

mitsubishi

Channel Isolated Analog-Digital Converter Module

User's Manual
(Hardware)

Q68AD-G

Thank you for buying the Mitsubishi general-purpose programmable controller MELSEC-Q Series.

Prior to use, please read both this manual and detailed manual thoroughly and familiarize yourself with the product.

MELSEC-Q

Mitsubishi Programmable
Controller

MODEL	Q-68A/D-G-U-HW
MODEL CODE	13JY10
IB(NA)-0800360-D(0810)MEE	

● SAFETY PRECAUTIONS ●

(Read these precautions before using.)

When using Mitsubishi equipment, thoroughly read this manual and the associated manuals introduced in the manual. Also pay careful attention to safety and handle the module properly.

These precautions apply only to Mitsubishi equipment. Refer to the user's manual of the CPU module to use for a description of the programmable controller system safety precautions.

These ● SAFETY PRECAUTIONS ● classify the safety precautions into two categories: "DANGER" and "CAUTION".




DANGER

Procedures which may lead to a dangerous condition and cause death or serious injury if not carried out properly.



CAUTION

Procedures which may lead to a dangerous condition and cause superficial to medium injury, or physical damage only, if not carried out properly.

Depending on circumstances, procedures indicated by  **CAUTION** may also be linked to serious results.

In any case, it is important to follow the directions for usage.

Store this manual in a safe place so that you can take it out and read it whenever necessary. Always forward it to the end user.

[DESIGN PRECAUTIONS]



DANGER

- Do not bunch the control wires or communication cables with the main circuit or power wires, or install them close to each other.
They should be installed 100 mm (3.94 inch) or more from each other.
Not doing so could result in noise that may cause malfunction.

[INSTALLATION PRECAUTIONS]

CAUTION

- Use the programmable controller in an environment that meets the general specifications given in the User's Manual of the CPU module being used. Using this programmable controller in an environment outside the range of the general specifications may cause electric shock, fire, malfunction, and damage to or deterioration of the product.
- While pressing the installation lever located at the bottom of module, insert the module fixing tab into the fixing hole in the base unit until it stops. Improper installation may result in malfunction, breakdown or the module coming loose and dropping.
Securely fix the module with screws if it is subject to vibration during use.
- Tighten the screws within the range of specified torque.
If the screws are loose, it may cause the module to fallout, short circuits, or malfunction.
If the screws are tightened too much, it may cause damage to the screw and/or the module, resulting in fallout, short circuits or malfunction.
- Be sure to shut off all phases of the external power supply used by the system before mounting or removing the module.
Not doing so may cause damage to the module.
- Do not directly touch the conductive area or electronic components of the module.
Doing so may cause malfunction or failure in the module.

[WIRING PRECAUTIONS]

CAUTION

- Be careful not to let foreign matters such as sawdust or wire chips get inside the module.
These may cause fires, failure or malfunction.
- The top surface of the module is covered with protective film to prevent foreign objects such as cable offcuts from entering the module when wiring. Do not remove this film until the wiring is complete.
Before operating the system, be sure to remove the film to provide adequate heat ventilation.

Revisions

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

Print Date	*Manual Number	Revision
Aug., 2006	IB(NA)-0800360-A	First edition
Sep., 2006	IB(NA)-0800360-B	Correction Chapter 2, Section 5.3
Oct., 2006	IB(NA)-0800360-C	Correction Chapter 2, Section 5.2, Section 5.3
Oct., 2008	IB(NA)-0800360-D	Correction Compliance with the EMC and Low Voltage Directives, Chapter 2, Chapter 4, Section 5.2, Section 5.3

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ABOUT MANUAL

The following manual is also related to this product.
In if necessary, order it by quoting the details in the table below.

Relevant Manual

Manual name	Manual number (Model code)
Channel Isolated Analog-Digital Converter Module Channel Isolated Analog-Digital Converter Module (With Signal Conditioning Function) User's Manual Q68AD-G/Q66AD-DG / GX Configurator-AD	SH-080647ENG (13JR96)

Compliance with the EMC and Low Voltage Directives

(1) For programmable controller system

To configure a system meeting the requirements of the EMC and Low Voltage Directives when incorporating the Mitsubishi programmable controller (EMC and Low Voltage Directives compliant) into other machinery or equipment, refer to Chapter 9 "EMC AND LOW VOLTAGE DIRECTIVES" of the QCPU User's Manual (Hardware Design, Maintenance and Inspection).

The CE mark, indicating compliance with the EMC and Low Voltage Directives, is printed on the rating plate of the programmable controller.

