MITSUBISHI

High-Speed Counter Module

User's Manual
(Hardware)

QD62
QD62E
QD62D

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	QD62 (E/D)-U-H-JE
MODEL CODE	13JQ69
IB(NA)-0800059-E(0712)MEE	

● SAFETY PRECAUTIONS ●

(Always read before starting use)

Before using this product, please read this manual and the relevant manuals introduced in this manual carefully and pay full attention to safety to handle the product correctly.
The instructions given in this manual are concerned with this product. For the safety instructions of the programmable controller system, please read the CPU module user's manual.
In this manual, the safety instructions are ranked as "DANGER" and "CAUTION".

⚠DANGER	Indicates that incorrect handling may cause hazardous conditions, resulting in death or severe injury.
⚠CAUTION	Indicates that incorrect handling may cause hazardous conditions, resulting in medium or slight personal injury or physical damage.

Note that the ⚠ **CAUTION** level may lead to a serious consequence according to the circumstances.
Always follow the instructions of both levels because they are important to personal safety.
Please keep this manual in a safe place for future reference and also pass this manual on to the end user.

[DESIGN PRECAUTIONS]

⚠DANGER

- Depending on the malfunction of the external output transistor, there may be cases where the output is ON or OFF status. Install external monitoring circuitry for output signals that may lead to major accidents.

⚠CAUTION

- 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 150 mm(5.9 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 contained in the CPU user's manual to use.
  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.
- 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 during use.
- Tighten the screws within the range of specified torque.
  If the screws are loose, it may cause 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.
- Completely turn off the externally supplied power used in the system before mounting or removing the module.
  Not doing so could result in damage to the product.
  Not doing so may cause electric shock or 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

- Perform correct pressure-displacement, crimp-contact or soldering for connector wire connections using the tools specified by the manufactures.
  Attach connectors to the module securely.
- 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.
- Be sure to fix communication cables or power supply cables leading from the module by placing them in the 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 communication 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.
- Always ground the shielded cable on the encoder side (relay box).
  Otherwise, malfunction may occur.
- When wiring, be sure to verify the rated voltage of the product as well as the terminal layout. Fire or failure may result if incorrect voltage is input or incorrect wiring is performed.
- Connecting terminals with incorrect voltage may result in malfunction or mechanical failure.

Revisions

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

Print Date	*Manual Number	Revision
Sep., 1999	IB-(NA)-0800059-A	First edition
Dec., 1999	IB-(NA)-0800059-B	Addition Conformation to the EMC Directice and Low Voltage Instruction
Nov., 2001	IB-(NA)-0800059-C	Partial correction Contact adress (Back cover)
Sep., 2007	IB-(NA)-0800059-D	Partial correction SAFETY PRECAUTION, CONTENTS Chapter 2, 3, 5, Section 5.2, 5.3
Dec., 2007	IB-(NA)-0800059-E	Partial correction SAFETY PRECAUTION, CONTENTS, Conformation to the EMC Directive and Low Voltage Instruction Chapter 2, 4, 5, 6

CONTENTS

About the Manuals

The following manuals are also related to this product.

Order them if necessary.

Related Manuals

Manual name	Manual No. (Model code)
Model QD62, QD62E, QD62D High-Speed Counter Module User's Manual	SH-080036 (13JL95)

Conformation to the EMC Directive and Low Voltage Instruction

When incorporating the Mitsubishi programmable controller into other machinery or system and keeping compliance with the EMC and low voltage directives, refer to Chapter 3, "EMC Directives and Low Voltage Directives" of the User's Manual (Hardware) included with the CPU module or base unit used.

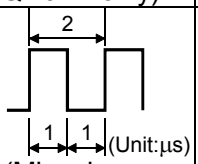
The CE logo is printed on the rating plate on the main body of the programmable controller that conforms to the EMC directive and low voltage instruction.

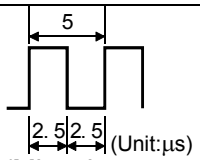
1. Overview

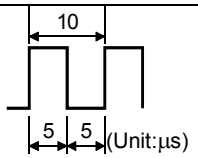
This user's manual describes the specifications and the part identification names of the following modules that are used with the CPU module for MELSEC-Q series: Model QD62 High-speed Counter Module (hereinafter referred to as QD62), Model QD62E High-speed Counter Module (hereinafter referred to as QD62E), and Model QD62D High-speed Counter Module (Hereinafter referred to as QD62D).

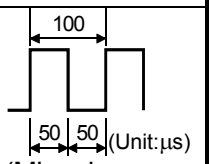
2. Performance Specifications

The following table shows the performance specifications of the high-speed counter modules:

<table>
<tr><th colspan="2">Item \ Model</th><th>QD62</th><th>QD62E</th><th>QD62D</th></tr>
<tr><td colspan="2">Number of I/O occupied point</td><td colspan="3">16 points (I/O assignment: Intelligent 16 points)</td></tr>
<tr><td colspan="2">Number of channels</td><td colspan="3">2 channels</td></tr>
<tr><td rowspan="2">Count input signal</td><td>Phase</td><td colspan="3">1-phase input, 2-phase input</td></tr>
<tr><td>Signal level</td><td colspan="2">5/12/24 V DC 2 to 5 mA</td><td>EIA rated RS-422-A Differential Line Driver Level { AM26LS31 (Texas Instruments Incorporated) or equivalent}</td></tr>
<tr><td rowspan="4">Counter</td><td>Counting speed (max) *1</td><td colspan="2">200/100/10 kPPS
(Depends on the Intelligent Function Module switch settings)</td><td>500/200/100/10 kPPS
(Depends on the Intelligent Function Module switch settings)</td></tr>
<tr><td>Counting range</td><td colspan="3">32-bit signed binary (-2147483648 to 2147483647)</td></tr>
<tr><td>Model</td><td colspan="3">UP/DOWN Preset counter + Ring counter function</td></tr>
<tr><td>Minimum count pulse width (Duty ratio 50 %)</td><td colspan="3">
<table>
<tr><th>500 kPPS (QD62D only)</th><th>200 kPPS</th><th>100 kPPS</th><th>10 kPPS</th></tr>
<tr><td> 

(Min. phase differential for 2-phase input: 0.5μs)</td><td> 

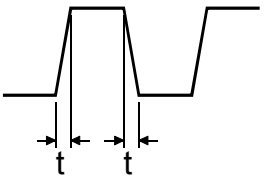
(Min. phase differential for 2-phase input: 1.25μs)</td><td> 

