



三菱電機マイクロシーケンサ  
MELSEC-F

Side A JAPANESE  
Side B ENGLISH

FX3G-1DA-BD

インストールマニュアル

マニュアル番号	JY997D33601
副番	G
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このたびは、三菱電機マイクロシーケンサ用FX3G-1DA-BD形アナログ出力機能拡張ボード(以下1DA-BDと略称)をお買い上げいただき、誠にありがとうございます。

本マニュアルは、本製品の各部名称、外形寸法、取付け、および仕様について述べたものです。本製品の取り扱いや操作などにつきましてはご使用前に、本マニュアルおよび関連製品マニュアルをお読みいただき、機器の知識や安全の情報、注意事項のすべてについて習熟してからご使用ください。また、製品に付属しているマニュアルは必要なときに取り出して読むよう大切に保管すると共に、必ず最終ユーザーまでお届け頂きますようお願いいたします。

商標について  
本マニュアルに記載してある会社名、製品名は、それぞれの会社の登録商標または商標です。

この印刷物は2017年6月発行です。なお、お断りなしに仕様を変更することがありますのでご了承ください。

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安全上のご注意 (ご使用前に必ずお読みください)

このマニュアルでは、安全に関する注意事項のランクを [警告]、[注意] として区分してあります。

	<b>警告</b> 取り扱いを誤ったばい、危険な状況が起こりえて、死亡または重傷を受ける可能性が想定されるばあい。
	<b>注意</b> 取り扱いを誤ったばい、危険な状況が起こりえて、中程度の傷害や軽傷を受ける可能性が想定されるばあい、および物的損害だけの発生が想定されるばあい。

なお、[注意] に記載した事項でも、状況によっては重大な結果に結びつ可能性があります。いずれも重要な内容を記載していますので、必ず守ってください。

関連マニュアルとマニュアルの入手方法

関連マニュアル		
マニュアル名称	マニュアル番号	内容
FX3S・FX3C・FX3DC・FX3U・FX3UCシリーズ ユーザーズマニュアル [アナログ制御編]	JY997D15201 【別冊】 形名コード：09RG17	FX3S・FX3C・FX3DC・FX3U・FX3UCシリーズのアナログ制御の仕様、プログラム方法に関する説明
FX3Sシリーズ ユーザーズマニュアル [ハードウェア編]	JY997D48501 【別冊】 形名コード：09RS34	FX3Sシリーズシーケンサ本体の入出力仕様、配線、取付けや保守などのハードウェアに関する詳細説明
FX3Cシリーズ ユーザーズマニュアル [ハードウェア編]	JY997D31201 【別冊】 形名コード：09RS20	FX3Cシリーズシーケンサ本体の入出力仕様、配線、取付けや保守などのハードウェアに関する詳細説明

マニュアルの入手方法  
マニュアルの入手方法には、下記の方法があります。

- 製本マニュアル(印刷物)の入手  
本製品のご購入店へお問合せください。
- 電子データ(PDFファイル)の入手  
三菱電機FAサイトから最新マニュアルをダウンロードできます。ホームページアドレスは巻末を参照ください。

対応規格

FX3G-1DA-BDは、2008年11月生産品からEC指令(EMC指令)に対応しています。詳細については、下記マニュアルを参照してください。  
→FX3Sシリーズハードウェアマニュアル(マニュアル番号：JY997D48301)  
→FX3Gシリーズハードウェアマニュアル(マニュアル番号：JY997D46001)

**注意**  
本製品は一般工業環境下でご使用ください。

EMC指令に適合するための要求

アナログ機能拡張ボードは、ヨーロッパ規格に準拠・適合しています。ただし、計測や制御において、精度を要求するばあいは、次の内容を実施されることをおすすめします。アナログ製品は、ノイズに敏感な製品のため、取扱い方法に注意してください。センサまたはアクチュエータの専用ケーブルを接続するばあいは、それらの機器メーカーの接続に関する要求に従ってください。弊社は、シールド線を使用することを推奨します。それ以外のEMC対策が実施されないばあいでもノイズ環境において誘導誤差が、±10%以内で使用できます。さらに、次のEMC対策を実施すると、本マニュアル記載の精度範囲程度に誘導誤差を軽減する効果があります。

- アナログケーブルは影響を受けやすいので、主回路線や高圧電線、負荷線との近接や束線は行わないでください。ノイズやサージ誘導の影響を受けやすくなります。できるだけアナログケーブルごとに分離してください。
- ケーブルは、シールド線を使用してください。シールド線のシールドを接地するばあい、ケーブルの片側のみ接地してください。
- アナログ値(AD変換後の値)をプログラムで使用するばあいは、平均値データを使用してください。EMCによる誘導誤差が制御に与える影響を軽減することができます。シーケンサプログラム、またはアナログ機能拡張ボードの機能を使用することで平均値データを得ることができます。

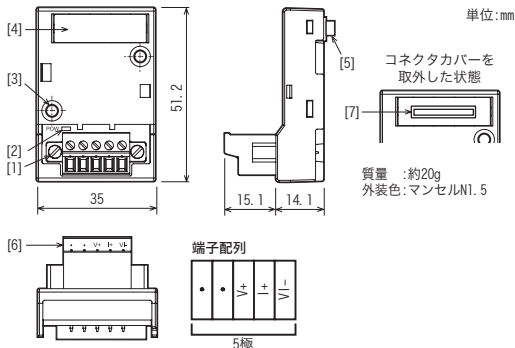
1. 製品概要

1DA-BDは、1点のアナログ出力を増設するための機能拡張ボードです。

1.1 同梱品の確認

製品本体	FX3G-1DA-BD形アナログ出力機能拡張ボード
付属品	<ul style="list-style-type: none"> <li>ボード取付け用M3×8タップピンネジ 2個</li> <li>サイドカバー</li> <li>インストールマニュアル(本書)</li> </ul>

1.2 外形寸法・各部名称



- 端子台脱着用ネジ
- POW LED: 基本ユニットより電源が正常に供給されているとき点灯します。
- 取付け穴(2-φ3.2)
- コネクタカバー
- シーケンサ接続用コネクタ
- アナログ出力用端子台(ヨーロッパ端子台)
- メモリスロット/ディスプレイモジュール接続用コネクタ

2. 取付け

取付け上の注意 [警告]

- 取付け、配線作業などを行うときは、必ず電源を外部にて全相共通遮断してから行ってください。感電、製品損傷の恐れがあります。

取付け上の注意 [注意]