(2) For the product

No additional measures are necessary for the compliance of this product with the EMC and Low Voltage Directives.

1. Overview

This manual describes the specifications and the names of the components and handling for the Q68AD-G channel isolated analog-digital converter module which are used with the MELSEC-Q series CPU modules. After unpacking, confirm that the following products are enclosed.

Table 1.1 Packing list

Model code	Quantity
Q68AD-G	1

2. Performance Specifications

The specifications for the Q68AD-G are shown in the following table. For general specifications, refer to the operation manual for the CPU module being used.

Table 2.1 Performance specifications

Item		Specifications					
Number of analog input points		8 points (8 channels)					
Analog input	Voltage	-10 to 10VDC (Input impedance: 1M Ω or more)					
	Current	0 to 20mADC (Input resistance: 250 Ω)					
Digital output		16-bit signed binary (normal resolution mode: -4096 to 4095 high resolution mode: -12288 to 12287, -16384 to 16383)					
	Using scaling function	16-bit signed binary (-32768 to 32767)					
I/O characteristics maximum resolution		Input	Analog input range	Normal resolution mode		High resolution mode	
				Digital output value	Maximum resolution	Digital output value	Maximum resolution
		Voltage	0 to 10V	0 to 4000	2.5mV	0 to 16000	0.625mV
			0 to 5V		1.25mV	0 to 12000	0.416mV
			1 to 5V		1.0mV		0.333mV
			1 to 5V (Expanded mode)	-1000 to 4500	1.0mV	-3000 to 13500	0.333mV
			-10 to 10V	-4000 to 4000	2.5mV	-16000 to 16000	0.625mV
			User range setting		0.375mV	-12000 to 12000	0.333mV
		Current	0 to 20mA	0 to 4000	5 μ A	0 to 12000	1.66 μ A
			4 to 20mA		4 μ A		1.33 μ A
			4 to 20mA (Expanded mode)	-1000 to 4500	4 μ A	-3000 to 13500	1.33 μ A
			User range setting	-4000 to 4000	1.37 μ A	-12000 to 12000	1.33 μ A
Accuracy (Accuracy relative to digital output value)	Reference accuracy ^{*1}	$\pm 0.1\%$ Normal resolution mode: $\pm 4\text{digit}^{*2}$, High resolution mode (0 to 10V, -10 to 10V): $\pm 16\text{digit}^{*2}$ High resolution mode (Other than the above ranges): $\pm 12\text{digit}^{*2}$					
	Temperature coefficient ^{*3}	$\pm 71.4\text{ppm}/^{\circ}\text{C}$ (0.00714%/ $^{\circ}\text{C}$)					

Table 2.1 Performance specifications(Continued)

Item	Specifications			
Common mode characteristic	Common mode voltage Input-common ground (input voltage 0V): 500VAC			
	Common mode voltage rejection ratio (VCM<500V): 60Hz 107dB, 50Hz 106dB)			
Sampling cycle *4	10ms / channel			
Response time *5	20ms			
Absolute maximum input	Voltage:±15V, Current :±30mA*6			
Isolation	Specific isolated area	Isolation method	Dielectric withstand voltage	Insulation resistance
	Between input terminal and programmable controller power supply	Transformer isolation	500VAC rms, 1min.	500VDC 10MΩ or more
	Between analog input channels		1000VAC rms, 1min.	
Maximum number of writes for Flash memory	Up to 50,000 times			
Number of I/O occupied points	16 points (I/O assignment: Intelligent 16 points)			
External wiring connection system	40-pin connector			
Applicable wire size	Within 0.3mm ² (AWG #22)			
External device connection connector	A6CON4 (sold separately)			
Internal current consumption (5 VDC)	0.46A			
Weight	0.16kg			

*1: Accuracy of offset/gain setting at ambient temperature.

*2: "digit" indicates a digital output value.

*3: Accuracy per temperature change of 1°C

Example: Accuracy when temperature changes from 25 to 30 °C

$$0.1\% \text{ (Reference accuracy)} + 0.00714\%/^{\circ}\text{C} \text{ (temperature coefficient)} \\ \times 5^{\circ}\text{C} \text{ (temperature change difference)} = 0.1357\%$$

*4: The cycle in which A/D conversion values are updated.

*5: The time required for an input signal to reach the A/D converter inside the Q68AD-G.

*6: Current value indicates value of instant input current that does not break module inner electrical resistance.

3. Part Names

This section explains the names of the components for the Q68AD-G.

