TOSHIBA

E6581154

INVERTER INSTRUCTION MANUAL

Compliance with CE Marking, UL Standard and CSA Standard

VF-nC1 Single-phase 100V
VF-nC1 Single-phase 200V
VF-nC1 Three-phase 200V

Toshiba Schneider Inverter Corporation

NOTICE
1. Make sure that this Instruction Manual is delivered to the end user of the inverter unit.
2. Keep this manual before installing or operating the inverter unit, and store it in a safe place for reference.

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1. Compliance with CE Marking

1.1. Abstract

In Europe, EMC directive is enforced starting 1st Jan. of 1996, and Low Voltage Directive starting 1st Jan. of 1997. The display of CE mark that demonstrates that products imported to European Union conform to these directives is required. Inverter itself cannot function alone, but is de-signed as a component in order to control machines or equipment which includes that inverter installed in a cubicle. Therefore the conformance to EMC directive is not required on inverter it-self. But since the object of the Low Voltage directive is equipment that is designed to be used with rated voltage of 50 to 1,000 VAC or 75 to 1,500 VDC, CE should be marked on inverter as to the Low Voltage directive.

But CE has to be marked on the final product installing inverters, that conforms to the EMC directive and the Low Voltage directive. And the product also may conform to Machine directive. The user that makes the final products have to take the responsibility for Marking of CE. For that reason, we recommend installation for Low Voltage directive and measurement for EMC directive, so that the products including our inverter should conform to the EMC and Low Voltage directive.

TOSHIBA carried out Approval testing and confirmation testing on representative models under the circumstances based on installation and measurement so that our products should conform to each directive. But we cannot confirm the conformance of the user's products to the EMC directive. Since EMC environment changes according to the construction of the cubicle and the relation of other installed electric equipment and the condition of wiring and installation, please confirm the conformance to the EMC directive for the final products on your side.

1.2. EMC directive

An inverter itself is not an object of CE marking.

A machine which consists of an inverter and a motor is an object of CE marking.
The EMC directive includes the emission section and the immunity section. VF-nC1 can conform to EMC directive by means of installing the recommended EMI noise filter to the input side, and wiring properly.
-> Emission: Emission of electromagnetic wave and electromagnetic interference
-> Immunity: Resistance to electromagnetic interference

[EMC directive]
89/336/EEC

Table 1 Relative standard

Noise type	Test item	Standard	Applicable standards
Emission	Conducted Emission	EN61800-3	EN55011 Group 1 class A
	Radiated Emission		EN55011 Group 1 class A
Immunity	Electrostatic Discharge		IEC61000-4-2
	Radiated Electromagnetic field		IEC61000-4-3
	Electrical Fast Transient/Burst		IEC61000-4-4
	Surge Immunity		IEC61000-4-5
	Conducted Disturbances		IEC61000-4-6
	Voltage dips, short interruptions and voltage variations		IEC61000-4-11

1.3. Compliance with EMC directive

1.3.1 The model, noise filter inside

(1) Single-phase 200V class : VFNC1S-2002PL to 2022PL

The above mentioned models install EMI noise filter inside. So the conducted and radiated noise can be reduced, optional EMI noise filters are not needed.

(The additional noise filter should be installed, when more effective reduction is required.)

(2) The main cables such as input to the EMI filter and output of the inverter and the signal cables should be shielded, then cable length should be wired as short as possible. The main input cable should be separated from the main output cable, and cables for control signal also should be separated from main cables, not wiring parallel and not bundling, cross the wires where necessary.

(3) Install EMI filter and inverter on the same metal back plate in an inverter panel. The metal back plate or the cubicle must be grounded absolutely, by using short thick wires, separated from the main cables.

(4) Shielded cables should be grounded on the metal back plate in order to reduce the radiated noise from the other cables. It is an effective measure that shielded cables are grounded close to the inverter or/and operation panel or/and EMI filter(less than 10cm).