- シーケンサ本体マニュアルに記載の一般仕様の環境で使用してください。ほこり、油煙、導電性ダスト、腐食性ガス(潮風、Cl<sub>2</sub>、H<sub>2</sub>S、SO<sub>2</sub>、NO<sub>2</sub>など)、可燃性ガスのある場所、高温、結露、風雨にさらされる場所、振動、衝撃がある場所で使用しないでください。感電、火災、誤動作、製品の損傷および、劣化の原因となることがあります。
- ネジ穴加工や配線工事を行うときに、切粉や電線屑を本製品やシーケンサなどの通風孔へ落ととし込まないでください。火災、故障、誤動作の原因となります。
- 製品の導電部には直接触らないでください。誤動作、故障の原因となります。
- 機能拡張ボードは、所定のコネクタに確実に装着してください。接触不良により誤動作の原因となることがあります。

取付け方法については、下記マニュアルを参照してください。  
→FX3Sシリーズユーザーズマニュアル[ハードウェア編]  
→FX3Gシリーズユーザーズマニュアル[ハードウェア編]

3. 配線

配線上の注意 [警告]

- 取付け、配線作業などを行うときは、必ず電源を外部にて全相共通遮断してから行ってください。感電、製品損傷の恐れがあります。

配線上の注意 [注意]

- ネジ穴加工や配線工事を行うときに、切粉や電線屑を本製品やシーケンサなどの通風孔へ落ととし込まないでください。火災、故障、誤動作の原因となります。
- ノイズの影響で異常なデータがシーケンサに書き込まれたことにより、シーケンサが誤動作をし、機械の破損や事故の原因になることがありますので次の項目を必ず守ってください。
  - 電源線やアナログ入力線は、主回路線や高圧電線、負荷線との近接や束線は行わないでください。ノイズやサージ誘導の影響を受けやすくなります。100mm以上離してください。
  - アナログ出力線のシールドは、必ず信号受取り側で一点接地を行ってください。また、強電系とは共通接地しないでください。
- ヨーロッパ式端子台タイプへの配線は、次の注意事項に従い適切に行ってください。感電、故障、短絡、断線、誤動作、製品損傷の恐れがあります。
  - 電線の末端処理寸法は、マニュアルに記載した寸法に従ってください。
  - 締付トルクは、マニュアルに記載したトルクに従ってください。
  - より線の末端は、“ヒゲ線”が出ないようにしてください。
  - 電線の末端は、ハンダメッキしないでください。
  - 規定サイズ以外の電線や規定本数を超える電線を接続しないでください。
  - 端子台や電線接続部分には、外力が直接加わらないように、電線を固定してください。
- 端子台タイプへの配線は、次の注意事項に従い適切に行ってください。感電、故障、短絡、断線、誤動作、製品損傷の恐れがあります。
  - 電線の末端処理寸法は、マニュアルに記載した寸法に従ってください。
  - 締付トルクは、マニュアルに記載したトルクに従ってください。
  - No.2サイズのプラスドライバ(軸径6mm以下)を使用し、ドライバが端子台仕切り部へ接触しないように締め付けてください。

3.1 使用ケーブルと端子締付トルク

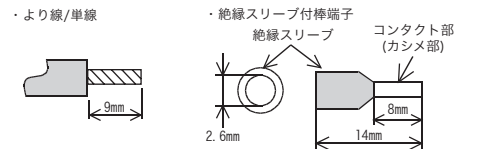
- ヨーロッパ式端子台
  - 電線サイズ  
相手機器との接続には、導体サイズがAWG22-20のものを使用してください。
- 適合電線

形式	電線サイズ
電線1本	0.3~0.5mm <sup>2</sup> (AWG22~20)
電線2本	0.3mm <sup>2</sup> (AWG22) × 2本

- 端末処理  
より線は被覆を剥ぎ芯線をよりそのまま接続し、単線は被覆を剥ぎそのまま接続してください。または、絶縁スリーブ付棒端子を使用し接続してください。  
<参考例>

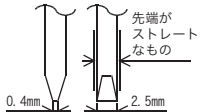
メーカー	形名	圧着工具
フエニックス・コンタクト株式会社	AI 0.5-8WH	CRIMPFOX 6 <sup>※1</sup> (またはCRIMPFOX 6T-F <sup>※2</sup> )

- ※1 旧形名 CRIMPFOX ZA 3
- ※2 旧形名 CRIMPFOX UD 6



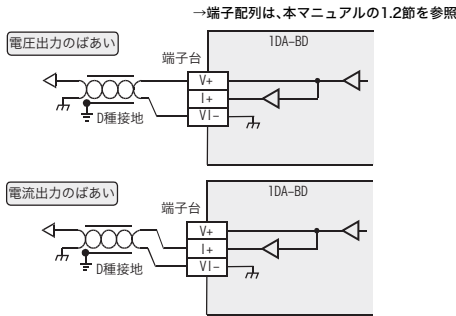
絶縁スリーブ付棒端子を使用するばあいは、電線のシースの厚みによって、入れにくくなるので、外形図を参考に電線サイズを選定してください。端子の締付トルクは、0.22~0.25N・mとしてください。規定範囲外のトルクで端子ネジを締め付けないでください。故障、誤動作の原因となります。

- 工具  
ヨーロッパ式端子台の端子を締め付けるばあい、市販している小形ドライバで右図のような先端に広がりがなく、ストレートな形状のものを使用してください。  
先端がストレートなもの



メーカー	形名
フエニックス・コンタクト株式会社	SZS 0.4×2.5

### 3.2 アナログ出力配線



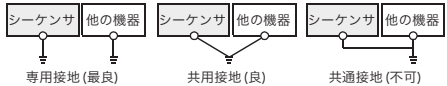
#### 3.2.1 配線上の注意

- アナログ出力線は、2芯ツイストのシールド線を用い、他の動力線や誘導を受けやすい線とは分離して配線してください。
- シールド線の接地は、D種接地を施してください。

### 3.3 接地

接地は下記の項目を実施してください。

- 接地はD種接地を実施してください。(接地抵抗: 100Ω以下)
- 接地はできるだけ、専用接地としてください。専用接地がとれないときは、下図の“共用接地”としてください。詳細は、下記マニュアルを参照してください。  
→FX3sシリーズユーザーズマニュアル[ハードウェア編]  
→FX3gシリーズユーザーズマニュアル[ハードウェア編]