(Min. phase differential for 2-phase input: 2.5μs)</td><td> 

(Min. phase differential for 2-phase input: 25μs)</td></tr>
</table>
</td></tr>
<tr><td rowspan="2">Coincidence output</td><td>Comparison range</td><td colspan="3">32-bit signed binary</td></tr>
<tr><td>Comparison result</td><td colspan="3">Set value < Count value; Set value = Count value; Set value > Count value</td></tr>
<tr><td rowspan="2">External input</td><td>Preset</td><td colspan="2" rowspan="2">5/12/24 V DC 2 to 5 mA</td><td rowspan="2">5/12/24 V DC 2-5 mA (EIA rated RS-422-A Differential Line Driver may be connected)</td></tr>
<tr><td>Function start</td></tr>
<tr><td>External output</td><td>Coincidence output</td><td>Transistor (sink type) output
2 points/channel 12/24 V DC
0.5A/point; 2A/common</td><td>Transistor (source type) output
2 points/channel 12/24 V DC
0.1A/point; 0.4A/common</td><td>Transistor (sink type) output
2 points/channel 12/24 V DC
0.5A/point; 2A/common</td></tr>
<tr><td colspan="2">Applicable connectors</td><td colspan="3">A6CON1 (Soldering type ,straight out); A6CON2 (Solderless type ,straight out); A6CON3 (Pressure welding type ,straight out); A6CON4 (Soldering type ,usable for straight out and diagonal out)</td></tr>
<tr><td colspan="2">5 V DC internal current consumption</td><td>0.30 A</td><td>0.33 A</td><td>0.38 A</td></tr>
<tr><td colspan="2">Weight</td><td>0.11 kg</td><td>0.11 kg</td><td>0.12 kg</td></tr>
</table>

*1: Counting speed is affected by pulse rise and fall time. Possible counting speeds are shown in the following chart. Note that if a pulse that has a large rise and/or fall time is counted, a miscount may occur.

Counting speed switch settings	500 k	200 k	100 k	10 k
Rise/fall time	Both 1 and 2 phase input			
t = 0.5 μs or less	500 kPPS	200 kPPS	100 kPPS	10 kPPS
t = 1.25 μs or less	200 kPPS	200 kPPS	100 kPPS	10 kPPS
t = 2.5 μs or less	—	100 kPPS	100 kPPS	10 kPPS
t = 25 μs or less	—	—	10 kPPS	10 kPPS
t = 500 μs	—	—	—	500PPS



Remark

Refer to the user's manual of the CPU module used for general specifications of the QD62(E/D).

3. Installation

3.1 Handling Precautions

The following explains the precautionary notes on handling the module.

1) Do not drop or apply severe shock to the module case since it is made of resin.
2) Do not remove the PCB of each module from its case. Doing so may cause breakdowns.
3) Be careful not to let foreign particles such as wire chips get inside the module.
   These may cause fire, breakdowns and malfunctions.
4) The top surface of the module is covered with a protective film to prevent foreign objects such as wire chips 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.
5) Tighten the module fixing screw within the following specified torque range.
   If the screw is too loose, it may cause a drop, short circuit, or malfunction.
   Excessive tightening may damage the screw and/or the module, resulting in a drop, short circuit or malfunction.

Screw location	Tightening torque range
Module fixing screws (M3 screws) *1	0.36 to 0.48 N·m

*1 The module can be easily fixed onto the base unit using the hook at the top of the module.
However, it is recommended to secure the module with the module fixing screw if the module is subject to significant vibration or shock.

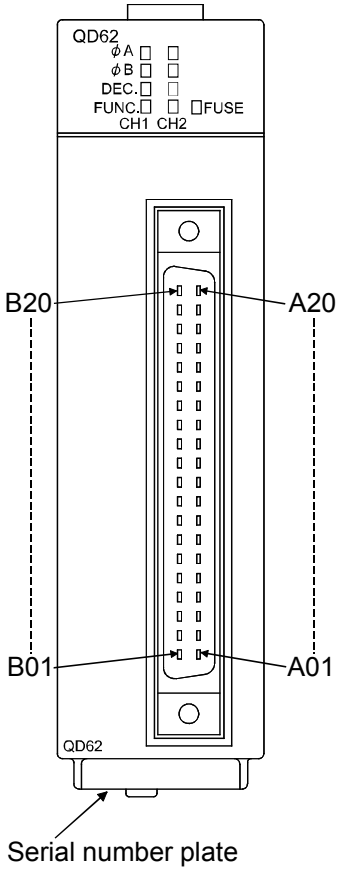
6) To mount the module on the base unit, fully insert the module fixing latch into the fixing hole in the base unit and press the module using the hole as a fulcrum.
   Improper installation may result in a malfunction or breakdown of the module, or may cause the module to fall off.

3.2 Installation Environment

For further details, refer to the user's manual for the CPU module used.

4. Part Identification Names

The following explains the names of the various parts of the high-speed counter module.



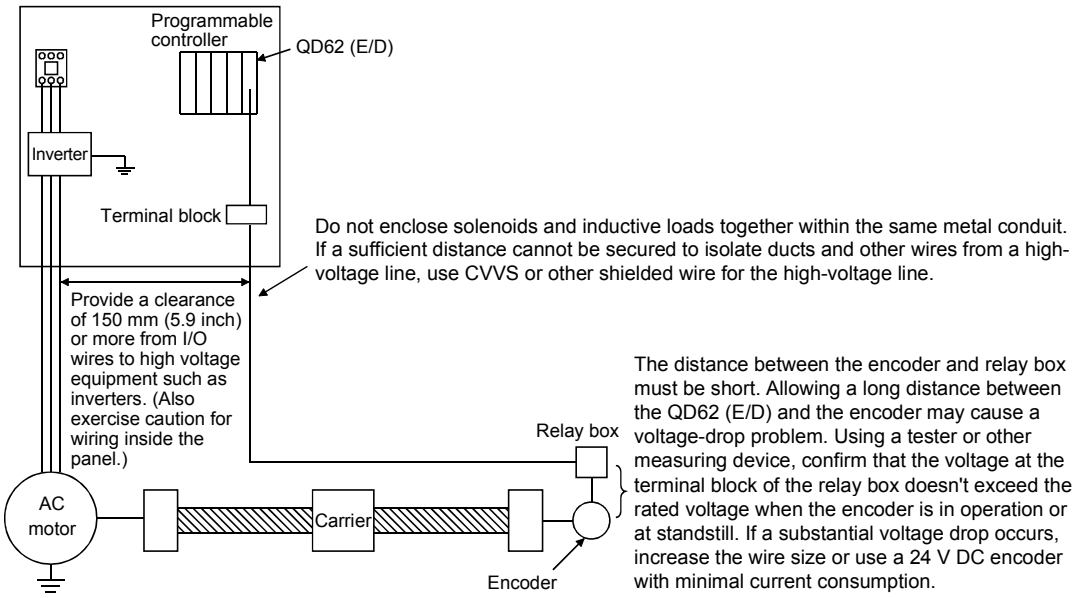
LED name	Description
ϕA	Lit: Voltage is being applied to the Phase A pulse input terminal.
ϕB	Lit: Voltage is being applied to the Phase B pulse input terminal.
DEC.	Lit: Counter is in the process of subtraction.
FUNC.	Lit: Voltage is being applied to the function start input terminal.
FUSE	Lit: Voltage is being applied to the external power supply input terminal while the fuse in the coincidence signal output section is broken.