(5) Installation of the zero-phase and/or the ferrite core can also effectively reduce the radiated noise further.(Input or/and output of inverter)

[Ex. Countermeasure - main circuit wiring]

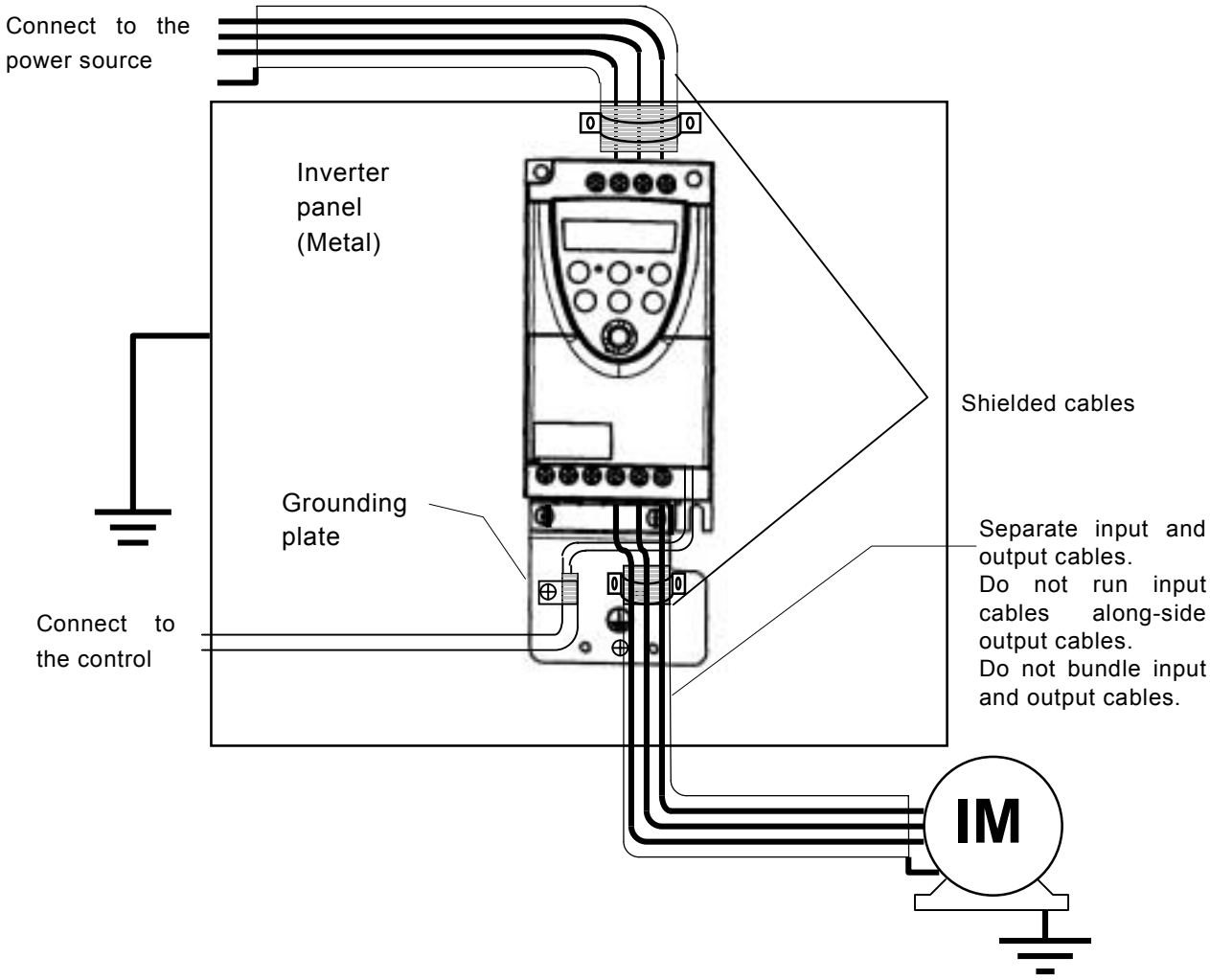
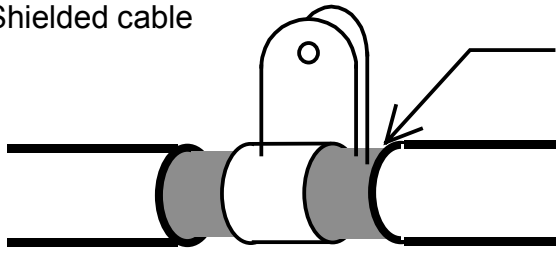


Fig. 1

Shielded cable



Strip the cable and fix it to the metal plate by means of a metal saddle for electrical work or equivalent.