- 接地線はAWG 20~22(0.3~0.5mm<sup>2</sup>)の太さのものを使用してください。
- 接地点はできるだけこのシーケンサの近くとし、接地線の距離を短くしてください。

## 4. 仕様

### 立上げ・保守時の注意 **注意**

- 分解、改造はしないでください。故障、誤動作、火災の原因となることがあります。  
\*修理については、三菱電機システムサービス株式会社にお問い合わせください。
- 本品を落下させたり、強い衝撃を与えないでください。破損の原因になります。

### 廃棄時の注意 **注意**

- 製品を廃棄するときは、産業廃棄物として扱ってください。

### 輸送・保管上の注意 **注意**

- 本品は精密機器のため輸送の間は専用の梱包箱や振動防止用パレットを使用するなどして一般仕様の値を超える衝撃を避けてください。本品の故障の原因になることがあります。輸送後、本品の動作確認および取付部などの破損確認を行ってください。

#### 4.1 対応シーケンサ

機種名	対応状況
FX3sシーケンサ	Ver. 1.00~(初品から)
FX3gシーケンサ	Ver. 1.10~

バージョン番号は、D8001/D8101をモニタし、下3桁の値で知ることができます。

- 機能拡張ボードは基本ユニットによって接続できる台数が下記のように異なります。  
FX3s, FX3g-14M□, FX3g-24M□形基本ユニット: 最大1台  
FX3g-40M□, FX3g-60M□形基本ユニット: 最大2台  
ただし、2台以上の重ねでの取り付けはできません。  
システム構成に関する詳細は、下記マニュアルを参照してください。  
→FX3s・FX3g・FX3gc・FX3u・FX3ucシリーズユーザーズマニュアル[アナログ制御編]

#### 4.2 一般仕様

一般仕様は、シーケンサ本体と同じです。  
一般仕様については、下記マニュアルを参照してください。  
→FX3sシリーズユーザーズマニュアル[ハードウェア編]  
→FX3gシリーズユーザーズマニュアル[ハードウェア編]

#### 4.3 性能仕様

項目	仕様	
	電圧出力	電流出力
アナログ出力範囲	DC 0~10V (外部負荷抵抗 2k~1MΩ)	DC 4~20mA (外部負荷抵抗 500Ω以下)
デジタル入力	12bit バイナリ	11bit バイナリ
分解能	2.5mV(10V/4000)	8μA(16mA/2000)
総合精度	<ul style="list-style-type: none"> <li>周囲温度25°C±5°Cのとき、フルスケール10Vに対し、±0.5%(±50mV)</li> <li>周囲温度0°C~55°Cのとき、フルスケール10Vに対し、±1.0%(±100mV)</li> </ul> 外部負荷抵抗2kΩで出荷調整されています。そのため2kΩより大きくなると、出力電圧が若干大きくなります。1MΩのばあい、出力電圧は最大2%高くなります。	<ul style="list-style-type: none"> <li>周囲温度25°C±5°Cのとき、フルスケール16mAに対し、±0.5%(±80μA)</li> <li>周囲温度0°C~55°Cのとき、フルスケール16mAに対し、±1.0%(±160μA)</li> </ul>
D/A変換時間	60μs(データの更新は毎演算周期)	
出力特性	外部負荷抵抗2kΩで、0~4000で0~10Vに調整(出荷時)	外部負荷抵抗250Ωで、0~2000で4~20mAに調整(出荷時)
	<b>注意:</b> 0V出力付近には、不感帯領域があり、デジタル入力値に対して、アナログ出力が一部反映されない領域があります。	
絶縁方式	シーケンサ間是非絶縁	
入出力占有点数	0点(シーケンサの最大入出力点数とは関係ありません。)	

#### 4.4 特殊デバイス一覧

R: 読出し W: 書込み

	デバイス番号		内容	R/W
	FX3s	FX3g ポートA ポートB		
特殊補助リレー	M8260	M8260 M8270	出力モード切替え OFF: 電圧出力 ON: 電流出力	R/W
	M8264	M8264 M8274	出力保持解除設定 OFF: RUN→STOP時に直前のアナログ出力を保持 ON: STOP時はオフセット値を出力	R/W
特殊データレジスタ	D8260	D8260 D8270	出力設定データ	R/W
	D8268	D8268 D8278	エラーステータス b0: 出力データ設定値エラー b1: 未使用 b2: 未使用 b3: 未使用 b4: EEPROMエラー b15~b5: 未使用	R/W
	D8269	D8269 D8279	機種コード=4	R

特殊デバイスの詳細については、下記マニュアルを参照してください。  
→FX3s・FX3g・FX3gc・FX3u・FX3ucシリーズユーザーズマニュアル[アナログ制御編]

本書によって、工業所有権その他の権利の実施に対する保証、または実施権を許諾するものではありません。  
また本書の掲載内容の使用により起因する工業所有権上の諸問題については、当社は一切その責任を負うことができません。

**保証について**  
 機会損失、二次損失などへの保証義務の除外  
 無償保証期間の内外を問わず、以下については当社責務外とさせていただきます。  
 (1) 当社の責に帰すことができない事由から生じた障害。  
 (2) 当社製品の故障に起因するお客様での機会損失、逸失利益。  
 (3) 当社の予見の有無を問わず特別の事情から生じた損害、二次損害、事故補償、当社製品以外への損傷。  
 (4) お客様による交換作業、現地機械設備の再調整、立上げ試運転その他の業務に対する補償。

**安全にお使いいただくために**  
 この製品は一般工業を対象とした汎用品として製作されたもので、人命にかかわるような状況下で使用される機器あるいはシステムに用いられることを目的として設計、製造されたものではありません。  
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三菱電機FA機器電話技術相談			
●電話技術相談窓口 ※1 春季・夏季・年末年始の休日を除く			
対象機種	電話番号	月曜~金曜	受付時間※1
MELSEC iQ-F/FX/F GOT-F900	052-725-2271	9:00~19:00(金曜は17:00まで)	土曜・日曜・祝日 9:00~17:00

### 三菱電機株式会社

〒100-8310 東京都千代田区丸の内2-7-3(東京ビル)





FX3G-1DA-BD

INSTALLATION MANUAL



Manual Number	JY997D33601
Revision	G
Date	June 2017

This manual describes the part names, dimensions, mounting, and specifications of the product. Before use, read this manual and the manuals of all relevant products fully to acquire proficiency in handling and operating the product. Make sure to learn all the product information, safety information, and precautions. Store this manual in a safe place so that it can be taken out and read whenever necessary. Always forward it to the end user. Registration: Phillips is a registered trademark of Phillips Screw Company. The company and product names described in this manual are registered trademarks or the trademarks of their respective companies.

