Before Using the Product

Before using the product, please read this manual. Make sure that the end users read this manual and then keep the manual in a safe place for future reference.

1. Relevant manuals

Before using the product, please read the Safety Guidelines included with the base unit used, especially the following sections.
- SAFETY PRECAUTIONS
- CONDITIONS OF USE FOR THE PRODUCT
- EMC AND LOW VOLTAGE DIRECTIVES
- WARRANTY

For the product information, refer to the following.

Description	Manual name [manual number]
Common information on MELSEC iQ-R series programmable controllers [*1]	MELSEC iQ-R Module Configuration Manual [SH-081262ENG]
Detailed information on this product used in standard mode	MELSEC iQ-R Channel Isolated Digital-Analog Converter Module User's Manual (Startup) [SH-081489ENG]
	MELSEC iQ-R Channel Isolated Digital-Analog Converter Module User's Manual (Application) Part 1 [SH-081491ENG]
Detailed information on this product used in SIL2 mode	MELSEC iQ-R Channel Isolated Digital-Analog Converter Module User's Manual (Application) Part 2 [SH-081491ENG]

*1 The information includes the system configuration, specifications, installation, wiring, maintenance, and inspection.
Please develop familiarity with the functions and performance of the product to handle the product correctly.

1. Manuels correspondants

Avant d'utiliser ce produit, prière de lire les "Safety Guidelines" (directive de sécurité) fournies avec l'unité de base, en particulier dans les sections suivantes.
- *PRÉCAUTIONS DE SÉCURITÉ*
- *CONDITIONS D'UTILISATION DE PRODUIT*
- *DIRECTIVES CEM ET BASSE TENSION*
- *GARANTIE*

2. Packing list

Check that the following items are included in the package of the product.

Item	Quantity
Module	1
Before Using the Product (this manual)	1

3. Signal layout of connector for external devices

Attribution des signaux de connecteur de dispositifs externes

■ R60DA8-G

```
A1  □ □  B1
A2  □ □  B2
A3  □ □  B3
A4  □ □  B4
A5  □ □  B5
A6  □ □  B6
A7  □ □  B7
A8  □ □  B8
A9  □ □  B9
A10 □ □  B10
A11 □ □  B11
A12 □ □  B12
A13 □ □  B13
A14 □ □  B14
A15 □ □  B15
A16 □ □  B16
A17 □ □  B17
A18 □ □  B18
A19 □ □  B19
A20 □ □  B20
```

Viewed from the front of the module

Pin No.	Signal name	Pin No.	Signal name
A1	CH1 V+/I+	B1	CH1 V-/I-
A2	—	B2	—
A3	CH2 V+/I+	B3	CH2 V-/I-
A4	—	B4	—
A5	CH3 V+/I+	B5	CH3 V-/I-
A6	—	B6	—
A7	CH4 V+/I+	B7	CH4 V-/I-
A8	—	B8	—
A9	—	B9	—
A10	CH5 V+/I+	B10	CH5 V-/I-
A11	—	B11	—
A12	CH6 V+/I+	B12	CH6 V-/I-
A13	—	B13	—
A14	CH7 V+/I+	B14	CH7 V-/I-
A15	—	B15	—
A16	CH8 V+/I+	B16	CH8 V-/I-
A17	—	B17	—
A18	—	B18	—
A19	24VDC	B19	24VDC
A20	24GDC	B20	24GDC

■ R60DA16-G

```
2A1  □ □ 2B1    1A1  □ □ 1B1
2A2  □ □ 2B2    1A2  □ □ 1B2
2A3  □ □ 2B3    1A3  □ □ 1B3
2A4  □ □ 2B4    1A4  □ □ 1B4
2A5  □ □ 2B5    1A5  □ □ 1B5
2A6  □ □ 2B6    1A6  □ □ 1B6
2A7  □ □ 2B7    1A7  □ □ 1B7
2A8  □ □ 2B8    1A8  □ □ 1B8
2A9  □ □ 2B9    1A9  □ □ 1B9
2A10 □ □ 2B10   1A10 □ □ 1B10
2A11 □ □ 2B11   1A11 □ □ 1B11
2A12 □ □ 2B12   1A12 □ □ 1B12
2A13 □ □ 2B13   1A13 □ □ 1B13
2A14 □ □ 2B14   1A14 □ □ 1B14
2A15 □ □ 2B15   1A15 □ □ 1B15
2A16 □ □ 2B16   1A16 □ □ 1B16
2A17 □ □ 2B17   1A17 □ □ 1B17
2A18 □ □ 2B18   1A18 □ □ 1B18
2A19 □ □ 2B19   1A19 □ □ 1B19
2A20 □ □ 2B20   1A20 □ □ 1B20

2A1 to 2B20    1A1 to 1B20
```

