

# **mitsubishi**

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# **Type QD70**

# **Positioning Module**

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**User's Manual**  
(Hardware)

**QD70P4**  
**QD70P8**

Thank you for buying the Mitsubishi general-purpose programmable logic 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  
Logic Controller

# ● SAFETY PRECAUTIONS ●

(Read these precautions before using.)

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

These precautions apply only to Mitsubishi equipment. Refer to CPU module User's Manual for a description of the PC system safety precautions.


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



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



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.

## [INSTALLATION PRECAUTION]

### CAUTION

- Use the PLC in an environment that meets the general specifications contained in CPU module User's Manual to use.  
Using this PLC in an environment outside the range of the general specifications may cause electric shock, fire, malfunction, and damage to or deterioration of the product.
- When installing the module, securely insert the module fixing tabs into the mounting holes of the base module while pressing the installation lever located at the bottom of the module downward.  
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 or shock during use.  
Tighten the screws within the range of specified torque.  
If the screws are loose, it may cause the module to fallout or malfunction.  
If the screws are tightened too much, it may cause damage to the screw and/or the module, resulting in fallout or malfunction.
- Switch all phases of the external power supply off when 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 PRECAUTION]

### **DANGER**

- Switch all phases of the external power supply off when installing or placing wiring. Not doing so may cause electric shock or damage to the product.

### **CAUTION**

- Check the layout of the terminals and then properly route the wires to the module.
- Solder connectors for external device properly.  
Insufficient soldering may cause malfunction.
- Be careful not to let foreign matter 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 ventilation.
- Securely connect the connectors for the drive module to the connectors on the module and firmly tighten the two screws.
- Be sure to fix cables leading from the module by placing them in a duct or clamping them.  
Cables not placed in the duct or without clamping may hang or shift, allowing them to be accidentally pulled, which may cause a module malfunction and cable damage.
- When removing the cable or power supply cable from the module, do not pull the cable. When removing the cable with a connector, hold the connector on the side that is connected to the module.  
Pulling the cable that is still connected to the module may cause malfunction or damage to the module or cable.
- The cable used for connecting the QD70 external input/output signal and the drive module should not be routed near or bundled with the main circuit cable, power cable and/or other such load-carrying cables other than those for the PLC. These cables should be separated by at least 100 mm (3.94 in.). They can cause electrical interference, surges and inductance that can lead to mis-operation.

## Revisions

\* The manual number is noted at the lower left of the back cover.

Print Date	*Manual Number	Revision
Mar., 2001	IB(NA)-0800169-A	First edition
Jun., 2001	IB(NA)-0800169-B	<div>Addition</div> About Manuals <div>Partial correction</div> Section 2.2
Dec., 2001	IB(NA)-0800169-C	<div>Partial correction</div> Section 1, Section 2.1

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## About Manuals

The following manuals are related to this product.  
Referring to this list, please request the necessary manuals.

### Detailed Manual

Manual name	Manual No. (Model code)
Type QD70 Positioning Module User's Manual	SH-080171 (13JR39)

## Conformation to the EMC Directive and Low Voltage Instruction

For details on making Mitsubishi PLC conform to the EMC directive and low voltage instruction when installing it in your product, please refer to Chapter 3, "EMC Directive and Low Voltage Instruction" of the using PLC CPU module User's Manual(Hardware).

The CE logo is printed on the rating plate on the main body of the PLC that conforms to the EMC directive and low voltage instruction.

To make this product conform to the EMC directive and low voltage instruction, please refer to Chapter 5 "Wiring".

## 1. Overview

This manual explains how to handle the Positioning Module, model numbers QD70P4 and QD70P8 (hereinafter collectively referred to as the QD70). After unpacking the QD70, please verify that the corresponding product as listed below is enclosed in the package.

Model name	Description	Quantity
QD70P4	QD70P4 Positioning Module (4-axis open collector output type)	1
QD70P8	QD70P8 Positioning Module (8-axis open collector output type)	1

The user should arrange for a connector for external wiring since it is not provided in the package.

\* Connector type

- A6CON1 (Soldering type, straight out)
- A6CON2 (Crimping type, straight out)
- A6CON4 (Soldering out, usable for straight out and diagonal out)

\* A6CON2 crimping tool

- Model name: FCN-363T-T005/H
- Supplier's offices :
  - FUJITSU AMERICA, INC.  
250E Caribbean Drive Sunnyvale, CA 94089 U.S.A  
Tel: (1-408)745-4900
  - FUJITSU EUROPE B.V.  
Jupiterstaat 13-15, our 2132 Hoofddorp, The Netherland  
Tel: (31)23-5560910
  - FUJITSU EUROPE B.V. Zweiniederlassung Deutschland  
Schatzbogen 86 D-81829 Munchen Germany  
Tel: (49)89-42742320
  - FUJITSU EUROPE (UK)  
Network House, Morres Drive, Maidenhead, Berkshire, SL6 4FH  
United Kingdom  
Tel: (44)1628-504600
  - FUJITSU EUROPE B.V.  
127 Chemin Des Bassins, Europarc, Cleteril 94035 Cleteril 94035  
France  
Tel: (33)145139940
  - FUJITSU ASIA PACIFIC PTE LIMITED  
102E Pasir Panjang Road, #04-01 Citilink Warehouse Complex,  
Singapore 118529  
Tel: (65)375-8560
  - FUJITSU HONG KONG CO., LTD.  
Suite 913 Ocean Centre, 5 Canton Road, TST, Kowloon, Hong Kong  
Tel: (852)2881-8495

