

MITSUBISHI

Channel Isolated Analog-Digital Converter Module (With Signal Conditioning Function)

User's Manual
(Hardware)

Q66AD-DG

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-66AD-DG-U-HW
MODEL CODE	13JY11
IB(NA)-0800361-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. After mounting the module to the base unit securely hold the module with module fixing bracket.
- 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

- Always ground the FG terminal for the programmable controller.
There is a risk of electric shock or malfunction.
- 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)-0800361-A	First edition
Sep., 2006	IB(NA)-0800361-B	Correction Chapter 2, Section 5.3
Oct., 2006	IB(NA)-0800361-C	Correction Chapter 1, Section 5.3, Chapter 6
Oct., 2008	IB(NA)-0800361-D	Correction Compliance with the EMC and Low Voltage Directives, Chapter 2, Chapter 4, Section 5.1, Section 5.3

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ABOUT MANUAL

The following manual is also related to this product.
If necessary, order it by quoting the details in the tables 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, the names of the components and handling precautions for the type Q66AD-DG channel isolated analog-digital converter module (with signal conditioning function) (hereafter referred to as the Q66AD-DG) which are used in combination with the MELSEC-Q series CPU modules.

After unpacking, confirm that the following products are enclosed.

Table 1.1 Packing list

Model code	Quantity
Q66AD-DG	1
FG terminal L-Shaped metal fitting	1

2. Performance Specifications

The specifications for the Q66AD-DG 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 point (2-wire transmitters)		6 points (6 channels)				
Input specification	With 2-wire transmitter	4 to 20mA ADC (Input resistance: 250Ω)				
	Without 2-wire transmitter	0 to 20mA ADC ±1 (Input resistance: 250Ω)				
Supply power specification	Supply voltage	26 ± 2VDC				
	Maximum supply current	24mA ADC				
	Short-circuit protection	Available Limit current: 25 to 35mA				
	Check terminals	Available				
Digital output		16-bit signed binary (normal resolution mode: -96 to 4095 high resolution mode: -288 to 12287)				
	Using scaling function	16-bit signed binary (-32768 to 32767)				
I/O characteristics maximum resolution		Analog input range	Normal resolution mode		High resolution mode	
			Digital output value	Maximum resolution	Digital output value	Maximum resolution
		0 to 20mA	0 to 4000	5 μA	0 to 12000	1.66 μA
		4 to 20mA		4 μA		1.33 μA
		4 to 20mA (Expanded mode)	-1000 to 4500	4 μA	-3000 to 13500	1.33 μA
User range setting ^{*4}	0 to 4000	1.37 μA	0 to 12000	1.33 μA		
Accuracy (Accuracy relative to digital output value)	Reference accuracy ^{*1}	±0.1% (Normal resolution mode: ±4digit ^{*2} , High resolution mode: ±12digit ^{*2})				
	Temperature coefficient ^{*3}	±71.4ppm/°C (0.00714%/°C)				
Sampling cycle ^{*5}		10ms / channel				
Response time ^{*6}		20ms				
Absolute maximum output		±30mA ^{*7}				

Table 2.1 Performance specifications(Continued)

Item	Specifications												
Isolation	<table border="1"> <thead> <tr> <th data-bbox="412 151 640 230">Specific isolated area</th> <th data-bbox="640 151 737 230">Isolation method</th> <th data-bbox="737 151 864 230">Dielectric withstand voltage</th> <th data-bbox="864 151 961 230">Insulation resistance</th> </tr> </thead> <tbody> <tr> <td data-bbox="412 230 640 308">Between the I/O terminal and programmable controller power supply</td> <td data-bbox="640 230 737 448" rowspan="3">Transformer isolation</td> <td data-bbox="737 230 864 308">500VAC rms, 1min.</td> <td data-bbox="864 230 961 448" rowspan="3">500VDC 10MΩ or more</td> </tr> <tr> <td data-bbox="412 308 640 387">Between analog input channels</td> <td data-bbox="737 308 864 387">1000VAC rms, 1min</td> </tr> <tr> <td data-bbox="412 387 640 448">Between external supply power and analog input</td> <td data-bbox="737 387 864 448">500VAC rms, 1min</td> </tr> </tbody> </table>	Specific isolated area	Isolation method	Dielectric withstand voltage	Insulation resistance	Between the I/O terminal and programmable controller power supply	Transformer isolation	500VAC rms, 1min.	500VDC 10MΩ or more	Between analog input channels	1000VAC rms, 1min	Between external supply power and analog input	500VAC rms, 1min
	Specific isolated area	Isolation method	Dielectric withstand voltage	Insulation resistance									
	Between the I/O terminal and programmable controller power supply	Transformer isolation	500VAC rms, 1min.	500VDC 10MΩ or more									
	Between analog input channels		1000VAC rms, 1min										
Between external supply power and analog input	500VAC rms, 1min												
Maximum number of writes to 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 0.3 mm ² (AWG# 22)												
External device connection connector	A6CON4 (sold separately)												
External supply power	24VDC +20%, -15%												
	Ripple, spike within 500mV _{P-P}												
	Inrush current: 5.0A, within 400μs												
	0.36A												
Internal current consumption (5 VDC)	0.42A												
Weight	0.22kg												

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

Q66AD-DG needs to be powered on 30 minutes prior to operation for compliance to the specification (accuracy).