Effective June 2017  
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Safety Precautions (Read these precautions before use.)

This manual classifies the safety precautions into two categories:

**WARNING** and **CAUTION**.

<b>WARNING</b>	Indicates that incorrect handling may cause hazardous conditions, resulting in death or severe injury.
<b>CAUTION</b>	Indicates that incorrect handling may cause hazardous conditions, resulting in medium or slight personal injury or physical damage.

Depending on the circumstances, procedures indicated by **CAUTION** may also cause severe injury. It is important to follow all precautions for personal safety.

Associated Manuals

Manual name	Manual No.	Description
FX3S/FX3G/FX3GC/FX3U/FX3UC Series User's Manual - Analog Control Edition	JY997D16701 MODEL CODE: 09R619	Describes specifications for analog control and programming method for FX3S/FX3G/FX3GC/FX3U/FX3UC Series PLC.
FX3S Series User's Manual - Hardware Edition	JY997D48601 MODEL CODE: 09R535	Explains FX3S Series PLC specifications for I/O, wiring, installation, and maintenance.
FX3G Series User's Manual - Hardware Edition	JY997D31301 MODEL CODE: 09R521	Explains FX3G Series PLC specifications for I/O, wiring, installation, and maintenance.

How to obtain manuals

For product manuals or documents, consult with the Mitsubishi Electric dealer from who you purchased your product.

Applicable standards

FX3G-1DA-BD units made in November, 2008 or later comply with the EC Directive (EMC Directive). Further information can be found in the following manual.

- FX3S Series Hardware Manual (Manual No. JY997D48301)
- FX3G Series Hardware Manual (Manual No. JY997D46001)

Attention

This product is designed for use in industrial applications.

Caution for EC Directive

The analog expansion boards have been found to be compliant to the European standards in the aforesaid manual and directive. However, for the very best performance from what are in fact delicate measuring and controlled output device Mitsubishi Electric would like to make the following points: As analog devices are sensitive by nature, their use should be considered carefully. For users of proprietary cables (integral with sensors or actuators), these users should follow those manufacturers installation requirements. Mitsubishi Electric recommend that shielded cables should be used. If NO other EMC protection is provided, then users may experience temporary loss or accuracy between ±10 % in very heavy industrial areas. However, Mitsubishi Electric suggest that if adequate EMC precautions are followed for the users complete control system, users should expect accuracy as specified in this manual.

- Sensitive analog cable should not be laid in the same trunking or cable conduit as high voltage cabling. Where possible users should run analog cables separately.
- Good cable shielding should be used. When terminating the shield at Earth - ensure that no earth loops are accidentally created.
- When reading analog values, EMC accuracy can be improved out by averaging the readings. This can be achieved either through functions on the analog expansion boards or through a users program in the PLC main unit.

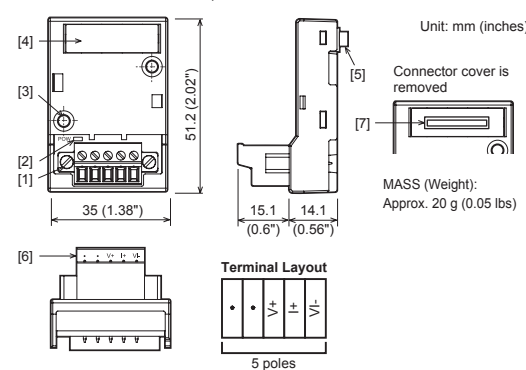
1. Outline

The FX3G-1DA-BD board (hereinafter called 1DA-BD) is an expansion board for adding one additional analog output point.

1.1 Incorporated Items

Product	Analog output expansion board FX3G-1DA-BD
Included items	<ul style="list-style-type: none"> <li>• M3×8 tapping screws for installation: 2 pcs.</li> <li>• Side cover</li> <li>• Installation Manual (This manual)</li> </ul>

1.2 External Dimensions, Part Names



- [1] Terminal block mounting screws
- [2] POW LED: Lit while power is properly supplied from main unit
- [3] Mounting holes (2-φ3.2)
- [4] Connector cover
- [5] Main unit connector
- [6] Terminal block to connect analog output
- [7] Memory cassette/Display module connector

2. Installation

INSTALLATION PRECAUTIONS	WARNING
<ul style="list-style-type: none"> <li>• Make sure to cut off all phases of the power supply externally before attempting installation or wiring work. Failure to do so may cause electric shock or damage to the product.</li> </ul>	

INSTALLATION PRECAUTIONS	CAUTION
<ul style="list-style-type: none"> <li>• Use the product within the generic environment specifications described in PLC main unit manual (Hardware Edition). Never use the product in areas with excessive dust, oily smoke, conductive dusts, corrosive gas (salt air, Cl<sub>2</sub>, H<sub>2</sub>S, SO<sub>2</sub>, or NO<sub>2</sub>), flammable gas, vibration or impacts, or expose it to high temperature, condensation, or rain and wind. If the product is used in such conditions, electric shock, fire, malfunctions, deterioration or damage may occur.</li> <li>• When drilling screw holes or wiring, make sure cutting or wire debris does not enter the ventilation slits. Failure to do so may cause fire, equipment failures or malfunctions.</li> <li>• Do not touch the conductive parts of the product directly. Doing so may cause device failures or malfunctions.</li> <li>• Connect expansion board securely to their designated connectors. Loose connections may cause malfunctions.</li> </ul>	

For the installation, refer to the following manual.  
→ FX3S Series User's Manual - Hardware Edition  
→ FX3G Series User's Manual - Hardware Edition

3. Wiring

WIRING PRECAUTIONS	WARNING
<ul style="list-style-type: none"> <li>• Make sure to cut off all phases of the power supply externally before attempting installation or wiring work. Failure to do so may cause electric shock or damage to the product.</li> </ul>	