## 2. Specifications

### 2.1 Performance Specifications

Item	Specification	
	QD70P4	QD70P8
Number of axes	4 axes	8 axes
Pulse output system	Open-collector output	
Maximum output pulse count (pulse/s)	200 kpulse/s	
Maximum connection distance between drive units	2m (6.56ft)	
Applicable wire size	0.3 mm <sup>2</sup> (when A6CON1 is used), AWG#24 (when A6CON2 is used), AWG#23 (when A6CON4 is used)	
Applicable connector	A6CON1, A6CON2, A6CON4 (sold separately)	
Number of I/O occupied points	32points (I/O assignment: 32points for intelligent function module)	
Internal current consumption (5VDC)	0.55A	0.74A
External 24V current consumption (24VDC)	0.065A	0.12A
Weight	0.15kg/0.33lb.	0.17kg/0.37lb.

### 2.2 Electrical Specifications

#### (1) Input specifications

Signal name	Rated input voltage /current	Working voltage range	ON voltage /current	OFF voltage /current	Input resistance	Response time
Zero signal (PG0)	5VDC /18mA	4.5 to 5.5VDC	2.7VDC or more/5.5mA or more	1.0VDC or less/0.5mA or less	Approx. 270Ω	0.1ms or less
Near-point dog signal (DOG) Speed-position switching signal(CHG)	24VDC/5mA	19.2 to 26.4VDC	17.5VDC or more/3mA or more	7VDC or less /0.9mA or less	Approx. 6.8kΩ	1ms or less

#### (2) Output specifications

Signal name	Rated load voltage	Working load voltage range	Max. load current/rush current	Max. voltage drop at ON	Leakage current at OFF	Response time
Pulse output (PULSE F/PULSE R)	5 to 24VDC	4.75 to 30VDC	50mA/1 point/ 200mA10ms or less	5VDC(TYP)	0.1mA or less	-
Deviation counter clear (CLEAR)	5 to 24VDC	4.75 to 30VDC	0.1A/1 point/ 0.4A10ms or less	1VDC(TYP) 2.5VDC(MAX)	0.1mA or less	2ms or less (resistance load)

#### (3) External power source (For driving the pulse output circuit)

Signal name	Rated input voltage	Current consumption
External power source input (+24V/24G)	24VDC (+20%/-15)(Ripple rate within 5%)	QD70P4:0.065A, QD70P8:0.12A

For the general specifications of the QD70, see User's Manual for the CPU module used.

## 3. Handling

### DANGER

- Provide a safety circuit outside the programmable logic controller so that the entire system will operate safely even when an external power supply error or PLC fault occurs.  
Failure to observe this could lead to accidents for incorrect outputs or malfunctioning.
  - (1) Configure an emergency stop circuit and interlock circuit such as a positioning upper limit/lower limit to prevent mechanical damage outside the PLC.
  - (2) The OPR operation is controlled by the OPR direction and OPR speed data.  
Deceleration starts when the near-point dog turns ON. Thus, if the OPR direction is incorrectly set, deceleration will not start and the machine will continue to travel.  
Configure an interlock circuit to prevent mechanical damage outside the PLC.
  - (3) When the module detects an error, deceleration stop will take place.  
Make sure that the OPR data and positioning data are within the parameter setting values.

### CAUTION

- Use the PLC in an environment that meets the general specifications contained in CPU module User's Manual to use.  
Using this PLC in an environment outside the range of the general specifications may cause electric shock, fire, malfunction, and damage to or deterioration of the product.
- When installing the module, securely insert the module fixing tabs into the mounting holes of the base module while pressing the installation lever located at the bottom of the module downward.  
Improper installation may result in malfunction, breakdown or dropping out of the module.  
Securely fix the module with screws if it is subject to vibration or shock during use.  
Tighten the screws within the range of specified torque.  
If the screws are loose, it may cause fallout or malfunction.  
If the screws are tightened too much, it may cause damage to the screw and/or the module, resulting in fallout or malfunction.
- Switch all phases of the external power supply off when 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.