Viewed from the front of the module

Pin No.	Signal name	Pin No.	Signal name	Pin No.	Signal name	Pin No.	Signal name
2A1	CH9 V+/I+	2B1	CH9 V-/I-	1A1	CH1 V+/I+	1B1	CH1 V-/I-
2A2	—	2B2	—	1A2	—	1B2	—
2A3	CH10 V+/I+	2B3	CH10 V-/I-	1A3	CH2 V+/I+	1B3	CH2 V-/I-
2A4	—	2B4	—	1A4	—	1B4	—
2A5	CH11 V+/I+	2B5	CH11 V-/I-	1A5	CH3 V+/I+	1B5	CH3 V-/I-
2A6	—	2B6	—	1A6	—	1B6	—
2A7	CH12 V+/I+	2B7	CH12 V-/I-	1A7	CH4 V+/I+	1B7	CH4 V-/I-
2A8	—	2B8	—	1A8	—	1B8	—
2A9	—	2B9	—	1A9	—	1B9	—
2A10	CH13 V+/I+	2B10	CH13 V-/I-	1A10	CH5 V+/I+	1B10	CH5 V-/I-
2A11	—	2B11	—	1A11	—	1B11	—
2A12	CH14 V+/I+	2B12	CH14 V-/I-	1A12	CH6 V+/I+	1B12	CH6 V-/I-
2A13	—	2B13	—	1A13	—	1B13	—
2A14	CH15 V+/I+	2B14	CH15 V-/I-	1A14	CH7 V+/I+	1B14	CH7 V-/I-
2A15	—	2B15	—	1A15	—	1B15	—
2A16	CH16 V+/I+	2B16	CH16 V-/I-	1A16	CH8 V+/I+	1B16	CH8 V-/I-
2A17	—	2B17	—	1A17	—	1B17	—
2A18	—	2B18	—	1A18	—	1B18	—
2A19	24VDC_2	2B19	24VDC_2	1A19	24VDC_1	1B19	24VDC_1
2A20	24GDC_2	2B20	24GDC_2	1A20	24GDC_1	1B20	24GDC_1

English	French
Viewed from the front of the module	*Vue de l'avant du module*
Pin No.	*Broche N°*
Signal name	*Nom de signal*

4. Wiring products

The table below shows applicable 40-pin connectors. When wiring, use applicable wires and an appropriate tightening torque.

Mitsubishi 40-pin connector		Wire			
Model	Tightening torque	Diameter	Type	Material	Temperature rating
A6CON1[*1]	0.20 to 0.29N·m	28 to 22 AWG	Stranded	Copper	75℃ or more
A6CON2		28 to 24 AWG			
A6CON4[*1]		28 to 22 AWG			

*1 Use cables with outside diameter of 1.3mm or shorter to connect 40 cables to the connector. In addition, consider the amount of current to be used and select appropriate cables.

4. Produits pour câblage

Le tableau ci-dessous indique quels connecteurs 40 broches sont à utiliser. Pour le câblage, utiliser les fils et couples de serrage prescrits.

Connecteur 40-broches Mitsubishi		Fil			
Modèle	Couple de serrage	Diamètre	Type	Matériau	Gamme de température
A6CON1[*1]	0,20 à 0,29N·m	28 à 22 AWG	Torsadé	Cuivre	75℃ ou plus
A6CON2		28 à 24 AWG			
A6CON4[*1]		28 à 22 AWG			

*1 Le diamètre extérieur des câbles utilisés pour les 40 raccordements au connecteur ne doit pas excéder 1,3 mm. Le choix d'une taille de conducteur dépendra de l'intensité de courant à prendre en considération.

5. Operating ambient temperature

Use the product within the following range.
- 0 to 55℃ (when an extended temperature range base unit is not used)
- 0 to 60℃ (when an extended temperature range base unit is used)

5. Température ambiante de fonctionnement

Ce produit doit être utilisé dans les conditions suivantes.
- *0 et 55℃ (quand une unité de base à gamme de température élargie n'est pas utilisée)*
- *0 et 60℃ (quand une unité de base à gamme de température élargie est utilisée)*

6. Mounting modules

When installing the programmable controller in a control panel, fully consider its operability, maintainability, and environmental resistance.
Securely mount all the MELSEC iQ-R series modules used on the base unit.
For details on the mounting method, refer to the MELSEC iQ-R Module Configuration Manual.

6. Montage des modules

Pour installer l'automate programmable dans un tableau de commande, prendre en compte tous les aspects d'opérabilité, de maintenabilité et de résistance à l'environnement.
Monter fermement sur l'unité de base tous les modules de la série MELSEC iQ-R à utiliser.
Pour le détail de la méthode de montage, voir le MELSEC iQ-R Module Configuration Manual (Manuel de configuration du module MELSEC iQ-R).