*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

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

*4: User range setting is 2 to 24mA.

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

*6: The time required for an input signal to reach the A/D converter inside the Q66AD-DG.

*7: 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 Q66AD-DG.

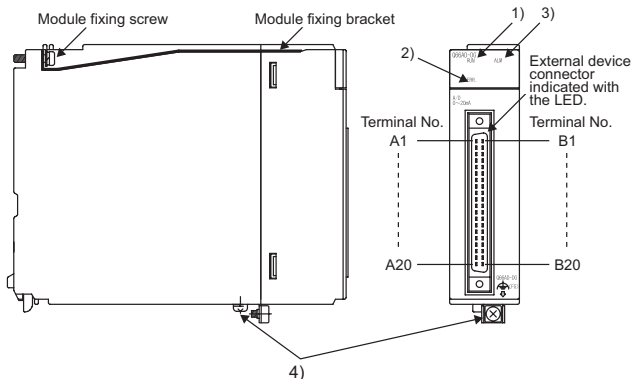


Table 3.1 Names of Part

No.	Name	Description
1)	RUN LED	Displays the operating status of the Q66AD-DG. 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 Q66AD-DG. 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 warning status of the Q66AD-DG. On : An alarm (process alarm, rate alarm) occurred. Flashing : An input signal error occurred. Off : Normal operation
4)	FG terminal L-Shaped metal fitting	Metal fitting to wire for FG of the Q66AD-DG.

Table 3.2 Signal layout

Terminal No.	Signal name	Terminal No.	Signal name
A1	CH1 P	B1	CH1 I+/CHK+
A2	-	B2	CH1 I-/CHK-
A3	-	B3	-
A4	CH2 P	B4	CH2 I+/CHK+
A5	-	B5	CH2 I-/CHK-
A6	-	B6	-
A7	CH3 P	B7	CH3 I+/CHK+
A8	-	B8	CH3 I-/CHK-
A9	-	B9	-
A10	CH4 P	B10	CH4 I+/CHK+
A11	-	B11	CH4 I-/CHK-
A12	-	B12	-
A13	CH5 P	B13	CH5 I+/CHK+
A14	-	B14	CH5 I-/CHK-
A15	-	B15	-
A16	CH6 P	B16	CH6 I+/CHK+
A17	-	B17	CH6 I-/CHK-
A18	-	B18	-
A19	DC24V	B19	DC24V
A20	DC24G	B20	DC24G

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.

Table 4.1 Tightening torque

Screw location	Tightening torque range
Module fixing screw (M3 screw)	0.36 to 0.48 N•m
Connector screw (M2.6 screw)	0.20 to 0.29 N•m
FG terminal screw (M3 screw)	0.42 to 0.58 N•m

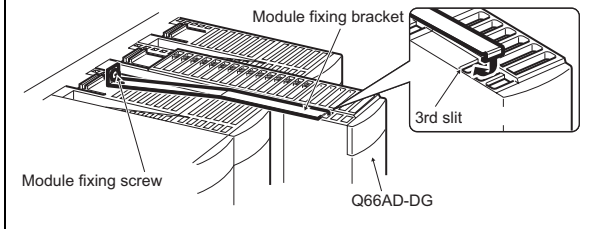
- (7) To mount the module on the base unit, fully insert the module fixing latch into the fixing hole in the base unit and press the module using the hole as a fulcrum.
Improper installation may result in a module malfunction, or may cause the module to fall off.

4.1 Mounting module fixing bracket

Hold the Q66AD-DG with module fixing bracket after the Q66AD-DG is mounted to the base unit.

POINT

Make sure that the module fixing bracket is hooked on the 3rd slit viewed from the front of Q66AD-DG. And tighten the module fixing screw at the specified torque.



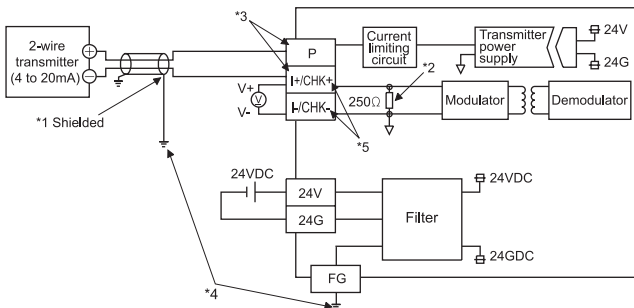
5. Wiring

5.1 Wiring precautions

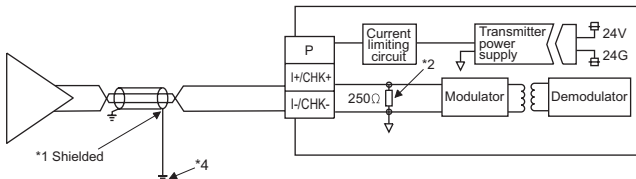
- (1) Use separate cables for the AC control circuit and the external input signals of the Q66AD-DG to prevent influences of AC surge or induction.
- (2) Keep a distance among the main circuit line, a high-voltage cable and a load cable from other than the programmable controller. Failure to do so may 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.
- (4) When wiring to the module placed on the right side of the Q66AD-DG is difficult, remove the Q66AD-DG before wiring.