1.3.2 The models without EMI filters

(1) Shingle-phase 100V class : VFNC1-1001P to 1007P
Three-phase 200V class : VFNC1-2001P to 2022P
Shingle-phase 200V class : VFNC1S-2002P to 2022P

This subsection explains what measures must be taken to satisfy the EMC directive.
Insert a recommended EMI filter (Table 2) on the input side of the inverter to reduce radiation and transmission noises. In the combinations listed in Table 2, inverters were checked for conformity with the EMC directive. For inverters used in Japan, it is recommended to use the NF series of noise filters.
Table 2 lists noise filters recommended for the inverters.

Table 2. Recommended EMI filter selection

Voltage class	Inverter	Filter for class A Compliance Motor cable length 20m or less	Filter for class B Compliance Motor cable length 5m or less
Three-phase 200V class	VFNC1-2001P	EMFA2006Z	-
	VFNC1-2002P	EMFA2006Z	-
	VFNC1-2004P	EMFA2006Z	-
	VFNC1-2007P	EMFA2006Z	-
	VFNC1-2015P	EMFA2015Z	-
	VFNC1-2022P	EMFA2015Z	-
Single-phase 200V class	VFNC1S-2002P	EMFAS2011Z	-
	VFNC1S-2004P	EMFAS2011Z	-
	VFNC1S-2007P	EMFAS2011Z	-
	VFNC1S-2015P	EMFAS2025Z	-
	VFNC1S-2022P	EMFAS2025Z	-
Single-phase 100V class	VFNC1S-1001P	EMFAS2011Z	-
	VFNC1S-1002P	EMFAS2011Z	-
	VFNC1S-1004P	EMFAS2011Z	-
	VFNC1S-1007P	EMFAS2025Z	-
Single-phase 200V class (Built-in filter type)	VFNC1S-2002PL	With a built-in filter	With a built-in filter
	VFNC1S-2004PL	With a built-in filter	With a built-in filter
	VFNC1S-2007PL	With a built-in filter	With a built-in filter
	VFNC1S-2015PL	With a built-in filter	With a built-in filter
	VFNC1S-2022PL	With a built-in filter	With a built-in filter

(2) The main cables such as input to the EMI filter and output of the inverter and the signal cables should be shielded, then cable length should be wired as short as possible. The main input cable should be separated from the main output cable, and cables for control signal also should be separated from main cables, not wiring parallel and not bundling, cross the wires where necessary.

(3) Install EMI filter and inverter on the same metal back plate in an inverter panel. The metal back plate or the cubicle must be grounded absolutely, by using short thick wires, separated from the main cables.

(4) Please separate input cable to EMI filter from output cable as much as possible.

(5) Shielded cables should be grounded on the metal back plate in order to reduce the radiated noise from the other cables. It is an effective measure that shielded cables are grounded close to the inverter or/and operation panel or/and EMI filter(less than 10cm).

(6) Installation of the zero-phase and/or the ferrite core can also effectively reduce the radiated noise further. (Input or/and output of inverter)

[Ex. Countermeasure - main circuit wiring]