### 3.1 Handling Precautions

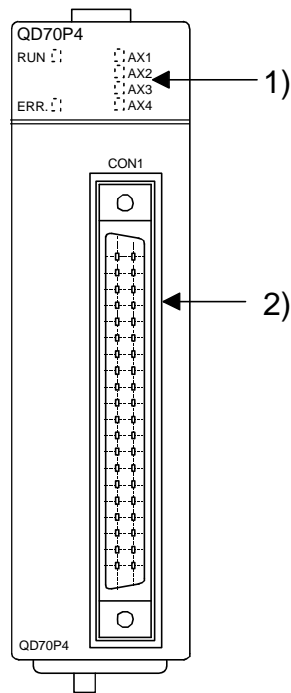
- (1) Since the module case is made of resin, do not drop it or subject it to strong impact.
- (2) The module can easily be secured to the base unit using the hooks located at the top of the module. However, if the module is to be placed in an area that is subject to strong vibration or impact, we recommend that it is secured with module mounting screws (to be provided by the user). In this case, tighten the module mounting screws within the following torque range.  
Module mounting screws (M3 × 12): Tightening torque range is from 36 to 48 N•cm.



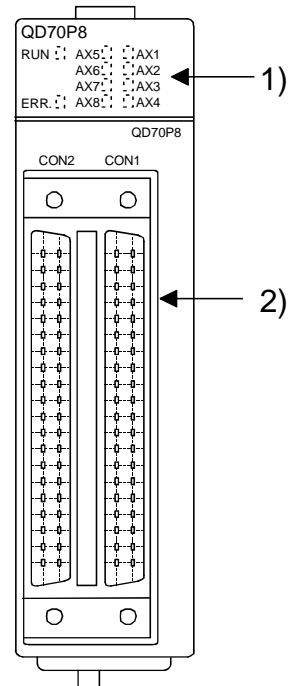
## 4. Part Identification Nomenclature

### (1) Part identification nomenclature

(a) QD70P4

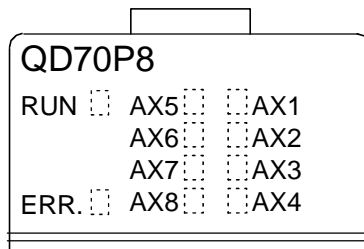


(b) QD70P8



Number	Name	Number	Name
1)	LED Display	2)	External device connector

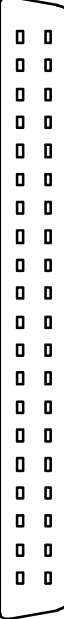
### (2) LED display contents



Details of indication	Operation Status	Description
<b>RUN</b> □ AX5 □ □AX1 AX6 □ □AX2 AX7 □ □AX3 <b>ERR.</b> □ AX8 □ □AX4	Extinguishment of RUN LED (The status of ERR. and AX1 to AX8 are unfixed.)	The hardware is faulty or the module error occurs.
<b>RUN</b> ■ AX5 □ □AX1 AX6 □ □AX2 AX7 □ □AX3 <b>ERR.</b> □ AX8 □ □AX4	Lighting of RUN LED, Extinguishment of ERR. LED	The module is normal.
<b>RUN</b> ■ AX5 □ □AX1 AX6 □ □AX2 AX7 □ □AX3 <b>ERR.</b> ■ AX8 □ □AX4	Lighting of ERR. LED	System error
<b>RUN</b> ■ AX5 □ □AX1 AX6 □ □AX2 AX7 □ □AX3 <b>ERR.</b> □ AX8 □ □AX4	Extinguishment of AX1 to AX8 LEDs	During axis stop, during axis standby
<b>RUN</b> ■ AX5 □ ■AX1 AX6 □ □AX2 AX7 □ □AX3 <b>ERR.</b> □ AX8 □ □AX4	Lighting of AX1 LED (Same even if the other axis is lit)	During axis operation
<b>RUN</b> ■ AX5 □ ◆AX1 AX6 □ □AX2 AX7 □ □AX3 <b>ERR.</b> ◆ AX8 □ □AX4	Flashing of ERR. LED Flasihing of AX1 LED (Same even if the other axis is flashes)	Axis error

The symbols in the Display column indicate the following statuses:  
□: Turns OFF, ■: Illuminates, ◆: Flashes