7. Safety standards

■ For UL listed
UL evaluation was performed only to UL508.
Functional safety evaluation was performed by TÜV Rheinland®.[*1]
*1 TÜV Rheinland is a registered trademark.

■ For IEC 61508 SIL 2
The R60DA8-G set to operate in SIL2 mode can be used for building safety function in generic industrial machines.
For details, refer to the MELSEC iQ-R Channel Isolated Digital-Analog Converter Module User's Manual (Application).

8. Calculation of the target failure measure (PFDavg/PFH)

The target failure measure (PFDavg/PFH) is a target value of reliability for each SIL level defined in IEC 61508: 2010 and IEC 61511: 2015.
When configuring a system using the SIL2 Process CPU, a SIL2 application shall configure a safety path, including safety input devices through safety output devices. Calculate the PFDavg/PFH for each SIL2 application using the following formula. If the safety path goes through the module set to operate in SIL2 mode multiple times, add the PFDavg/PFH for that module multiple times.

$$\text{PFDavg/PFH} = (\text{PFDavg/PFH of A}) + (\text{PFDavg/PFH of B}) \times \alpha^{*5} + (\text{PFDavg/PFH of C}) + (\text{PFDavg/PFH of D}) + (\text{PFDavg/PFH of E})$$

Symbol	Definition
A[*1]	SIL2 Process CPU
B[*2*4]	Module set to operate in SIL2 mode and connected to safety input devices
C[*2*4]	Module set to operate in SIL2 mode and connected to safety output devices
D[*3*4]	Safety input device
E[*3*4]	Safety output device

*1 When performing safety communications between SIL2 Process CPUs on the safety path, add the PFDavg/PFH for SIL2 Process CPUs performing safety communications on the safety path. Add no PFDavg/PFH for SIL2 Process CPUs not performing safety communications on the safety path, even if they are on the same network.
*2 Perform the calculation with the PFDavg/PFH for the SIL2-mode modules used.
*3 For PFDavg/PFH of D and E, refer to manuals for the safety devices used.
*4 When the SIL2 application includes multiple safety input devices and safety output devices, perform the calculation by adding all PFDavg/PFH for the safety input devices, safety output devices, and SIL2-mode modules that are connected to these safety input/output devices.
*5 For SIL2-mode modules used in a SIL2 application configured with multiple inputs, multiply the PFDavg/PFH of these modules by the number of input points (α) for the calculation.

The R60DA8-G set in SIL2 mode is used together with the RY40PT5B-AS. The total values of the PFDavg/PFH for the R60DA8-G in SIL2 mode and the RY40PT5B-AS are listed in the following tables.

PFDavg[*6*7]

1 years	2 years	5 years
3.64×10^{-4}	7.28×10^{-4}	1.82×10^{-3}

PFH[*6*7]

1 years	2 years	5 years
8.65×10^{-8}	8.65×10^{-8}	8.66×10^{-8}

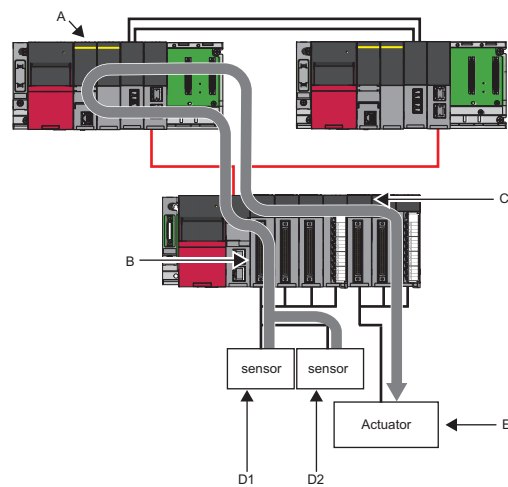*6 The PFDavg/PFH values are listed by proof test interval.
*7 The PFH values are for when the module is used at the ambient temperature of 40℃.

The following formulas show calculation examples of PFDavg/PFH for a SIL2 application with multiple inputs where SIL2 Process CPUs, an analog-digital converter module, and a digital-analog converter module are used.
Connect multiple sensors to the analog-digital converter module. Connect an actuator to the digital-analog converter module.
A SIL2 Process CPU controls the output of actuator according to the input from the sensors.
- PFDavg = (PFDavg of A) + (PFDavg of B) × 2 + (PFDavg of C) + (PFDavg of D1) + (PFDavg of D2) + (PFDavg of E)
- PFH = (PFH of A) + (PFH of B) × 2 + (PFH of C) + (PFH of D1) + (PFH of D2) + (PFH of E)

9. Information and services

For further information and services, please consult your local Mitsubishi representative.