

## Chapter 11 COMPLIANCE WITH STANDARDS

### 11.1 Compliance with UL Standards and Canadian Standards (cUL certification)

#### 11.1.1 General

Originally, the UL standards were established by Underwriters Laboratories, Inc. as private criteria for inspections/investigations pertaining to fire/accident insurance in the USA. Later, these standards were authorized as the official standards to protect operators, service personnel and the general populace from fires and other accidents in the USA.

cUL certification means that UL has given certification for products to clear CSA Standards. cUL certified products are equivalent to those compliant with CSA Standards.

#### 11.1.2 Considerations when using FRENIC-Mini in systems to be certified by UL and cUL

If you want to use the FRENIC-Mini series of inverters as a part of UL Standards or CSA Standards (cUL certified) certified product, refer to the related guidelines described on page ix.

### 11.2 Compliance with European Standards

The CE marking on Fuji products indicates that they comply with the essential requirements of the Electromagnetic Compatibility (EMC) Directive 89/336/EEC issued by the Council of the European Communities and Low Voltage Directive 73/23/EEC.

Only the EMC filter built-in type of inverters that bear a CE marking are compliant with these EMC Directives.

Inverters that bear a CE marking or TÜV mark are compliant with the Low Voltage Directive.

#### The products comply with the following standards:

Low Voltage Directive	EN50178:	1997
EMC Directives	EN61800-3:	1996+A11 : 2000
	EN55011:	1998+A : 1999
	Immunity:	Second environment (EN61800-3+A11 Industrial)
	Emission:	Class 1A (EN55011+A1) (Applicable only to the EMC filter built-in type of inverters)
	:	Second environment (EN61800-3 + A11 Industrial) (Applicable only when an optional EMC-compliant filter is attached)

#### CAUTION

The FRENIC-Mini series of inverters are categorized as a "restricted sales distribution class" of the EN61800-3. When you use these products with any home appliances or office equipment, you may need to take appropriate countermeasures to reduce or eliminate any noise emitted from these products.

## 11.3 Compliance with EMC Standards

### 11.3.1 General

The CE marking on inverters does not ensure that the entire equipment including our CE-marked products is compliant with the EMC Directive. Therefore, CE marking for the equipment shall be the responsibility of the equipment manufacturer. For this reason, Fuji's CE mark is indicated under the condition that the product shall be used within equipment meeting all requirements for the relevant Directives. Instrumentation of such equipment shall be the responsibility of the equipment manufacturer.

Generally, machinery or equipment includes not only our products but other devices as well. Manufacturers, therefore, shall design the whole system to be compliant with the relevant Directives.

In addition, to satisfy the requirements noted above, use a Fuji FRENIC inverter in connection with an EMC-compliant filter (optional feature) or an EMC filter built-in type inverter in accordance with the instructions contained in this instruction manual. Installing the inverter(s) in a metal panel may be necessary, depending upon the operating environment of the equipment that the inverter is to be used with.



Our EMC compliance test is performed under the following conditions.

- Motor Sound (carrier frequency) (F26): 15 kHz
- Wiring length (of the shielded cable) between the inverter and motor: 33ft(10m)

### 11.3.2 Recommended installation procedure

To make the machinery or equipment fully compliant with the EMC Directive, have certified technicians wire the motor and inverter in strict accordance with the procedure described below.

#### ■ In the case of EMC filter built-in type of inverters

- (1) Mount the EMC grounding flange (that comes with the inverter) to the inverter with screws in order to ground the wire shield(s). (See Figure 11.1.)

