-32,000 to 32,000	Specify the scaling upper limit value.
Scaling lower limit value	iw_Scl_L_Lim	Word	-32,000 to 32,000	Specify the scaling lower limit value.

●Output labels

Name (comment)	Label name	Data type	Initial value	Description
Execution status	FB_ENO	Bit	OFF	ON: Execution command is ON. OFF: Execution command is OFF.
Completed without error	FB_OK	Bit	OFF	When ON, it indicates that the scaling setting is completed.
Error flag	FB_ERROR	Bit	OFF	When ON, it indicates that an error has occurred.
Error code	ERROR_ID	Word	0	FB error code output.

FB Version Upgrade History

Version	Date	Description
1.00A	2014/6/30	First edition

Note

This chapter includes information related to the function block.

It does not include information on restrictions of use such as combination with modules or programmable controller CPUs.

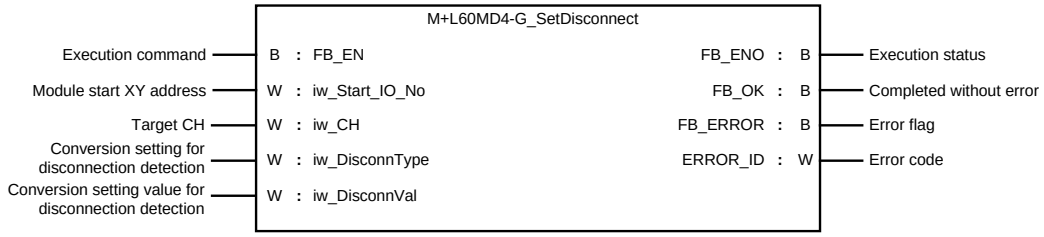
Please make sure to read user's manuals for the corresponding products before using the products.

2.4. M+L60MD4-G_SetDisconnect (Disconnection detection setting)

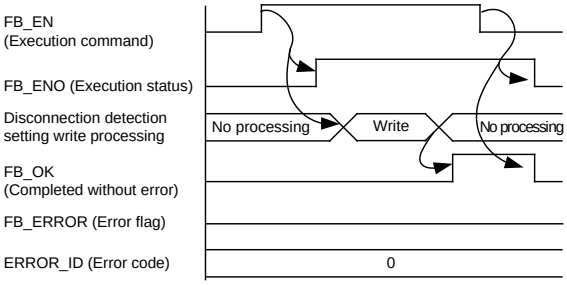
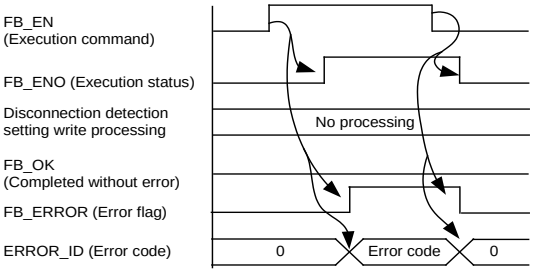
FB Name

M+L60MD4-G_SetDisconnect

Function Overview

<table>
<tr><td>Item</td><td colspan="2">Description</td></tr>
<tr><td>Function overview</td><td colspan="2">Sets the disconnection detection of the specified channel.</td></tr>
<tr><td>Symbol</td><td colspan="2"> 
</td></tr>
<tr><td rowspan="3">Applicable hardware and software</td><td>Multiple input (voltage/current/ temperature) module</td><td>L60MD4-G</td></tr>
<tr><td>CPU module</td><td><table><tr><th>Series</th><th>Model</th></tr><tr><td>MELSEC-L Series</td><td>LCPU</td></tr></table></td></tr>
<tr><td>Engineering software</td><td>GX Works2 *1<table><tr><th>Language</th><th>Software version</th></tr><tr><td>English version</td><td>Version1.24A or later</td></tr><tr><td>Chinese version</td><td>Version1.49B or later</td></tr></table>*1 For software versions applicable to the modules used, refer to "Relevant manuals".</td></tr>
<tr><td>Programming language</td><td colspan="2">Ladder</td></tr>
<tr><td>Number of steps</td><td colspan="2">372 steps (for MELSEC-L series CPU)
*The number of steps of the FB in a program depends on the CPU model that is used and input and output definition.</td></tr>
</table>

Item	Description
Function description	1) By turning ON FB_EN (Execution command), the disconnection detection setting of the specified channel is configured. 2) FB operation is one-shot only, triggered by the FB_EN signal. 3) The setting value is validated when the Operating condition setting request signal (Yn9) is turned OFF → ON → OFF or the Operating condition setting request FB (M+L60MD4-G_RequestSetting) is executed. 4) When the setting value of iw_CH (Target CH) is out of range, the FB_ERROR output turns ON and processing is interrupted, and the error code is stored in ERROR_ID (Error code). Refer to the error code explanation section for details.
Compiling method	Macro type
Restrictions and precautions	1) The FB does not include error recovery processing. Program the error recovery processing separately in accordance with the required system operation. 2) The FB cannot be used in an interrupt program. 3) Please ensure that the FB_EN signal is capable of being turned OFF by the program. Do not use this FB in programs that are only executed once such as a subroutine, FOR-NEXT loop because it is impossible to turn OFF. 4) When two or more of these FBs are used, precaution must be taken to avoid repetition of iw_CH (Target CH). 5) This FB uses index registers Z7 to Z9. Please do not use these index registers in an interrupt program. 6) Every input must be provided with a value for proper FB operation. 7) To operate the L60MD4-G, set the input type/range setting according to the device and system to be connected. Set the proper settings for the device and system with the parameter setting in GX Works2 or the initial setting FB (M+L60MD4-G_InitialSetting). For details on how to use the parameter setting in GX Works2, refer to GX Works2 Version 1 Operating Manual (Common). 8) When a value set for iw_DisconnType (Conversion setting for disconnection detection) is out of the setting range, no errors occur in this FB; however an error occurs in the module at a operating condition setting request. Please read the MELSEC-L Multiple Input (Voltage/Current/Temperature) Module User's Manual for the errors on the module.
FB operation type	Pulsed execution (1 scan execution type)
Application example	Refer to "Appendix 1 FB Library Application Examples".

Item	Description
Timing chart	[When operation completes without error]  [When an error occurs] 
Relevant manuals	• MELSEC-L Multiple Input (Voltage/Current/Temperature) Module User's Manual • MELSEC-L CPU Module User's Manual (Hardware Design, Maintenance and Inspection) • GX Works2 Version 1 Operating Manual (Common) • GX Works2 Version 1 Operating Manual (Simple Project, Function Block)

Error codes

●Error code list

Error code	Description	Action
10 (Decimal)	The specified channel is not valid. iw_CH (Target CH) is not within the range of 1 to 4.	Please try again after confirming the setting.

Labels

●Input labels

Name (comment)	Label name	Data type	Setting range	Description
Execution command	FB_EN	Bit	ON, OFF	ON: The FB is activated. OFF: The FB is not activated.
Module start XY address	iw_Start_IO_No	Word	Depends on the I/O point range of the CPU. For details, refer to the CPU user's manual.	Specify the starting XY address (in hexadecimal) where the L60MD4-G is connected. (For example, enter H10 for X10.)
Target CH	iw_CH	Word	1 to 4	Specify the channel number.
Conversion setting for disconnection detection	iw_DisconnType	Word	0_H: Value just before disconnection 1_H: Upscale 2_H: Downscale 3_H: Any value	Specify the conversion setting for disconnection detection.
Conversion setting value for disconnection detection	iw_DisconnVal	Word	-32768 to 32767	Specify the conversion setting value for disconnection detection.

●Output labels

Name (comment)	Label name	Data type	Initial value	Description
Execution status	FB_ENO	Bit	OFF	ON: Execution command is ON. OFF: Execution command is OFF.
Completed without error	FB_OK	Bit	OFF	When ON, it indicates that the disconnection detection setting is completed.
Error flag	FB_ERROR	Bit	OFF	When ON, it indicates that an error has occurred.
Error code	ERROR_ID	Word	0	FB error code output.

FB Version Upgrade History

Version	Date	Description
1.00A	2014/6/30	First edition

Note

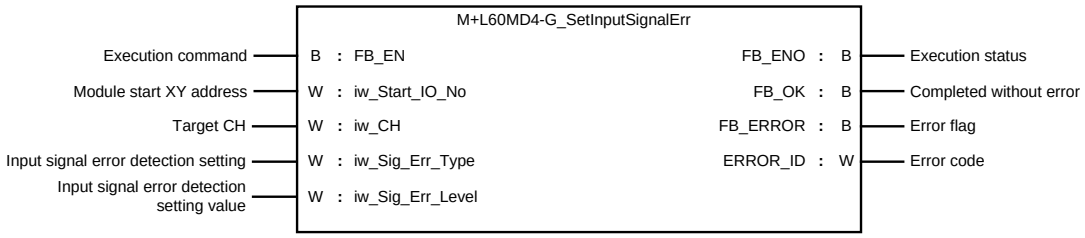
This chapter includes information related to the function block.
It does not include information on restrictions of use such as combination with modules or programmable controller CPUs.
Please make sure to read user's manuals for the corresponding products before using the products.

2.5. M+L60MD4-G_SetInputSignalErr (Input signal error detection setting)

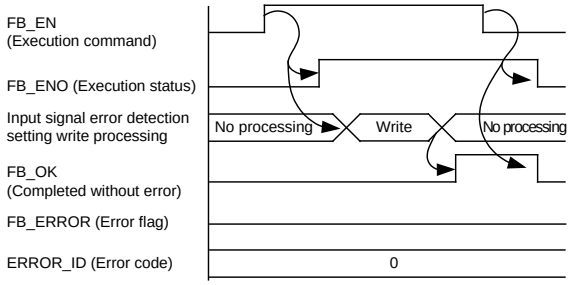
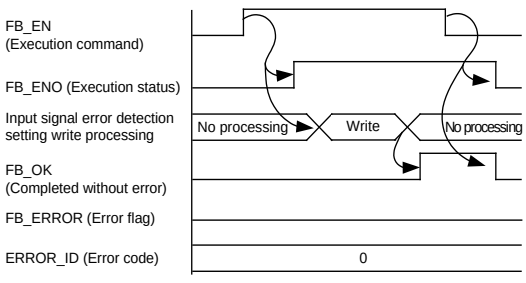
FB Name

M+L60MD4-G_SetInputSignalErr

Function Overview

Item	Description	
Function overview	Sets the input signal error detection of the specified conversion channel (CH1 to CH4).	
Symbol		
Applicable hardware and software	Multiple input (voltage/current/ temperature) module	L60MD4-G
	CPU module	Series: MELSEC-L Series; Model: LCPU
	Engineering software	GX Works2 *1 Language: English version — Software version: Version1.24A or later Language: Chinese version — Software version: Version1.49B or later *1 For software versions applicable to the modules used, refer to "Relevant manuals".
Programming language	Ladder	
Number of steps	389 steps (for MELSEC-L series CPU) *The number of steps of the FB in a program depends on the CPU model that is used and input and output definition.	

Item	Description
Function description	1) By turning ON FB_EN (Execution command), the input signal error detection setting of the specified channel is configured. 2) FB operation is one-shot only, triggered by the FB_EN signal. 3) The setting value is validated when the Operating condition setting request signal (Yn9) is turned OFF → ON → OFF or the Operating condition setting request FB (M+L60MD4-G_RequestSetting) is executed. 4) When the setting value of iw_CH (Target CH) is out of range, the FB_ERROR output turns ON and processing is interrupted, and the error code is stored in ERROR_ID (Error code). Refer to the error code explanation section for details. 5) When the input signal error detection setting is out of range, the FB_ERROR output turns ON and processing is interrupted, and the error code is stored in ERROR_ID. Refer to the error code explanation section for details.
Compiling method	Macro type

Item	Description
Restrictions and precautions	1) The FB does not include error recovery processing. Program the error recovery processing separately in accordance with the required system operation. 2) The FB cannot be used in an interrupt program. 3) Please ensure that the FB_EN signal is capable of being turned OFF by the program. Do not use this FB in programs that are only executed once such as a subroutine, FOR-NEXT loop because it is impossible to turn OFF. 4) When two or more of these FBs are used, precaution must be taken to avoid repetition of iw_CH (Target CH). 5) This FB uses index registers Z7 to Z9. Please do not use these index registers in an interrupt program. 6) Every input must be provided with a value for proper FB operation. 7) To operate the L60MD4-G, set the input type/range setting according to the device and system to be connected. Set the proper settings for the device and system with the parameter setting in GX Works2 or the initial setting FB (M+L60MD4-G_InitialSetting). For details on how to use the parameter setting in GX Works2, refer to GX Works2 Version 1 Operating Manual (Common). 8) In either of the following cases 1) and 2), no errors occur in this FB; however an error occurs in the module at an operating condition setting request. Please read the MELSEC-L Multiple Input (Voltage/Current/Temperature) Module User's Manual for the errors on the module. 1) When iw_Sig_Err_Type (Input signal error detection setting) is set to "4_H: Simple disconnection detection" while either of "4 to 20 mA (Expansion)" or "0 to 5 V (Expansion) is not selected in Input type/range setting (Un¥G500 to 503) of iw_CH (Target CH) 2) When a value set for iw_Sig_Err_Level (Input signal error detection setting value) is out of the setting range
FB operation type	Pulsed execution (1 scan execution type)
Application example	Refer to "Appendix 1 FB Library Application Examples".
Timing chart	[When operation completes without error]  [When an error occurs] 

Item	Description
Relevant manuals	• MELSEC-L Multiple Input (Voltage/Current/Temperature) Module User's Manual • MELSEC-L CPU Module User's Manual (Hardware Design, Maintenance and Inspection) • GX Works2 Version 1 Operating Manual (Common) • GX Works2 Version 1 Operating Manual (Simple Project, Function Block)

Error codes

●Error code list

Error code	Description	Action
10 (Decimal)	The specified channel is not valid. iw_CH (Target CH) is not within the range of 1 to 4.	Please try again after confirming the setting.
11 (Decimal)	The input signal error detection setting is not valid. iw_Sig_Err_Type (Input signal error detection setting) is not within the range of 0_H to 4_H.	Please try again after confirming the setting.

Labels

●Input labels

Name (comment)	Label name	Data type	Setting range	Description
Execution command	FB_EN	Bit	ON, OFF	ON: The FB is activated. OFF: The FB is not activated.
Module start XY address	iw_Start_IO_No	Word	Depends on the I/O point range of the CPU. For details, refer to the CPU user's manual.	Specify the starting XY address (in hexadecimal) where the L60MD4-G is connected. (For example, enter H10 for X10.)
Target CH	iw_CH	Word	1 to 4	Specify the channel number.
Input signal error detection setting	iw_Sig_Err_Type	Word	0_H: Disable 1_H: Upper and lower limit detection 2_H: Lower limit detection 3_H: Upper limit detection 4_H: Simple disconnection detection	Set the input signal error detection setting value.
Input signal error detection setting value	iw_Sig_Err_Level	Word	0 to 250 (Unit: 0.1%)	Specify the input signal error detection setting value.

●Output labels

Name (comment)	Label name	Data type	Initial value	Description
Execution status	FB_ENO	Bit	OFF	ON: Execution command is ON. OFF: Execution command is OFF.
Completed without error	FB_OK	Bit	OFF	When ON, it indicates that the input signal error detection setting is completed.
Error flag	FB_ERROR	Bit	OFF	When ON, it indicates that an error has occurred.
Error code	ERROR_ID	Word	0	FB error code output.

FB Version Upgrade History

Version	Date	Description
1.00A	2014/6/30	First edition

Note

This chapter includes information related to the function block.

It does not include information on restrictions of use such as combination with modules or programmable controller CPUs.

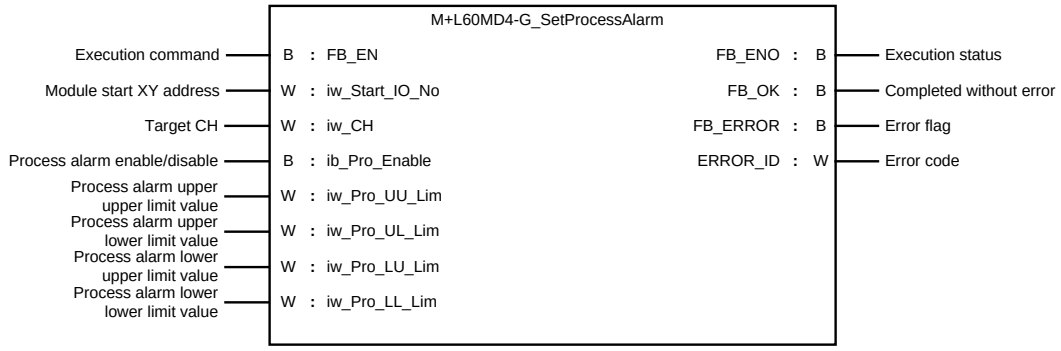
Please make sure to read user's manuals for the corresponding products before using the products.

2.6. M+L60MD4-G_SetProcessAlarm (Process alarm setting)

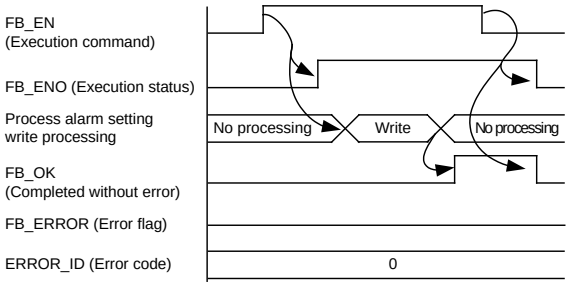
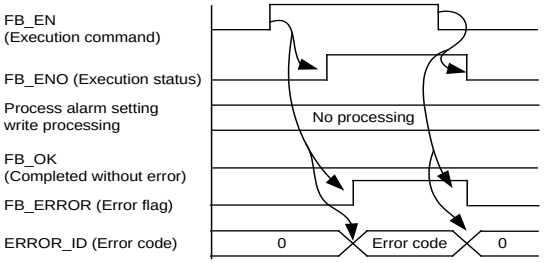
FB Name

M+L60MD4-G_SetProcessAlarm

Function Overview

Item	Description	
Function overview	Sets the process alarm of the specified channel.	
Symbol		
Applicable hardware and software	Multiple input (voltage/current/ temperature) module	L60MD4-G
	CPU module	Series: MELSEC-L Series; Model: LCPU
	Engineering software	GX Works2 *1 Language: English version — Software version: Version1.24A or later Language: Chinese version — Software version: Version1.49B or later *1 For software versions applicable to the modules used, refer to "Relevant manuals".
Programming language	Ladder	
Number of steps	241 steps (for MELSEC-L series CPU) *The number of steps of the FB in a program depends on the CPU model that is used and input and output definition.	