Terminal number		QD62,QD62E	Terminal number		QD62D
CH1	CH2	Signal name	CH1	CH2	Signal name
A20	A13	Phase A pulse input 24 V	A20	A14	Phase A pulse input
B20	B13	Phase A pulse input 12 V	B20	B14	Phase $\overline{A}$ pulse input
A19	A12	Phase A pulse input 5 V	A19	A13	Phase B pulse input
B19	B12	ABCOM	B19	B13	Phase $\overline{B}$ pulse input
A18	A11	Phase B pulse input 24 V	A18	A12	Preset input 24 V
B18	B11	Phase B pulse input 12 V	B18	B12	Preset input 12 V
A17	A10	Phase B pulse input 5 V	A17	A11	Preset input 5 V
B17	B10	Preset input 24 V	B17	B11	PRSTCOM
A16	A09	Preset input 12 V	A16	A10	Function start input 24 V
B16	B09	Preset input 5 V	B16	B10	Function start input 12 V
A15	A08	CTRLCOM	A15	A09	Function start input 5 V
B15	B08	Function start input 24 V	B15	B09	FUNCCOM
A14	A07	Function start input 12 V	A08	A07	NC
B14	B07	Function start input 5 V	B08	B07	NC
A06	A05	EQU1 (Coincidence output point No. 1)	A06	A05	EQU1 (Coincidence output point No. 1)
B06	B05	EQU2 (Coincidence output point No. 2)	B06	B05	EQU2 (Coincidence output point No. 2)
A04	A03	NC	A04	A03	NC
B04	B03	NC	B04	B03	NC
A02	A01	0 V	A02	A01	0 V
B02	B01	12/24 V	B02	B01	12/24 V

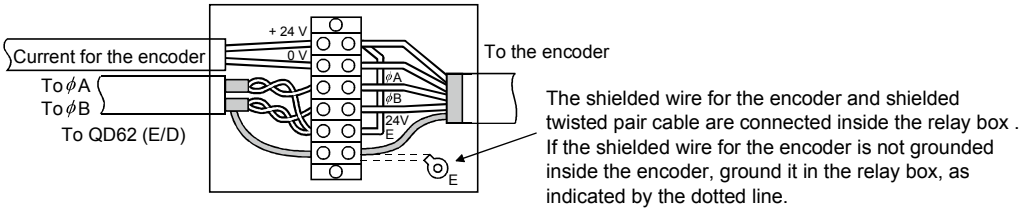
5. External Wiring

5.1 Wiring Precautions

1) Different terminals have been prepared for connection depending on the voltage of the input signal. Connecting a terminal of incorrect voltage may result in malfunction or mechanical failure.
2) For 1-phase input, always perform pulse input wiring on the Phase A side.
3) For the QD62 (E/D), count will be performed if pulse status noise is input and a miscount will result.
4) Provide the following measures against noise for high-speed pulse input:
   a) Always use a shielded twisted pair cable and provide grounding.
   b) Avoid placing the shielded twisted pair cable parallel to wires that have large amounts of noise such as power cables or input/output cables. Place the cable at least 150mm (5.9 inch) from such wires and perform wiring using the least distance as possible.
5) An example of wiring incorporating measures against noise is shown below:



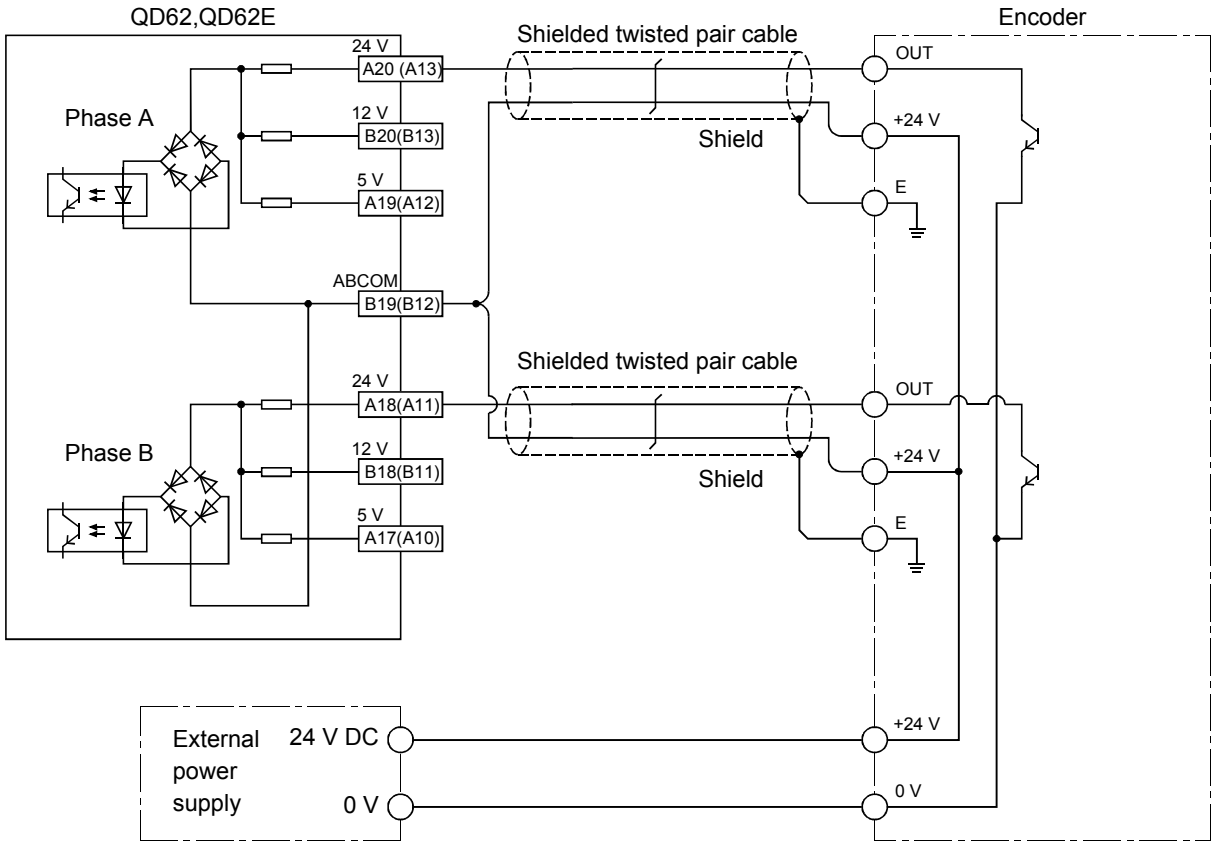
- Grounding the shielded twisted pair cable is performed on the encoder side (relay box). (This example shows connection with 24 V sink load.