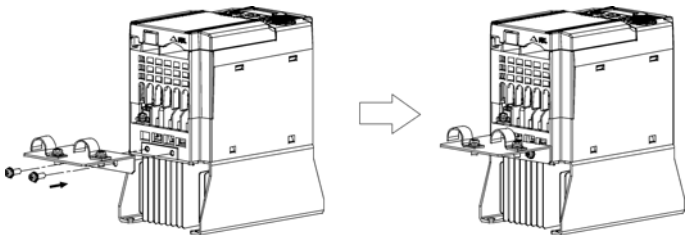


Figure 11.1 Attaching the EMC Grounding Flange

- (2) Use shielded wires for the motor cable and route it as short as possible. Firmly clamp the wire shield to the flange to ground it. Further, connect the wire shield electrically to the grounding terminal of motor. (See Figure 11.2.)

- (3) Use shielded wires for the control signals of the inverter to input to/output from the control terminals. Firmly clamp the control wire shields to the EMC grounding flange (in the same way as the motor cables).

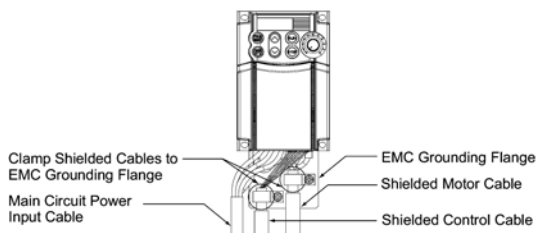


Figure 11.2 Connecting Shielded Cables

<When an RS-485 Communications Card (optional) is used>

Use a shielded cable for connection. Strip the cable of the cable sheath so that the shield is exposed, as shown at right. Then connect the shield wire firmly to the shield grounding clamp so that it is grounded.

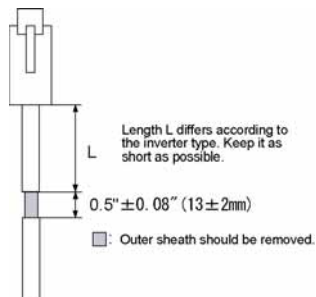


Figure 11.3 Preparing End of Extension Cable or LAN Cable for Connection

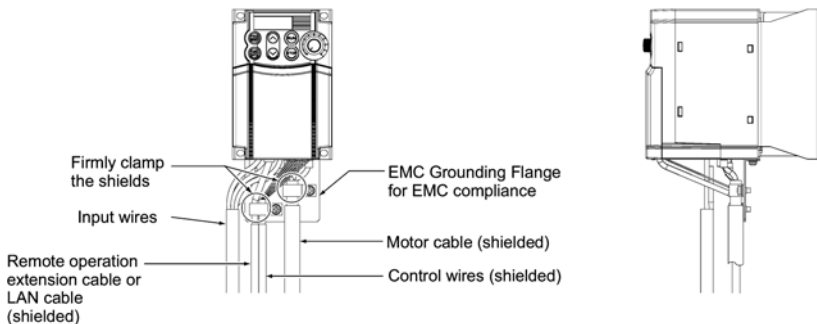


Figure 11.4 Connecting Shield Wire for Compliance with EMC Directive

- (4) If noise from the inverter exceeds the permissible level, enclose the inverter and its peripherals within a metal panel as shown in Figure 11.5.

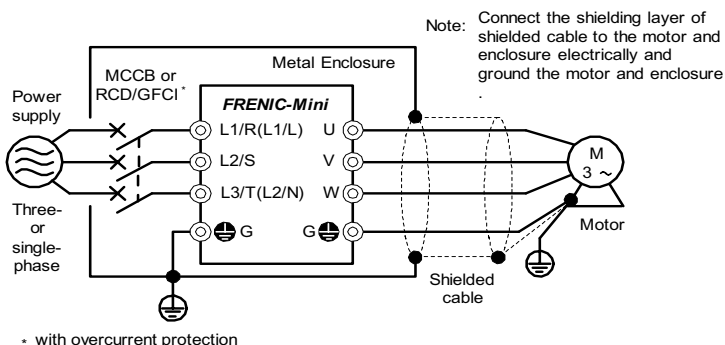


Figure 11.5 Installing the Inverter into a Metal Panel

■ In case an outboard, EMC-compliant (optional) is used

- 1) Install the inverter and the filter on a grounded metal plate. Use a shielded cable also for connection of the motor. Make the cables as short as possible. Connect the shield wire firmly to the metal plate. Also connect the shield wire electrically to the grounding terminal of the motor.
- 2) Use shielded wire for connection around the control terminals of the inverter and also for connection of the signal cable of an RS-485 Communications Card. As with the motor, clamp the shield wire firmly to a grounded plate.
- 3) If noise from the inverter exceeds the permissible level, enclose the inverter and its peripherals within a metal panel as shown in Figure 11.6.