Item	Description
Function description	1) By turning ON FB_EN (Execution command), the process alarm of the specified channel is set. 2) FB operation is one-shot only, triggered by the FB_EN signal. 3) The setting value is validated when the Operating condition setting request signal (Yn9) is turned OFF → ON → OFF or the Operating condition setting request FB (M+L60MD4-G_RequestSetting) is executed. 4) When the setting value of iw_CH (Target CH) is out of range, the FB_ERROR output turns ON and processing is interrupted, and the error code is stored in ERROR_ID (Error code). Refer to the error code explanation section for details.
Compiling method	Macro type
Restrictions and precautions	1) The FB does not include error recovery processing. Program the error recovery processing separately in accordance with the required system operation. 2) The FB cannot be used in an interrupt program. 3) Please ensure that the FB_EN signal is capable of being turned OFF by the program. Do not use this FB in programs that are only executed once such as a subroutine, FOR-NEXT loop because it is impossible to turn OFF. 4) When two or more of these FBs are used, precaution must be taken to avoid repetition of iw_CH (Target CH). 5) This FB uses index registers Z7 to Z9. Please do not use these index registers in an interrupt program. 6) Every input must be provided with a value for proper FB operation. 7) To operate the L60MD4-G, set the input type/range setting according to the device and system to be connected. Set the proper settings for the device and system with the parameter setting in GX Works2 or the initial setting FB (M+L60MD4-G_InitialSetting). For details on how to use the parameter setting in GX Works2, refer to GX Works2 Version 1 Operating Manual (Common). 8) In any of the following cases 1) to 3), no errors occur in this FB; however an error occurs in the module at an operating condition setting request. Please read the MELSEC-L Multiple Input (Voltage/Current/Temperature) Module User's Manual for the errors on the module. 1) When a value that exceeds iw_Pro_LU_Lim (Process alarm lower upper limit value) is set for iw_Pro_LL_Lim (Process alarm lower lower limit value) 2) When a value that exceeds iw_Pro_UL_Lim (Process alarm upper lower limit value) is set for iw_Pro_LU_Lim (Process alarm lower upper limit value) 3) When a value that exceeds iw_Pro_UU_Lim (Process alarm upper upper limit value) is set for iw_Pro_UL_Lim (Process alarm upper lower limit value)
FB operation type	Pulsed execution (1 scan execution type)

Item	Description
Application example	Refer to "Appendix 1 FB Library Application Examples".
Timing chart	[When operation completes without error]  [When an error occurs] 
Relevant manuals	• MELSEC-L Multiple Input (Voltage/Current/Temperature) Module User's Manual • MELSEC-L CPU Module User's Manual (Hardware Design, Maintenance and Inspection) • GX Works2 Version 1 Operating Manual (Common) • GX Works2 Version 1 Operating Manual (Simple Project, Function Block)

Error codes

●Error code list

Error code	Description	Action
10 (Decimal)	The specified channel is not valid. iw_CH (Target CH) is not within the range of 1 to 4.	Please try again after confirming the setting.

Labels

●Input labels

Name (comment)	Label name	Data type	Setting range	Description
Execution command	FB_EN	Bit	ON, OFF	ON: The FB is activated. OFF: The FB is not activated.
Module start XY address	iw_Start_IO_No	Word	Depends on the I/O point range of the CPU. For details, refer to the CPU user's manual.	Specify the starting XY address (in hexadecimal) where the L60MD4-G is connected. (For example, enter H10 for X10.)
Target CH	iw_CH	Word	1 to 4	Specify the channel number.
Process alarm enable/disable	ib_Pro_Enable	Bit	ON, OFF	ON: Enable the warning output of the process alarm. OFF: Disable the warning output of the process alarm.
Process alarm upper upper limit value	iw_Pro_UU_Lim	Word	-32,768 to 32,767	Specify the process alarm upper upper limit value.
Process alarm upper lower limit value	iw_Pro_UL_Lim	Word	-32,768 to 32,767	Specify the process alarm upper lower limit value.
Process alarm lower upper limit value	iw_Pro_LU_Lim	Word	-32,768 to 32,767	Specify the process alarm lower upper limit value.
Process alarm lower lower limit value	iw_Pro_LL_Lim	Word	-32,768 to 32,767	Specify the process alarm lower lower limit value.

●Output labels

Name (comment)	Label name	Data type	Initial value	Description
Execution status	FB_ENO	Bit	OFF	ON: Execution command is ON. OFF: Execution command is OFF.
Completed without error	FB_OK	Bit	OFF	When ON, it indicates that the process alarm setting is completed.
Error flag	FB_ERROR	Bit	OFF	When ON, it indicates that an error has occurred.
Error code	ERROR_ID	Word	0	FB error code output.

FB Version Upgrade History

Version	Date	Description
1.00A	2014/6/30	First edition

Note

This chapter includes information related to the function block.

It does not include information on restrictions of use such as combination with modules or programmable controller CPUs.

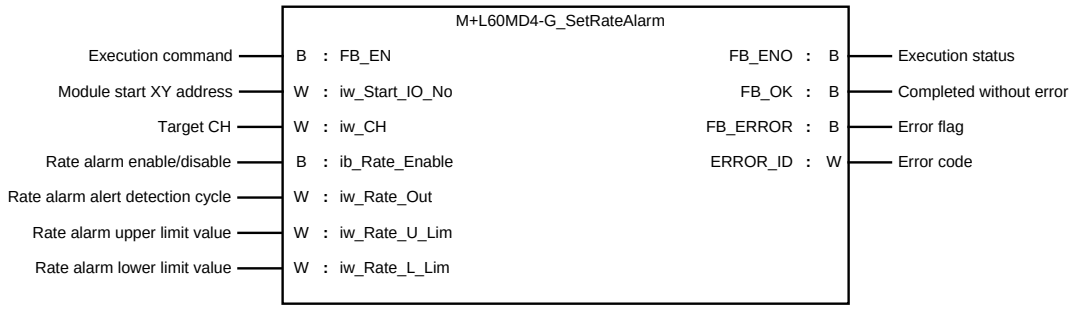
Please make sure to read user's manuals for the corresponding products before using the products.

2.7. M+L60MD4-G_SetRateAlarm (Rate alarm setting)

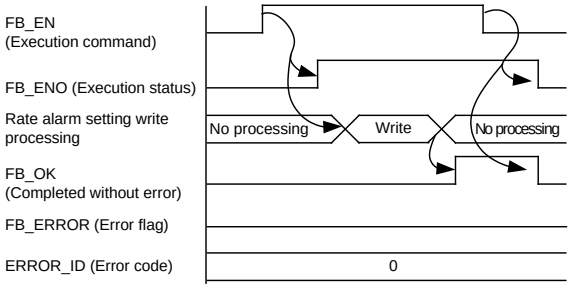
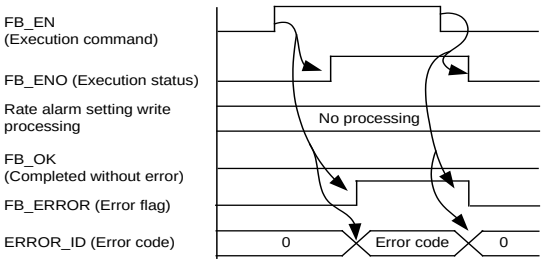
FB Name

M+L60MD4-G_SetRateAlarm

Function Overview

Item	Description	
Function overview	Sets the rate alarm of the specified channel.	
Symbol		
Applicable hardware and software	Multiple input (voltage/current/ temperature) module	L60MD4-G
	CPU module	Series: MELSEC-L Series; Model: LCPU
	Engineering software	GX Works2 *1 Language: English version — Software version: Version1.24A or later Language: Chinese version — Software version: Version1.49B or later *1 For software versions applicable to the modules used, refer to "Relevant manuals".
Programming language	Ladder	
Number of steps	233 steps (for MELSEC-L series CPU) *The number of steps of the FB in a program depends on the CPU model that is used and input and output definition.	

Item	Description
Function description	1) By turning ON FB_EN (Execution command), the rate alarm of the specified channel is set. 2) FB operation is one-shot only, triggered by the FB_EN signal. 3) The setting value is validated when the Operating condition setting request signal (Yn9) is turned OFF → ON → OFF or the Operating condition setting request FB (M+L60MD4-G_RequestSetting) is executed. 4) When the setting value of iw_CH (Target CH) is out of range, the FB_ERROR output turns ON and processing is interrupted, and the error code is stored in ERROR_ID (Error code). Refer to the error code explanation section for details.
Compiling method	Macro type
Restrictions and precautions	1) The FB does not include error recovery processing. Program the error recovery processing separately in accordance with the required system operation. 2) The FB cannot be used in an interrupt program. 3) Please ensure that the FB_EN signal is capable of being turned OFF by the program. Do not use this FB in programs that are only executed once such as a subroutine, FOR-NEXT loop because it is impossible to turn OFF. 4) When two or more of these FBs are used, precaution must be taken to avoid repetition of iw_CH (Target CH). 5) This FB uses index registers Z7 to Z9. Please do not use these index registers in an interrupt program. 6) Every input must be provided with a value for proper FB operation. 7) To operate the L60MD4-G, set the input type/range setting according to the device and system to be connected. Set the proper settings for the device and system with the parameter setting in GX Works2 or the initial setting FB (M+L60MD4-G_InitialSetting). For details on how to use the parameter setting in GX Works2, refer to GX Works2 Version 1 Operating Manual (Common). 8) In either of the following cases 1) and 2), no errors occur in this FB; however an error occurs in the module at an operating condition setting request. Please read the MELSEC-L Multiple Input (Voltage/Current/Temperature) Module User's Manual for the errors on the module. 1) When a value set for iw_Rate_Out (Rate alarm alert detection cycle) is out of the setting range 2) When a value that exceeds iw_Rate_U_Lim (Rate alarm upper limit value) is set for iw_Rate_L_Lim (Rate alarm lower limit value)
FB operation type	Pulsed execution (1 scan execution type)
Application example	Refer to "Appendix 1 FB Library Application Examples".

Item	Description
Timing chart	[When operation completes without error]  [When an error occurs] 
Relevant manuals	• MELSEC-L Multiple Input (Voltage/Current/Temperature) Module User's Manual • MELSEC-L CPU Module User's Manual (Hardware Design, Maintenance and Inspection) • GX Works2 Version 1 Operating Manual (Common) • GX Works2 Version 1 Operating Manual (Simple Project, Function Block)

Error codes

●Error code list

Error code	Description	Action
10 (Decimal)	The specified channel is not valid. iw_CH (Target CH) is not within the range of 1 to 4.	Please try again after confirming the setting.

Labels

●Input labels

Name (comment)	Label name	Data type	Setting range	Description
Execution command	FB_EN	Bit	ON, OFF	ON: The FB is activated. OFF: The FB is not activated.
Module start XY address	iw_Start_IO_No	Word	Depends on the I/O point range of the CPU. For details, refer to the CPU user's manual.	Specify the starting XY address (in hexadecimal) where the L60MD4-G is connected. (For example, enter H10 for X10.)
Target CH	iw_CH	Word	1 to 4	Specify the channel number.
Rate alarm enable/disable	ib_Rate_Enable	Bit	ON, OFF	ON: Enable the alert output of the rate alarm. OFF: Disable the alert output of the rate alarm.
Rate alarm alert detection cycle	iw_Rate_Out	Word	1 to 36000	Specify the rate alarm alert detection cycle.
Rate alarm upper limit value	iw_Rate_U_Lim	Word	-32,768 to 32,767	Specify the rate alarm upper limit value.
Rate alarm lower limit value	iw_Rate_L_Lim	Word	-32,768 to 32,767	Specify the rate alarm lower limit value.

●Output labels

Name (comment)	Label name	Data type	Initial value	Description
Execution status	FB_ENO	Bit	OFF	ON: Execution command is ON. OFF: Execution command is OFF.
Completed without error	FB_OK	Bit	OFF	When ON, it indicates that the rate alarm setting is completed.
Error flag	FB_ERROR	Bit	OFF	When ON, it indicates that an error has occurred.
Error code	ERROR_ID	Word	0	FB error code output.

FB Version Upgrade History

Version	Date	Description
1.00A	2014/6/30	First edition

Note

This chapter includes information related to the function block.

It does not include information on restrictions of use such as combination with modules or programmable controller CPUs.

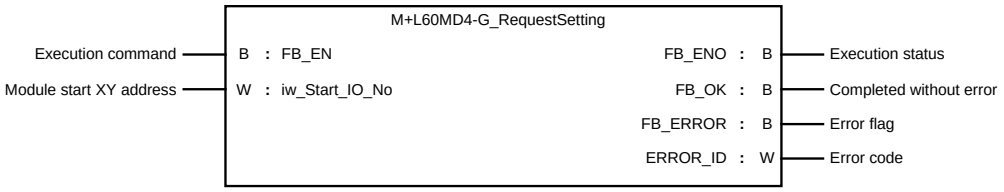
Please make sure to read user's manuals for the corresponding products before using the products.

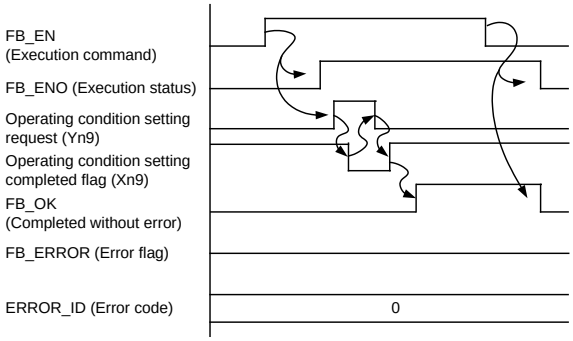
2.8. M+L60MD4-G_RequestSetting (Operating condition setting request)

FB Name

M+L60MD4-G_RequestSetting

Function Overview

<table>
<tr><th>Item</th><th colspan="2">Description</th></tr>
<tr><td>Function overview</td><td colspan="2">Validates the settings of each function.</td></tr>
<tr><td>Symbol</td><td colspan="2"> 
</td></tr>
<tr><td rowspan="3">Applicable hardware and software</td><td>Multiple input (voltage/current/ temperature) module</td><td>L60MD4-G</td></tr>
<tr><td>CPU module</td><td><table><tr><th>Series</th><th>Model</th></tr><tr><td>MELSEC-L Series</td><td>LCPU</td></tr></table></td></tr>
<tr><td>Engineering software</td><td>GX Works2 *1<table><tr><th>Language</th><th>Software version</th></tr><tr><td>English version</td><td>Version1.24A or later</td></tr><tr><td>Chinese version</td><td>Version1.49B or later</td></tr></table>*1 For software versions applicable to the modules used, refer to "Relevant manuals".</td></tr>
<tr><td>Programming language</td><td colspan="2">Ladder</td></tr>
<tr><td>Number of steps</td><td colspan="2">277 steps (for MELSEC-L series CPU)
*The number of steps of the FB in a program depends on the CPU model that is used and input and output definition.</td></tr>
<tr><td>Function description</td><td colspan="2">1) By turning ON FB_EN (Execution command), the settings of all channels (CH1 to CH4) are enabled. For information on the settings that are enabled, refer to MELSEC-L Multiple Input (Voltage/Current/Temperature) Module User's Manual.
2) After FB_EN (Execution command) is turned ON, the execution of this FB continues until each function setting is completed.</td></tr>
<tr><td>Compiling method</td><td colspan="2">Macro type</td></tr>
</table>

Item	Description
Restrictions and precautions	1) When this FB is executed while the L60MD4-G is being operated, the conversion is stopped. The conversion restarts after FB_OK turns ON. 2) The FB does not include error recovery processing. Program the error recovery processing separately in accordance with the required system operation. 3) Please ensure that the FB_EN signal is capable of being turned OFF by the program. Do not use this FB in programs that are only executed once such as a subroutine, FOR-NEXT loop because it is impossible to turn OFF. 4) The FB cannot be used in an interrupt program. 5) This FB uses index register Z9. Please do not use the index register in an interrupt program. 6) Every input must be provided with a value for proper FB operation. 7) When this FB is used in two or more places, a duplicated coil warning may occur during compile operation due to the Y signal being operated by index modification. However this is not a problem and the FB will operate without error. 8) To operate the L60MD4-G, set the input type/range setting according to the device and system to be connected. Set the proper settings for the device and system with the parameter setting in GX Works2 or the initial setting FB (M+L60MD4-G_InitialSetting). For details on how to use the parameter setting in GX Works2, refer to GX Works2 Version 1 Operating Manual (Common).
FB operation type	Pulsed execution (multiple scan execution type)
Application example	Refer to "Appendix 1 FB Library Application Examples".
Timing chart	[When operation completes without error] 
Relevant manuals	• MELSEC-L Multiple Input (Voltage/Current/Temperature) Module User's Manual • MELSEC-L CPU Module User's Manual (Hardware Design, Maintenance and Inspection) • GX Works2 Version 1 Operating Manual (Common) • GX Works2 Version 1 Operating Manual (Simple Project, Function Block)

Error codes

●Error code list

Error code	Description	Action
None	None	None

Labels

●Input labels

Name (comment)	Label name	Data type	Setting range	Description
Execution command	FB_EN	Bit	ON, OFF	ON: The FB is activated. OFF: The FB is not activated.
Module start XY address	iw_Start_IO_No	Word	Depends on the I/O point range of the CPU. For details, refer to the CPU user's manual.	Specify the starting XY address (in hexadecimal) where the L60MD4-G is connected. (For example, enter H10 for X10.)

●Output labels

Name (comment)	Label name	Data type	Initial value	Description
Execution status	FB_ENO	Bit	OFF	ON: Execution command is ON. OFF: Execution command is OFF.
Completed without error	FB_OK	Bit	OFF	When ON, it indicates that the operating condition setting is completed.
Error flag	FB_ERROR	Bit	OFF	Always OFF
Error code	ERROR_ID	Word	0	Always 0

FB Version Upgrade History

Version	Date	Description
1.00A	2014/6/30	First edition

Note

This chapter includes information related to the function block.

It does not include information on restrictions of use such as combination with modules or programmable controller CPUs.

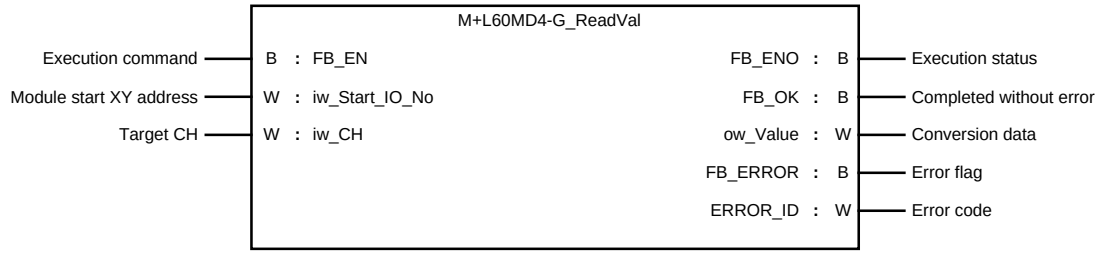
Please make sure to read user's manuals for the corresponding products before using the products.

2.9. M+L60MD4-G_ReadVal (Read conversion data)

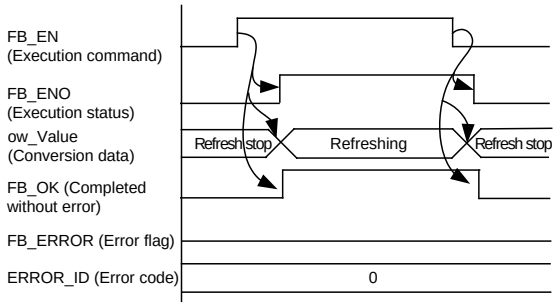
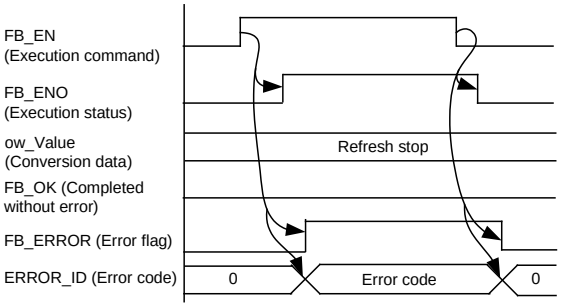
FB Name

M+L60MD4-G_ReadVal

Function Overview

<table>
<tr><th>Item</th><th colspan="2">Description</th></tr>
<tr><td>Function overview</td><td colspan="2">Reads the conversion data of the specified channel.</td></tr>
<tr><td>Symbol</td><td colspan="2"> 
</td></tr>
<tr><td rowspan="3">Applicable hardware and software</td><td>Multiple input (voltage/current/ temperature) module</td><td>L60MD4-G</td></tr>
<tr><td>CPU module</td><td><table><tr><th>Series</th><th>Model</th></tr><tr><td>MELSEC-L Series</td><td>LCPU</td></tr></table></td></tr>
<tr><td>Engineering software</td><td>GX Works2 *1<table><tr><th>Language</th><th>Software version</th></tr><tr><td>English version</td><td>Version1.24A or later</td></tr><tr><td>Chinese version</td><td>Version1.49B or later</td></tr></table>*1 For software versions applicable to the modules used, refer to "Relevant manuals".</td></tr>
<tr><td>Programming language</td><td colspan="2">Ladder</td></tr>
<tr><td>Number of steps</td><td colspan="2">305 steps (for MELSEC-L series CPU)
*The number of steps of the FB in a program depends on the CPU model that is used and input and output definition.</td></tr>
</table>

Item	Description
Function description	1) By turning ON FB_EN (Execution command), the conversion data of the specified channel (CH1 to CH4) is read. 2) The read ow_Value (Conversion data) depends on the input type/range setting and averaging processing function setting. 3) When the conversion completed flag (XnE) is OFF, reading the conversion data of the specified channel is not executed. 4) When the setting value of iw_CH (Target CH) is out of range, the FB_ERROR output turns ON and processing is interrupted, and the error code 10 (Decimal) is stored in ERROR_ID (Error code). Refer to the error code explanation section for details. 5) When the digital output value is set in the auto refresh setting of the intelligent function module, this FB is unnecessary.
Compiling method	Macro type
Restrictions and precautions	1) The FB does not include error recovery processing. Program the error recovery processing separately in accordance with the required system operation. 2) The FB cannot be used in an interrupt program. 3) Please ensure that the FB_EN signal is capable of being turned OFF by the program. Do not use this FB in programs that are only executed once such as a subroutine, FOR-NEXT loop because it is impossible to turn OFF. 4) When two or more of these FBs are used, precaution must be taken to avoid repetition of iw_CH (Target CH). 5) This FB uses index registers Z7 to Z9. Please do not use these index registers in an interrupt program. 6) Every input must be provided with a value for proper FB operation. 7) To operate the L60MD4-G, set the input type/range setting according to the device and system to be connected. Set the proper settings for the device and system with the parameter setting in GX Works2 or the initial setting FB (M+L60MD4-G_InitialSetting). For details on how to use the parameter setting in GX Works2, refer to GX Works2 Version 1 Operating Manual (Common).
FB operation type	Real-time execution
Application example	Refer to "Appendix 1 FB Library Application Examples".