WIRING PRECAUTIONS	CAUTION
--------------------	---------

- When drilling screw holes or wiring, make sure cutting or wire debris does not enter the ventilation slits. Failure to do so may cause fire, equipment failures or malfunctions.
- Make sure to observe the following precautions in order to prevent any damage to the machinery or accidents due to abnormal data written to the PLC under the influence of noise:
  - 1) Do not bundle the power line or shield of the analog input/output cable together with or lay it close to the main circuit, high-voltage line, or load line. Otherwise, noise disturbance and/or surge induction are likely to take place. As a guideline, lay the control line at least 100 mm (3.94") or more away from the main circuit, high-voltage line, or load line.
  - 2) Ground the shield of the analog input/output cable at one point on the signal receiving side. However, do not use common grounding with heavy electrical systems.
- Make sure to properly wire to the terminal block (European type) in accordance with the following precautions. Failure to do so may cause electric shock, equipment failures, a short-circuit, wire breakage, malfunctions, or damage to the product.
  - The disposal size of the cable end should follow the dimensions described in the manual.
  - Tightening torque should follow the specifications in the manual.
  - Twist the end of strand wire and make sure that there are no loose wires.
  - Do not solder-plate the electric wire ends.
  - Do not connect more than the specified number of wires or electric wires of unspecified size.
  - Affix the electric wires so that neither the terminal block nor the connected parts are directly stressed.
- Make sure to properly wire to the terminal blocks in accordance with the following precautions. Failure to do so may cause electric shock, equipment failures, a short-circuit, wire breakage, malfunctions, or damage to the product.
  - The disposal size of the cable end should follow the dimensions described in the manual.
  - Tightening torque should follow the specifications in the manual.
  - Tighten the screws using a Phillips-head screwdriver No.2 (shaft diameter 6 mm (0.24") or less). Make sure that the screwdriver does not touch the partition part of the terminal block.

3.1 Applicable Cable and Terminal Tightening Torque

3.1.1 Terminal block (European type)

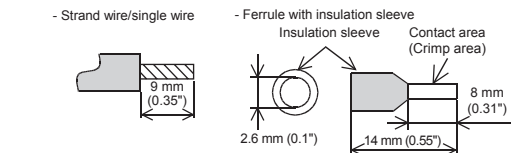
- 1) Wire size  
Wiring to analog device should use 20-22 AWG wire.
- 2) Applicable cable

Type	Wire size
Single-wire	0.3 mm <sup>2</sup> to 0.5 mm <sup>2</sup> (AWG22 to 20)
2-wire	2 pieces of 0.3 mm <sup>2</sup> (AWG22)

- 3) Termination of cable end  
Strip the coating of strand wire and twist the cable core before connecting it, or strip the coating of single wire before connecting it. An alternative connection is to use a ferrule with insulating sleeve. <Reference>

Manufacturer	Model	Caulking tool
Phoenix Contact Co., Ltd.	AI 0.5-8WH	CRIMPFOX 6 <sup>1</sup> (or CRIMPFOX 6T-F <sup>2</sup> )

- \*1 Old model name: CRIMPFOX ZA 3
- \*2 Old model name: CRIMPFOX UD 6



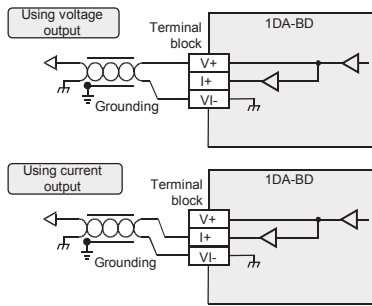
When using a ferrule with insulation sleeve, choose a wire with proper cable sheath referring to the above outside dimensions, or otherwise, the wire cannot be inserted easily. The tightening torque must be 0.22 to 0.25 N·m. Do not tighten terminal screws with a torque outside the above-mentioned range. Failure to do so may cause equipment failures or malfunctions.

- 4) Tool  
For tightening the terminal, use a commercially available small screwdriver having a straight form that is not widened toward the end as shown right.  
**Caution:**  
If the diameter of screwdriver grip is too small, tightening torque will not be able to be achieved. Use the following recommended screwdriver or an appropriate replacement (grip diameter: approximately 25 mm (0.98")). <Reference>

Manufacturer	Model
Phoenix Contact Co., Ltd.	SZS 0.4×2.5

### 3.2 Wiring of Analog Output

→ For the terminal configuration, refer to Section 1.2



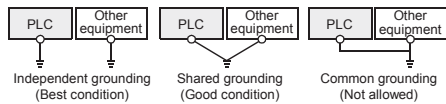
- \*1 Use 2-core shielded twisted pair cable for the analog output lines, and separate the analog output lines from other power lines or inductive lines.
- \*2 The grounding resistance should be 100 Ω or less.

### 3.3 Grounding

Grounding should be performed as stated below.

- The grounding resistance should be 100 Ω or less.
- Independent grounding should be performed for best results. When independent grounding is not performed, perform "shared grounding" of the following figure. For details, refer to the following manual.

→ FX3s Series User's Manual - Hardware Edition  
→ FX3G Series User's Manual - Hardware Edition



- The grounding wire size should be AWG 22-20 (0.3-0.5 mm<sup>2</sup>).
- The grounding point should be close to the PLC, and all grounding wire should be as short as possible.

### 4. Specifications

<b>STARTUP AND MAINTENANCE PRECAUTIONS</b>	<b>CAUTION</b>
<ul style="list-style-type: none"> <li>Do not disassemble or modify the PLC. Doing so may cause fire, equipment failures, or malfunctions. * For repair, contact your local Mitsubishi Electric representative.</li> <li>Do not drop the product or exert strong impact to it. Doing so may cause damage.</li> </ul>	

<b>DISPOSAL PRECAUTIONS</b>	<b>CAUTION</b>
<ul style="list-style-type: none"> <li>Please contact a certified electronic waste disposal company for the environmentally safe recycling and disposal of your device.</li> </ul>	

<b>TRANSPORTATION AND STORAGE PRECAUTIONS</b>	<b>CAUTION</b>
<ul style="list-style-type: none"> <li>The product is a precision instrument. During transportation, avoid impacts larger than those specified in the general specifications by using dedicated packaging boxes and shock-absorbing pallets. Failure to do so may cause failures in the product. After transportation, verify operation of the product and check for damage of the mounting part, etc.</li> </ul>	

#### 4.1 Applicable PLC

Model name	Applicability
FX3s Series PLC	Ver. 1.00 or later (from first production)
FX3G Series PLC	Ver. 1.10 or later

The version number can be checked by monitoring D8001/D8101 as the last three digits indicate it.

- The number of connectable expansion boards varies depending on the main unit as follows:
  - FX3s, FX3G-14M□, FX3G-24M□ Main units: 1 unit
  - FX3G-40M□, FX3G-60M□ Main units: 2 units
- Never stack up two or more expansion boards.