### (3) External device connector signal layout

Pin layout		CON2 (For axis5 to axis8)				CON1 (For axis1 to axis4)			
		Pin No.	Signal name	Pin No.	Signal name	Pin No.	Signal name	Pin No.	Signal name
	B20		PG06 COM <sup>*1</sup>	A20	PG08 COM <sup>*1</sup>	B20	PG02 COM <sup>*1</sup>	A20	PG04 COM <sup>*1</sup>
	B19		PG06	A19	PG08	B19	PG02	A19	PG04
	B18		PG05 COM <sup>*1</sup>	A18	PG07 COM <sup>*1</sup>	B18	PG01 COM <sup>*1</sup>	A18	PG03 COM <sup>*1</sup>
	B17		PG05	A17	PG07	B17	PG01	A17	PG03
	B16		CLEAR6 COM <sup>*2</sup>	A16	CLEAR8 COM <sup>*2</sup>	B16	CLEAR2 COM <sup>*2</sup>	A16	CLEAR4 COM <sup>*2</sup>
	B15		CLEAR6	A15	CLEAR8	B15	CLEAR2	A15	CLEAR4
	B14		CLEAR5 COM <sup>*2</sup>	A14	CLEAR7 COM <sup>*2</sup>	B14	CLEAR1 COM <sup>*2</sup>	A14	CLEAR3 COM <sup>*2</sup>
	B13		CLEAR5	A13	CLEAR7	B13	CLEAR1	A13	CLEAR3
	B12		CHG6	A12	CHG8	B12	CHG2	A12	CHG4
	B11		CHG5	A11	CHG7	B11	CHG1	A11	CHG3
	B10		DOG6	A10	DOG8	B10	DOG2	A10	DOG4
	B9		DOG5	A9	DOG7	B9	DOG1	A9	DOG3
	B8		COM 5-6 <sup>*3</sup>	A8	COM 7-8 <sup>*3</sup>	B8	COM 1-2 <sup>*3</sup>	A8	COM 3-4 <sup>*3</sup>
	B7		PULSE F6	A7	PULSE F8	B7	PULSE F2	A7	PULSE F4
	B6		PULSE COM6 <sup>*4</sup>	A6	PULSE COM8 <sup>*4</sup>	B6	PULSE COM2 <sup>*4</sup>	A6	PULSE COM4 <sup>*4</sup>
	B5		PULSE R6	A5	PULSE R8	B5	PULSE R2	A5	PULSE R4
	B4		PULSE F5	A4	PULSE F7	B4	PULSE F1	A4	PULSE F3
	B3		PULSE COM5 <sup>*4</sup>	A3	PULSE COM7 <sup>*4</sup>	B3	PULSE COM1 <sup>*4</sup>	A3	PULSE COM3 <sup>*4</sup>
	B2		PULSE R5	A2	PULSE R7	B2	PULSE R1	A2	PULSE R3
	B1		Vacant	A1	Vacant	B1	+24V <sup>*5</sup>	A1	+24G <sup>*5</sup>

\*1: Common for PG0□. (Axis No. 1 to 8 goes into □).

\*2: Common for CLEAR□. (Axis No. 1 to 8 goes into □).

\*3: Common for DOG□, CHG□. (Axis No. 1 to 8 goes into □).

\*4: Common for PULSE F□, PULSE R□. (Axis No. 1 to 8 goes into □).

\*5: The external power source (24VDC) should be connected in order to output a command pulse.

(When outputting a command pulse of axis 5 to 8, the external power source (24VDC) should be connected to A1 and B1 of the connector CON1 (for axis 1 to 4 use).)