5.2 External Wiring

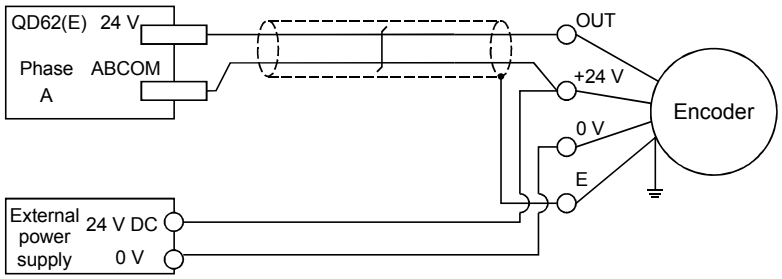
1) Wiring example of a module and an encoder

a) Wiring example with an open collector output type encoder (24 V DC)

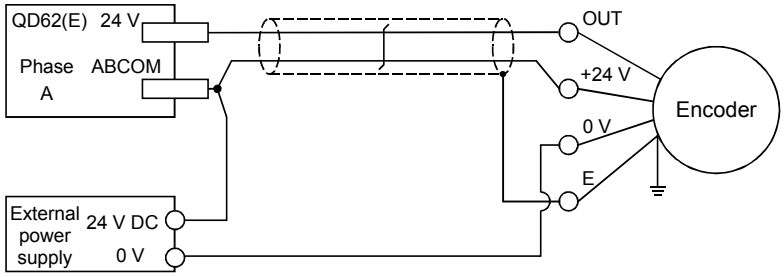


POINT

When wiring the QD62, QD62E and the encoder, separate the power supply cable and signal cable.
The following diagram shows an example.
[Wiring example]

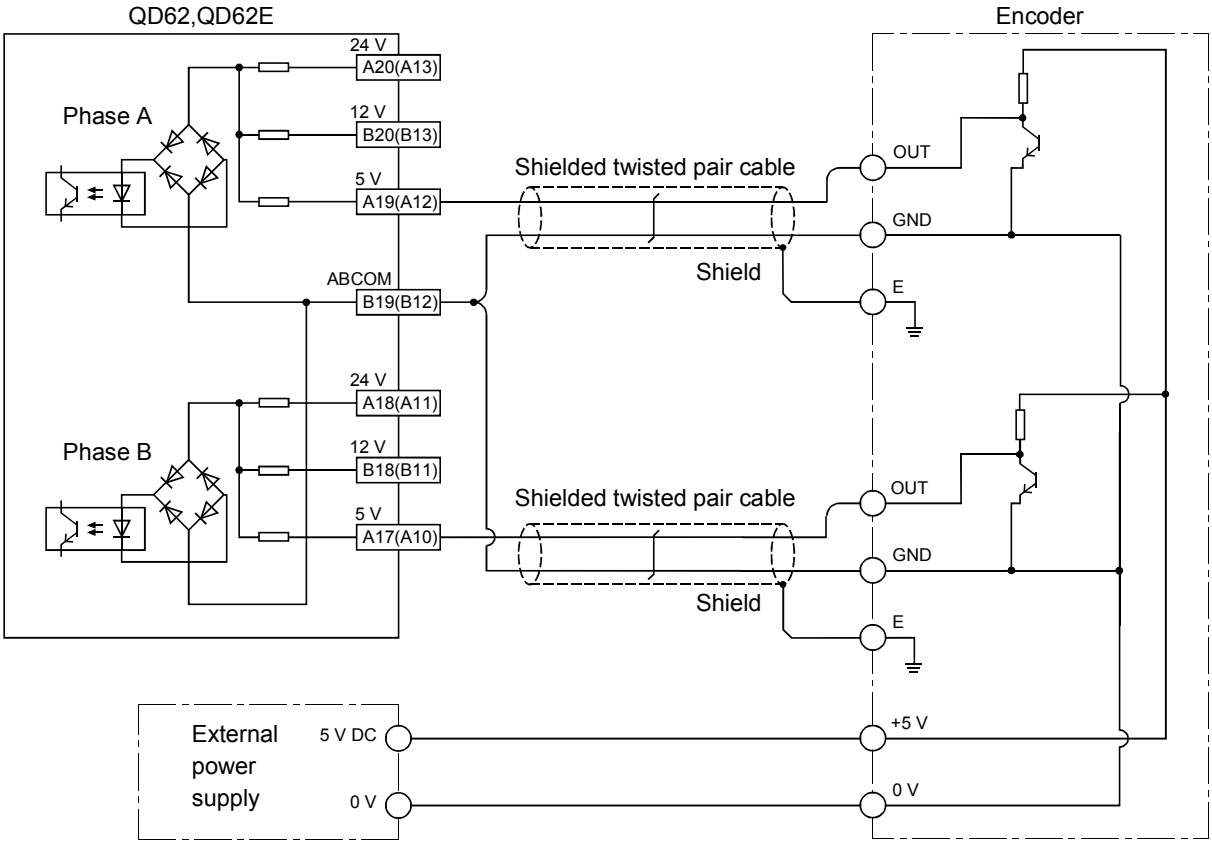


[Incorrect wiring example]