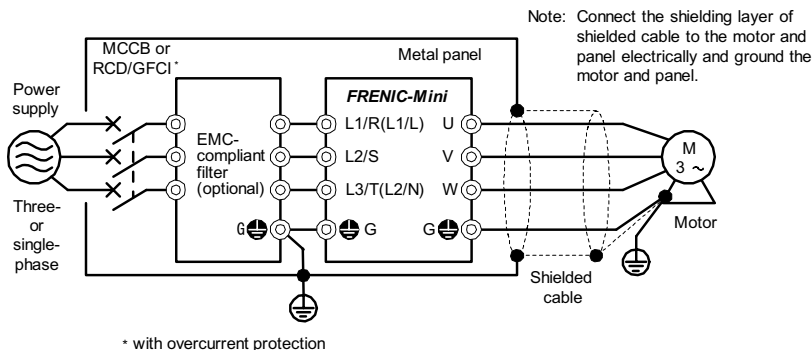


Figure 11.6 Installing the Inverter with EMC-compliant filter into a Metal Panel

### 11.3.3 Leakage current of EMC-filter built-in type inverter and outboard EMC-complaint filter

Table 11.1 Leakage current of EMC filter built-in type inverter

Input Power	Inverter type	Leakage current (mA)	
		Normal	Worst
Three-phase 230V	FRNF12C1E-2U	7.5	7.5
	FRNF25C1E-2U		
	FRNF50C1E-2U		
	FRN001C1E-2U	13.0	20.0
	FRN002C1E-2U		
	FRN003C1E-2U		
Three-phase 460V	FRNF50C1E-4U	5.4	33.0
	FRN001C1E-4U		
	FRN002C1E-4U	3.8	25.0
	FRN003C1E-4U		
	FRN005C1E-4U		
Single-phase 230V	FRNF12C1E-7U	8.3	8.3
	FRNF25C1E-7U		
	FRNF50C1E-7U		
	FRN001C1E-7U	4.1	8.2
	FRN002C1E-7U		
	FRN003C1E-7U		

Table 11.2 Leakage current of EMC-compliant filter (optional)

Input power	Inverter type	Filter type	Leakage current (mA)	
			Normal	Worst
Three-phase 230V	FRNF12C1E-2U	FE5956-6-46 (EFL-0.75E11-2)	3.0	3.0
	FRNF25C1E-2U			
	FRNF50C1E-2U			
	FRN001C1E-2U	FE5956-26-47 (EFL-4.0E11-2)	3.0	3.0
	FRN002C1E-2U			
	FRN003C1E-2U			
Three-phase 460V	FRN005C1E-2U	15TDHE84 (Delta Electronics, Inc.)	4.0	27.0
	FRNF50C1E-4U			
	FRN001C1E-4U			
	FRN002C1E-4U			
	FRN003C1E-4U			
Single-phase 230V	FRN005C1E-4U	30DKCE5 (Delta Electronics, Inc.)	1.0	1.8
	FRNF12C1E-7U			
	FRNF25C1E-7U			
	FRNF50C1E-7U			
	FRN001C1E-7U			
	FRN002C1E-7U			
FRN003C1E-7U				

## 11.4 Harmonic Component Regulation in the EU

### 11.4.1 General comments

When you use general-purpose industrial inverters in the EU, the harmonics emitted from the inverter to power lines are strictly regulated as stated below.