Item	Description
Timing chart	[When operation completes without error]  [When an error occurs] 
Relevant manuals	• MELSEC-L Multiple Input (Voltage/Current/Temperature) Module User's Manual • MELSEC-L CPU Module User's Manual (Hardware Design, Maintenance and Inspection) • GX Works2 Version 1 Operating Manual (Common) • GX Works2 Version 1 Operating Manual (Simple Project, Function Block)

Error codes

●Error code list

Error code	Description	Action
10 (Decimal)	The specified channel is not valid. iw_CH (Target CH) is not within the range of 1 to 4.	Please try again after confirming the setting.

Labels

●Input labels

Name (comment)	Label name	Data type	Setting range	Description
Execution command	FB_EN	Bit	ON, OFF	ON: The FB is activated. OFF: The FB is not activated.
Module start XY address	iw_Start_IO_No	Word	Depends on the I/O point range of the CPU. For details, refer to the CPU user's manual.	Specify the starting XY address (in hexadecimal) where the L60MD4-G is connected. (For example, enter H10 for X10.)
Target CH	iw_CH	Word	1 to 4	Specify the channel number.

●Output labels

Name (comment)	Label name	Data type	Initial value	Description
Execution status	FB_ENO	Bit	OFF	ON: Execution command is ON. OFF: Execution command is OFF.
Completed without error	FB_OK	Bit	OFF	When ON, it indicates that the conversion value is being read.
Conversion data	ow_Value	Word	0	The conversion value is stored.
Error flag	FB_ERROR	Bit	OFF	When ON, it indicates that an error has occurred.
Error code	ERROR_ID	Word	0	FB error code output.

FB Version Upgrade History

Version	Date	Description
1.00A	2014/6/30	First edition

Note

This chapter includes information related to the function block.

It does not include information on restrictions of use such as combination with modules or programmable controller CPUs.

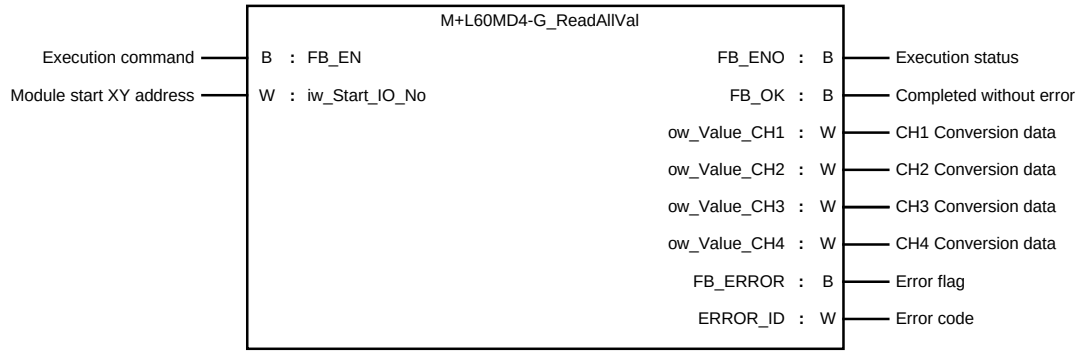
Please make sure to read user's manuals for the corresponding products before using the products.

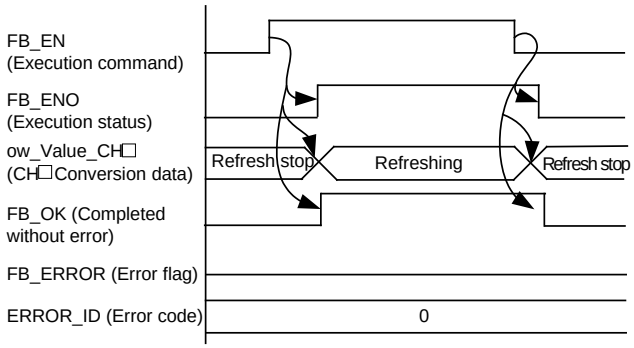
2.10. M+L60MD4-G_ReadAllVal (Read all A/D conversion data)

FB Name

M+L60MD4-G_ReadAllVal

Function Overview

<table>
<tr><th>Item</th><th colspan="2">Description</th></tr>
<tr><td>Function overview</td><td colspan="2">Reads the conversion data of CH1 to CH4.</td></tr>
<tr><td>Symbol</td><td colspan="2"> 
</td></tr>
<tr><td rowspan="3">Applicable hardware and software</td><td>Multiple input (voltage/current/ temperature) module</td><td>L60MD4-G</td></tr>
<tr><td>CPU module</td><td><table><tr><th>Series</th><th>Model</th></tr><tr><td>MELSEC-L Series</td><td>LCPU</td></tr></table></td></tr>
<tr><td>Engineering software</td><td>GX Works2 *1<table><tr><th>Language</th><th>Software version</th></tr><tr><td>English version</td><td>Version1.24A or later</td></tr><tr><td>Chinese version</td><td>Version1.49B or later</td></tr></table>*1 For software versions applicable to the modules used, refer to "Relevant manuals".</td></tr>
<tr><td>Programming language</td><td colspan="2">Ladder</td></tr>
<tr><td>Number of steps</td><td colspan="2">265 steps (for MELSEC-L series CPU)
*The number of steps of the FB in a program depends on the CPU model that is used and input and output definition.</td></tr>
</table>

Item	Description
Function description	1) By turning ON FB_EN (Execution command), the conversion data of CH1 to CH4 are read. 2) The read ow_Value_CH1 (CH1 Conversion data) to ow_Value_CH4 (CH4 Conversion data) depend on the input type/range setting and averaging processing function setting. 3) When the conversion completed flag (XnE) is OFF, reading the conversion data of CH1 to CH4 is not executed. 4) When the digital output value is set in the auto refresh setting of the intelligent function module, this FB is unnecessary.
Compiling method	Macro type
Restrictions and precautions	1) The FB does not include error recovery processing. Program the error recovery processing separately in accordance with the required system operation. 2) The FB cannot be used in an interrupt program. 3) Please ensure that the FB_EN signal is capable of being turned OFF by the program. Do not use this FB in programs that are only executed once such as a subroutine, FOR-NEXT loop because it is impossible to turn OFF. 4) This FB uses index registers Z8 and Z9. Please do not use these index registers in an interrupt program. 5) Every input must be provided with a value for proper FB operation. 6) To operate the L60MD4-G, set the input type/range setting according to the device and system to be connected. Set the proper settings for the device and system with the parameter setting in GX Works2 or the initial setting FB (M+L60MD4-G_InitialSetting). For details on how to use the parameter setting in GX Works2, refer to GX Works2 Version 1 Operating Manual (Common).
FB operation type	Real-time execution
Application example	Refer to "Appendix 1 FB Library Application Examples".
Timing chart	[When operation completes without error] 
Relevant manuals	• MELSEC-L Multiple Input (Voltage/Current/Temperature) Module User's Manual • MELSEC-L CPU Module User's Manual (Hardware Design, Maintenance and Inspection) • GX Works2 Version 1 Operating Manual (Common) • GX Works2 Version 1 Operating Manual (Simple Project, Function Block)

Error codes

●Error code list

Error code	Description	Action
None	None	None

Labels

●Input labels

Name (comment)	Label name	Data type	Setting range	Description
Execution command	FB_EN	Bit	ON, OFF	ON: The FB is activated. OFF: The FB is not activated.
Module start XY address	iw_Start_IO_No	Word	Depends on the I/O point range of the CPU. For details, refer to the CPU user's manual.	Specify the starting XY address (in hexadecimal) where the L60MD4-G is connected. (For example, enter H10 for X10.)

●Output labels

Name (comment)	Label name	Data type	Initial value	Description
Execution status	FB_ENO	Bit	OFF	ON: Execution command is ON. OFF: Execution command is OFF.
Completed without error	FB_OK	Bit	OFF	When ON, it indicates that the conversion value is being read.
CH1 Conversion data	ow_Value_CH1	Word	0	The digital output value of CH1 is stored.
CH2 Conversion data	ow_Value_CH2	Word	0	The digital output value of CH2 is stored.
CH3 Conversion data	ow_Value_CH3	Word	0	The digital output value of CH3 is stored.
CH4 Conversion data	ow_Value_CH4	Word	0	The digital output value of CH4 is stored.
Error flag	FB_ERROR	Bit	OFF	Always OFF
Error code	ERROR_ID	Word	0	Always 0

FB Version Upgrade History

Version	Date	Description
1.00A	2014/6/30	First edition

Note

This chapter includes information related to the function block.

It does not include information on restrictions of use such as combination with modules or programmable controller CPUs.

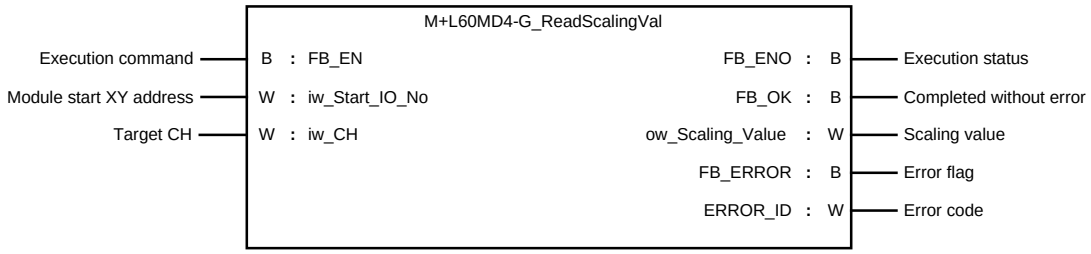
Please make sure to read user's manuals for the corresponding products before using the products.

2.11. M+L60MD4-G_ReadScalingVal (Read scaling value)

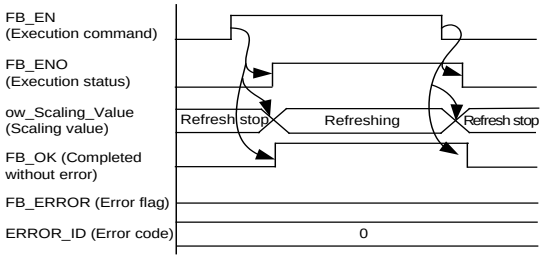
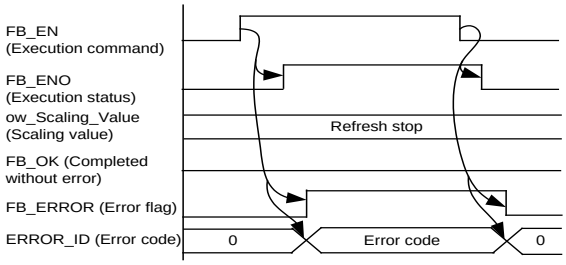
FB Name

M+L60MD4-G_ReadScalingVal

Function Overview

<table>
<tr><td>Item</td><td colspan="2">Description</td></tr>
<tr><td>Function overview</td><td colspan="2">Reads the scaling value of the specified channel.</td></tr>
<tr><td>Symbol</td><td colspan="2"> 
</td></tr>
<tr><td rowspan="3">Applicable hardware and software</td><td>Multiple input (voltage/current/ emperature) module</td><td>L60MD4-G</td></tr>
<tr><td>CPU module</td><td><table><tr><th>Series</th><th>Model</th></tr><tr><td>MELSEC-L Series</td><td>LCPU</td></tr></table></td></tr>
<tr><td>Engineering software</td><td>GX Works2 *1<table><tr><th>Language</th><th>Software version</th></tr><tr><td>English version</td><td>Version1.24A or later</td></tr><tr><td>Chinese version</td><td>Version1.49B or later</td></tr></table>*1 For software versions applicable to the modules used, refer to "Relevant manuals".</td></tr>
<tr><td>Programming language</td><td colspan="2">Ladder</td></tr>
<tr><td>Number of steps</td><td colspan="2">380 steps (for MELSEC-L series CPU)
*The number of steps of the FB in a program depends on the CPU model that is used and input and output definition.</td></tr>
</table>

Item	Description
Function description	1) By turning ON FB_EN (Execution command), the scaling value of the specified conversion channel (CH1 to CH4) is read. 2) The read ow_Scaling_Value (Scaling value) depends on the input type/range setting, the averaging processing function setting, and scaling function setting. 3) In either of the following cases, the scaling value is not read. • When the scaling enable/disable setting (Un¥G53) is disabled • When the conversion completed flag (XnE) is OFF 4) When the setting value of iw_CH (Target CH) is out of range, the FB_ERROR output turns ON and processing is interrupted, and the error code 10 (Decimal) is stored in ERROR_ID (Error code). Refer to the error code explanation section for details. 5) When the scaling value is set in the auto refresh setting of the intelligent function module, this FB is unnecessary.
Compiling method	Macro type
Restrictions and precautions	1) The FB does not include error recovery processing. Program the error recovery processing separately in accordance with the required system operation. 2) The FB cannot be used in an interrupt program. 3) Please ensure that the FB_EN signal is capable of being turned OFF by the program. Do not use this FB in programs that are only executed once such as a subroutine, FOR-NEXT loop because it is impossible to turn OFF. 4) When two or more of these FBs are used, precaution must be taken to avoid repetition of iw_CH (Target CH). 5) This FB uses index registers Z7 to Z9. Please do not use these index registers in an interrupt program. 6) Every input must be provided with a value for proper FB operation. 7) To operate the L60MD4-G, set the input type/range setting according to the device and system to be connected. Set the proper settings for the device and system with the parameter setting in GX Works2 or the initial setting FB (M+L60MD4-G_InitialSetting). For details on how to use the parameter setting in GX Works2, refer to GX Works2 Version 1 Operating Manual (Common).
FB operation type	Real-time execution
Application example	Refer to "Appendix 1 FB Library Application Examples".

Item	Description
Timing chart	[When operation completes without error]  [When an error occurs] 
Relevant manuals	• MELSEC-L Multiple Input (Voltage/Current/Temperature) Module User's Manual • MELSEC-L CPU Module User's Manual (Hardware Design, Maintenance and Inspection) • GX Works2 Version 1 Operating Manual (Common) • GX Works2 Version 1 Operating Manual (Simple Project, Function Block)

Error codes

●Error code list

Error code	Description	Action
10 (Decimal)	The specified channel is not valid. iw_CH (Target CH) is not within the range of 1 to 4.	Please try again after confirming the setting.

Labels

●Input labels

Name (comment)	Label name	Data type	Setting range	Description
Execution command	FB_EN	Bit	ON, OFF	ON: The FB is activated. OFF: The FB is not activated.
Module start XY address	iw_Start_IO_No	Word	Depends on the I/O point range of the CPU. For details, refer to the CPU user's manual.	Specify the starting XY address (in hexadecimal) where the L60MD4-G is connected. (For example, enter H10 for X10.)
Target CH	iw_CH	Word	1 to 4	Specify the channel number.

●Output labels

Name (comment)	Label name	Data type	Initial value	Description
Execution status	FB_ENO	Bit	OFF	ON: Execution command is ON. OFF: Execution command is OFF.
Completed without error	FB_OK	Bit	OFF	When ON, it indicates that the scaling value is being read.
Scaling value	ow_Scaling_Value	Word	0	The scaling value is stored.
Error flag	FB_ERROR	Bit	OFF	When ON, it indicates that an error has occurred.
Error code	ERROR_ID	Word	0	FB error code output.

FB Version Upgrade History

Version	Date	Description
1.00A	2014/6/30	First edition

Note

This chapter includes information related to the function block.

It does not include information on restrictions of use such as combination with modules or programmable controller CPUs.

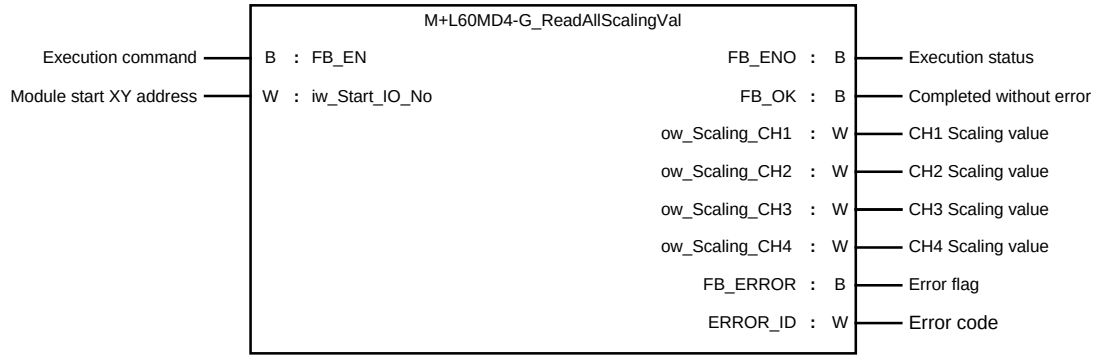
Please make sure to read user's manuals for the corresponding products before using the products.