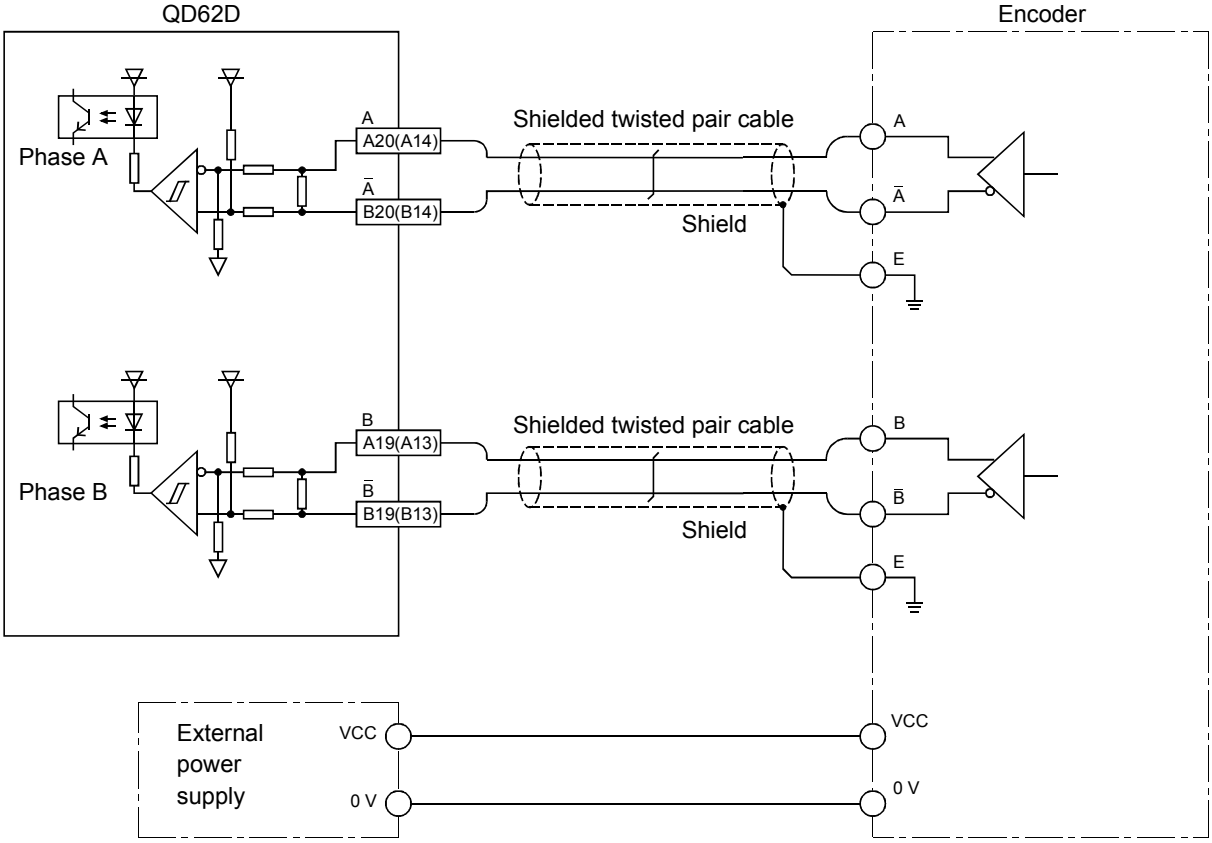


The current flows through the shielded twisted pair cable in the same direction, so there is no cancelling effect.
This makes it more prone to electromagnetic induction.

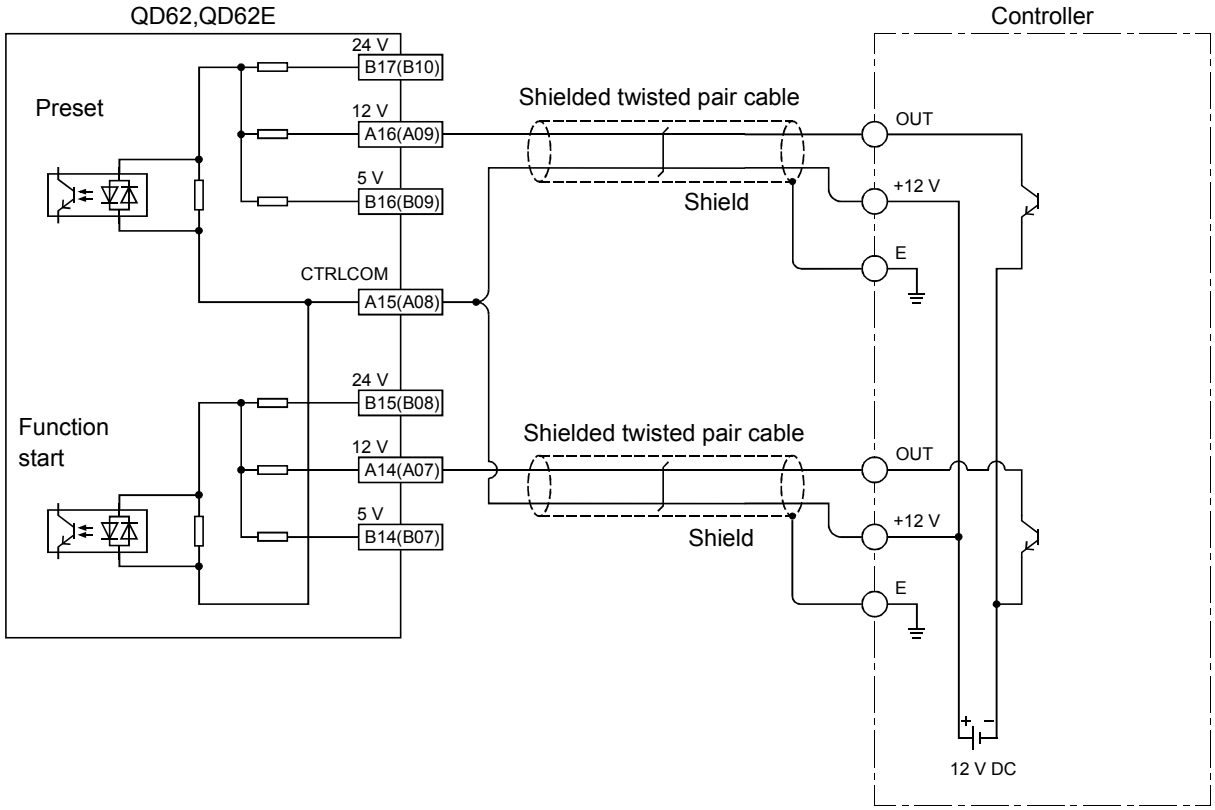
b) Wiring example with a voltage output type encoder (5 V DC)