For details on the system configuration, refer to the following manual.  
→ FX3s/FX3G/FX3GC/FX3U/FX3UC Series User's Manual - Analog Control Edition

### 4.2 General Specifications

The general specifications are equivalent to the PLC main unit. For general specifications, refer to the following manuals.

→ FX3s Series User's Manual - Hardware Edition  
→ FX3G Series User's Manual - Hardware Edition

### 4.3 Performance Specifications

Item	Specifications	
	Voltage output	Current output
<b>Analog output range</b>	0 to 10 V DC (External load resistance: 2 kΩ to 1 MΩ)	4 to 20 mA DC (External load resistance: 500 Ω or less)
<b>Digital input</b>	12 bits, binary	11 bits, binary
<b>Resolution</b>	2.5 mV (10 V/4000)	8 μA (16 mA/2000)
<b>Total accuracy</b>	<ul style="list-style-type: none"> <li>±0.5 % (±50 mV) for full scale of 10 V (when ambient temperature is 25 °C±5 °C)</li> <li>±1.0 % (±100 mV) for full scale of 10 V (when ambient temperature is 0 °C to 55 °C)</li> </ul> Shipment adjustment is carried out by external load resistance 2 kΩ. If external load resistance becomes larger than 2 kΩ, the output voltage will increase slightly. When the load is 1 MΩ, the output voltage becomes about 2 % higher than the correct value.	<ul style="list-style-type: none"> <li>±0.5 % (±80 μA) for full scale of 16 mA (when ambient temperature is 25 °C±5 °C)</li> <li>±1.0 % (±160 μA) for full scale of 16 mA (when ambient temperature is 0 °C to 55 °C)</li> </ul>
<b>D/A conversion time</b>	60 μs (The data will be updated at every scan time of the PLC.)	
<b>output characteristics</b>	0 to 4000 are adjusted to 0 to 10 V when the external load resistance is 2 kΩ.	0 to 2000 are adjusted to 4 to 20 mA when the external load resistance is 250 Ω.
<b>Insulation method</b>	No insulation between the PLC.	
<b>Occupied points</b>	0 point (This number is not related to the maximum number of input/output points of the PLC.)	

### 4.4 List of Special Devices

R: Read W: Write

	Device number		Description	R/W
	FX3s	FX3G		
<b>Special auxiliary relay</b>	M8260	M8260 M8270	Switches the output mode OFF: Voltage output ON: Current output	R/W
	M8264	M8264 M8274	Output Holding Function Cancellation Setting OFF: Holds the analog data output just before stop of the PLC. ON: Output the offset data at stop of the PLC.	R/W
<b>Special data register</b>	D8260	D8260 D8270	Output setting data	R/W
	D8268	D8268 D8278	Error status b0: Output data setting error b1: Unused b2: Unused b3: Unused b4: EEPROM error b15 to b5: Unused	R/W
	D8269	D8269 D8279	Model code = 4	R

As for the details of the special devices, refer to the following manual.  
→ FX3s/FX3G/FX3GC/FX3U/FX3UC Series User's Manual - Analog Control Edition

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#### Warranty

Exclusion of loss in opportunity and secondary loss from warranty liability  
Regardless of the gratis warranty term, Mitsubishi shall not be liable for compensation to:  
(1) Damages caused by any cause found not to be the responsibility of Mitsubishi.  
(2) Loss in opportunity, lost profits incurred to the user by Failures of Mitsubishi products.  
(3) Special damages and secondary damages whether foreseeable or not, compensation for accidents, and compensation for damages to products other than Mitsubishi products.  
(4) Replacement by the user, maintenance of on-site equipment, start-up test run and other tasks.

#### 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 Electric.
- 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.

**MITSUBISHI ELECTRIC CORPORATION**

HEAD OFFICE : TOKYO BUILDING, 2-7-3 MARUNOUCHI, CHIYODA-KU, TOKYO 100-8310, JAPAN

# FX3G-1DA-BD INSTALLATION MANUAL

# FX3G

Manual Number	JY997D33601
Revision	G
Date	June 2017

This manual describes the part names, dimensions, mounting, and specifications of the product. Before use, read this manual and the manuals of all relevant products fully to acquire proficiency in handling and operating the product. Make sure to learn all the product information, safety information, and precautions. Store this manual in a safe place so that it can be taken out and read whenever necessary. Always forward it to the end user.

Registration: Phillips is a registered trademark of Phillips Screw Company. The company and product names described in this manual are registered trademarks or the trademarks of their respective companies.

Effective June 2017  
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## Safety Precautions (Read these precautions before use.)

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Depending on the circumstances, procedures indicated by **CAUTION** may also cause severe injury. It is important to follow all precautions for personal safety.

## Associated Manuals

Manual name	Manual No.	Description
FX3S/FX3G/FX3GC/FX3U/ FX3UC Series User's Manual - Analog Control Edition	JY997D16701 MODEL CODE: 09R619	Describes specifications for analog control and programming method for FX3S/FX3G/FX3GC/ FX3U/FX3UC Series PLC.
FX3S Series User's Manual - Hardware Edition	JY997D48601 MODEL CODE: 09R535	Explains FX3S Series PLC specifications for I/O, wiring, installation, and maintenance.
FX3G Series User's Manual - Hardware Edition	JY997D31301 MODEL CODE: 09R521	Explains FX3G Series PLC specifications for I/O, wiring, installation, and maintenance.

## How to obtain manuals

For product manuals or documents, consult with the Mitsubishi Electric dealer from who you purchased your product.

## Applicable standards

FX3G-1DA-BD units made in November, 2008 or later comply with the EC Directive (EMC Directive). Further information can be found in the following manual.

→ FX3S Series Hardware Manual (Manual No. JY997D48301)  
→ FX3G Series Hardware Manual (Manual No. JY997D46001)

**Attention**  
This product is designed for use in industrial applications.

## Caution for EC Directive

The analog expansion boards have been found to be compliant to the European standards in the aforesaid manual and directive. However, for the very best performance from what are in fact delicate measuring and controlled output device Mitsubishi Electric would like to make the following points: As analog devices are sensitive by nature, their use should be considered carefully. For users of proprietary cables (integral with sensors or actuators), these users should follow those manufacturers installation requirements. Mitsubishi Electric recommend that shielded cables should be used. If NO other EMC protection is provided, then users may experience temporary loss or accuracy between ±10 % in very heavy industrial areas. However, Mitsubishi Electric suggest that if adequate EMC precautions are followed for the users complete control system, users should expect accuracy as specified in this manual.

