

## Chapter 10 COMPLIANCE WITH STANDARDS

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

#### 10.1.1 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.

#### 10.1.2 Considerations when using FRENIC-Multi in systems to be certified by UL and cUL

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

### 10.2 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 and Low Voltage Directive 73/23/EEC issued by the Council of the European Communities.

If connected with a specified external EMC filter, Fuji inverters that bear a CE marking but have no built-in EMC filter become compliant with these EMC Directives.

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

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

Low Voltage Directive EN50178: 1997

EMC Directives EN61800-3: 2004

Immunity: Second environment (Industrial)

Emission: See below.

	EMC filter	Capacity of inverter		
		3 HP or below	5 HP	7.5 HP or above
Three-phase 230 V class series	External	Category C2		
	Built-in	Category C2	Category C3	
Three-phase 460 V class series	External	Category C3		
	Built-in	Category C2		Category C3
Single-phase 230 V class series	External	Category C3	—	
	Built-in	Category C2	—	

#### CAUTION

When you use FRENIC-Multi inverters categorized as "Category C2" of the EN61800-3 in a domestic environment, you may need to take appropriate countermeasures to reduce or eliminate any noise emitted from these inverters.

FRENIC-Multi inverters categorized as "Category C3" of the EN61800-3 are not designed for use in a domestic environment. These inverters may interfere with the operations of home appliances or office equipment due to noise emitted from them.


## 10.3 Compliance with EMC Standards

### 10.3.1 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) in accordance with the instructions contained in this instruction manual. Installing the inverter(s) in a metal enclosure 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 (10 m)

### 10.3.2 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 with a capacity of 5 HP or below

- 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 10.1.)

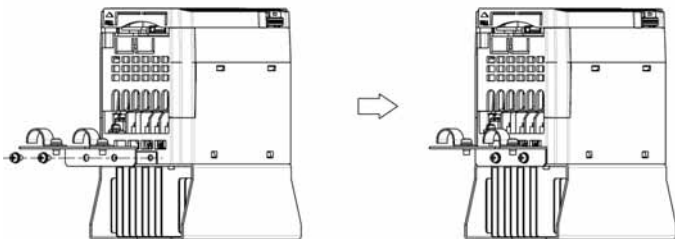


Figure 10.1 Attaching the EMC Grounding Flange

- 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 10.2.)
- 3) 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. As with the motor, clamp the shield wire firmly to a grounded plate. (See Figure 10.2.)

- 4) In the case of FRN001E1E-7U, motor cable shall be wired through the ring core (that comes with the inverter), and the ring core shall be fixed by the EMC grounding flange.

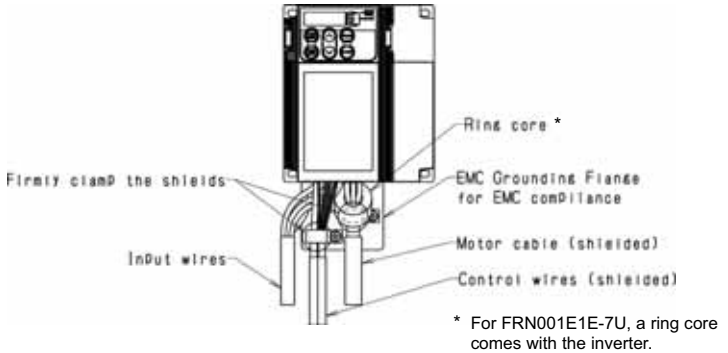
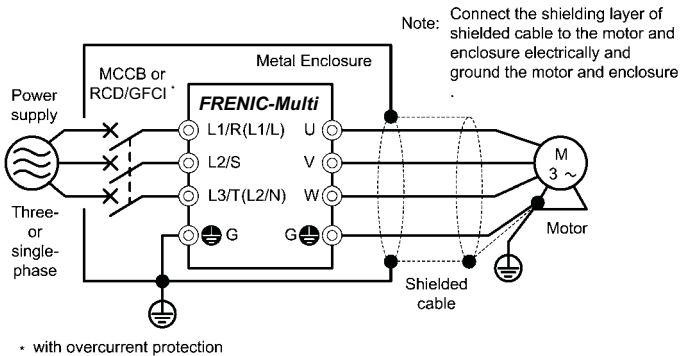


Figure 10.2 Connecting Shielded Cables

- 5) If noise from the inverter exceeds the permissible level, enclose the inverter and its peripherals within a metal enclosure as shown in Figure 10.3.