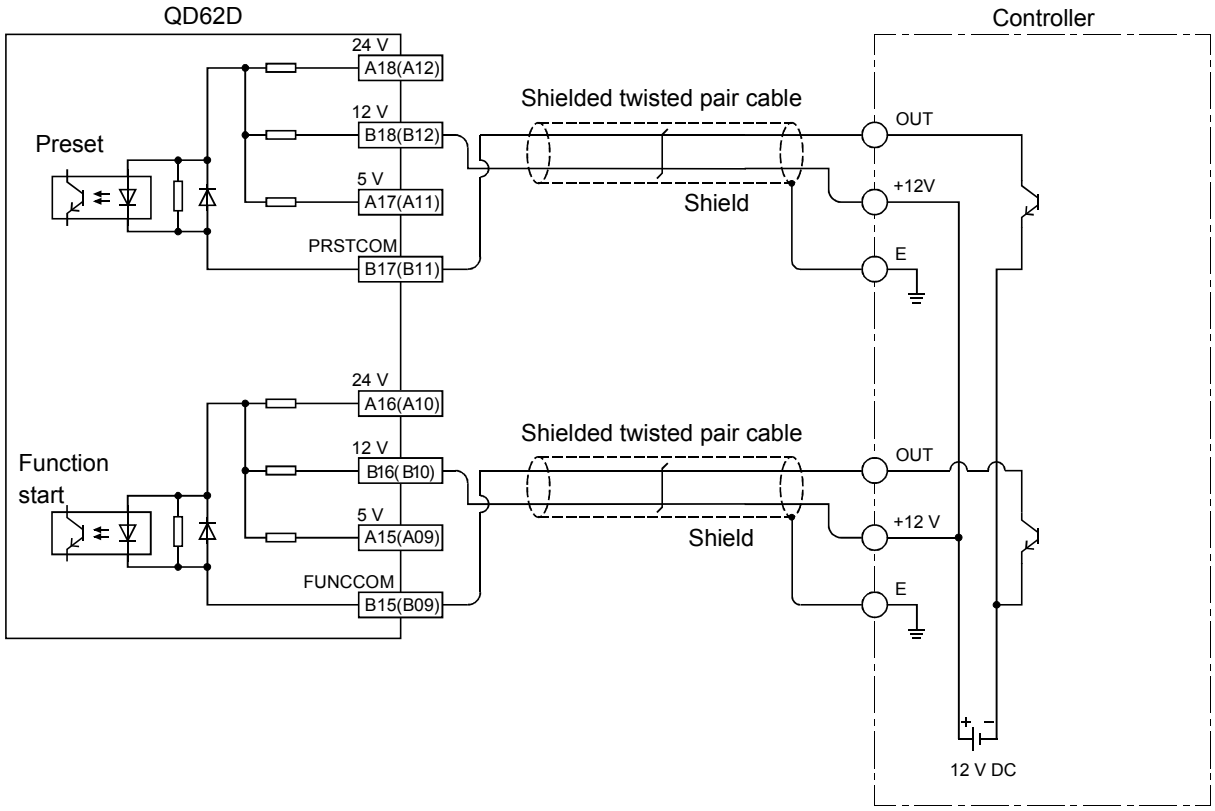


c) Wiring example with line driver (AM26LS31 or equivalent) pulse generator

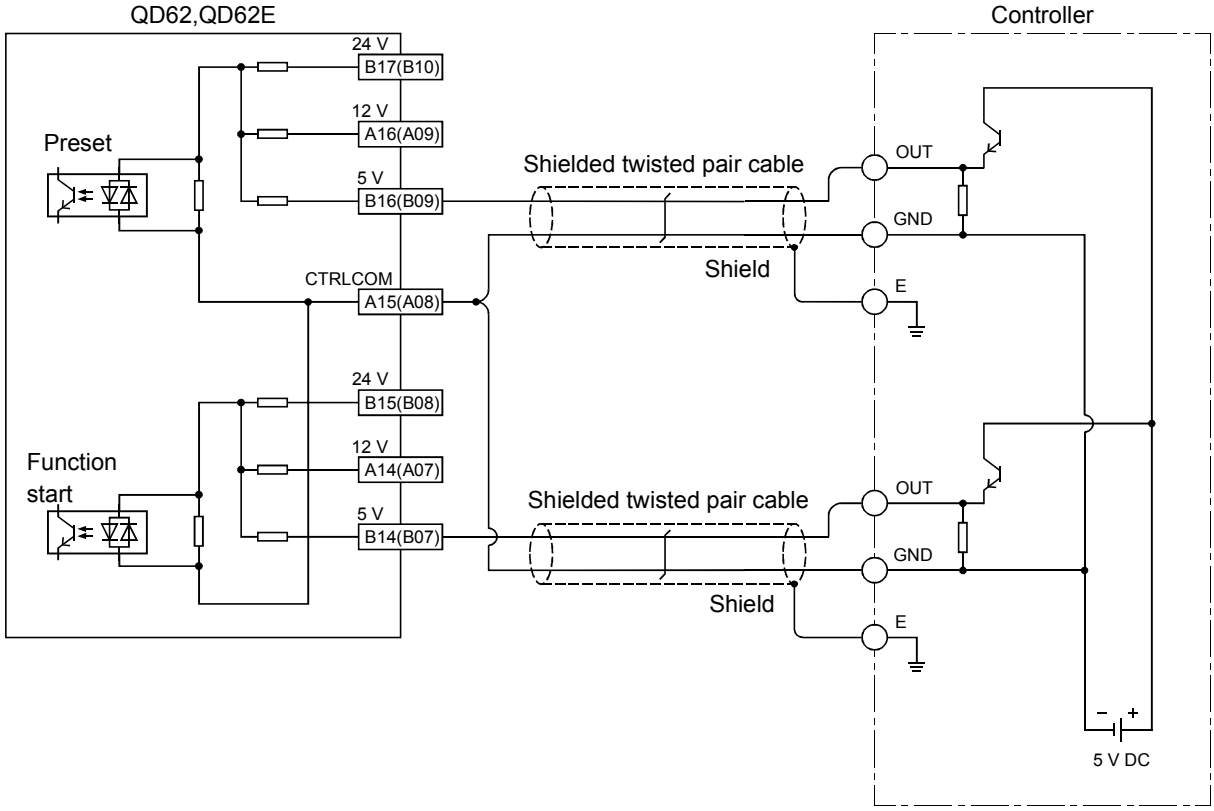


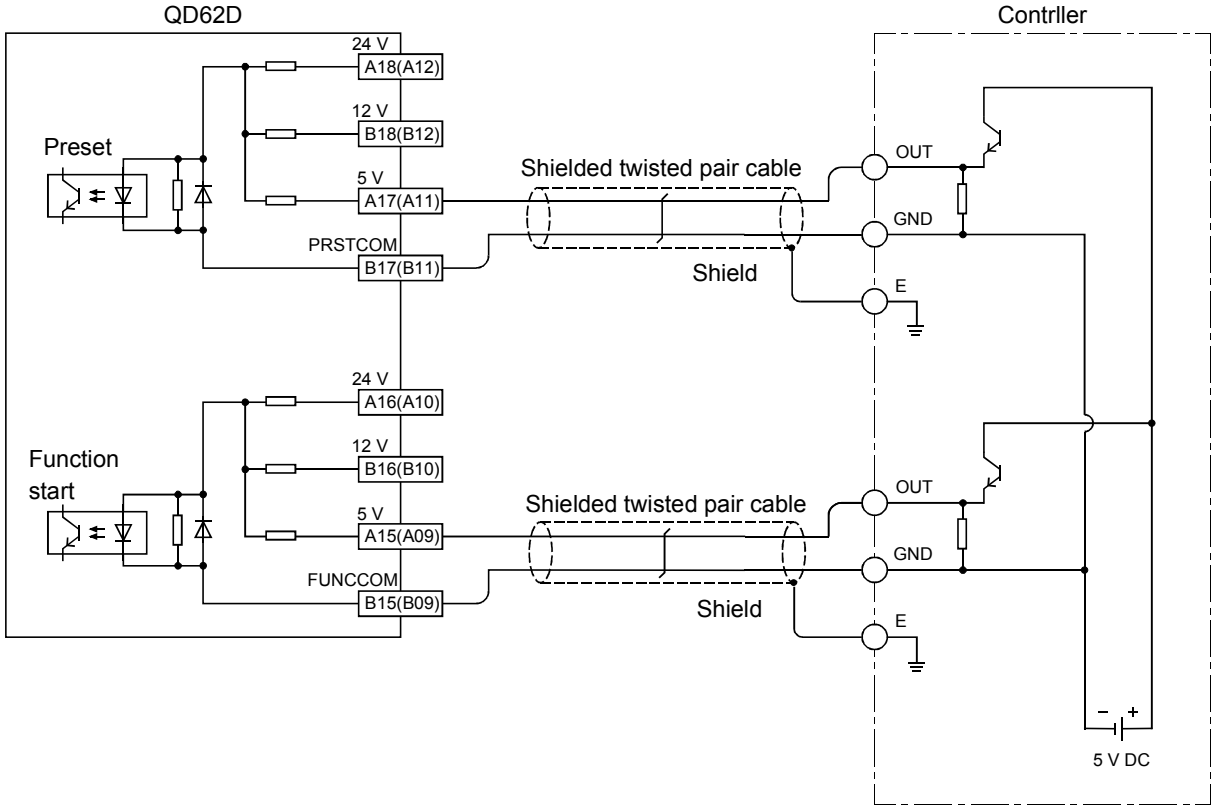