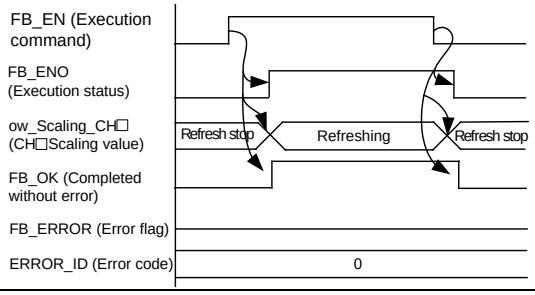
2.12. M+L60MD4-G_ReadAllScalingVal (Read all scaling values)

FB Name

M+L60MD4-G_ReadAllScalingVal

Function Overview

<table>
<tr><th>Item</th><th colspan="2">Description</th></tr>
<tr><td>Function overview</td><td colspan="2">Reads the scaling value of CH1 to CH4.</td></tr>
<tr><td>Symbol</td><td colspan="2"> 
</td></tr>
<tr><td rowspan="3">Applicable hardware and software</td><td>Multiple input (voltage/current/ temperature) module</td><td>L60MD4-G</td></tr>
<tr><td>CPU module</td><td><table><tr><th>Series</th><th>Model</th></tr><tr><td>MELSEC-L Series</td><td>LCPU</td></tr></table></td></tr>
<tr><td>Engineering software</td><td>GX Works2 *1<table><tr><th>Language</th><th>Software version</th></tr><tr><td>English version</td><td>Version1.24A or later</td></tr><tr><td>Chinese version</td><td>Version1.49B or later</td></tr></table>*1 For software versions applicable to the modules used, refer to "Relevant manuals".</td></tr>
<tr><td>Programming language</td><td colspan="2">Ladder</td></tr>
<tr><td>Number of steps</td><td colspan="2">319 steps (for MELSEC-L series CPU)
*The number of steps of the FB in a program depends on the CPU model that is used and input and output definition.</td></tr>
</table>

Item	Description
Function description	1) By turning ON FB_EN (Execution command), the scaling values of CH1 to CH4 are read. 2) The read ow_Scaling_CH1 (CH1 Scaling value) to ow_Scaling_CH4 (CH4 Scaling value) depend on the input type/range setting, the averaging processing function setting, and scaling function (conversion) setting. 3) The scaling value is not read from the channel for which the scaling enable/disable setting (Un¥G53) is disabled. 4) When the conversion completed flag (XnE) is OFF, reading the scaling value of CH1 to CH4 is not executed. 5) When the scaling value is set in the auto refresh setting of the intelligent function module, this FB is unnecessary.
Compiling method	Macro type
Restrictions and precautions	1) The FB does not include error recovery processing. Program the error recovery processing separately in accordance with the required system operation. 2) The FB cannot be used in an interrupt program. 3) Please ensure that the FB_EN signal is capable of being turned OFF by the program. Do not use this FB in programs that are only executed once such as a subroutine, FOR-NEXT loop because it is impossible to turn OFF. 4) This FB uses index registers Z8 and Z9. Please do not use these index registers in an interrupt program. 5) Every input must be provided with a value for proper FB operation. 6) To operate the L60MD4-G, set the input type/range setting according to the device and system to be connected. Set the proper settings for the device and system with the parameter setting in GX Works2 or the initial setting FB (M+L60MD4-G_InitialSetting). For details on how to use the parameter setting in GX Works2, refer to GX Works2 Version 1 Operating Manual (Common).
FB operation type	Real-time execution
Application example	Refer to "Appendix 1 FB Library Application Examples".
Timing chart	[When operation completes without error] 

Item	Description
Relevant manuals	• MELSEC-L Multiple Input (Voltage/Current/Temperature) Module User's Manual • MELSEC-L CPU Module User's Manual (Hardware Design, Maintenance and Inspection) • GX Works2 Version 1 Operating Manual (Common) • GX Works2 Version 1 Operating Manual (Simple Project, Function Block)

Error codes

●Error code list

Error code	Description	Action
None	None	None

Labels

●Input labels

Name (comment)	Label name	Data type	Setting range	Description
Execution command	FB_EN	Bit	ON, OFF	ON: The FB is activated. OFF: The FB is not activated.
Module start XY address	iw_Start_IO_No	Word	Depends on the I/O point range of the CPU. For details, refer to the CPU user's manual.	Specify the starting XY address (in hexadecimal) where the L60MD4-G is connected. (For example, enter H10 for X10.)

●Output labels

Name (comment)	Label name	Data type	Initial value	Description
Execution status	FB_ENO	Bit	OFF	ON: Execution command is ON. OFF: Execution command is OFF.
Completed without error	FB_OK	Bit	OFF	When ON, it indicates that the scaling value is being read.
CH1 Scaling value	ow_Scaling_CH1	Word	0	The scaling value of CH1 is stored.
CH2 Scaling value	ow_Scaling_CH2	Word	0	The scaling value of CH2 is stored.
CH3 Scaling value	ow_Scaling_CH3	Word	0	The scaling value of CH3 is stored.
CH4 Scaling value	ow_Scaling_CH4	Word	0	The scaling value of CH4 is stored.
Error flag	FB_ERROR	Bit	OFF	Always OFF
Error code	ERROR_ID	Word	0	Always 0

FB Version Upgrade History

Version	Date	Description
1.00A	2014/6/30	First edition

Note

This chapter includes information related to the function block.

It does not include information on restrictions of use such as combination with modules or programmable controller CPUs.

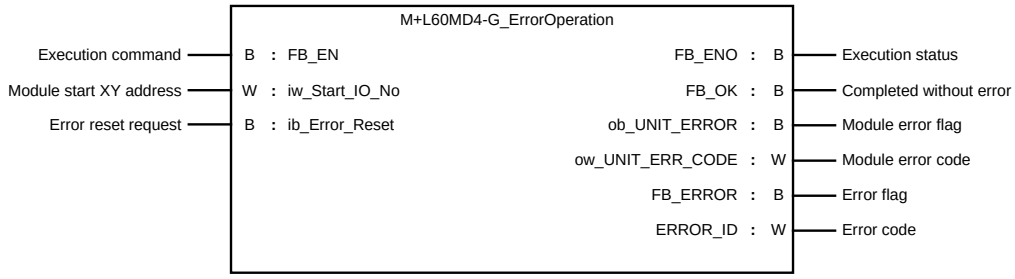
Please make sure to read user's manuals for the corresponding products before using the products.

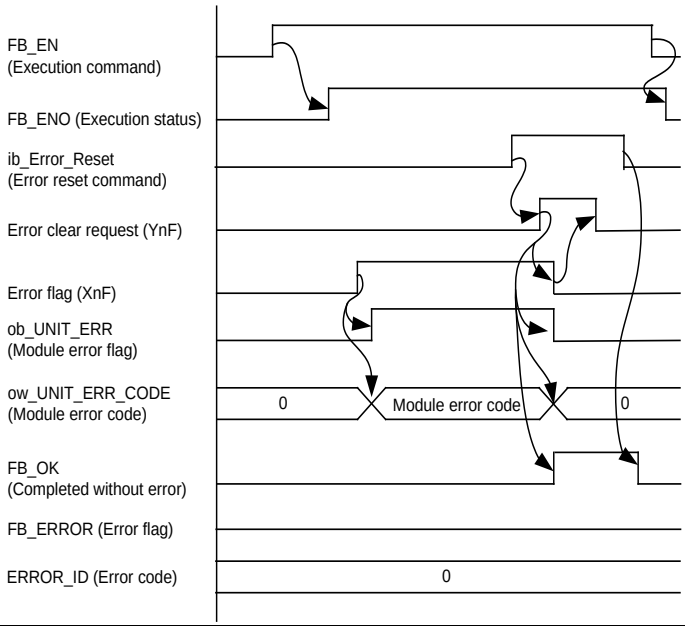
2.13. M+L60MD4-G_ErrorOperation (Error operation)

FB Name

M+L60MD4-G_ErrorOperation

Function Overview

<table>
<tr><th>Item</th><th colspan="2">Description</th></tr>
<tr><td>Function overview</td><td colspan="2">Monitors error codes and resets errors.</td></tr>
<tr><td>Symbol</td><td colspan="2"> 
</td></tr>
<tr><td rowspan="3">Applicable hardware and software</td><td>Multiple input (voltage/current/ temperature) module</td><td>L60MD4-G</td></tr>
<tr><td>CPU module</td><td><table><tr><th>Series</th><th>Model</th></tr><tr><td>MELSEC-L Series</td><td>LCPU</td></tr></table></td></tr>
<tr><td>Engineering software</td><td>GX Works2 *1<table><tr><th>Language</th><th>Software version</th></tr><tr><td>English version</td><td>Version1.24A or later</td></tr><tr><td>Chinese version</td><td>Version1.49B or later</td></tr></table>*1 For software versions applicable to the modules used, refer to "Relevant manuals".</td></tr>
<tr><td>Programming language</td><td colspan="2">Ladder</td></tr>
<tr><td>Number of steps</td><td colspan="2">291 steps (for MELSEC-L series CPU)
*The number of steps of the FB in a program depends on the CPU model that is used and input and output definition.</td></tr>
<tr><td>Function description</td><td colspan="2">1) By turning on FB_EN (Execution command), the current error code in the target intelligent function module is output.
2) After FB_EN (Execution command) is turned ON, the error is reset when ib_Error_Reset (Error reset request) is turned ON during error occurrence.</td></tr>
<tr><td>Compiling method</td><td colspan="2">Macro type</td></tr>
</table>

Item	Description
Restrictions and precautions	1) The FB does not include error recovery processing. Program the error recovery processing separately in accordance with the required system operation. 2) The FB cannot be used in an interrupt program. 3) Please ensure that the FB_EN signal is capable of being turned OFF by the program. Do not use this FB in programs that are only executed once such as a subroutine, FOR-NEXT loop because it is impossible to turn OFF. 4) This FB uses index registers Z8 and Z9. Please do not use these index registers in an interrupt program. 5) Every input must be provided with a value for proper FB operation. 6) When this FB is used in two or more places, a duplicated coil warning may occur during compile operation due to the Y signal being operated by index modification. However this is not a problem and the FB will operate without error. 7) To operate the L60MD4-G, set the input type/range setting according to the device and system to be connected. Set the proper settings for the device and system with the parameter setting in GX Works2 or the initial setting FB (M+L60MD4-G_InitialSetting). For details on how to use the parameter setting in GX Works2, refer to GX Works2 Version 1 Operating Manual (Common).
FB operation type	Real-time execution
Application example	Refer to "Appendix 1 FB Library Application Examples".
Timing chart	[When operation completes without error] 
Relevant manuals	• MELSEC-L Multiple Input (Voltage/Current/Temperature) Module User's Manual • MELSEC-L CPU Module User's Manual (Hardware Design, Maintenance and Inspection) • GX Works2 Version 1 Operating Manual (Common) • GX Works2 Version 1 Operating Manual (Simple Project, Function Block)

Error codes

●Error code list

Error code	Description	Action
None	None	None

Labels

●Input labels

Name (comment)	Label name	Data type	Setting range	Description
Execution command	FB_EN	Bit	ON, OFF	ON: The FB is activated. OFF: The FB is not activated.
Module start XY address	iw_Start_IO_No	Word	Depends on the I/O point range of the CPU. For details, refer to the CPU user's manual.	Specify the starting XY address (in hexadecimal) where the L60MD4-G is connected. (For example, enter H10 for X10.)
Error reset command	ib_Error_Reset	Bit	ON, OFF	Turn ON for the error reset. Turn OFF after the error reset.

●Output labels

Name (comment)	Label name	Data type	Initial value	Description
Execution status	FB_ENO	Bit	OFF	Execution command is ON. (Module errors are being monitored.) OFF: Execution command is OFF.
Completed without error	FB_OK	Bit	OFF	When ON, it indicates that an error reset is completed.
Module error flag	ob_UNIT_ERROR	Bit	OFF	When ON, it indicates that a module error has occurred.
Module error code	ow_UNIT_ERR_CODE	Word	0	Stores the error code of the current error.
Error flag	FB_ERROR	Bit	OFF	Always OFF
Error code	ERROR_ID	Word	0	Always 0

FB Version Upgrade History

Version	Date	Description
1.00A	2014/6/30	First edition

Note

This chapter includes information related to the function block.

It does not include information on restrictions of use such as combination with modules or programmable controller CPUs.

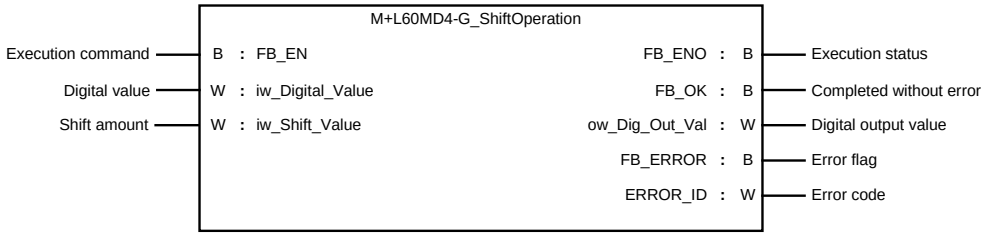
Please make sure to read user's manuals for the corresponding products before using the products.

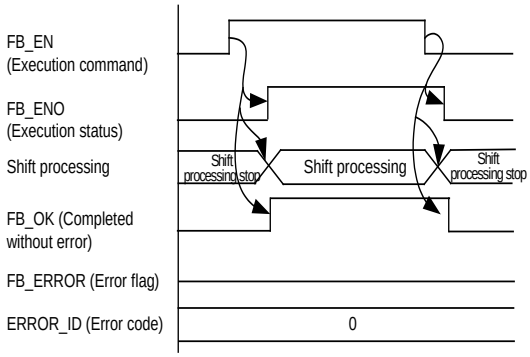
2.14. M+L60MD4-G_ShiftOperation (Shift operation)

FB Name

M+L60MD4-G_ShiftOperation

Function Overview

<table>
<tr><th>Item</th><th colspan="2">Description</th></tr>
<tr><td>Function overview</td><td colspan="2">Adds the shift amount to the digital value.</td></tr>
<tr><td>Symbol</td><td colspan="2"> 
</td></tr>
<tr><td rowspan="3">Applicable hardware and software</td><td>Multiple input (voltage/current/ temperature) module</td><td>L60MD4-G</td></tr>
<tr><td>CPU module</td><td><table><tr><th>Series</th><th>Model</th></tr><tr><td>MELSEC-L Series</td><td>LCPU</td></tr></table></td></tr>
<tr><td>Engineering software</td><td>GX Works2 *1<table><tr><th>Language</th><th>Software version</th></tr><tr><td>English version</td><td>Version1.24A or later</td></tr><tr><td>Chinese version</td><td>Version1.49B or later</td></tr></table>*1 For software versions applicable to the modules used, refer to "Relevant manuals".</td></tr>
<tr><td>Programming language</td><td colspan="2">Ladder</td></tr>
<tr><td>Number of steps</td><td colspan="2">166 steps (for MELSEC-L series CPU)
*The number of steps of the FB in a program depends on the CPU model that is used and input and output definition.</td></tr>
<tr><td>Function description</td><td colspan="2">1) By turning ON FB_EN (Execution command), the shift amount is added to a digital value*1.
*1 Input the conversion data read from the L60MD4-G with M+L60MD4-G_ReadVal or others as the digital value.
2) If the value after the addition is out of the range from -32,768 to 32,767, the value is fixed to -32,768 or 32,767.</td></tr>
</table>

Item	Description
Compiling method	Macro type
Restrictions and precautions	1) The FB does not include error recovery processing. Program the error recovery processing separately in accordance with the required system operation. 2) The FB cannot be used in an interrupt program. 3) Please ensure that the FB_EN signal is capable of being turned OFF by the program. Do not use this FB in programs that are only executed once such as a subroutine, FOR-NEXT loop because it is impossible to turn OFF. 4) Every input must be provided with a value for proper FB operation. 5) To operate the L60MD4-G, set the input type/range setting according to the device and system to be connected. Set the proper settings for the device and system with the parameter setting in GX Works2 or the initial setting FB (M+L60MD4-G_InitialSetting). For details on how to use the parameter setting in GX Works2, refer to GX Works2 Version 1 Operating Manual (Common). 6) When FB_OK (Completed without error) is ON, ow_Dig_Out_Val (Digital output value) is enabled. 7) By turning OFF FB_EN, ow_Dig_Out_Val (Digital output value) is cleared to 0.
FB operation type	Real-time execution
Application example	Refer to "Appendix 1 FB Library Application Examples".
Timing chart	[When operation completes without error] 
Relevant manuals	• MELSEC-L Multiple Input (Voltage/Current/Temperature) Module User's Manual • MELSEC-L CPU Module User's Manual (Hardware Design, Maintenance and Inspection) • GX Works2 Version 1 Operating Manual (Common) • GX Works2 Version 1 Operating Manual (Simple Project, Function Block)

Error codes

●Error code list

Error code	Description	Action
None	None	None

Labels

●Input labels

Name (comment)	Label name	Data type	Setting range	Description
Execution command	FB_EN	Bit	ON, OFF	ON: The FB is activated. OFF: The FB is not activated.
Digital value	iw_Digital_Value	Word	-32,768 to 32,767	Specify a digital value.
Shift amount	iw_Shift_Value	Word	-32,768 to 32,767	Specify the shift amount.

●Output labels

Name (comment)	Label name	Data type	Initial value	Description
Execution status	FB_ENO	Bit	OFF	ON: Execution command is ON. OFF: Execution command is OFF.
Completed without error	FB_OK	Bit	OFF	When ON, it indicates that the shift operation is being executed.
Digital output value	ow_Dig_Out_Val	Word	0	The digital value after the shift amount is added is stored.
Error flag	FB_ERROR	Bit	OFF	Always OFF
Error code	ERROR_ID	Word	0	Always 0

FB Version Upgrade History

Version	Date	Description
1.00A	2014/6/30	First edition

Note

This chapter includes information related to the function block.

It does not include information on restrictions of use such as combination with modules or programmable controller CPUs.

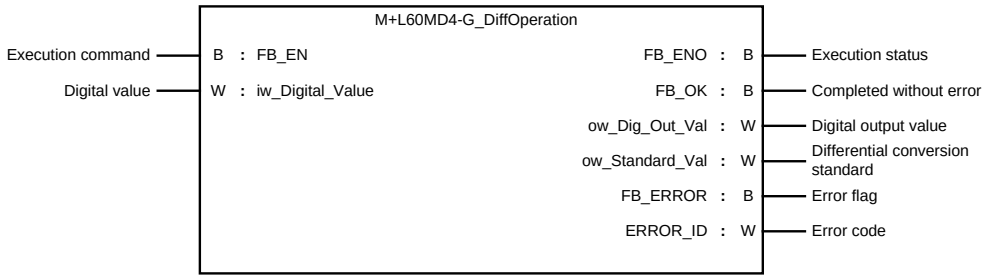
Please make sure to read user's manuals for the corresponding products before using the products.

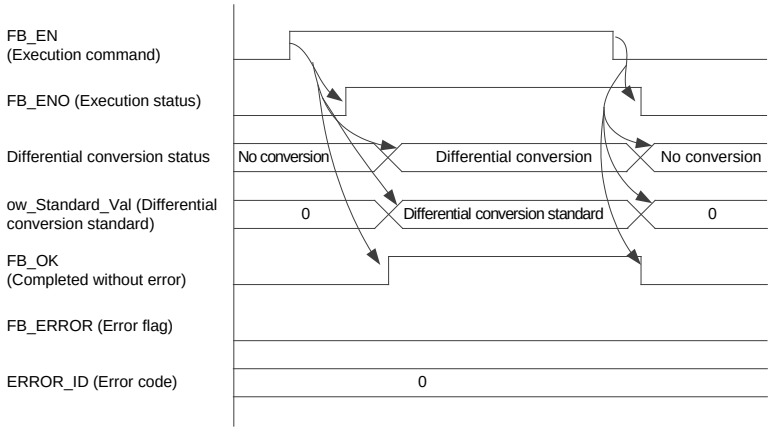
2.15. M+L60MD4-G_DiffOperation (Differential conversion process)

FB Name

M+L60MD4-G_DiffOperation

Function Overview

<table>
<tr><td>Item</td><td colspan="2">Description</td></tr>
<tr><td>Function overview</td><td colspan="2">Outputs the difference obtained by subtracting the standard value from the digital value.</td></tr>
<tr><td>Symbol</td><td colspan="2"> 
</td></tr>
<tr><td rowspan="3">Applicable hardware and software</td><td>Multiple input (voltage/current/ temperature) module</td><td>L60MD4-G</td></tr>
<tr><td>CPU module</td><td><table><tr><th>Series</th><th>Model</th></tr><tr><td>MELSEC-L Series</td><td>LCPU</td></tr></table></td></tr>
<tr><td>Engineering software</td><td>GX Works2 *1<table><tr><th>Language</th><th>Software version</th></tr><tr><td>English version</td><td>Version1.24A or later</td></tr><tr><td>Chinese version</td><td>Version1.49B or later</td></tr></table>*1 For software versions applicable to the modules used, refer to "Relevant manuals".</td></tr>
<tr><td>Programming language</td><td colspan="2">Ladder</td></tr>
<tr><td>Number of steps</td><td colspan="2">183 steps (for MELSEC-L series CPU)
*The number of steps of the FB in a program depends on the CPU model that is used and input and output definition.</td></tr>
</table>

Item	Description
Function description	1) By turning ON FB_EN (Execution command), the differential conversion process is executed. 2) iw_Digital_Value (Digital value) when FB_EN (Execution command) changes from OFF to ON is ow_Standard_Val (Differential conversion standard). As long as FB_EN (Execution command) remains ON, the difference obtained by subtracting ow_Standard_Val (Differential conversion standard) from iw_Digital_Value (Digital value) is output. *1 Input the conversion data read from the L60MD4-G with M+L60MD4-G_ReadVal or others as the digital value.
Compiling method	Macro type
Restrictions and precautions	1) The FB does not include error recovery processing. Program the error recovery processing separately in accordance with the required system operation. 2) The FB cannot be used in an interrupt program. 3) Please ensure that the FB_EN signal is capable of being turned OFF by the program. Do not use this FB in programs that are only executed once such as a subroutine, FOR-NEXT loop because it is impossible to turn OFF. 4) Every input must be provided with a value for proper FB operation. 5) To operate the L60MD4-G, set the input type/range setting according to the device and system to be connected. Set the proper settings for the device and system with the parameter setting in GX Works2 or the initial setting FB (M+L60MD4-G_InitialSetting). For details on how to use the parameter setting in GX Works2, refer to GX Works2 Version 1 Operating Manual (Common). 6) When FB_OK (Completed without error) is ON, ow_Dig_Out_Val (Digital output value) and ow_Standard_Val (Differential conversion standard) are enabled. 7) By turning OFF FB_EN, ow_Dig_Out_Val (Digital output value) and ow_Standard_Val (Differential conversion standard) are cleared to 0.
FB operation type	Real-time execution
Application example	Refer to "Appendix 1 FB Library Application Examples".
Timing chart	[When operation completes without error] 

Item	Description
Relevant manuals	• MELSEC-L Multiple Input (Voltage/Current/Temperature) Module User's Manual • MELSEC-L CPU Module User's Manual (Hardware Design, Maintenance and Inspection) • GX Works2 Version 1 Operating Manual (Common) • GX Works2 Version 1 Operating Manual (Simple Project, Function Block)

Error codes

●Error code list

Error code	Description	Action
None	None	None

Labels

●Input labels

Name (comment)	Label name	Data type	Setting range	Description
Execution command	FB_EN	Bit	ON, OFF	ON: The FB is activated. OFF: The FB is not activated.
Digital value	iw_Digital_Value	Word	-32,768 to 32,767	Specify a digital value for which the differential conversion is to be executed.