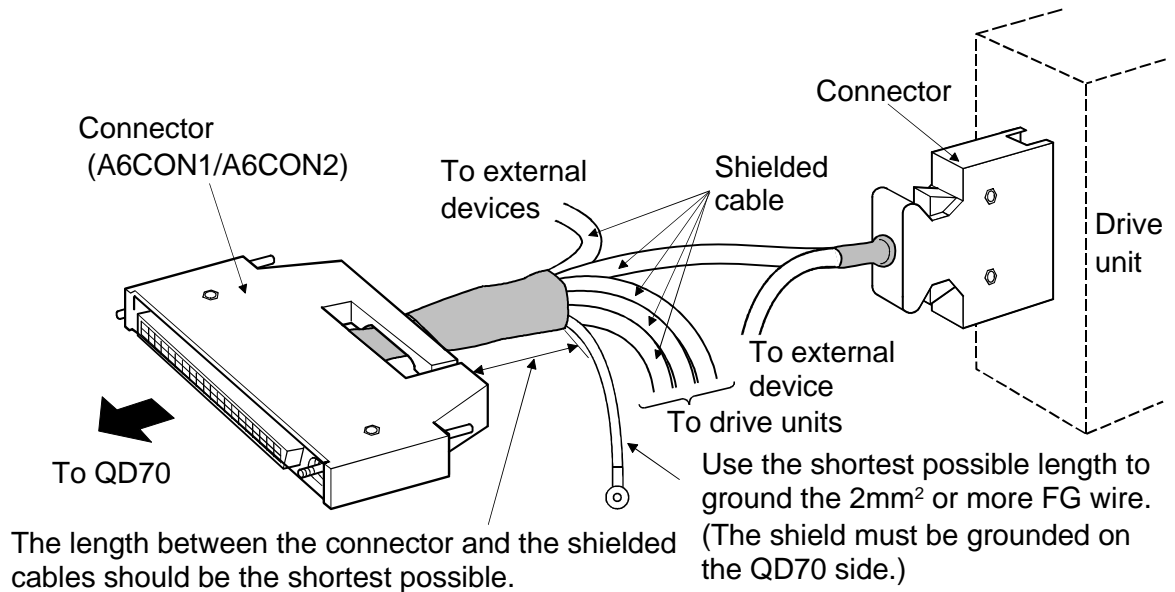
## 5. Wiring

### DANGER

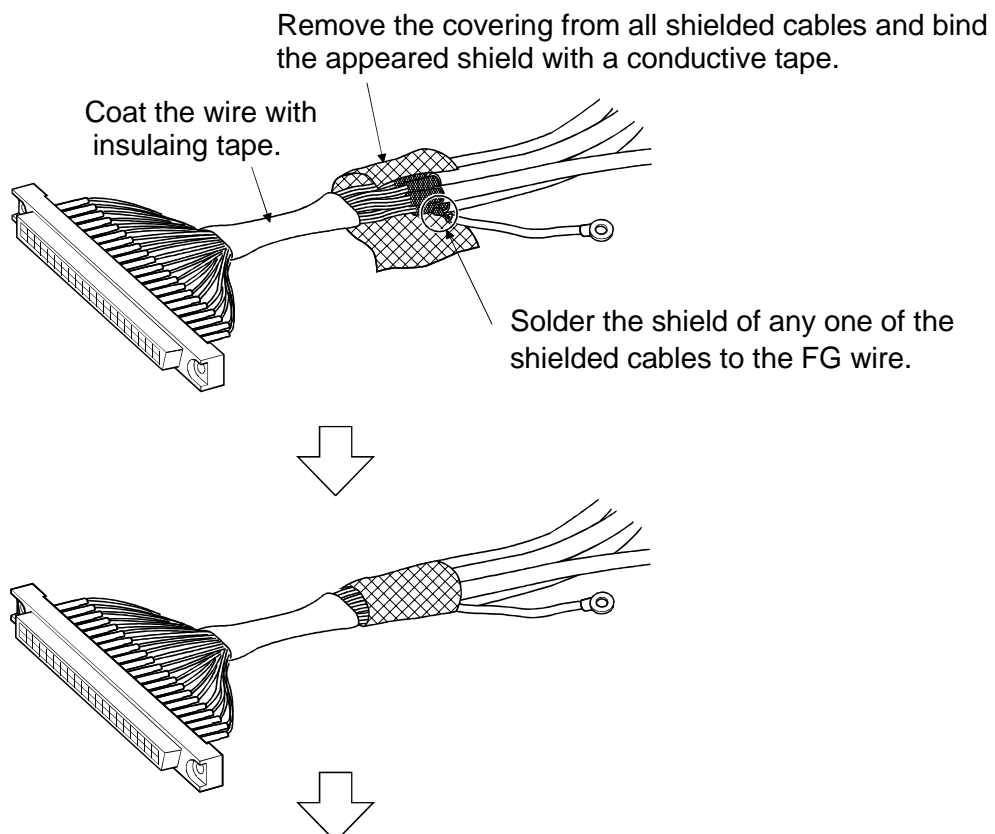
- Switch all phases of the external power supply off when installing or placing wiring. Not doing so may cause electric shock or damage to the product.

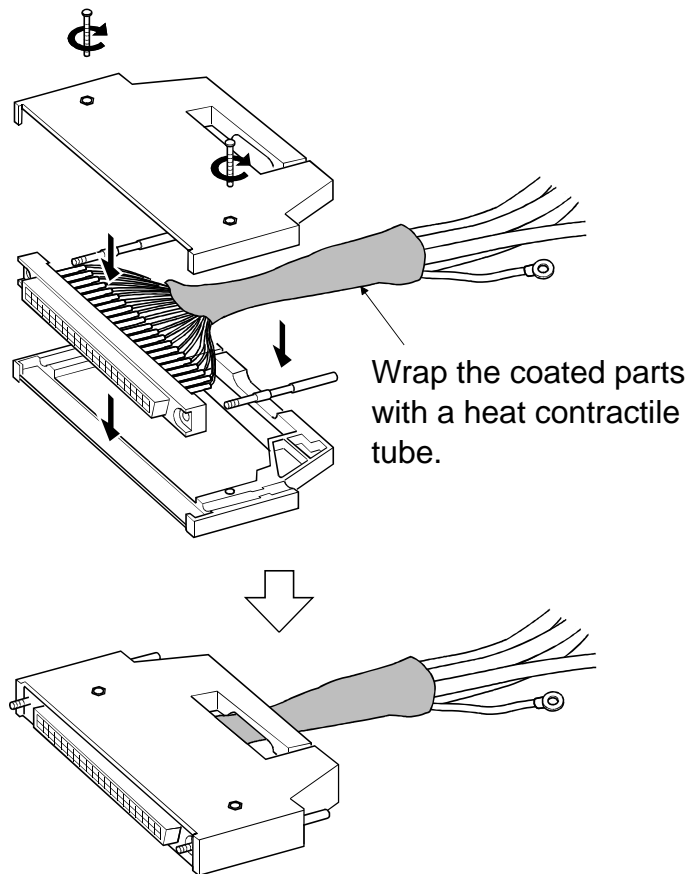
#### 5.1 Wiring Precautions

- (1) If cables to connect to QD70 absolutely must be positioned near (within 100 mm) the power line, use a general shielded cable. The shield must be grounded on the QD70 side.