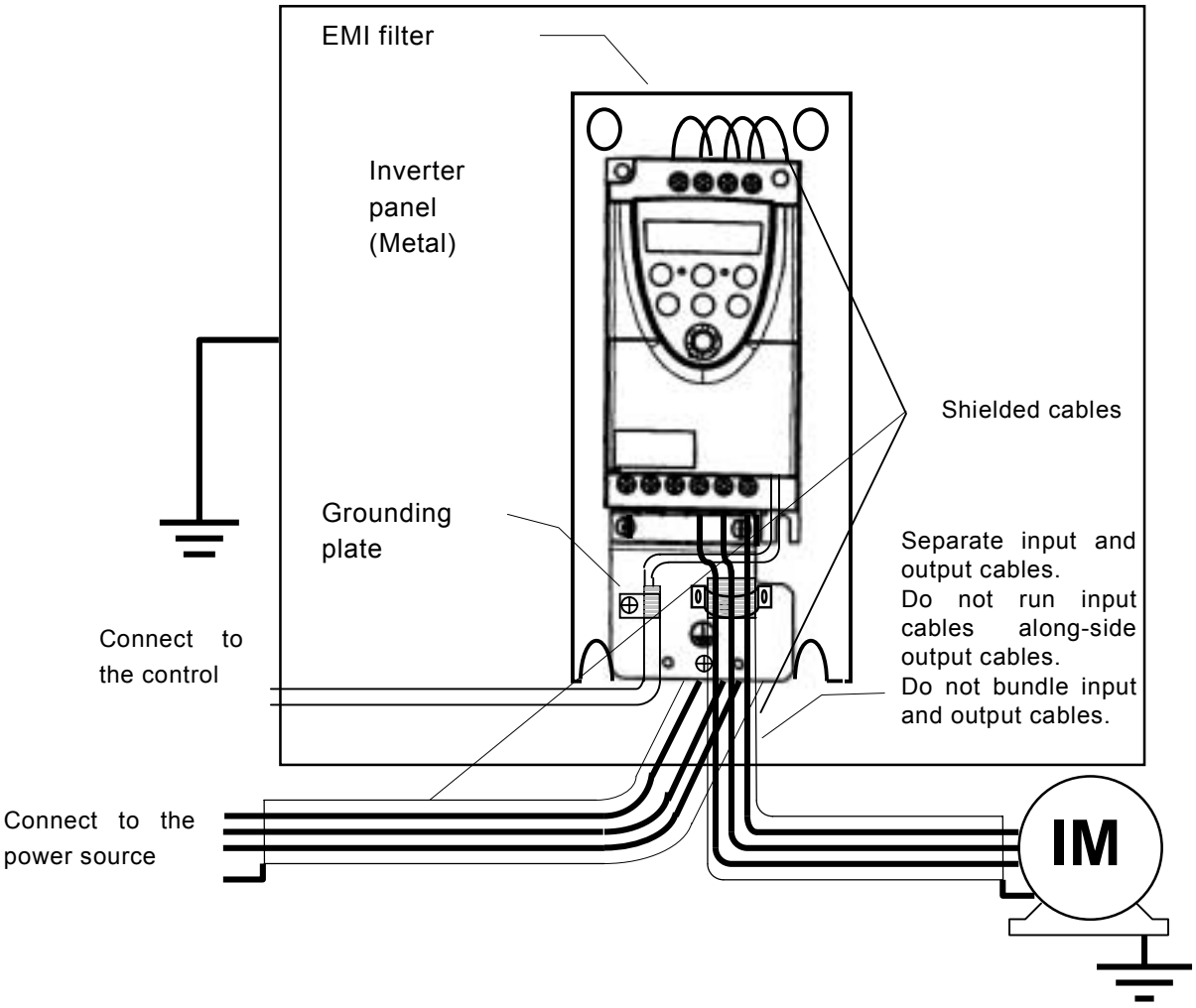


Fig. 2

Note 1)

Process as shown below.

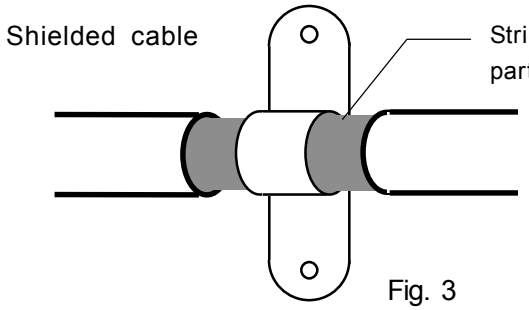


Fig. 3

[Operating with external signals]

To operate with external signals, process as following figures.

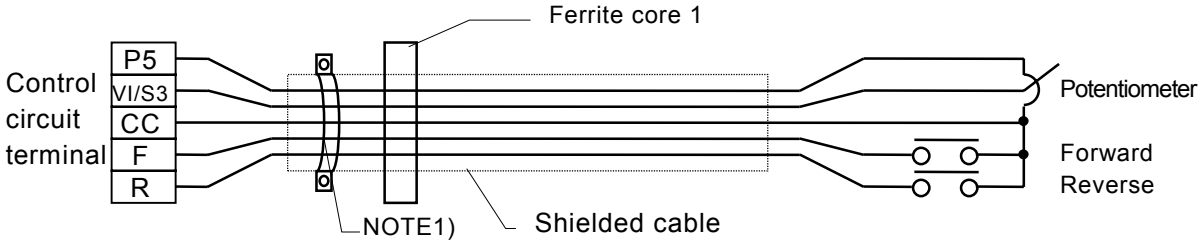


Fig. 4

[Accessories for countermeasure]