●Output labels

Name (comment)	Label name	Data type	Initial value	Description
Execution status	FB_ENO	Bit	OFF	ON: Execution command is ON. OFF: Execution command is OFF.
Completed without error	FB_OK	Bit	OFF	When ON, it indicates that the differential conversion is being executed.
Digital output value	ow_Dig_Out_Val	Word	0	The digital value for which the differential conversion has been executed is stored.
Differential conversion standard	ow_Standard_Val	Word	0	The differential conversion standard (a digital value when FB_EN is turned ON) is stored.
Error flag	FB_ERROR	Bit	OFF	Always OFF
Error code	ERROR_ID	Word	0	Always 0

FB Version Upgrade History

Version	Date	Description
1.00A	2014/6/30	First edition

Note

This chapter includes information related to the function block.

It does not include information on restrictions of use such as combination with modules or programmable controller CPUs.

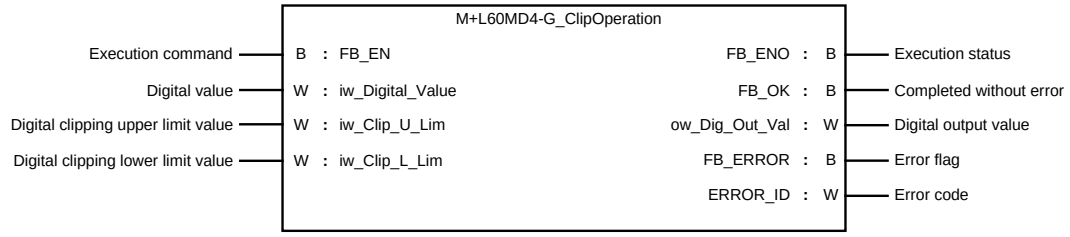
Please make sure to read user's manuals for the corresponding products before using the products.

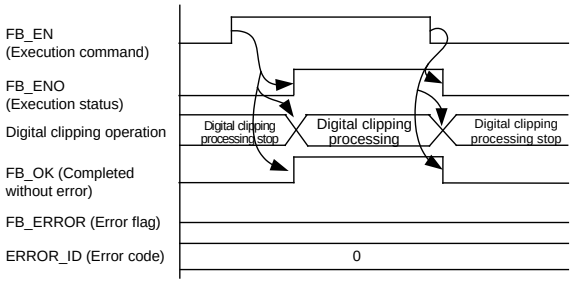
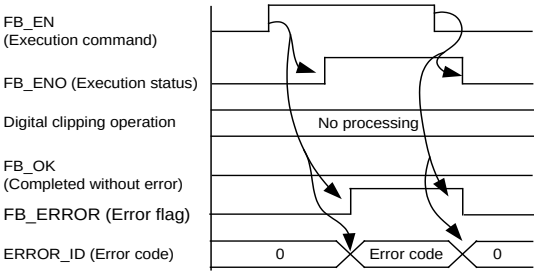
2.16. M+L60MD4-G_ClipOperation (Digital clipping operation)

FB Name

M+L60MD4-G_ClipOperation

Function Overview

Item	Description	
Function overview	Limits a digital value at the digital clipping upper and lower limit values.	
Symbol		
Applicable hardware and software	Multiple input (voltage/current/ temperature) module	L60MD4-G
	CPU module	Series: MELSEC-L Series / Model: LCPU
	Engineering software	GX Works2 *1 Language: English version / Software version: Version1.24A or later Language: Chinese version / Software version: Version1.49B or later *1 For software versions applicable to the modules used, refer to "Relevant manuals".
Programming language	Ladder	
Number of steps	175 steps (for MELSEC-L series CPU) *The number of steps of the FB in a program depends on the CPU model that is used and input and output definition.	

Item	Description
Function description	1) By turning ON FB_EN (Execution command), the digital clipping operation is started. 2) If iw_Digital_Value (Digital value)*1 exceeds iw_Clip_U_Lim (Digital clipping upper limit value) or falls below iw_Clip_L_Lim (Digital clipping lower limit value) while FB_EN (Execution command) is ON, iw_Digital_Value (Digital value) is limited at the upper or lower limit value. *1 Input the conversion data read from the L60MD4-G with M+L60MD4-G_ReadVal or others as the digital value. 3) If iw_Clip_U_Lim (Digital clipping upper limit value) is equal to or less than iw_Clip_L_Lim (Digital clipping lower limit value), the FB_ERROR output turns ON and processing is interrupted, and the error code is stored in ERROR_ID. Refer to the error code explanation section for details.
Compiling method	Macro type
Restrictions and precautions	1) The FB does not include error recovery processing. Program the error recovery processing separately in accordance with the required system operation. 2) The FB cannot be used in an interrupt program. 3) Please ensure that the FB_EN signal is capable of being turned OFF by the program. Do not use this FB in programs that are only executed once such as a subroutine, FOR-NEXT loop because it is impossible to turn OFF. 4) Every input must be provided with a value for proper FB operation. 5) To operate the L60MD4-G, set the input type/range setting according to the device and system to be connected. Set the proper settings for the device and system with the parameter setting in GX Works2 or the initial setting FB (M+L60MD4-G_InitialSetting). For details on how to use the parameter setting in GX Works2, refer to GX Works2 Version 1 Operating Manual (Common). 6) When FB_OK (Completed without error) is ON, ow_Dig_Out_Val (Digital output value) is enabled. 7) By turning OFF FB_EN, ow_Dig_Out_Val (Digital output value) is cleared to 0.
FB operation type	Real-time execution
Application example	Refer to "Appendix 1 FB Library Application Examples".
Timing chart	[When operation completes without error]  [When an error occurs] 

Item	Description
Relevant manuals	• MELSEC-L Multiple Input (Voltage/Current/Temperature) Module User's Manual • MELSEC-L CPU Module User's Manual (Hardware Design, Maintenance and Inspection) • GX Works2 Version 1 Operating Manual (Common) • GX Works2 Version 1 Operating Manual (Simple Project, Function Block)

Error codes

●Error code list

Error code	Description	Action
11 (Decimal)	The digital clipping upper limit value is equal to or less than the lower limit value.	Please try again after confirming the setting.

Labels

●Input labels

Name (comment)	Label name	Data type	Setting range	Description
Execution command	FB_EN	Bit	ON, OFF	ON: The FB is activated. OFF: The FB is not activated.
Digital value	iw_Digital_Value	Word	-32,768 to 32,767	Specify a digital value for which the digital clipping operation is to be executed.
Digital clipping upper limit value	iw_Clip_U_Lim	Word	-32,768 to 32,767	Specify the digital clipping upper limit value.
Digital clipping lower limit value	iw_Clip_L_Lim	Word	-32,768 to 32,767	Specify the digital clipping lower limit value.

●Output labels

Name (comment)	Label name	Data type	Initial value	Description
Execution status	FB_ENO	Bit	OFF	ON: Execution command is ON. OFF: Execution command is OFF.
Completed without error	FB_OK	Bit	OFF	When ON, it indicates that the digital clipping operation is being executed.
Digital output value	ow_Dig_Out_Val	Word	0	The digital value for which the digital clipping operation has been executed is stored.
Error flag	FB_ERROR	Bit	OFF	When ON, it indicates that an error has occurred.
Error code	ERROR_ID	Word	0	FB error code output.

FB Version Upgrade History

Version	Date	Description
1.00A	2014/6/30	First edition

Note

This chapter includes information related to the function block.

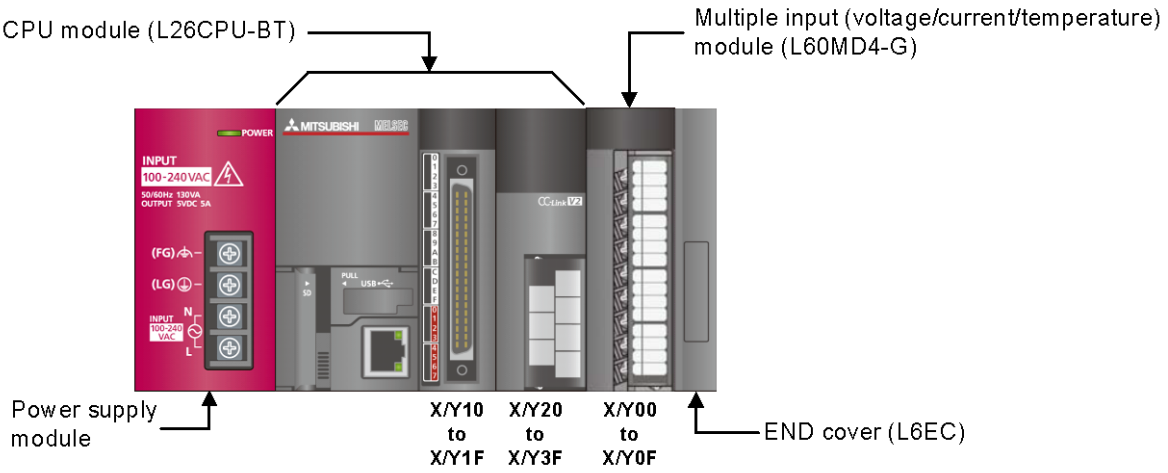
It does not include information on restrictions of use such as combination with modules or programmable controller CPUs.

Please make sure to read user's manuals for the corresponding products before using the products.

Appendix 1. FB Library Application Examples

L60MD4-G FB application examples are as follows.

1) System configuration



Reminder

• Every input must be provided with a value for proper FB operation. If not set, the values will be unspecified.

• Abbreviations may be used in the label comments due to the limitation on the number of the characters to display in GX Works2.

2) Global label setting

None

3) Application example settings

a) Common setting

Input and output item	Value	Description
Module start XY address	0	Specify the starting XY address where the L60MD4-G is connected.

List of devices

a) External input (command)

Device	FB name	Application (ON details)
M0	M+L60MD4-G_InitialSetting	Initial setting request
M10	M+L60MD4-G_SetAverage	Averaging proc setting request
M20	M+L60MD4-G_SetScaling	Scaling setting request
M21		Scaling enable:ON/disable:OFF
M30	M+L60MD4-G_SetDisconnect	Disconnection detection set req.
M40	M+L60MD4-G_SetInputSignalErr	Input signal error setting req.
M50	M+L60MD4-G_SetProcessAlarm	Process alarm setting request
M51		Process alarm enable/disable set
M60	M+L60MD4-G_SetRateAlarm	Rate alarm setting request
M61		Rate alarm enable/disable set
M70	M+L60MD4-G_RequestSetting	Operating condition setting req.
M80	M+L60MD4-G_ReadVal	Conversion value reading request
M90	M+L60MD4-G_ReadAllVal	All conversion value reading req
M100	M+L60MD4-G_ReadScalingVal	Scaling value reading request
M110	M+L60MD4-G_ReadAllScalingVal	All scaling value reading req.
M120	M+L60MD4-G_ErrorOperation	Error operation request
M121		Error reset request
M130	M+L60MD4-G_ShiftOperation	Shift operation request
D130		Digital value
M140	M+L60MD4-G_DiffOperation	Diff conversion process request
D140		Digital value
M150	M+L60MD4-G_ClipOperation	Digital clipping operation req.
D150		Digital value

b) External output (check)

Device	FB name	Application (ON details)
M1	M+L60MD4-G_InitialSetting	Initial setting FB ready
M2		Initial setting complete
F0		Initial setting FB error
D0		Initial setting FB error code
M11	M+L60MD4-G_SetAverage	Averaging proc setting FB ready
M12		Averaging proc setting complete
F1		Averaging proc setting FB error
D10		Averaging proc set FB error code
M22	M+L60MD4-G_SetScaling	Scaling setting FB ready
M23		Scaling setting complete
F2		Scaling setting FB error
D20		Scaling setting FB error code
M31	M+L60MD4-G_SetDisconnect	Disconnection detect set FB rdy.
M32		Disconnection detection set comp
F3		Disconnection detect set FB err.
D30		Disconnect detect set FB err cod
M41	M+L60MD4-G_SetInputSignalErr	Input signal error set FB ready
M42		Input signal error setting comp.
F4		Input signal err setting FB err
D40		Input signal err set FB err code
M52	M+L60MD4-G_SetProcessAlarm	Process alarm setting FB ready
M53		Process alarm setting complete
F5		Process alarm setting FB error
D50		Process alarm set FB error code
M62	M+L60MD4-G_SetRateAlarm	Rate alarm setting FB ready
M63		Rate alarm setting complete
F6		Rate alarm setting FB error
D60		Rate alarm setting FB error code
M71	M+L60MD4-G_RequestSetting	Operate condition set req FB rdy
M72		Operating condition set req comp

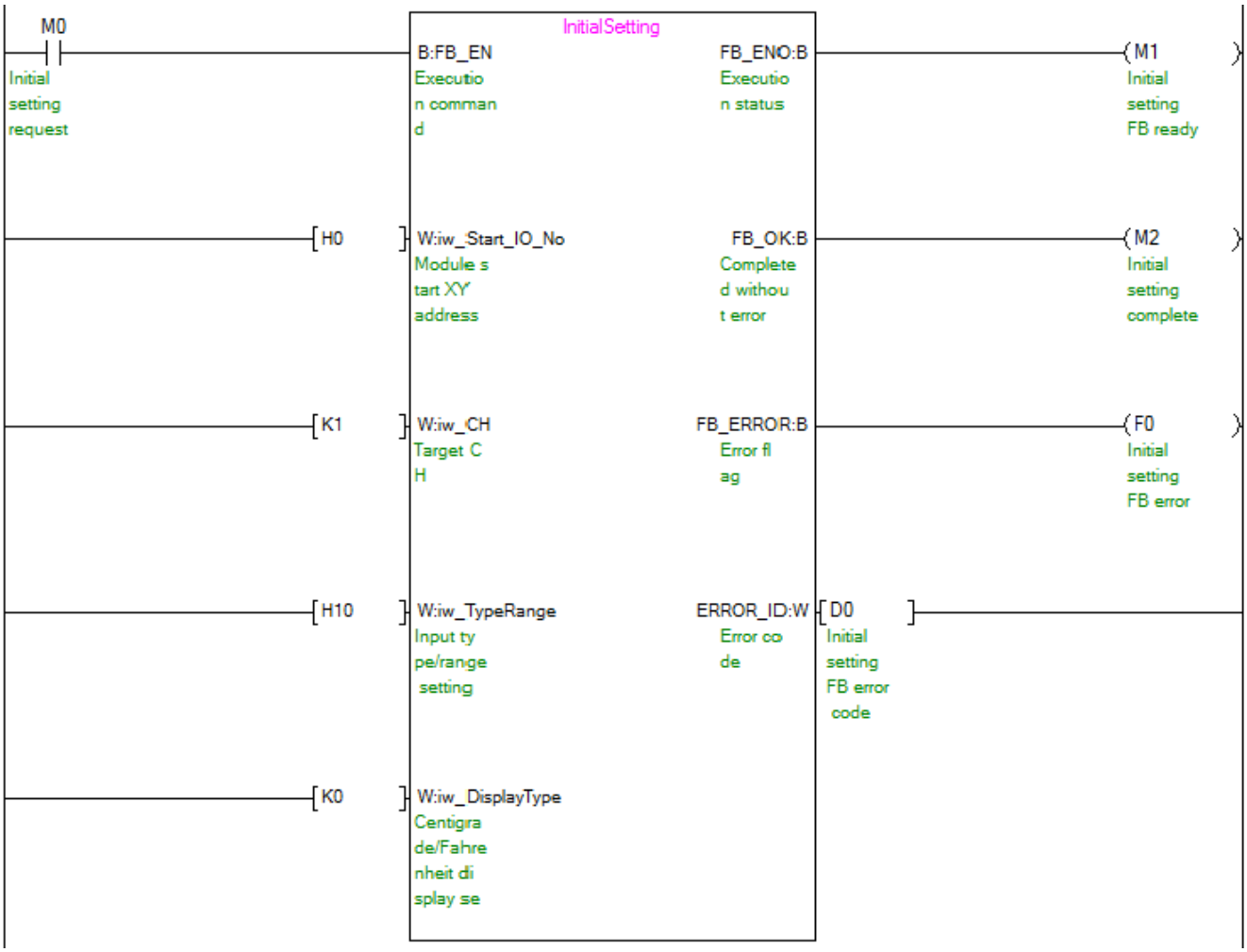
Device	FB name	Application (ON details)
M81	M+L60MD4-G_ReadVal	Conversion value read FB ready
M82		Conversion value read complete
F8		Conversion value read FB error
D80		Conversion data
D81		Conversion value read FB err cod
M91	M+L60MD4-G_ReadAllVal	Conversion value all read FB rdy
M92		Conversion value read comp. all
D90		CH1 Conversion data
D91		CH2 Conversion data
D92		CH3 Conversion data
D93		CH4 Conversion data
M101	M+L60MD4-G_ReadScalingVal	Scaling value reading FB ready
M102		Scaling value reading complete
F10		Scaling value reading FB error
D100		Scaling value
D101		Scaling value read FB error code
M111	M+L60MD4-G_ReadAllScalingVal	Scaling value all read FB ready
M112		Scaling value all read complete
D110		CH1 Scaling value
D111		CH2 Scaling value
D112		CH3 Scaling value
D113		CH4 Scaling value
M122	M+L60MD4-G_ErrorOperation	Error operation FB ready
M123		Error operation complete
M124		Module error
D120		Module error code
M131	M+L60MD4-G_ShiftOperation	Shift operation FB ready
M132		Shift operation complete
D131		Shift conversion value
M141	M+L60MD4-G_DiffOperation	Diff conversion proc FB ready
M142		Diff conversion process complete
D141		Differential conversion value
D142		Differential conversion standard

Device	FB name	Application (ON details)
M151	M+L60MD4-G_ClipOperation	Digital clipping operate FB rdy.
M152		Digital clipping operation comp.
F15		Digital clipping operate FB err.
D151		Digital output value
D152		Digital clip operate FB err code

M+L60MD4-G_InitialSetting (Initial setting)

Label name	Setting value	Description
iw_Start_IO_No	H0	Set the starting XY address where the L60MD4-G is connected to 0H.
iw_CH	K1	Set the target channel to channel 1.
iw_TypeRange	H10	Set the input type/range setting to 4 to 20 mA.
iw_DisplayType	K0	Set the Centigrade/Fahrenheit display setting to the Centigrade display.