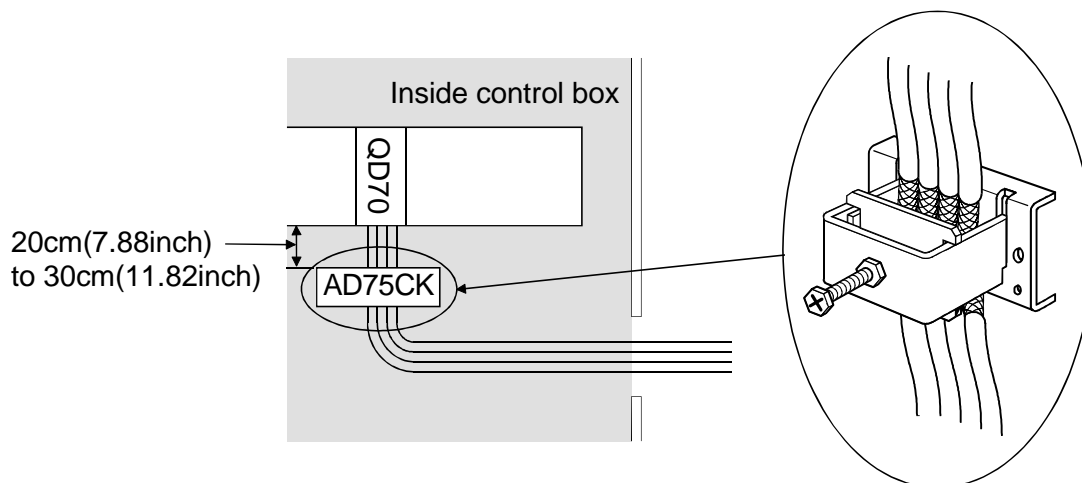


#### [Processing example of shielded cables]





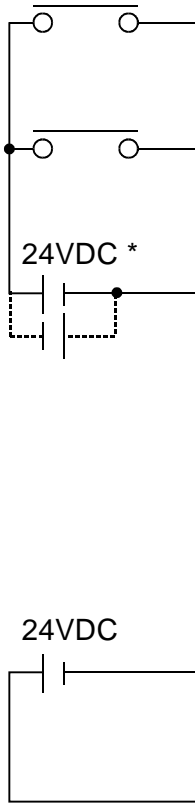
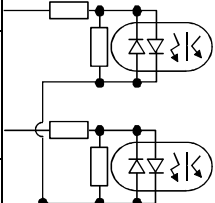
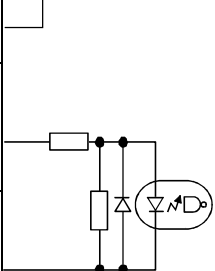
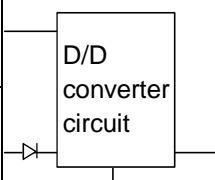
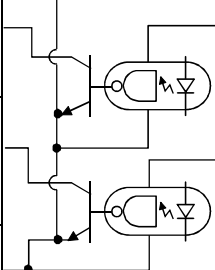
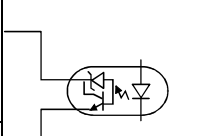
- (2) The shielded cable for connecting QD70 can be secured in place.  
If the shielded cable is not secured, unevenness or movement of the shielded cable or careless pulling on it could result in damage to the QD70 or drive unit or shielded cable or defective cable connections could cause mis-operation of the unit.
- (3) To make this product conform to the EMC directive and low voltage instruction, be sure to use of a AD75CK type cable clamp (manufactured by Mitsubishi Electric) for grounding to the control box.



Using the AD75CK, you can tie four cables of about 7mm outside diameter together for grounding.

## 5.2 External Interface

Shows summary image of the internal circuit of the interface for connection to external devices of the QD70. (For QD70P4, axis 1).

Input/output class	External wiring	Pin No.	Internal circuit	Signal name	
Input		B9		Near-point dog signal	DOG1
		B11		Speed-position switching signal	CHG1
		B8		Common	COM1-2
		B17		Zero signal	PG01
		B18		Zero signal common	PG01 COM
		A1		External power input (0V)	24G
		B1		External power input (24VDC)	+24V
Output		B4		Pulse output F (CW/PULSE)	PULSE F1
		B2		Pulse output R (CCW/SIGN)	PULSE R1
		B3		Pulse output common	PULSE COM1
		B13		Deviation counter clear	CLEAR1
		B14		Deviation counter clear common	CLEAR1 COM

\*: Either polarity can be connected to the common (COM1-2).

## 6. Setting from GX Developer

Settings for QD70 pulse output mode, external input/output signal logic, and rotation direction can be made by the GX Developer intelligent function module switch setting.