• with overcurrent protection

Figure 10.3 Installing the EMC Filter Built-in Type of Inverters into a Metal Enclosure

■ In the case of inverters with an external EMC-compliant filter (optional)

- 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.  
For the inverters from 7.5 to 20 HP, install them in a metal enclosure to comply with the EMC directive.
- 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 enclosure as shown in Figure 10.4.

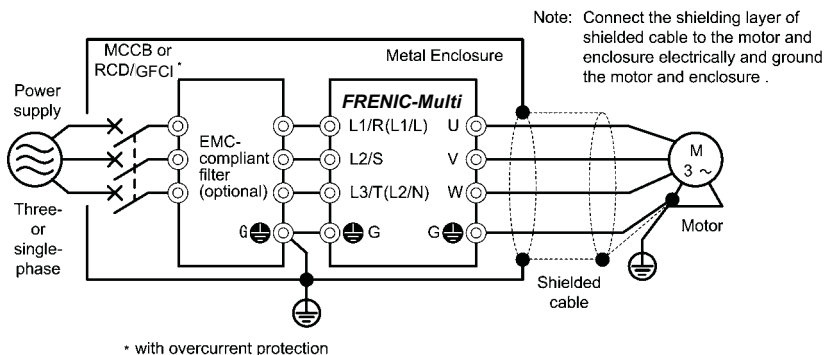


Figure 10.4 Installing the Inverter with an External EMC-compliant Filter (Optional) into a Metal Enclosure

### 10.3.3 Leakage current from EMC-filter built-in type inverters or inverters with an external EMC-complaint filter (optional)

Table 10.1 Leakage Current from EMC Filter Built-in Type Inverter

Input power	Inverter type	Leakage current (mA) *1)	
		Normal	Worst *2)
Three-phase 230 V	FRNF12E1E-2U	7.5	7.5
	FRNF25E1E-2U		
	FRNF50E1E-2U		
	FRN001E1E-2U		
	FRN002E1E-2U	13.0	20.0
	FRN003E1E-2U		
	FRN005E1E-2U		
	FRN007E1E-2U	21.0	21.0
	FRN010E1E-2U		
	FRN015E1E-2U		
FRN020E1E-2U			
Three-phase 460 V	FRNF50E1E-4U	5.4	33.0
	FRN001E1E-4U		
	FRN002E1E-4U		
	FRN003E1E-4U	3.8	25.0
	FRN005E1E-4U		
	FRN007E1E-4U	3.8	11.7
	FRN010E1E-4U		
	FRN015E1E-4U	6.8	22.3
FRN020E1E-4U			
Single-phase 230 V	FRNF12E1E-7U	8.3	8.3
	FRNF25E1E-7U		
	FRNF50E1E-7U		
	FRN001E1E-7U		
	FRN002E1E-7U	4.1	8.2
	FRN003E1E-7U		

\*1) The values are calculated assuming the power supplies of three-phase 240 V (50 Hz), three-phase 400 V (50 Hz), and single-phase 230 V (50 Hz).

\*2) The worst condition includes a phase loss in the supply line.