2) Wiring example of a controller and an external input terminal
When the controller (sink loading type) is 12 V DC:



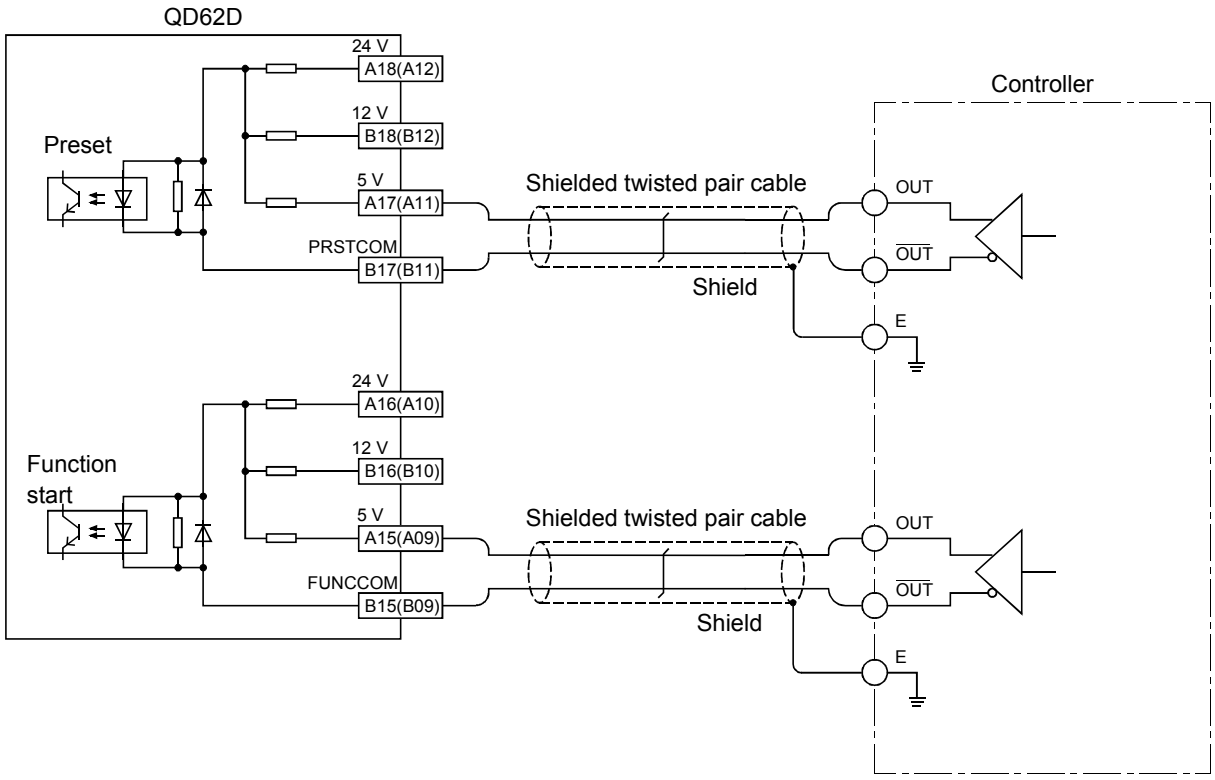


When the controller (source loading type) is 5 V DC:





When the controller is a line driver:

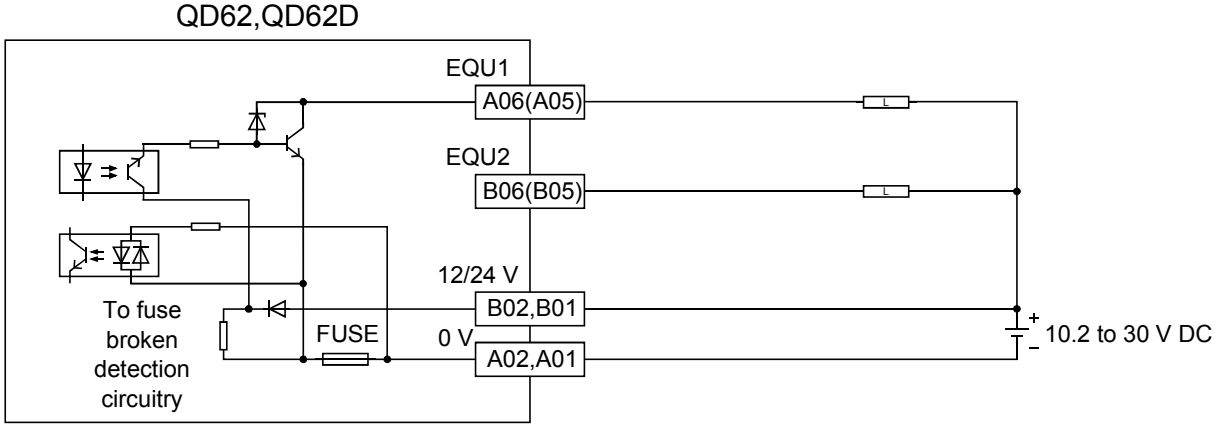


3) Wiring example with an external output

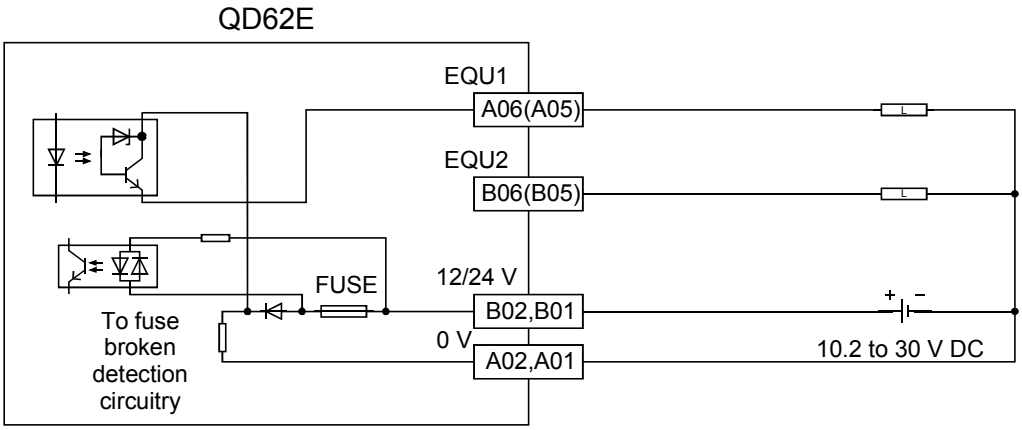
When the coincidence output (EQU terminal) is used, an external power supply of 10.2 to 30 V DC will be required for operation of the internal photocoupler.

A wiring example is shown below.

a) For QD62, QD62D (Sink output type)



b) For QD62E (Source output type)

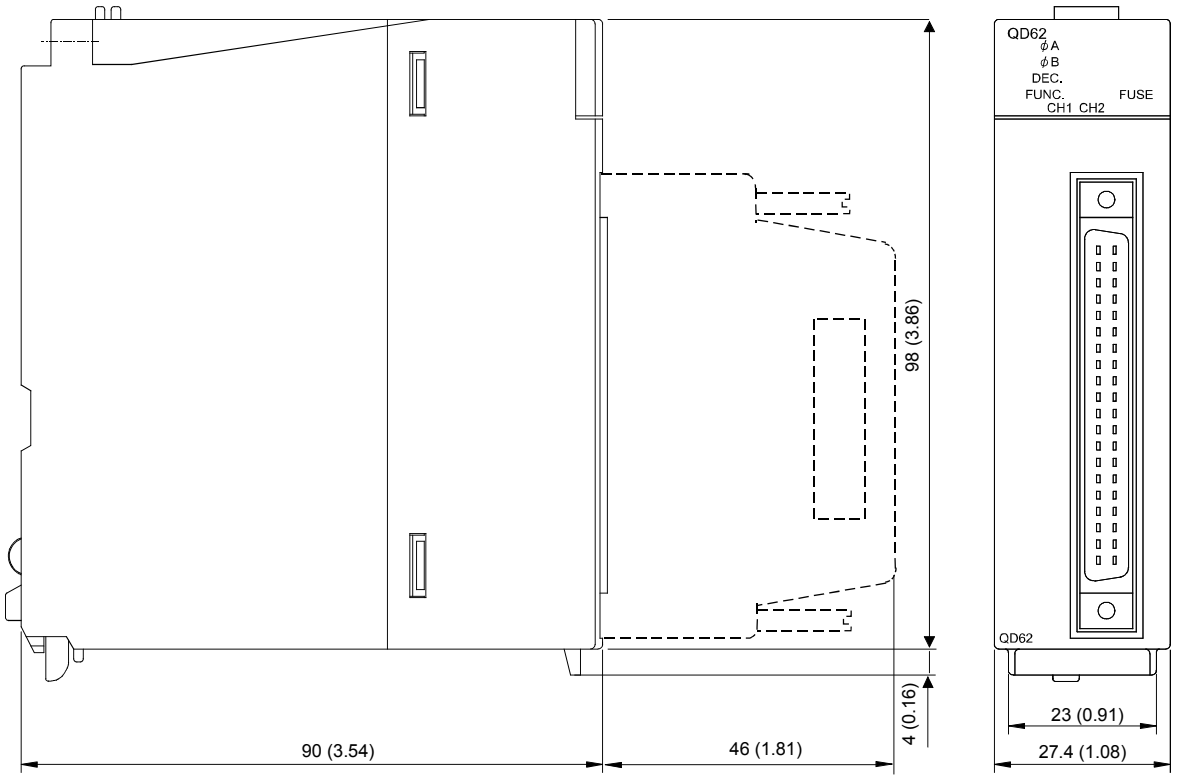


5.3 Intelligent Function Module Switch Settings

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

	Setting item	
Switch 1 (for Channel 1)	0 □ □ □ H	Pulse input mode 0: 1 phase multiple of 1 1: 1 phase multiple of 2 2: CW/CCW 3: 2 phase multiple of 1 4: 2 phase multiple of 2 5: 2 phase multiple of 4
Switch 2 (for Channel 2)		Counting speed setting 0: 10 kPPS 1: 100 kPPS 2: 200 kPPS 3: 500 kPPS (only for the QD62D)
		Counter type 0: Linear counter 1: Ring counter
Switch 3	Reserved	
Switch 4	Reserved	
Switch 5	Reserved	

6. External Dimensions Diagram



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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