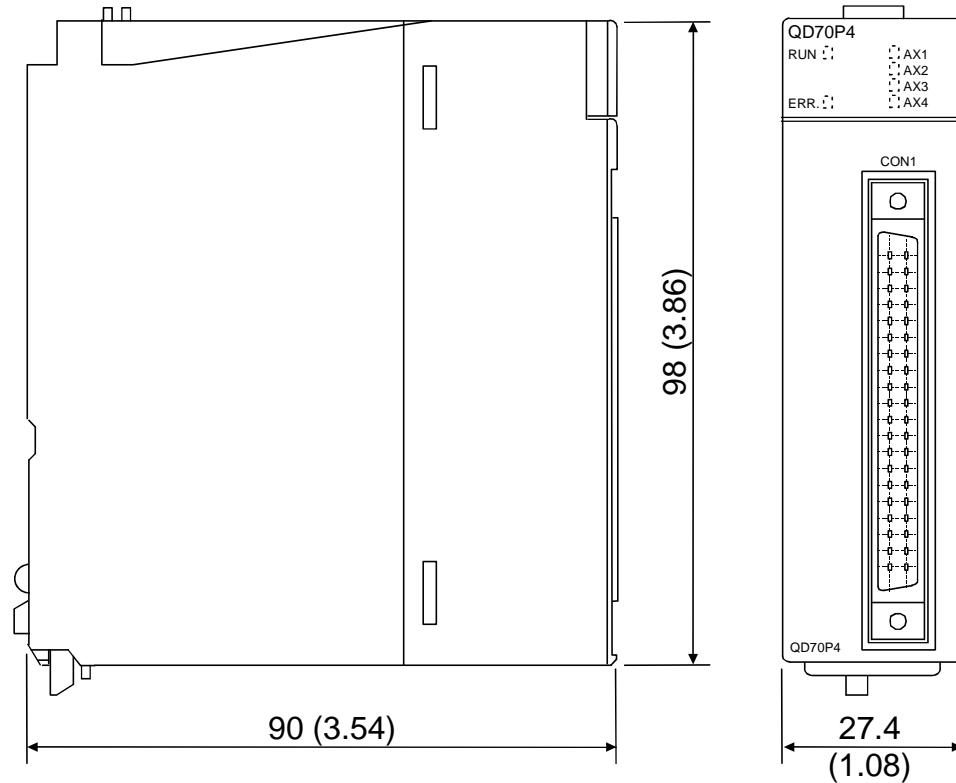
Use the GX Developer's I/O assignment setting to make the intelligent function module switch setting.

- The intelligent function module switch has switches 1 to 5, and is set at 16 bit data.
- If the intelligent function module switch setting is not operated, the default setting for switches 1 to 5 is 0.

Switch No.	Setting items	Setting details/bit assignment
Switch 1	Pulse output mode	<div> <div> b15  <div> <div>⑧</div> <div>⑦</div> <div>⑥</div> <div>⑤</div> <div>④</div> <div>③</div> <div>②</div> <div>①</div> </div> </div> <div> b8 b7  <div> <div>⑧</div> <div>⑦</div> <div>⑥</div> <div>⑤</div> <div>④</div> <div>③</div> <div>②</div> <div>①</div> </div> </div> <div> b0 </div> </div> <p>① to ⑧ indicate axis No.  00: CW/CCW mode  01: PULSE/SIGN mode</p>
Switch 2	Pulse output logic selection	<div> <div> b15  <div> <div>⑧</div> <div>⑦</div> <div>⑥</div> <div>⑤</div> <div>④</div> <div>③</div> <div>②</div> <div>①</div> </div> </div> <div> b8 b7  <div> <div>⑧</div> <div>⑦</div> <div>⑥</div> <div>⑤</div> <div>④</div> <div>③</div> <div>②</div> <div>①</div> </div> </div> <div> b0 </div> </div> <p>Deviation counter clear output logic selection      Pulse output logic selection</p>
	Deviation counter clear output logic selection	<p>① to ⑧ indicate axis No.  0: Negative logic  1: Positive logic</p>
Switch 3	Zero signal input logic selection	<div> <div> b15  <div> <div>⑧</div> <div>⑦</div> <div>⑥</div> <div>⑤</div> <div>④</div> <div>③</div> <div>②</div> <div>①</div> </div> </div> <div> b8 b7  <div> <div>⑧</div> <div>⑦</div> <div>⑥</div> <div>⑤</div> <div>④</div> <div>③</div> <div>②</div> <div>①</div> </div> </div> <div> b0 </div> </div> <p>Rotation direction setting      Zero signal input logic selection</p>
	Rotation direction setting	<p>① to ⑧ indicate axis No.  &lt;Rotation direction setting&gt;  0: Current value increment with forward run pulse output  1: Current value increment with reverse run pulse output</p>
Switch 4	Near-point dog signal input logic selection	<div> <div> b15  <div> <div>—</div> </div> </div> <div> b7  <div> <div>⑧</div> <div>⑦</div> <div>⑥</div> <div>⑤</div> <div>④</div> <div>③</div> <div>②</div> <div>①</div> </div> </div> <div> b0 </div> </div> <p>① to ⑧ indicate axis No.  0: Negative logic  1: Positive logic</p>
Switch 5		Vacant