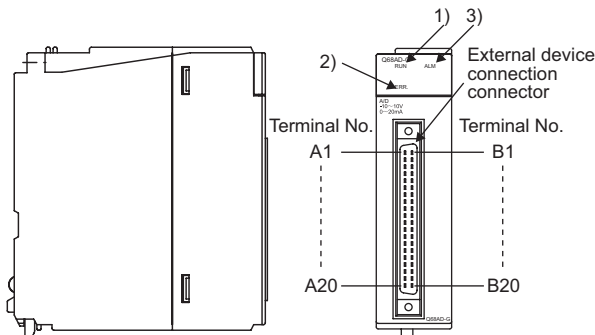


Table 3.1 Names of Part

No.	Name	Description
1)	RUN LED	Displays the operating status of the Q68AD-G. On : Normal operation Flashing : During offset/gain setting mode Off : 5V power supply interrupted, watchdog timer error occurred, or online module change enabled.
2)	ERR LED	Displays the error status of the Q68AD-G. On : Error Flashing : Error in switch settings Switch No. 5 of the intelligent function module has been set to a value other than zero. Off : Normal operation
3)	ALM LED	Indicates the alarm status of the Q68AD-G. On : An alarm (process alarm, rate alarm) occurred. Flashing : An input signal error occurred. Off : Normal operation

Table 3.2 Signal layout

Terminal No.	Signal name	Terminal No.	Signal name
A1	CH1 V+	B1	CH1 V-/I-
A2	CH1 I+	B2	-
A3	-	B3	CH2 V+
A4	CH2 V-/I-	B4	CH2 I+
A5	-	B5	-
A6	CH3 V+	B6	CH3 V-/I-
A7	CH3 I+	B7	-
A8	-	B8	CH4 V+
A9	CH4 V-/I-	B9	CH4 I+
A10	-	B10	-
A11	CH5 V+	B11	CH5 V-/I-
A12	CH5 I+	B12	-
A13	-	B13	CH6 V+
A14	CH6 V-/I-	B14	CH6 I+
A15	-	B15	-
A16	CH7 V+	B16	CH7 V-/I-
A17	CH7 I+	B17	-
A18	-	B18	CH8 V+
A19	CH8 V-/I-	B19	CH8 I+
A20	-	B20	-

4. Handling Precautions

- (1) Do not drop the module or subject it to heavy impact.
- (2) Do not remove the PCB of the module from its case.
Doing so may cause the module to fail.
- (3) Prevent foreign matter such as dust or wire chips from entering the module.
Such foreign matter can cause a fire, failure, or malfunction.
- (4) A protective film is attached to the top of the module to prevent foreign matter, such as wire chips, from entering the module during wiring.
Do not remove the film during wiring.
Remove it for heat dissipation before system operation.
- (5) Before handling the module, touch a grounded metal object to discharge the static electricity from the human body.
Failure to do so may cause the module to fail or malfunction.
- (6) Tighten the terminal screws using torque within the following ranges.
Loose screws may cause short circuits, mechanical failures or malfunctions.

Screw location	Tightening torque range
Module fixing screw (M3 screw)	0.36 to 0.48 N•m
FG terminal screw (M3 screw)	0.42 to 0.58 N•m

- (7) To mount the module on the base unit, fully insert the module fixing latch into the fixing hole in the base unit and press the module using the hole as a fulcrum.
Improper installation may result in a module malfunction, or may cause the module to fall off.

5. Wiring

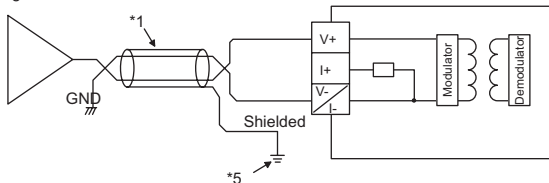
5.1 Wiring precautions

- (1) Use separate cables for the AC control circuit and the external input signals of the Q68AD-G to prevent influences of AC surge or induction.
- (2) Keep a distance among the main circuit line, a high-voltage cable and a load cable from other than the programmable controller. Failure to do so may increase the effects of noise, surges and induction.
- (3) The shield wire or the shield of the shielded cable must be grounded at one end.

5.2 External wiring

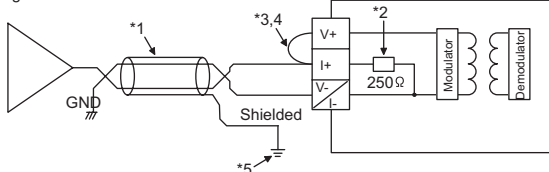
(1) For voltage input

Signal source 0 to $\pm 10\text{V}$



(2) For current input

Signal source 0 to 20mA



- *1: Use a 2-core twisted shielded wire for the power wire.
- *2: Shows input resistance.
- *3: For current input, be sure to connect (V+) and (I+) terminals.
- *4: Connect (V+) terminal to (I+) terminal in the external device connection connector (A6CON4) to reduce resistance of the connection conductor.
- *5: Always ground the shield of the wire of each channel.