- Sensitive analog cable should not be laid in the same trunking or cable conduit as high voltage cabling. Where possible users should run analog cables separately.
- Good cable shielding should be used. When terminating the shield at Earth - ensure that no earth loops are accidentally created.
- When reading analog values, EMC accuracy can be improved out by averaging the readings. This can be achieved either through functions on the analog expansion boards or through a users program in the PLC main unit.

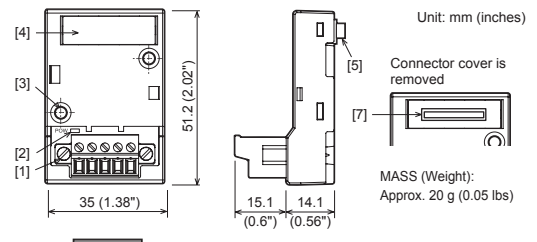
## 1. Outline

The FX3G-1DA-BD board (hereinafter called 1DA-BD) is an expansion board for adding one additional analog output point.

### 1.1 Incorporated Items

Product	Analog output expansion board FX3G-1DA-BD
<b>Included items</b>	<ul style="list-style-type: none"> <li>• M3×8 tapping screws for installation: 2 pcs.</li> <li>• Side cover</li> <li>• Installation Manual (This manual)</li> </ul>

### 1.2 External Dimensions, Part Names



- [1] Terminal block mounting screws
- [2] POW LED: Lit while power is properly supplied from main unit
- [3] Mounting holes (2-φ3.2)
- [4] Connector cover
- [5] Main unit connector
- [6] Terminal block to connect analog output
- [7] Memory cassette/Display module connector

## 2. Installation

### INSTALLATION PRECAUTIONS **WARNING**

- Make sure to cut off all phases of the power supply externally before attempting installation or wiring work.  
Failure to do so may cause electric shock or damage to the product.

### INSTALLATION PRECAUTIONS **CAUTION**

- Use the product within the generic environment specifications described in PLC main unit manual (Hardware Edition). Never use the product in areas with excessive dust, oily smoke, conductive dusts, corrosive gas (salt air, Cl<sub>2</sub>, H<sub>2</sub>S, SO<sub>2</sub>, or NO<sub>2</sub>), flammable gas, vibration or impacts, or expose it to high temperature, condensation, or rain and wind. If the product is used in such conditions, electric shock, fire, malfunctions, deterioration or damage may occur.
- When drilling screw holes or wiring, make sure cutting or wire debris does not enter the ventilation slits. Failure to do so may cause fire, equipment failures or malfunctions.
- Do not touch the conductive parts of the product directly. Doing so may cause device failures or malfunctions.
- Connect expansion board securely to their designated connectors. Loose connections may cause malfunctions.

For the installation, refer to the following manual.  
→ FX3S Series User's Manual - Hardware Edition  
→ FX3G Series User's Manual - Hardware Edition

## 3. Wiring

### WIRING PRECAUTIONS **WARNING**

- Make sure to cut off all phases of the power supply externally before attempting installation or wiring work.  
Failure to do so may cause electric shock or damage to the product.

### WIRING PRECAUTIONS **CAUTION**

- When drilling screw holes or wiring, make sure cutting or wire debris does not enter the ventilation slits. Failure to do so may cause fire, equipment failures or malfunctions.
- Make sure to observe the following precautions in order to prevent any damage to the machinery or accidents due to abnormal data written to the PLC under the influence of noise:
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  - 2) Ground the shield of the analog input/output cable at one point on the signal receiving side. However, do not use common grounding with heavy electrical systems.
- Make sure to properly wire to the terminal block (European type) in accordance with the following precautions. Failure to do so may cause electric shock, equipment failures, a short-circuit, wire breakage, malfunctions, or damage to the product.
  - The disposal size of the cable end should follow the dimensions described in the manual.
  - Tightening torque should follow the specifications in the manual.
  - Twist the end of strand wire and make sure that there are no loose wires.
  - Do not solder-plate the electric wire ends.
  - Do not connect more than the specified number of wires or electric wires of unspecified size.
  - Affix the electric wires so that neither the terminal block nor the connected parts are directly stressed.
- Make sure to properly wire to the terminal blocks in accordance with the following precautions. Failure to do so may cause electric shock, equipment failures, a short-circuit, wire breakage, malfunctions, or damage to the product.
  - The disposal size of the cable end should follow the dimensions described in the manual.
  - Tightening torque should follow the specifications in the manual.
  - Tighten the screws using a Phillips-head screwdriver No.2 (shaft diameter 6 mm (0.24") or less). Make sure that the screwdriver does not touch the partition part of the terminal block.

## 3.1 Applicable Cable and Terminal Tightening Torque

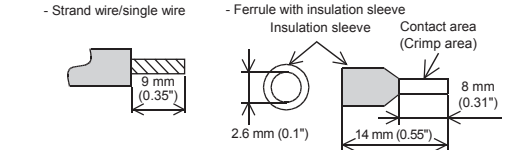
### 3.1.1 Terminal block (European type)

Type	Wire size
Single-wire	0.3 mm <sup>2</sup> to 0.5 mm <sup>2</sup> (AWG22 to 20)
2-wire	2 pieces of 0.3 mm <sup>2</sup> (AWG22)

- 1) Wire size  
Wiring to analog device should use 20-22 AWG wire.
- 2) Applicable cable

Manufacturer	Model	Caulking tool
Phoenix Contact Co., Ltd.	AI 0.5-8WH	CRIMPFOX 6 <sup>1</sup> (or CRIMPFOX 6T-F <sup>2</sup> )

- \*1 Old model name: CRIMPFOX ZA 3
- \*2 Old model name: CRIMPFOX UD 6



When using a ferrule with insulation sleeve, choose a wire with proper cable sheath referring to the above outside dimensions, or otherwise, the wire cannot be inserted easily. The tightening torque must be 0.22 to 0.25 N·m. Do not tighten terminal screws with a torque outside the above-mentioned range. Failure to do so may cause equipment failures or malfunctions.

### 4) Tool

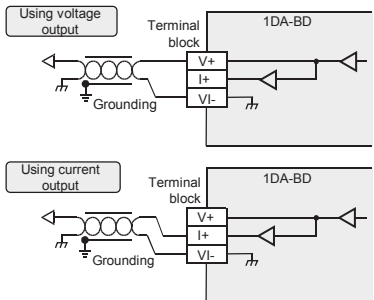
For tightening the terminal, use a commercially available small screwdriver having a straight form that is not widened toward the end as shown right.