5.2 External wiring

(1) For 2-wire transmitter input



(2) For current input



*1 Use a 2-core twisted shielded wire for the power wire.

*2 Shows input resistance.

*3 To connect with the 2-wire transmitter, be sure to connect to P and I+/CHK+.

*4 Always use a ground. In addition, ground the FG of the power supply module.

*5 The check terminals (CHK+, CHK-) are used to check the amount of input in mA in relation to the 2-wire transmitter output.

This can be checked since analog inputs of 4 to 20mA are converted to analog outputs of 1 to 5V.

The relationship of this conversion can be expressed by the following formula:

$$\text{Analog output(V)} = \frac{\text{Analog input(mA)}}{1000} \times 250\Omega$$

IMPORTANT


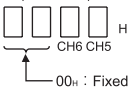

Q66AD-DG needs to be powered on 30 minutes prior to operation for compliance to the specification (accuracy). Therefore, power on 30 minutes prior to offset/gain setting or after online module change.

5.3 Intelligent Function Module Switch setting

The intelligent function module switches are set using the I/O assignment settings of GX Developer.

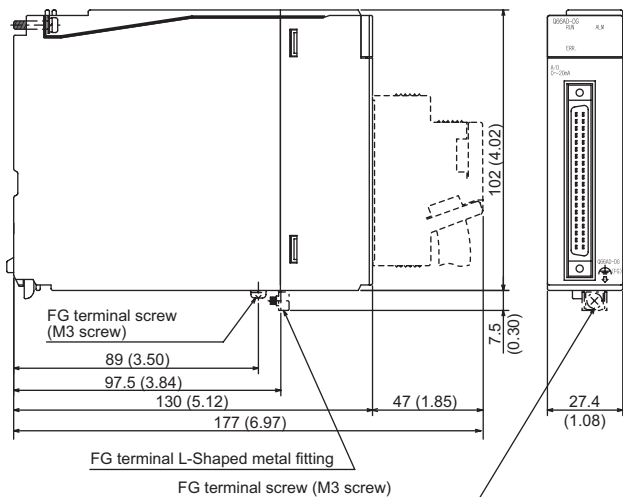
It can be easy to set by inputting using hexadecimal-4 digits.

Table 5.1 Switch setting item

Switch No.	Setting item																	
Switch 1	Input range setting (CH1 to CH4)  CH4 CH3 CH2 CH1	<table border="1"> <thead> <tr> <th>Analog input range</th> <th>Input range setting value</th> </tr> </thead> <tbody> <tr> <td>4 to 20mA (For 2-wire transmitter input)</td> <td>0H</td> </tr> <tr> <td>4 to 20mA (For current input)</td> <td>6H</td> </tr> <tr> <td>0 to 20mA (For current input)</td> <td>7H</td> </tr> <tr> <td>4 to 20mA (Expanded mode) (For 2-wire transmitter input)</td> <td>AH</td> </tr> <tr> <td>4 to 20mA (Expanded mode) (For current input)</td> <td>CH</td> </tr> <tr> <td>User range setting (For current input)</td> <td>EH</td> </tr> <tr> <td>User range setting (For 2-wire transmitter input)</td> <td>FH</td> </tr> </tbody> </table>	Analog input range	Input range setting value	4 to 20mA (For 2-wire transmitter input)	0H	4 to 20mA (For current input)	6H	0 to 20mA (For current input)	7H	4 to 20mA (Expanded mode) (For 2-wire transmitter input)	AH	4 to 20mA (Expanded mode) (For current input)	CH	User range setting (For current input)	EH	User range setting (For 2-wire transmitter input)	FH
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4 to 20mA (Expanded mode) (For 2-wire transmitter input)	AH																	
4 to 20mA (Expanded mode) (For current input)	CH																	
User range setting (For current input)	EH																	
User range setting (For 2-wire transmitter input)	FH																	
Switch 2	Input range setting (CH5,CH6)  CH6 CH5 00H: Fixed																	
Switch 3	Empty																	
Switch 4	 <p>00H: Fixed</p> <p>0H: Normal resolution mode</p> <p>1H to FH (value other than 0H)*: High resolution mode</p> <p>0H: Normal mode (A/D conversion processing)</p> <p>1H to FH (value other than 0H)*: Offset/gain setting mode</p>																	
Switch 5	0H: Fixed																	

* 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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