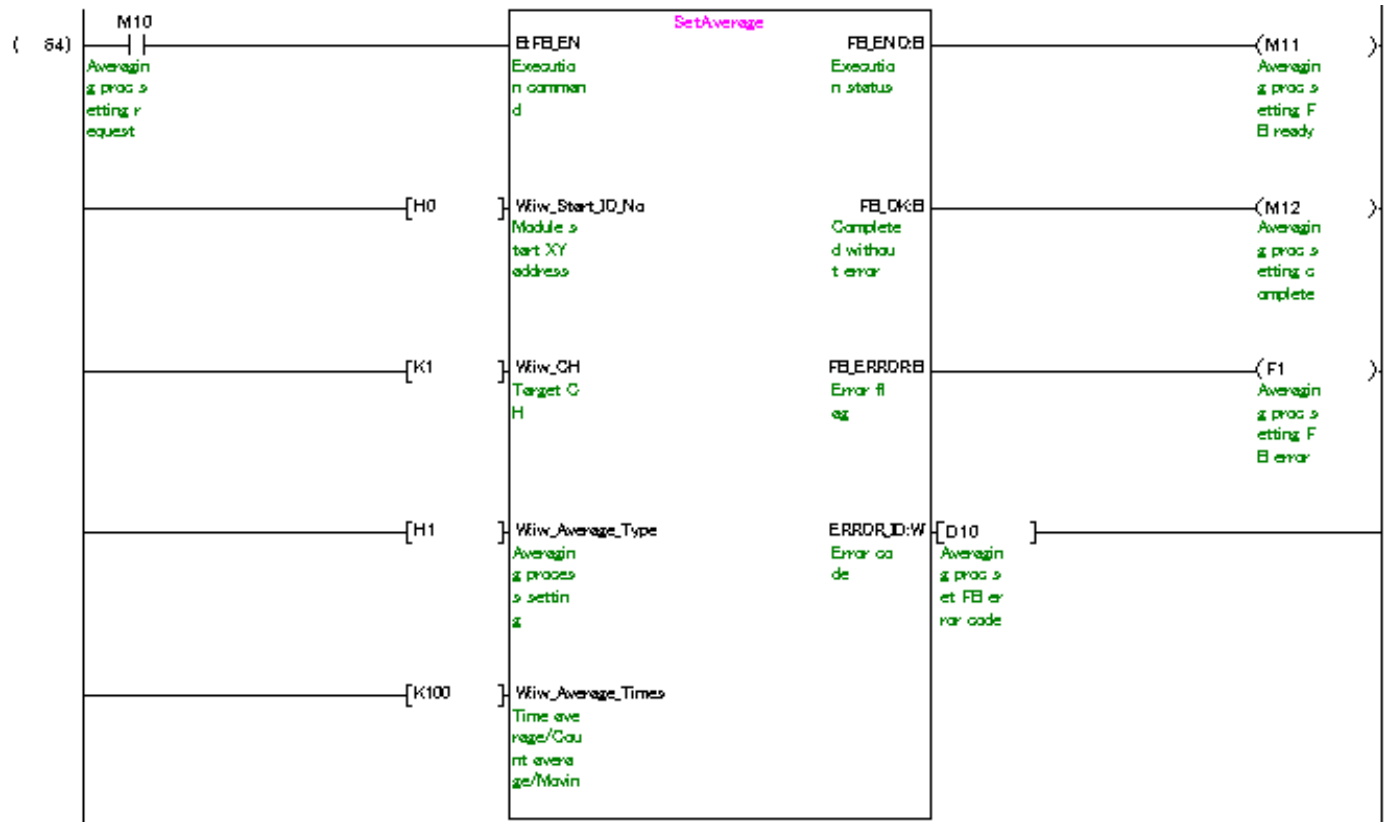
By turning ON M0, the setting values of the input type/range setting and Centigrade/Fahrenheit display setting of channel 1 are written to the buffer memory.



M+L60MD4-G_SetAverage (Averaging process setting)

Label name	Setting value	Description
iw_Start_IO_No	H0	Set the starting XY address where the L60MD4-G is connected to 0H.
iw_CH	K1	Set the target channel to channel 1.
iw_Average_Type	H1	Set the averaging process type to "Time average".
iw_Average_Times	K100	Set the time average to 100.

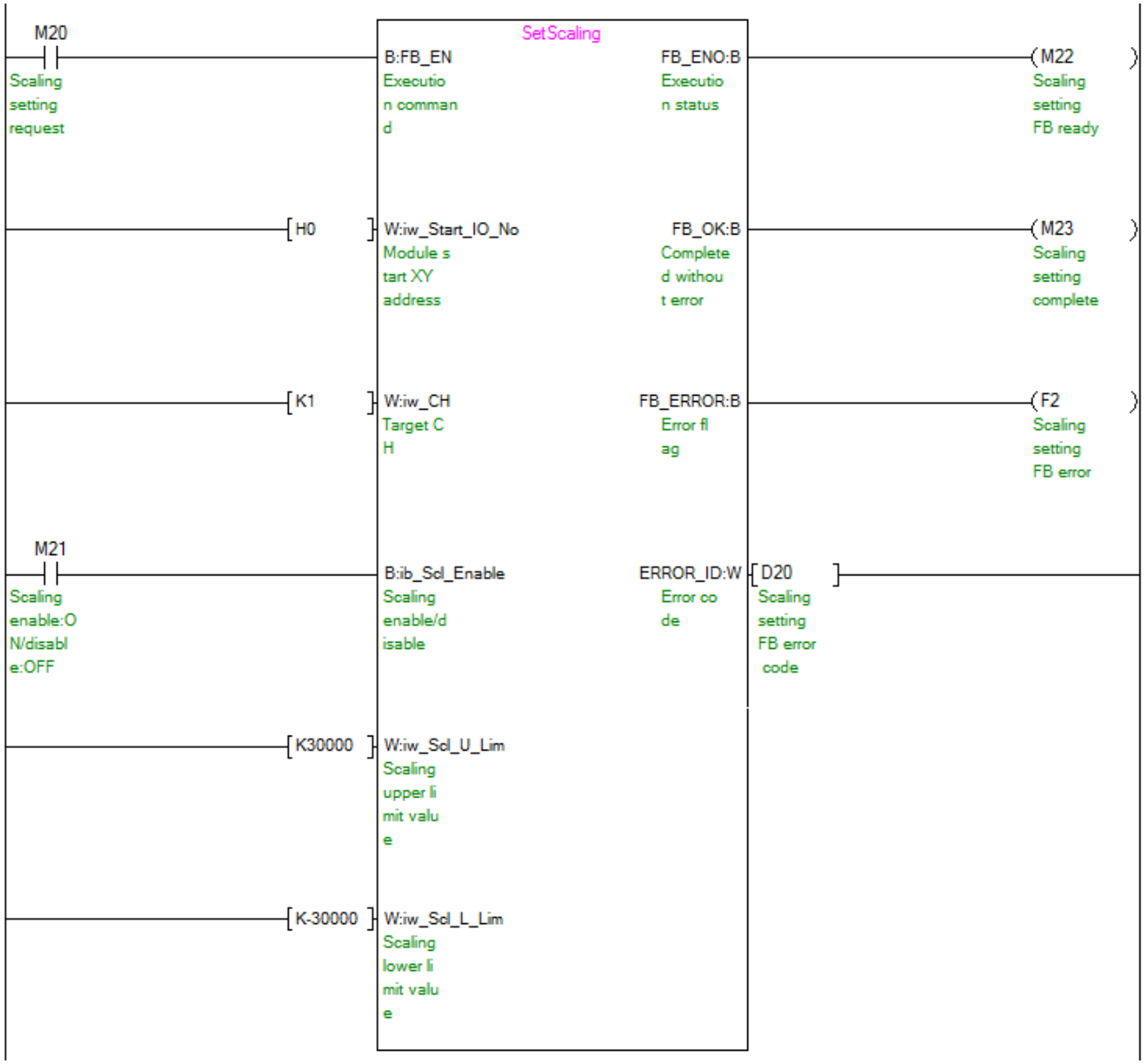
By turning ON M10, the averaging processing type setting value of channel 1 is written to the buffer memory.



M+L60MD4-G_SetScaling (Scaling setting)

Label name	Setting value	Description
iw_Start_IO_No	H0	Set the starting XY address where the L60MD4-G is connected to 0H.
iw_CH	K1	Set the target channel to channel 1.
ib_Scl_Enable	ON/OFF	Turn ON to enable the scaling.
iw_Scl_U_Lim	K30000	Set the scaling upper limit value to 30,000.
iw_Scl_L_Lim	K-30000	Set the scaling lower limit value to -30,000.

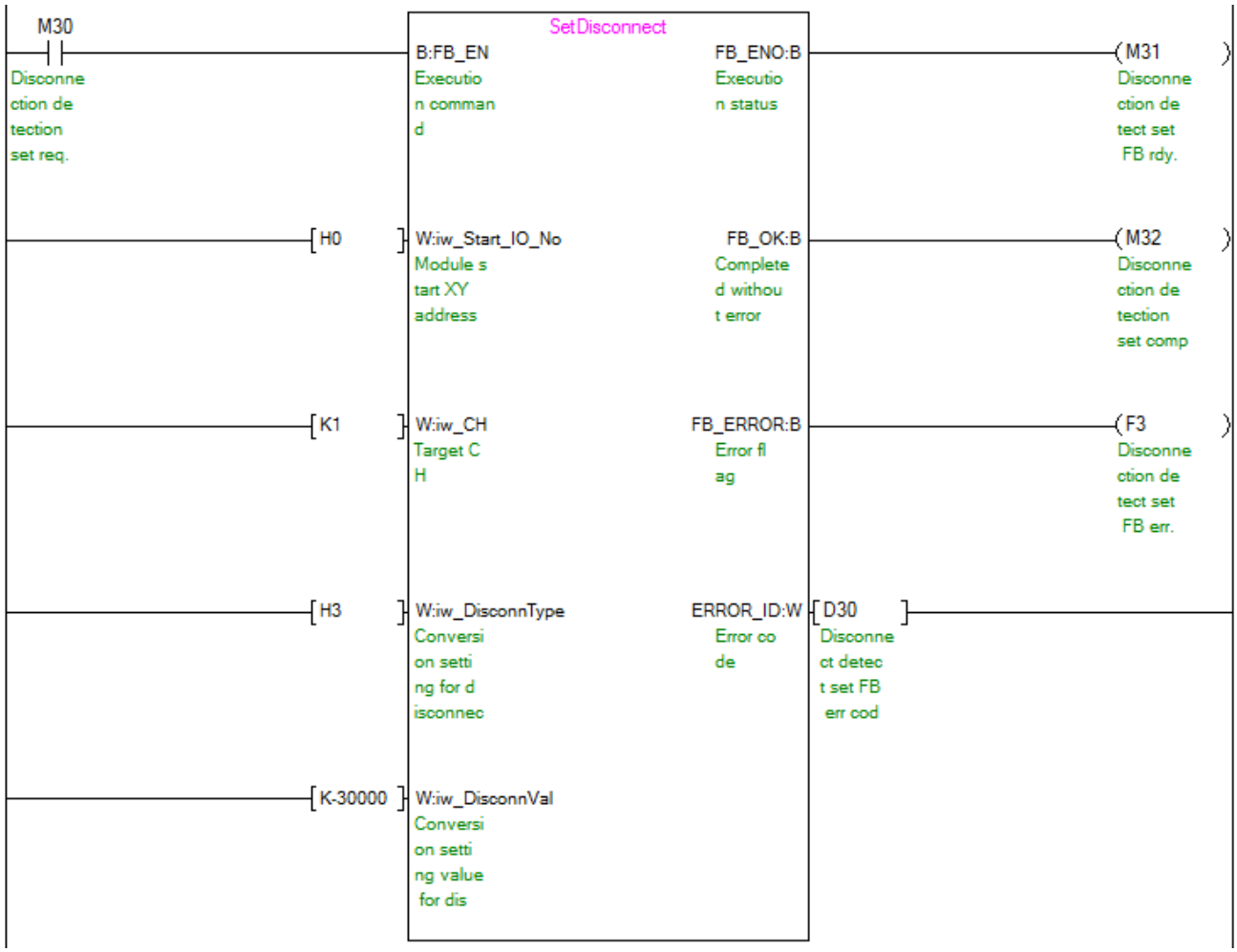
By turning ON M20, the scaling setting value of channel 1 is written to the buffer memory.



M+L60MD4-G_SetDisconnect (Disconnection detection setting)

Label name	Setting value	Description
iw_Start_IO_No	H0	Set the starting XY address where the L60MD4-G is connected to 0H.
iw_CH	K1	Set the target channel to channel 1.
iw_DisconnType	H3	Set the conversion setting for disconnection detection of channel 1 to "3: Any value".
iw_DisconnVal	K-30000	Set the conversion setting value for disconnection detection to -30,000.

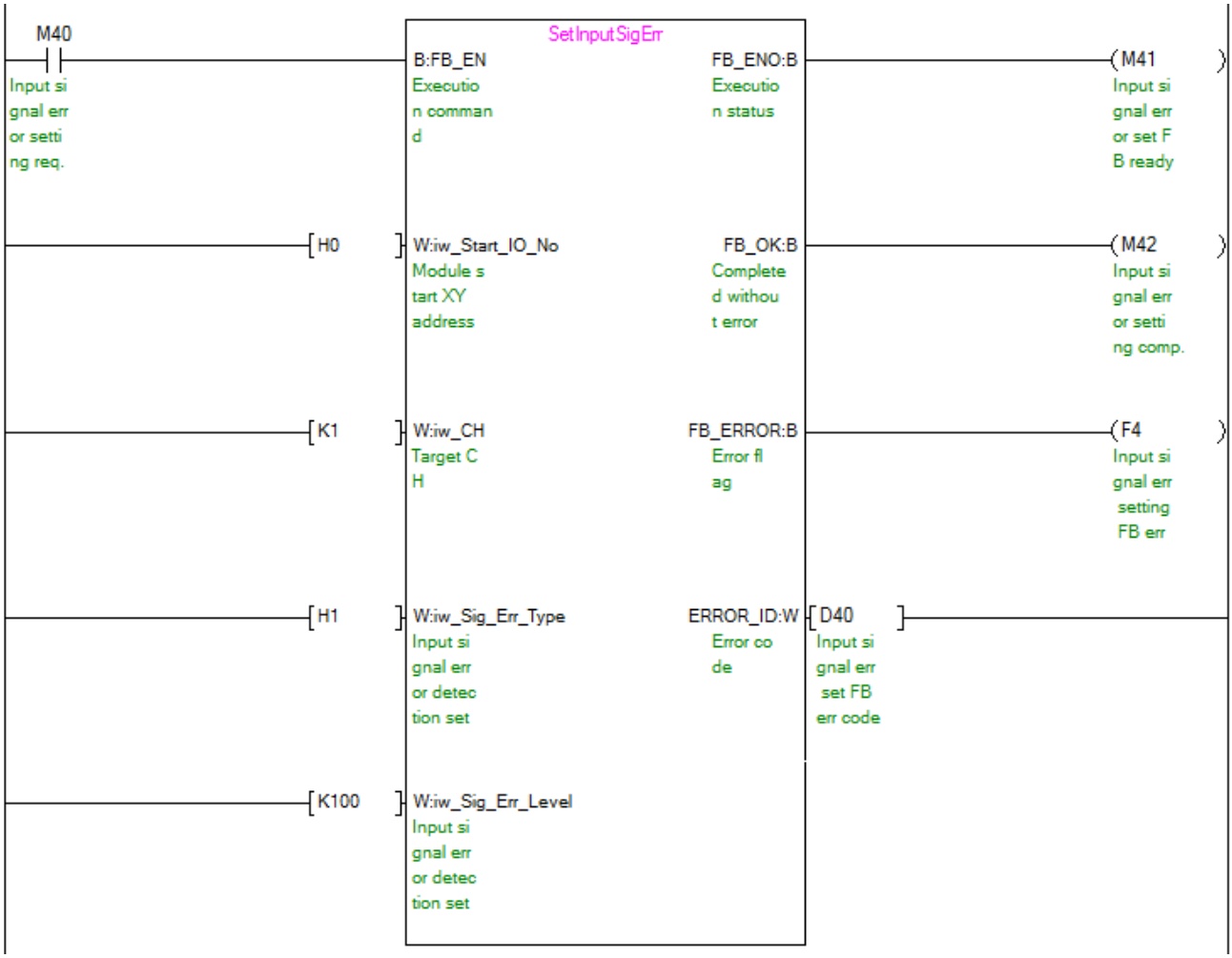
By turning ON M30, the conversion setting and conversion setting value for disconnection detection of channel 1 are written to the buffer memory.



M+L60MD4-G_SetInputSignalErr (Input signal error detection setting)

Label name	Setting value	Description
iw_Start_IO_No	H0	Set the starting XY address where the L60MD4-G is connected to 0H.
iw_CH	K1	Set the target channel to channel 1.
iw_Sig_Err_Type	H1	Set the input signal error detection setting of channel 1 to "Upper and lower limit detection".
iw_Sig_Err_Level	K100	Set the input signal error detection setting value to 10.0%.

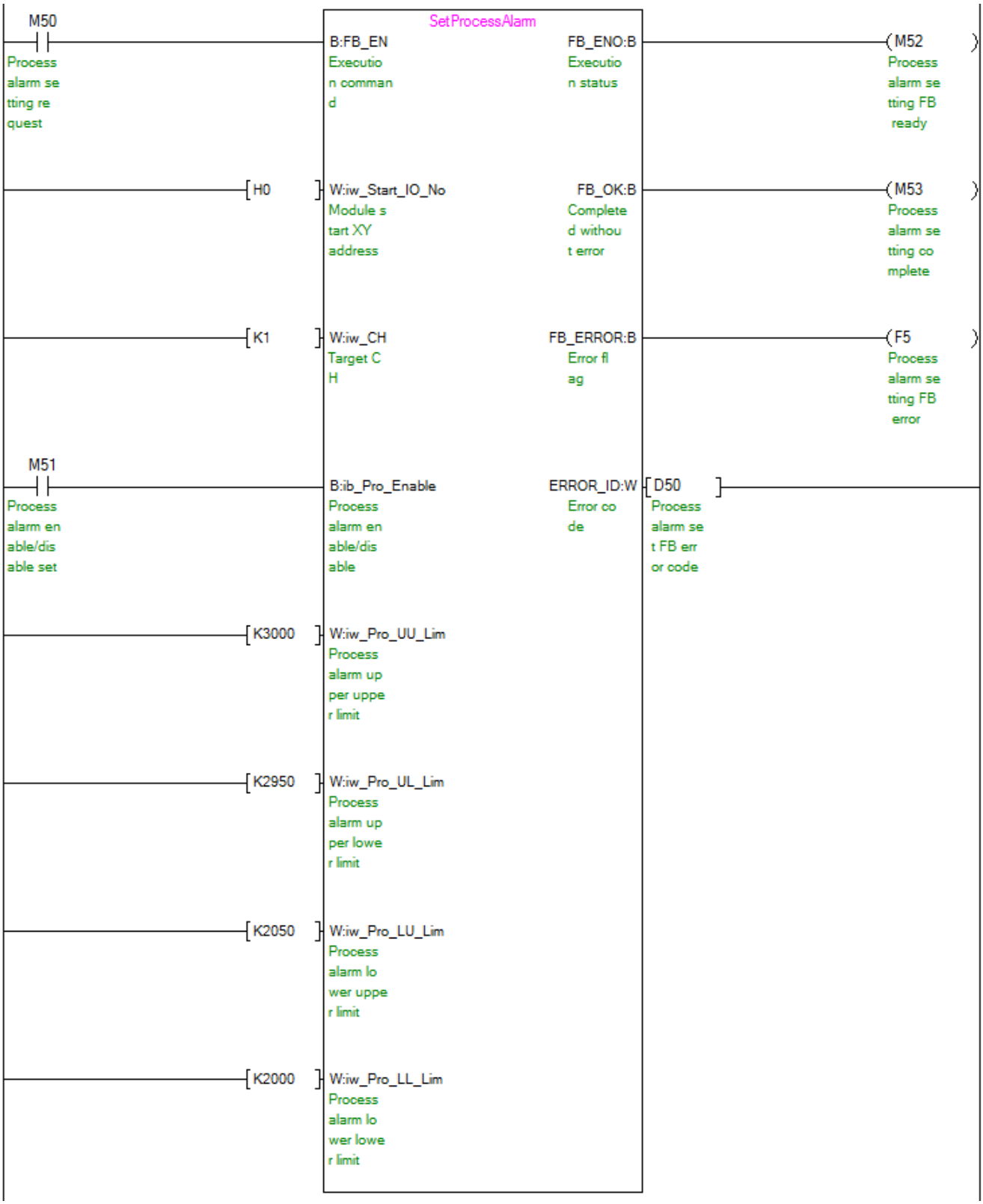
By turning ON M40, the input signal error detection setting value of channel 1 is written to the buffer memory.