**Caution:**  
If the diameter of screwdriver grip is too small, tightening torque will not be able to be achieved. Use the following recommended screwdriver or an appropriate replacement (grip diameter: approximately 25 mm (0.98")).

Manufacturer	Model
Phoenix Contact Co., Ltd.	SZS 0.4×2.5

## 3.2 Wiring of Analog Output

→ For the terminal configuration, refer to Section 1.2



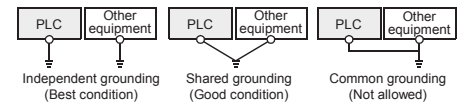
- \*1 Use 2-core shielded twisted pair cable for the analog output lines, and separate the analog output lines from other power lines or inductive lines.
- \*2 The grounding resistance should be 100 Ω or less.

## 3.3 Grounding

Grounding should be performed as stated below.

- The grounding resistance should be 100 Ω or less.
- Independent grounding should be performed for best results. When independent grounding is not performed, perform "shared grounding" of the following figure.

For details, refer to the following manual.  
→ FX3S Series User's Manual - Hardware Edition  
→ FX3G Series User's Manual - Hardware Edition



- The grounding wire size should be AWG 22-20 (0.3-0.5 mm<sup>2</sup>).
- The grounding point should be close to the PLC, and all grounding wire should be as short as possible.

## 4. Specifications

STARTUP AND MAINTENANCE PRECAUTIONS <b>CAUTION</b>
<ul style="list-style-type: none"> <li>• Do not disassemble or modify the PLC. Doing so may cause fire, equipment failures, or malfunctions.</li> <li>* For repair, contact your local Mitsubishi Electric representative.</li> <li>• Do not drop the product or exert strong impact to it. Doing so may cause damage.</li> </ul>

DISPOSAL PRECAUTIONS <b>CAUTION</b>
<ul style="list-style-type: none"> <li>• Please contact a certified electronic waste disposal company for the environmentally safe recycling and disposal of your device.</li> </ul>

TRANSPORTATION AND STORAGE PRECAUTIONS <b>CAUTION</b>
<ul style="list-style-type: none"> <li>• The product is a precision instrument. During transportation, avoid impacts larger than those specified in the general specifications by using dedicated packaging boxes and shock-absorbing pallets. Failure to do so may cause failures in the product. After transportation, verify operation of the product and check for damage of the mounting part, etc.</li> </ul>

### 4.1 Applicable PLC

Model name	Applicability
FX3S Series PLC	Ver. 1.00 or later (from first production)
FX3G Series PLC	Ver. 1.10 or later

The version number can be checked by monitoring D8001/D8101 as the last three digits indicate it.

- The number of connectable expansion boards varies depending on the main unit as follows:
  - FX3S, FX3G-14M□, FX3G-24M□ Main units: 1 unit
  - FX3G-40M□, FX3G-60M□ Main units: 2 units
 Never stack up two or more expansion boards.

For details on the system configuration, refer to the following manual.  
→ FX3S/FX3G/FX3GC/FX3U/FX3UC Series User's Manual - Analog Control Edition

## 4.2 General Specifications

The general specifications are equivalent to the PLC main unit. For general specifications, refer to the following manuals.  
→ FX3S Series User's Manual - Hardware Edition  
→ FX3G Series User's Manual - Hardware Edition

### 4.3 Performance Specifications

Item	Specifications	
	Voltage output	Current output
Analog output range	0 to 10 V DC (External load resistance: 2 kΩ to 1 MΩ)	4 to 20 mA DC (External load resistance: 500 Ω or less)
Digital input	12 bits, binary	11 bits, binary
Resolution	2.5 mV (10 V/4000)	8 μA (16 mA/2000)
Total accuracy	<ul style="list-style-type: none"> <li>• ±0.5 % (±50 mV) for full scale of 10 V (when ambient temperature is 25 °C±5 °C)</li> <li>• ±1.0 % (±100 mV) for full scale of 10 V (when ambient temperature is 0 °C to 55 °C)</li> <li>Shipment adjustment is carried out by external load resistance 2 kΩ.</li> <li>If external load resistance becomes larger than 2 kΩ, the output voltage will increase slightly.</li> <li>When the load is 1 MΩ, the output voltage becomes about 2 % higher than the correct value.</li> </ul>	<ul style="list-style-type: none"> <li>• ±0.5 % (±80 μA) for full scale of 16 mA (when ambient temperature is 25 °C±5 °C)</li> <li>• ±1.0 % (±160 μA) for full scale of 16 mA (when ambient temperature is 0 °C to 55 °C)</li> </ul>
D/A conversion time	60 μs (The data will be updated at every scan time of the PLC.)	
output characteristics	<p><b>Caution:</b> An area of dead band is located in the region of 0V. Therefore the output analog value may not represent the digital value accurately.</p>	
Insulation method	No insulation between the PLC.	
Occupied points	0 point (This number is not related to the maximum number of input/output points of the PLC.)	

### 4.4 List of Special Devices

R: Read W: Write

	Device number			Description	R/W
	FX3S	FX3G			
	Board A	Board B			
Special auxiliary relay	M8260	M8260	M8270	Switches the output mode OFF: Voltage output ON: Current output	R/W
	M8264	M8264	M8274	Output Holding Function Cancellation Setting OFF: Holds the analog data output just before stop of the PLC. ON: Output the offset data at stop of the PLC.	R/W
Special data register	D8260	D8260	D8270	Output setting data	R/W
	D8268	D8268	D8278	Error status b0: Output data setting error b1: Unused b2: Unused b3: Unused b4: EEPROM error b15 to b5: Unused	R/W
	D8269	D8269	D8279	Model code = 4	R

As for the details of the special devices, refer to the following manual.  
→ FX3S/FX3G/FX3GC/FX3U/FX3UC Series User's Manual - Analog Control Edition

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		铅 (Pb)	汞 (Hg)	镉 (Cd)	六价铬 (Cr(VI))	多溴联苯 (PBB)	多溴二苯醚 (PBDE)
可编程控制器		○	○	○	○	○	○
印刷电路板		×	○	○	○	○	○

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<ul style="list-style-type: none"> <li>• 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.</li> <li>• Before using the product for special purposes such as nuclear power, electric power, aerospace, medicine or passenger movement vehicles, consult with Mitsubishi Electric.</li> <li>• 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 fail-safe functions in the system.</li> </ul>