If an inverter whose rated input is 1 kW or less is connected to public low-voltage power supply, it is regulated by the harmonics emission regulations from inverters to power lines (with the exception of industrial low-voltage power lines). Refer to Figure 11.7 below for details.

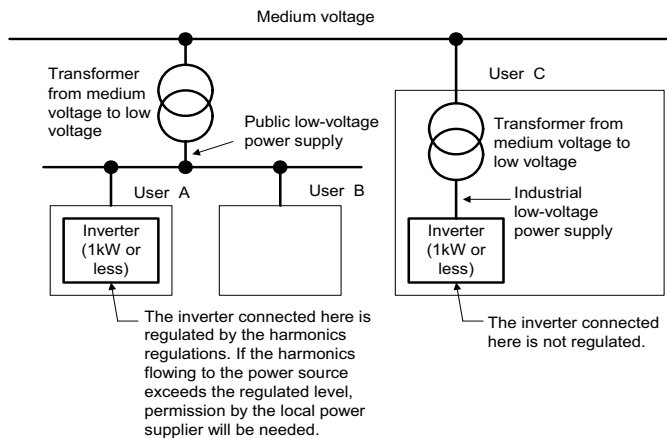


Figure 11.7 Power Source and Regulation

## 11.4.2 Compliance with the harmonic component regulation

Table 11.3 Compliance with Harmonic Component Regulation

Power supply voltage	Inverter type	w/o DC reactor	w/ DC reactor	Applicable DC reactor type
Three-phase 230 V	FRNF12C1■-2U	√*	√*	DCR2-0.2
	FRNF25C1■-2U	√*	√*	DCR2-0.2
	FRNF50C1■-2U	√*	√*	DCR2-0.4
	FRN001C1■-2U	√*	√*	DCR2-0.75
Three-phase 460 V	FRNF50C1■-4U	—	√	DCR4-0.4
	FRN001C1■-4U	—	√	DCR4-0.75
Single-phase 230 V	FRNF12C1■-7U	—	√	DCR2-0.2
	FRNF25C1■-7U	—	√	DCR2-0.4
	FRNF50C1■-7U	—	√	DCR2-0.75
	FRN001C1■-7U	—	—	DCR2-1.5

\* Inverter types marked with √ in the table above are compliant with the EN61000-3-2 (+A14), so they may be connected to public low-voltage power supply unconditionally. Conditions apply when connecting models marked with "—". If you want to connect them to public low-voltage power supply, you need to obtain permission from the local electric power supplier. In general, you will need to provide the supplier with the harmonics current data of the inverter. To obtain the data, contact your Fuji Electric representative.

Note 1) A box (■) in the above table replaces S or E depending on the enclosure.

2) When supplying three-phase 200 VAC power stepped down from a three-phase 400 VAC power line using a transformer, the level of harmonic flow from the 400 VAC line will be regulated.

## 11.5 Compliance with the Low Voltage Directive in the EU

### 11.5.1 General

General-purpose inverters are regulated by the Low Voltage Directive in the EU. Fuji Electric has obtained the proper certification for the Low Voltage Directive from the official inspection agency. Fuji Electric states that all our inverters with CE and/or TÜV marking are compliant with the Low Voltage Directive.

### 11.5.2 Points for consideration when using the FRENIC-Mini series in a system to be certified by the Low Voltage Directive in the EU

If you want to use the FRENIC-Mini series of inverters in systems/equipment in the EU, refer to the guidelines on page vii.

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**Compact Inverter**  
***FRENIC-Mini***

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**Instruction manual**

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Fuji Electric FA Components & Systems Co., Ltd.  
Fuji Electric Corp. of America

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The purpose of this instruction manual is to provide accurate information in handling, setting up and operating of the FRENIC-Mini series of inverters. Please feel free to send your comments regarding any errors or omissions you may have found, or any suggestions you may have for generally improving the manual.

In no event will Fuji Electric FA Components & Systems Co., Ltd. be liable for any direct or indirect damages resulting from the application of the information in this manual.

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