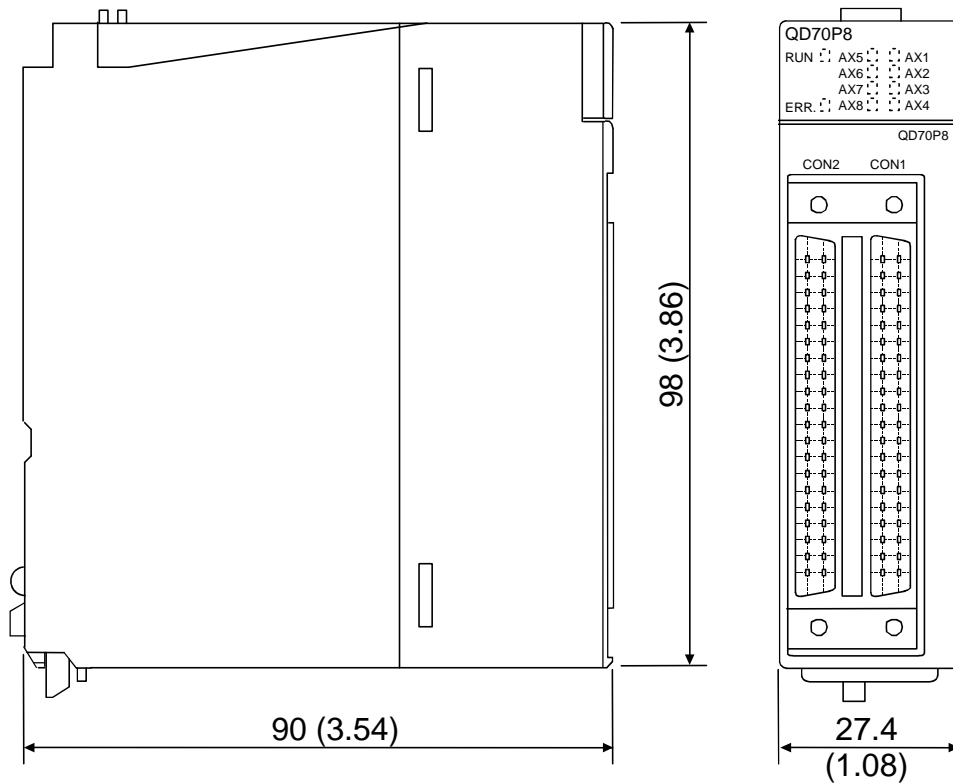
## 7. External Dimensions

(1) QD70P4



Unit:mm (in.)

(2) QD70P8



Unit:mm (in.)

## 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.

Country/Region	Sales office/Tel	Country/Region	Sales office/Tel
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Brazil	MELCO-TEC Rep. Com.e Assessoria Tecnica Ltda. Av. Rio Branco, 123-15 ,and S/1507, Rio de Janeiro, RJ CEP 20040-005, Brazil Tel : +55-21-221-8343	Taiwan	Setsuyo Enterprise Co., Ltd. 6F., No.105 Wu-Kung 3rd.RD, Wu-Ku Hsiang, Taipei Hsine, Taiwan Tel : +886-2-2299-2499
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U.K	Mitsubishi Electric Europe B.V. UK Branch Travellers Lane, Hatfield, Herts., AL10 8XB,UK Tel : +44-1707-276100	Singapore	Mitsubishi Electric Asia Pte, Ltd. 307 ALEXANDRA ROAD #05-01/02, MITSUBISHI ELECTRIC BUILDING SINGAPORE 159943 Tel : +65-473-2480
Italy	Mitsubishi Electric Europe B.V. Italian Branch Centro Dir. Colleoni, Pal. Perseo - Ingr.2 Via Paracelso 12, 20041 Agrate B., Milano, Italy Tel:+39-039-60531	Thailand	F. A. Tech Co.,Ltd. 898/28,29,30 S.V.City Building,Office Tower 2,Floor 17-18 Rama 3 Road, Bangkpongpan, Yannawa, Bangkok 10120 Tel : +66-2-682-6522
Spain	Mitsubishi Electric Europe B.V. Spanish Branch Carretera de Rubi 76-80 08190 - Sant Cugat del Valles, Barcelona, Spain Tel:+34-935-653135	Indonesia	P.T. Autoteknindo SUMBER MAKMUR Jl. Muara Karang Selatan Block A Utara No.1 Kav. No.11 Kawasan Industri/ Pergudangan Jakarta - Utara 14440 Tel : +62-21-663-0833
South Africa	Circuit Breaker Industries LTD. Private Bag 2016, Isando 1600, Johannesburg, South Africa Tel : +27-11-928-2000	India	Messung Systems Put,Ltd. Electronic Sadan NO:111 Unit No15, M.I.D.C BHOSARI,PUNE-411026 Tel : +91-20-7128927
Hong Kong	Ryoden Automation Ltd. 10th Floor, Manulife Tower, 169 Electric Road, North Point, HongKong Tel : +852-2887-8870	Australia	Mitsubishi Electric Australia Pty. Ltd. 348 Victoria Road, PostalBag, No 2, Rydalmere, N.S.W 2116, Australia Tel : +61-2-9684-7777



## MITSUBISHI ELECTRIC CORPORATION

HEAD OFFICE : 1-8-12, OFFICE TOWER Z 14F HARUMI CHUO-KU 104-6212, JAPAN  
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