M+L60MD4-G_SetProcessAlarm (Process alarm setting)

Label name	Setting value	Description
iw_Start_IO_No	H0	Set the starting XY address where the L60MD4-G is connected to 0H.
iw_CH	K1	Set the target channel to channel 1.
ib_Pro_Enable	ON/OFF	Turn ON to enable the process alarm.
iw_Pro_UU_Lim	K3000	Set the process alarm upper upper limit value to 3,000.
iw_Pro_UL_Lim	K2950	Set the process alarm upper lower limit value to 2,950.
iw_Pro_LU_Lim	K2050	Set the process alarm lower upper limit value to 2,050.
iw_Pro_LL_Lim	K2000	Set the process alarm lower lower limit value to 2,000.

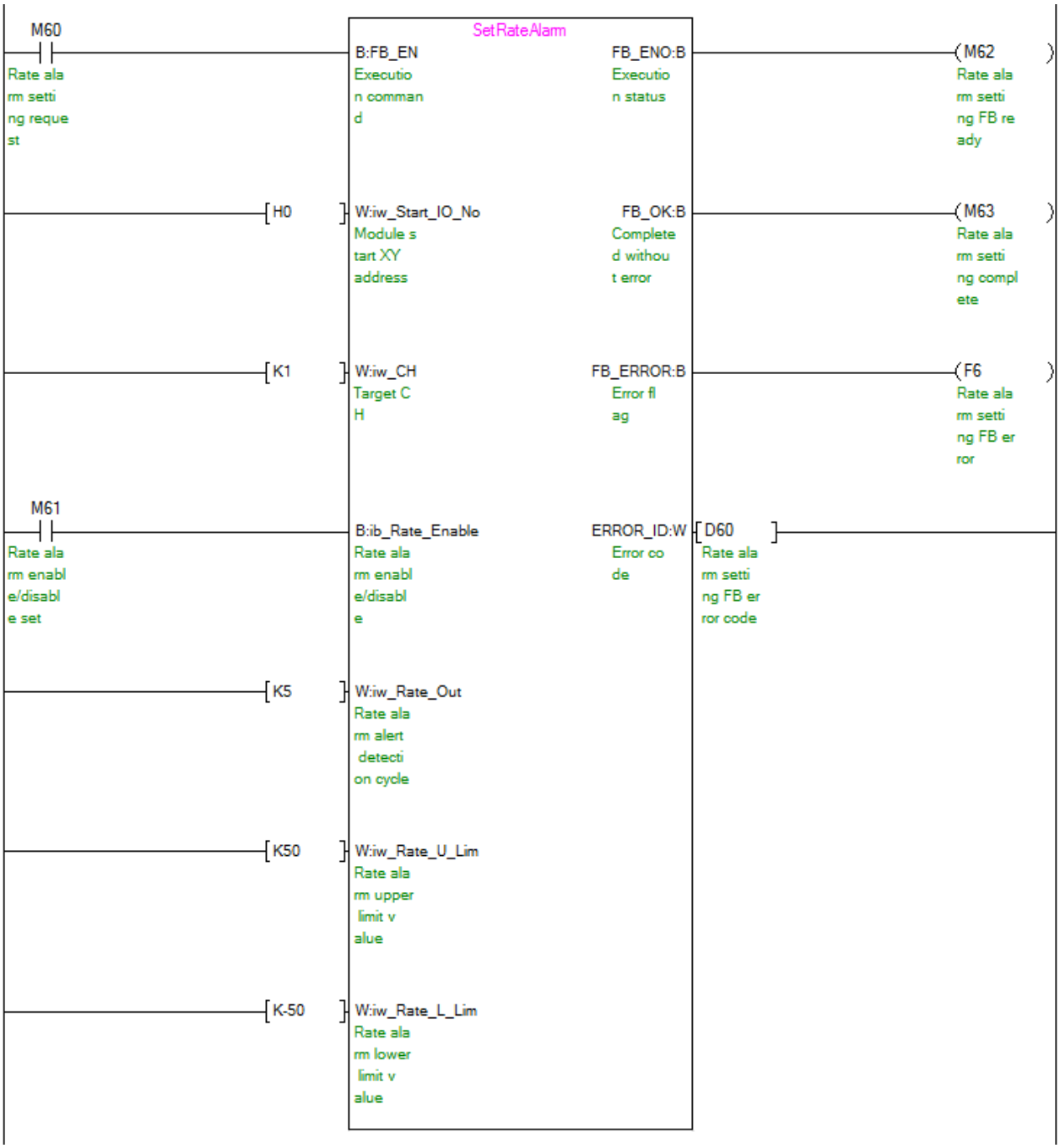
By turning ON M50, the process alarm setting value of channel 1 is written to the buffer memory.


M50
Process alarm setting request
SetProcessAlarm
B:FB_EN
Execution command
FB_ENO:B
Execution status
M52
Process alarm setting FB ready
H0
W:iw_Start_IO_No
Module start XY address
FB_OK:B
Completed without error
M53
Process alarm setting complete
K1
W:iw_CH
Target CH
FB_ERROR:B
Error flag
F5
Process alarm setting FB error
M51
Process alarm enable/disable set
B:ib_Pro_Enable
Process alarm enable/disable
ERROR_ID:W
Error code
D50
Process alarm set FB error code
K3000
W:iw_Pro_UU_Lim
Process alarm upper upper limit
K2950
W:iw_Pro_UL_Lim
Process alarm upper lower limit
K2050
W:iw_Pro_LU_Lim
Process alarm lower upper limit
K2000
W:iw_Pro_LL_Lim
Process alarm lower lower limit

M+L60MD4-G_SetRateAlarm (Rate alarm setting)

Label name	Setting value	Description
iw_Start_IO_No	H0	Set the starting XY address where the L60MD4-G is connected to 0H.
iw_CH	K1	Set the target channel to channel 1.
ib_Rate_Enable	ON/OFF	Turn ON to enable the rate alarm.
iw_Rate_Out	K5	Set the rate alarm alert detection cycle to 5 times.
iw_Rate_U_Lim	K50	Set the rate alarm upper limit value to 50.
iw_Rate_L_Lim	K-50	Set the rate alarm lower limit value to -50.

By turning ON M60, the rate alarm setting value of channel 1 is written to the buffer memory.

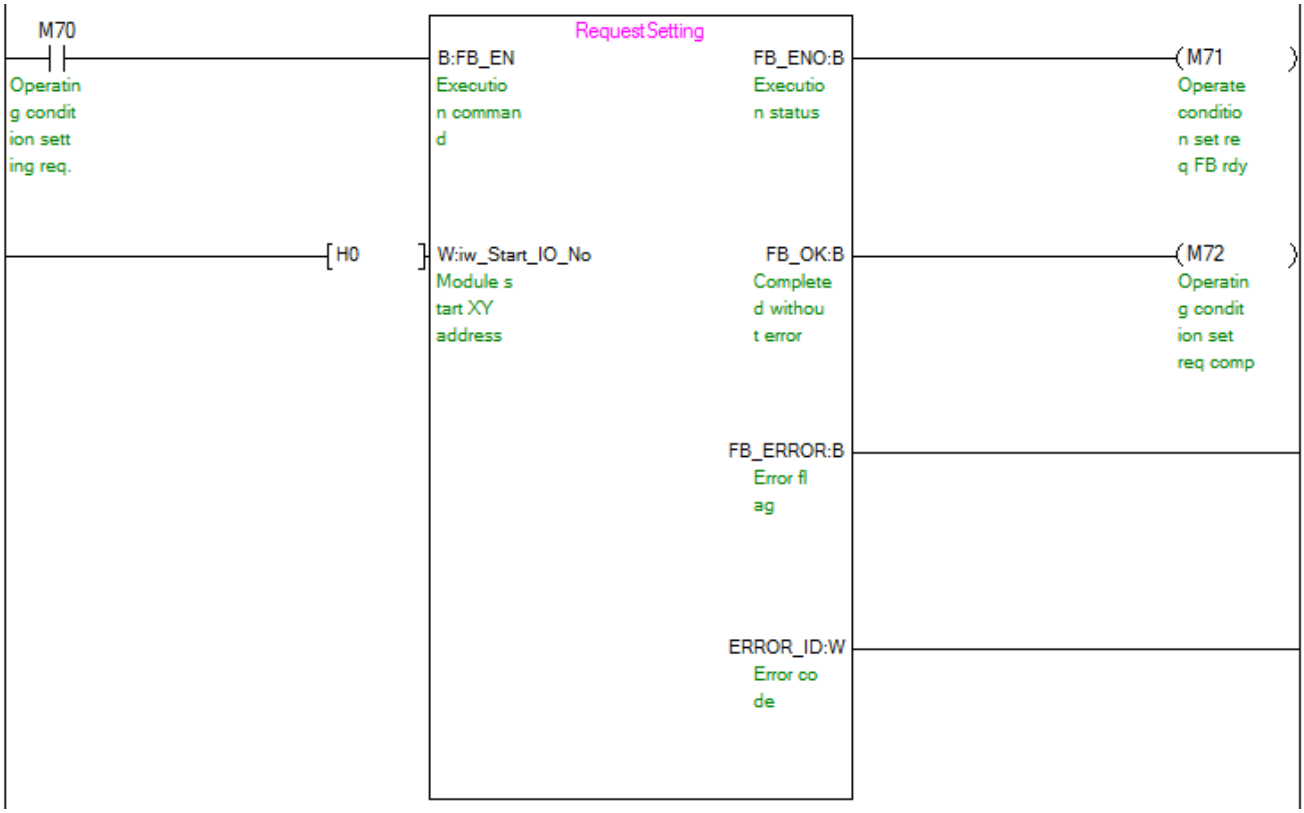

M60
Rate alarm setting request
SetRateAlarm
B:FB_EN
Execution command
FB_ENO:B
Execution status
M62
Rate alarm setting FB ready
H0
W:iw_Start_IO_No
Module start XY address
FB_OK:B
Completed without error
M63
Rate alarm setting complete
K1
W:iw_CH
Target CH
FB_ERROR:B
Error flag
F6
Rate alarm setting FB error
M61
Rate alarm enable/disable set
B:ib_Rate_Enable
Rate alarm enable/disable
ERROR_ID:W
Error code
D60
Rate alarm setting FB error code
K5
W:iw_Rate_Out
Rate alarm alert detection cycle
K50
W:iw_Rate_U_Lim
Rate alarm upper limit value
K-50
W:iw_Rate_L_Lim
Rate alarm lower limit value

M+L60MD4-G_RequestSetting (Operating condition setting request)

Label name	Setting value	Description
iw_Start_IO_No	H0	Set the starting XY address where the L60MD4-G is connected to 0H.

By turning ON M70, the following settings are enabled.

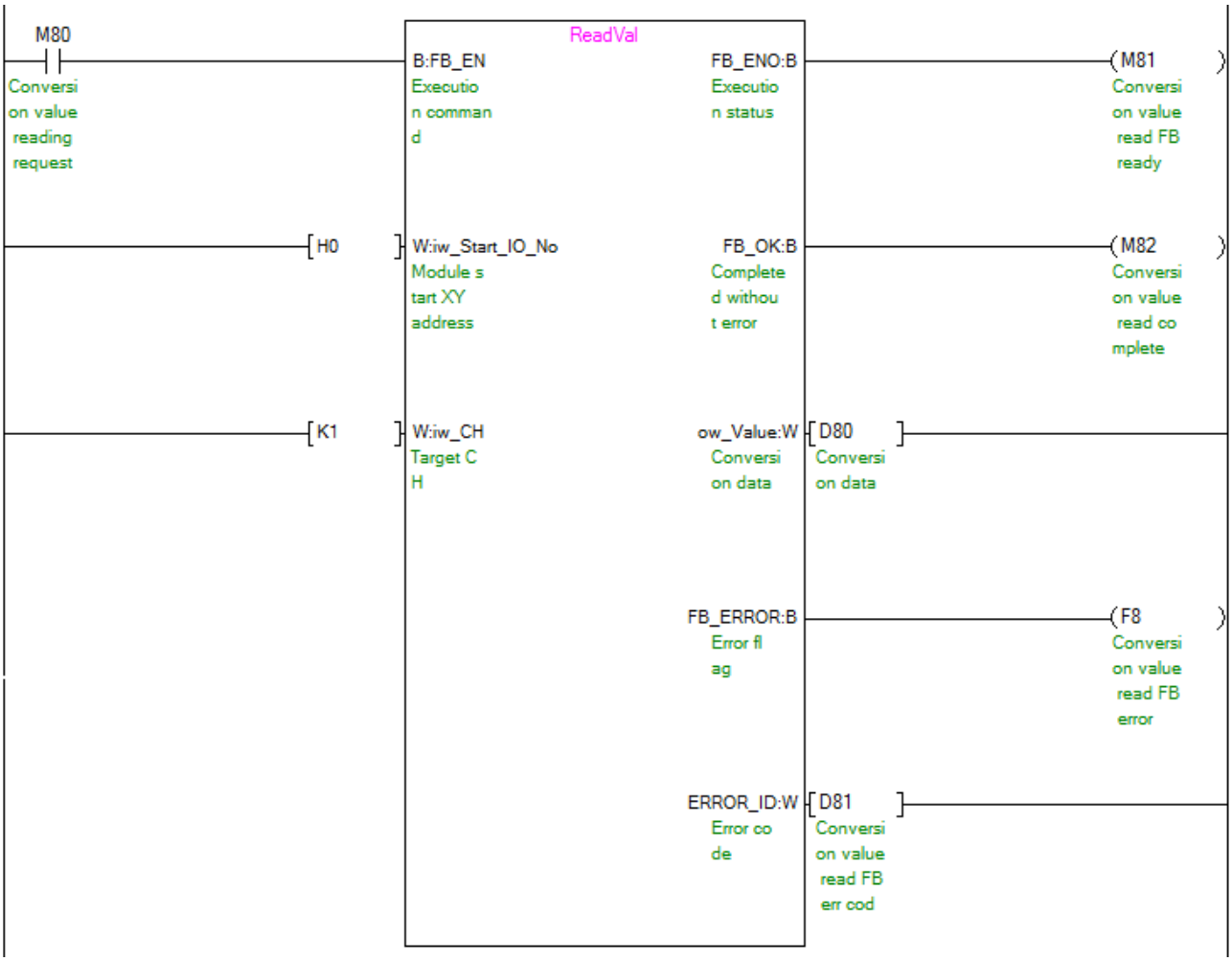
- Input type/range setting
- Centigrade/Fahrenheit display setting
- Averaging processing setting
- Scaling setting
- Disconnection detection setting
- Input signal error detection setting
- Process alarm setting
- Rate alarm setting



M+L60MD4-G_ReadVal (Read conversion data)

Label name	Setting value	Description
iw_Start_IO_No	H0	Set the starting XY address where the L60MD4-G is connected to 0H.
iw_CH	K1	Set the target channel to channel 1.

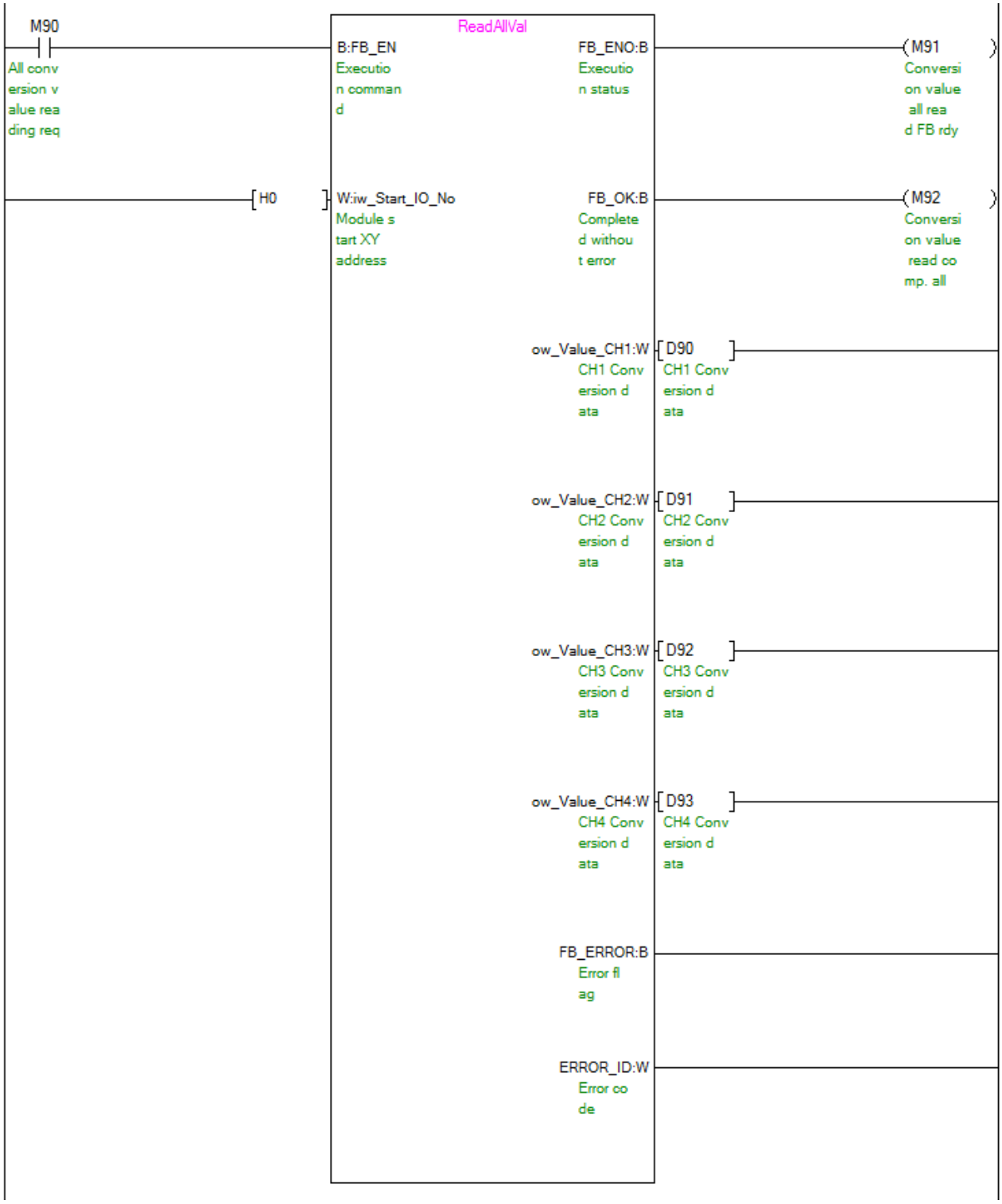
By turning ON M80, the conversion data of channel 1 is read.



M+L60MD4-G_ReadAllVal (Read all A/D conversion data)

Label name	Setting value	Description
iw_Start_IO_No	H0	Set the starting XY address where the L60MD4-G is connected to 0H.