Remarks

If the external wiring is disconnected during use of voltage input on the Q68AD-G, depending on the internal circuit characteristics, a certain time is required until the digital output reaches a value equivalent to 0V.
To avoid the phenomenon, connect a resistor (approximately $1\text{M}\Omega$) across (V+) and (V-) terminals.

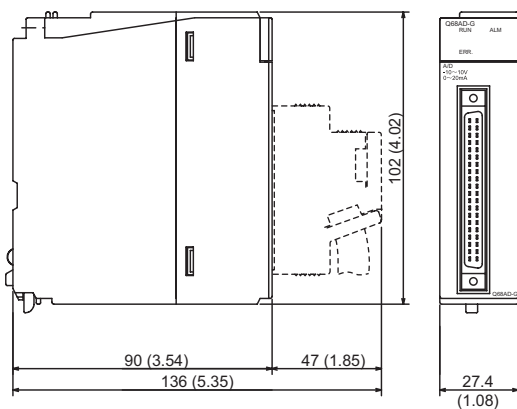
5.3 Intelligent function module switch setting

The intelligent function module switches are set using the I/O assignment settings of GX Developer. It can be easy to set by inputting using hexadecimal-4 digits.

Switch No.	Setting item																					
Switch 1	Input range setting (CH1 to CH4) <div><div></div><div></div><div></div><div></div><div>H</div></div> <div>CH4 CH3 CH2 CH1</div>	<table><tr><th>Analog input range</th><th>Input range setting value</th></tr><tr><td>4 to 20mA</td><td>0H</td></tr><tr><td>0 to 20mA</td><td>1H</td></tr><tr><td>1 to 5V</td><td>2H</td></tr><tr><td>0 to 5V</td><td>3H</td></tr><tr><td>-10 to 10V</td><td>4H</td></tr><tr><td>0 to 10V</td><td>5H</td></tr><tr><td>1 to 5V (Expanded mode)</td><td>AH</td></tr><tr><td>4 to 20mA (Expanded mode)</td><td>BH</td></tr><tr><td>User range setting</td><td>FH</td></tr></table>	Analog input range	Input range setting value	4 to 20mA	0H	0 to 20mA	1H	1 to 5V	2H	0 to 5V	3H	-10 to 10V	4H	0 to 10V	5H	1 to 5V (Expanded mode)	AH	4 to 20mA (Expanded mode)	BH	User range setting	FH
Analog input range	Input range setting value																					
4 to 20mA	0H																					
0 to 20mA	1H																					
1 to 5V	2H																					
0 to 5V	3H																					
-10 to 10V	4H																					
0 to 10V	5H																					
1 to 5V (Expanded mode)	AH																					
4 to 20mA (Expanded mode)	BH																					
User range setting	FH																					
Switch 2	Input range setting (CH5 to CH8) <div><div></div><div></div><div></div><div></div><div>H</div></div> <div>CH8 CH7 CH6 CH5</div>																					
Switch 3	Empty																					
Switch 4	<div><div></div><div></div><div></div><div></div><div>H</div></div> <div>00H: Fixed</div> <div>0H: Normal resolution mode</div> <div>1H to FH (value other than 0H)*: High resolution mode</div> <div>0H: Normal mode (A/D conversion processing)</div> <div>1H to FH (value other than 0H)*: Offset/gain setting mode</div>																					
Switch 5	0H:Fixed																					

*1 Setting any value within the setting range will provide the same operation.
When the setting range is 1H to FH, set 1H for example.

6. External Dimensions



Unit: mm (inch)

Warranty

Mitsubishi will not be held liable for damage caused by factors found not to be the cause of Mitsubishi; machine damage or lost profits caused by faults in the Mitsubishi products; damage, secondary damage, accident compensation caused by special factors unpredictable by Mitsubishi; damages to products other than Mitsubishi products; and to other duties.

For safe use

- This product has been manufactured as a general-purpose part for general industries, and has not been designed or manufactured to be incorporated in a device or system used in purposes related to human life.
- Before using the product for special purposes such as nuclear power, electric power, aerospace, medicine or passenger movement vehicles, consult with Mitsubishi.
- This product has been manufactured under strict quality control. However, when installing the product where major accidents or losses could occur if the product fails, install appropriate backup or failsafe functions in the system.

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