Table 10.2 Leakage Current from Inverters with an External EMC-complaint Filter (Optional)

Input power	Inverter type	Filter type	Leakage current (mA) *1)	
			Normal	Worst *2)
Three-phase 230 V	FRNF12E1S-2U	EFL-0.75E11-2	3.0	3.0
	FRNF25E1S-2U			
	FRNF50E1S-2U			
	FRN001E1S-2U			
	FRN002E1S-2U	EFL-4.0E11-2	3.0	3.0
	FRN003E1S-2U			
	FRN005E1S-2U			
	FRN007E1S-2U	EFL-7.5E11-2	11	11
	FRN010E1S-2U			
FRN015E1S-2U	EFL-15SP-2	20	20	
FRN020E1S-2U				
Three-phase 460 V	FRNF50E1S-4U	15TDHS84	4.0	27.0
	FRN001E1S-4U			
	FRN002E1S-4U			
	FRN003E1S-4U			
	FRN005E1S-4U	FN3011-30-61	0.4	3.1
	FRN007E1S-4U			
	FRN010E1S-4U			
	FRN015E1S-4U	FN301150-62	0.4	3.1
FRN020E1S-4U				
Single-phase 230 V	FRNF12E1S-7U	30DKCS5	1.0	1.8
	FRNF25E1S-7U			
	FRNF50E1S-7U			
	FRN001E1S-7U			
	FRN002E1S-7U			
FRN003E1S-7U				

\*1) The values are calculated assuming the power supplies of three-phase 240 V (50 Hz), three-phase 400 V (50 Hz), and single-phase 230 V (50 Hz).

\*2) The worst condition includes a phase loss in the supply line.

## 10.4 Harmonic Component Regulation in the EU

### 10.4.1 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 1kW 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 10.5 below for details.

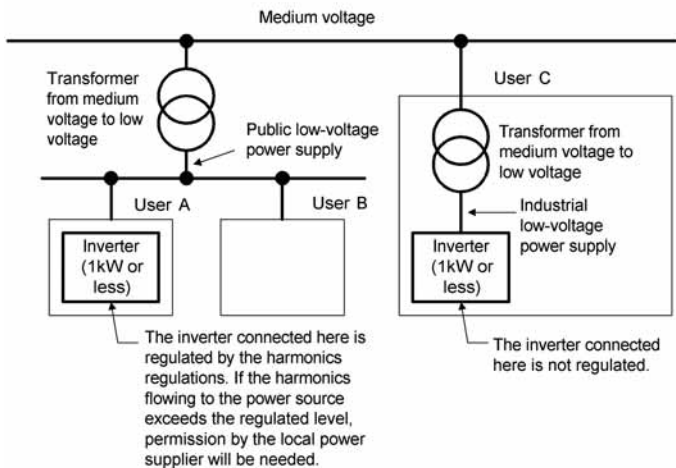


Figure 10.5 Power Source and Regulation

## 10.4.2 Compliance with the harmonic component regulation

Table 10.3 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	FRNF12E1 ■-2U	√ *	√ *	DCR2-0.2
	FRNF25E1 ■-2U	√ *	√ *	DCR2-0.2
	FRNF50E1 ■-2U	√ *	√ *	DCR2-0.4
	FRN001E1 ■-2U	√ *	√ *	DCR2-0.75
Three-phase 460 V	FRNF50E1 ■-4U	—	√	DCR4-0.4
	FRN001E1 ■-4U	—	√	DCR4-0.75
Single-phase 230 V	FRNF12E1 ■-7U	—	√	DCR2-0.2
	FRNF25E1 ■-7U	—	√	DCR2-0.4
	FRNF50E1 ■-7U	—	√	DCR2-0.75
	FRN001E1 ■-7U	—	—	DCR2-1.5

\* When supplying three-phase 230 VAC power stepped down from a three-phase 460 VAC power line using a transformer, the level of harmonic flow from the 460 VAC line will be regulated.

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

**Note 2)** 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, consult your Fuji Electric representative.

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

### 10.5.1 General

General-purpose inverters are regulated by the Low Voltage Directive in the EU. Fuji Electric states that all our inverters with CE or TÜV mark are compliant with the Low Voltage Directive.

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

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

MEMO

**High Performance Compact Inverter**

***FRENIC-Multi***

---

**Instruction manual**

First Edition, June 2007

Fuji Electric FA Components & Systems Co., Ltd.

Fuji Electric Corp. of America

---

The purpose of this instruction manual is to provide accurate information in handling, setting up and operating of the FRENIC-Multi 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.

---

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

---

2007-07(G07/G07)05CM