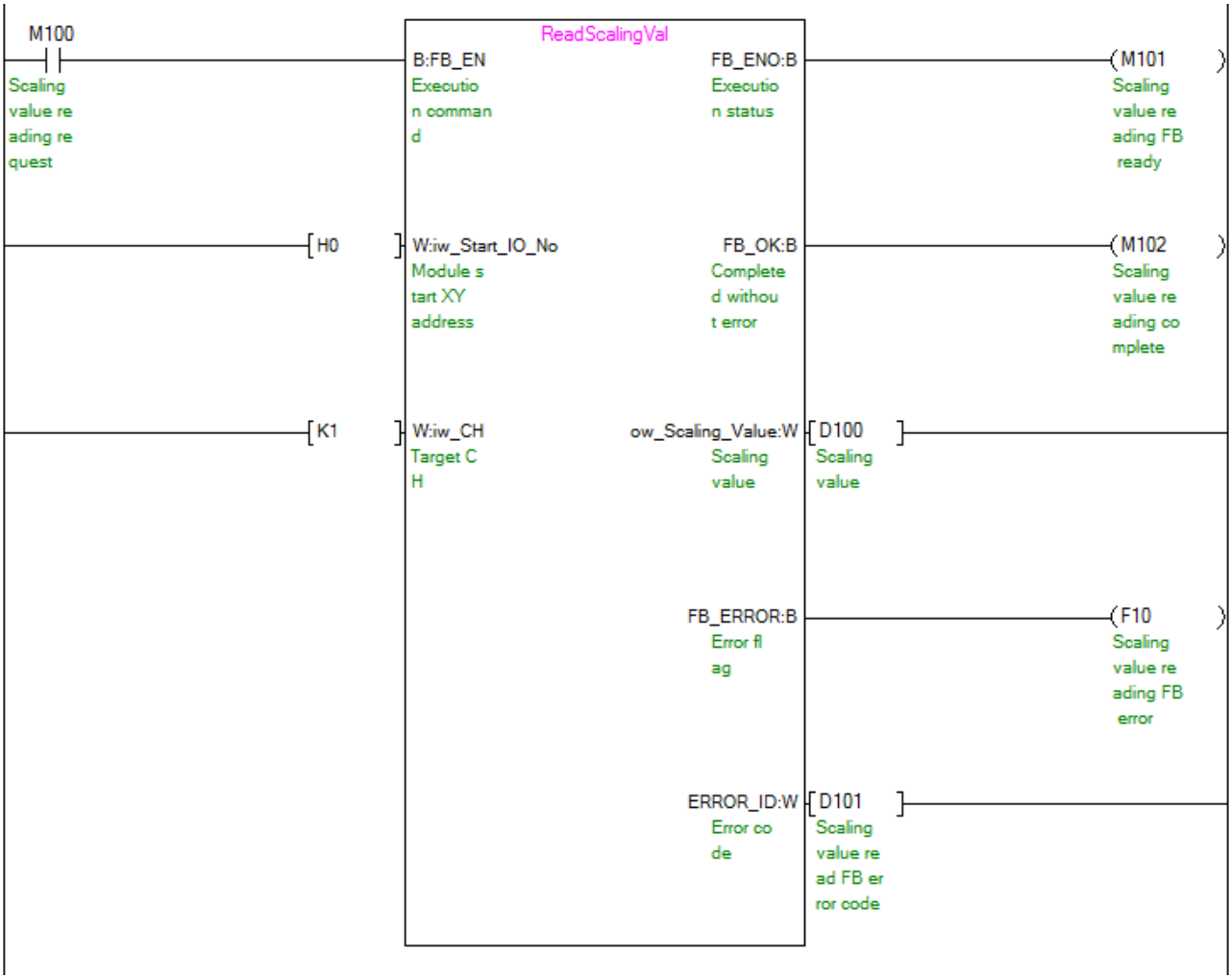
By turning ON M90, the conversion data of channel 1 to channel 4 are read.



M+L60MD4-G_ReadScalingVal (Read scaling value)

Label name	Setting value	Description
iw_Start_IO_No	H0	Set the starting XY address where the L60MD4-G is connected to 0H.
iw_CH	K1	Set the target channel to channel 1.

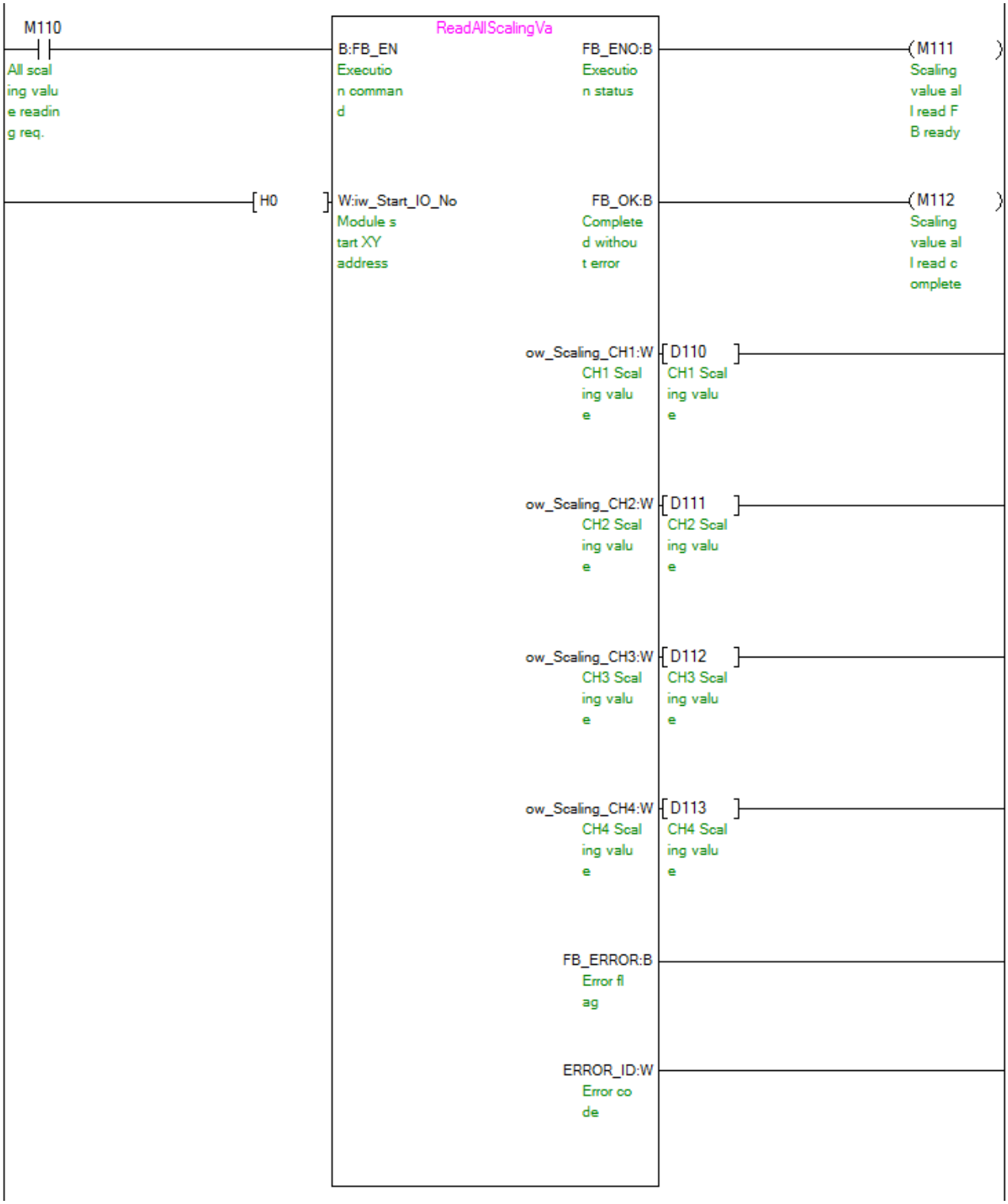
By turning ON M100, the scaling value of channel 1 is read.



M+L60MD4-G_ReadAllScalingVal (Read all scaling values)

Label name	Setting value	Description
iw_Start_IO_No	H0	Set the starting XY address where the L60MD4-G is connected to 0H.

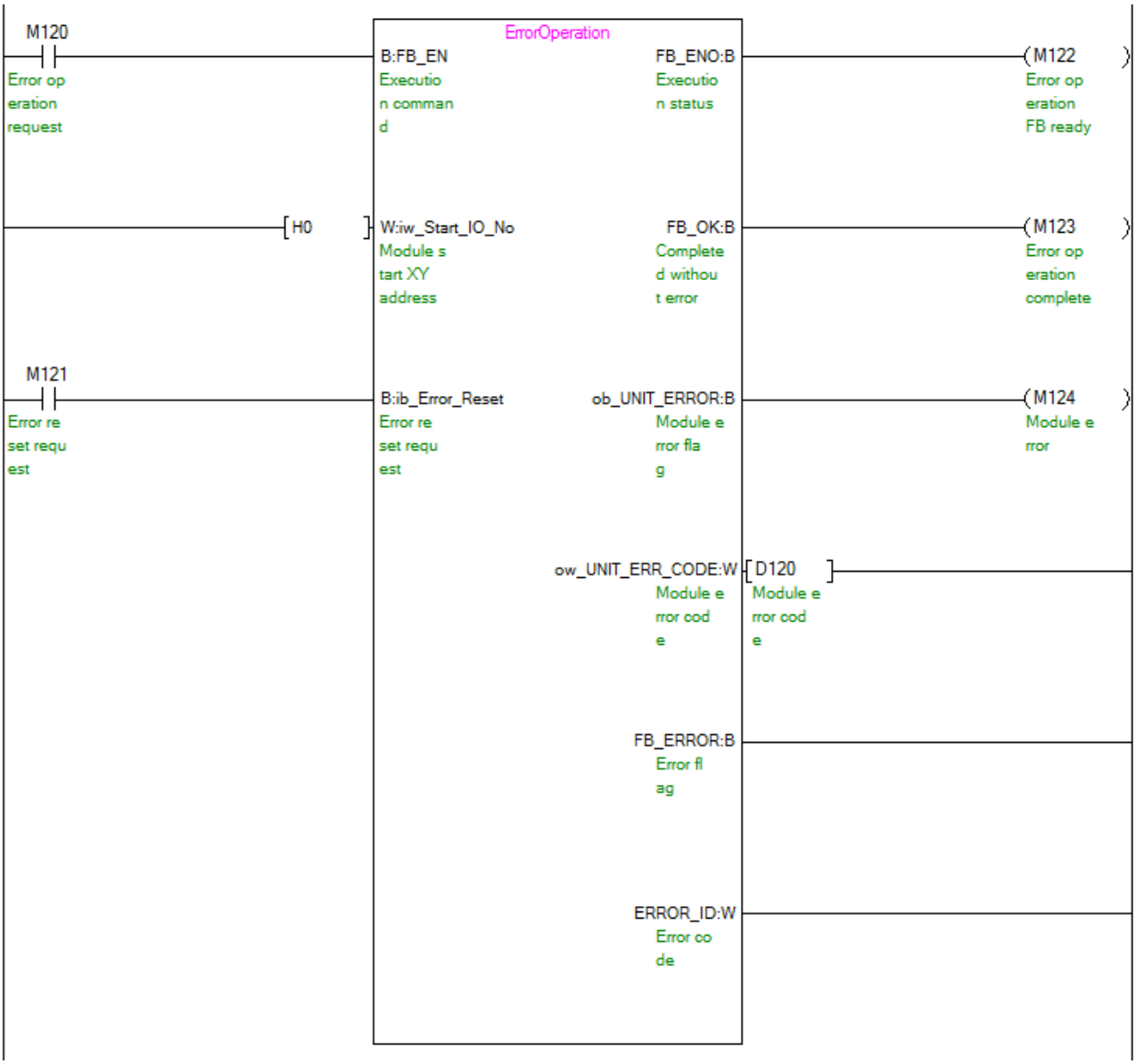
By turning ON M110, the scaling values of channel 1 to channel 4 are read.



M+L60MD4-G_ErrorOperation (Error operation)

Label name	Setting value	Description
iw_Start_IO_No	H0	Set the starting XY address where the L60MD4-G is connected to 0H.
ib_Error_Reset	ON/OFF	Turn ON for the error reset.

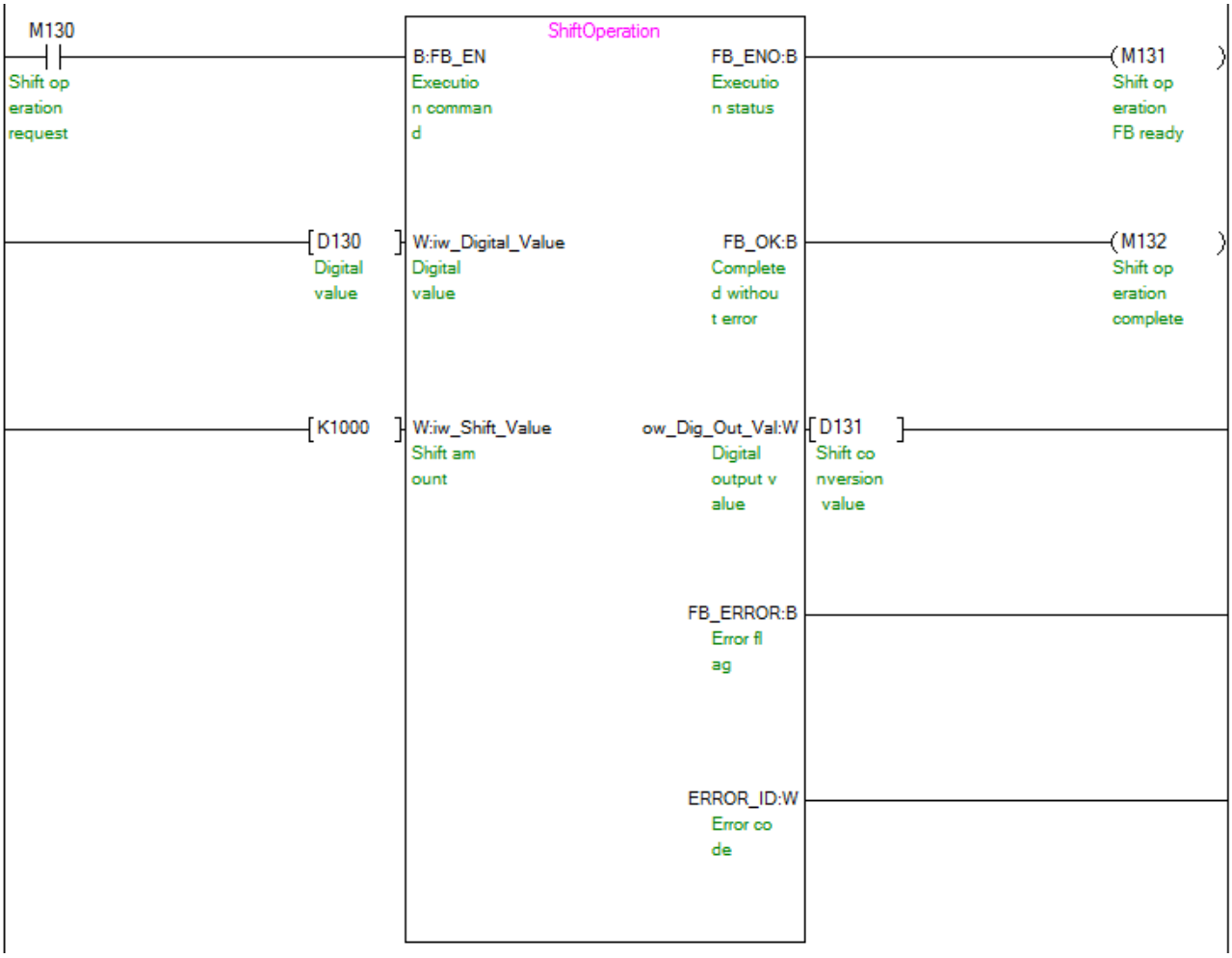
By turning ON M120, the error code is output when an error occurs. By turning ON M121 after the error output, the error is reset.



M+L60MD4-G_ShiftOperation (Shift operation)

Label name	Setting value	Description
iw_Digital_Value	-	Store a digital output value for which the shift amount is to be added.
iw_Shift_Value	K1000	Set the shift amount to 1,000.

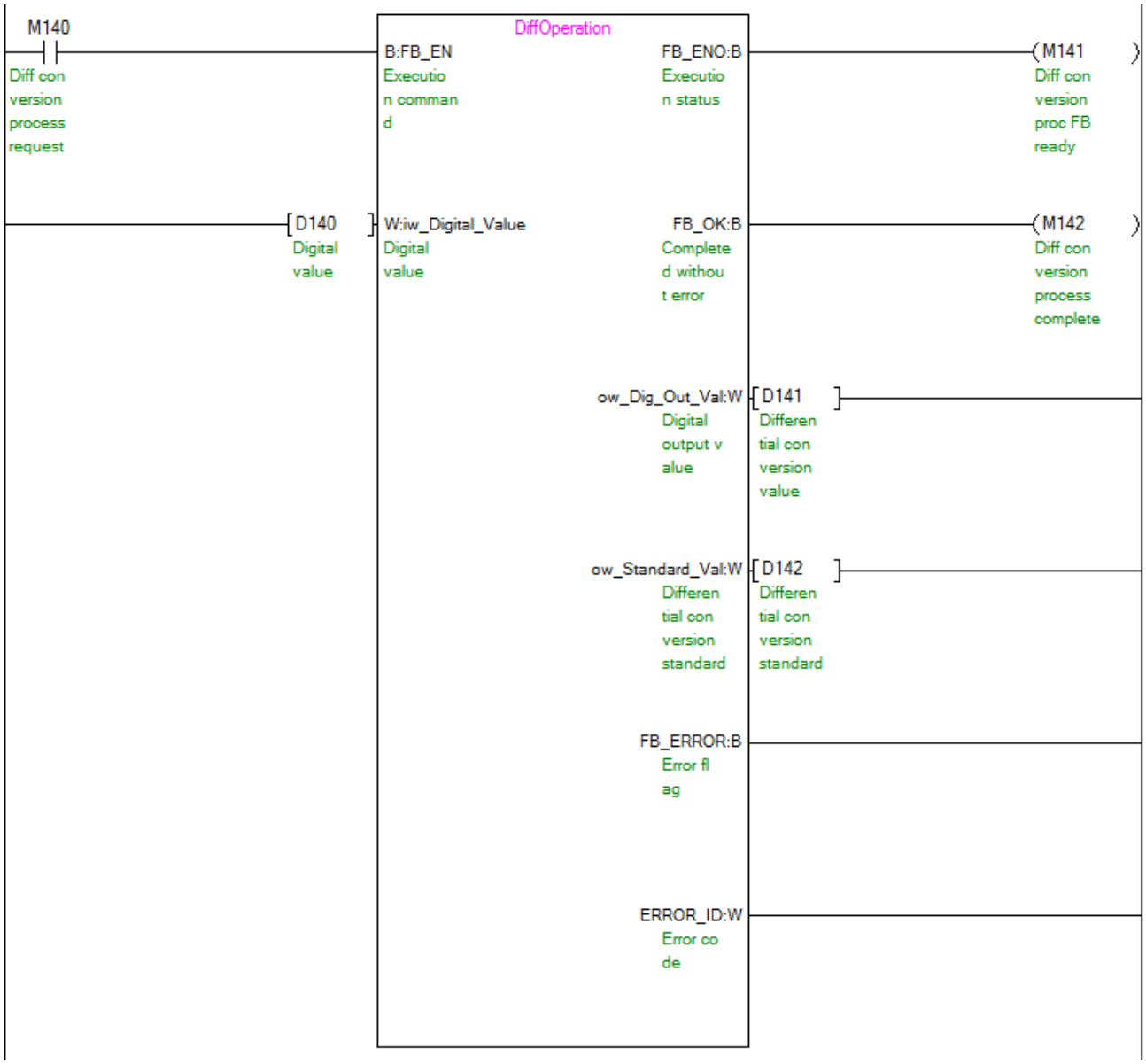
By turning ON M130, the digital value after the shift amount is added is output.



M+L60MD4-G_DiffOperation (Differential conversion process)

Label name	Setting value	Description
iw_Digital_Value	-	Store a digital value for which the differential conversion is to be executed.

By turning ON M140, the difference obtained by subtracting the standard value from the digital value is output.



M+L60MD4-G_ClipOperation (Digital clipping operation)

Label name	Setting value	Description
iw_Digital_Value	-	Store a digital value for which the digital clipping operation is executed.
iw_Clip_U_Lim	K12000	Set the digital clipping upper limit value to 12,000.
iw_Clip_L_Lim	K0	Set the digital clipping lower limit value to 0.

By turning ON M150, if the input digital value exceeds the digital clipping upper limit value or falls below the lower limit value, the value is limited at the upper or lower limit value and then output.