- Shielded cable : Showa electric Wire & Cable Co. LTD.
  Type form/ CV-S, 600V or less
- Shielded cable : SUMITOMO 3M Co. Ltd. Electro-magnetic guard shielded sleeve
  Type form/ DS-5,7,10,14
- EMI filter : Toshiba Schneider Inverter Corporation
  Type form/ For further details, see Table2
- Ferrite core 1 : TDK Co. Ltd.
  Type form/ ZCAT3035-1330

[Apply if needed]

- Grounding plate : Toshiba Schneider Inverter Corporation
  Type form/ EMP001Z
- Ferrite core : NEC TOKIN Corporation
  Type form/ ESD-R-47D-1
- Zero-phase reactor : Soshin denki Co. Ltd.
  Type form/ RC5078 or RC9129
- Radio noise filter : Soshin denki Co. Ltd.
  Type form/ NF series

1.4. Low voltage directive

Inverter itself is an object of the CE marking.

The Low Voltage Directive defines the safety of the electric equipment. VF-A7 series conform to the Low Voltage directive based on EN50178.

Normative standard : EN50178/Electronic equipment for use in power installation
Pollution degree :2(5.2.15.2)
Over-voltage category : 3 200V class 3.0 mm (5.2.16.1)

EN50178 provides that for electronic equipment used in power installations. The main intention is to stipulate minimum requirements for the design and manufacture of electronic equipment, for protection against electric shock, for testing and for the integration into systems for power installations.

1.5. Compliance with Low voltage directive

Please carry out the below mentioned countermeasures for the Low Voltage Directive in case of using VF-NC1 as components of your products.

(1) **Inverter should be installed in a panel.** Pay attention to wiring openings, so that it should prevent someone from touching live parts through the opening in case of maintenance.

2) No more than 1 cable should be connected to one earth terminal of the main terminal board. In this case, other cables for ground should be grounded on the metal back plate and/or in the cubicle. The cross-sectional area of grounding cable shall be, in any case, not less than;

Table 3. Grounding cable

Voltage class	Capacity of applicable motor (kW)	Inverter model	Wire size
			Grounding cable (mm^2)
Single-phase 100V class	0.1	VFNC1S-1001P	3.5
	0.2	VFNC1S-1002P	3.5
	0.4	VFNC1S-1004P	3.5
	0.75	VFNC1S-1007P	3.5
Single-phase 200V class	0.2	VFNC1S-2002P(L)	3.5
	0.4	VFNC1S-2004P(L)	3.5
	0.75	VFNC1S-2007P(L)	3.5
	1.5	VFNC1S-2015P(L)	3.5
	2.2	VFNC1S-2022P(L)	5.5
Three-phase 200V class	0.1	VFNC1-2001P	3.5
	0.2	VFNC1-2002P	3.5
	0.4	VFNC1-2004P	3.5
	0.75	VFNC1-2007P	3.5
	1.5	VFNC1-2015P	3.5
	2.2	VFNC1-2022P	3.5

(3) MCCB or fuse should be connected to the input side of the EMI filter.

2. Compliance with UL Standard and CSA Standard

The VF-NC1 models, that conform to the UL Standard and CSA Standard have the UL/CSA mark on the nameplate.

2.1. Compliance with Installation

The VF-NC1 inverter must be installed in a panel, and used within the ambient temperature specification.
They can be used at ambient temperature of up to 50 degrees by peeling off the label on the top of the inverter.

2.2. Compliance with Connection

Use the UL conformed cables (Rating 75degrees or more) with the ring terminal at wiring to the inverter input/ output terminals (R/L1, S/L2, T/L3, U/T1, V/T2, W/T3).

2.3. Compliance with Peripheral devices

Use the UL listed fuses at connecting to power supply.
Refer to the instruction manual about selecting the rating of them.
Short circuit test is performed under the condition of the power supply short-circuit currents in below.
These currents and fuse currents depend on the applicable motor capacities.

Table 4. AIC and fuse

Voltage class	Capacity of applicable motor (kW)	Inverter model	AIC (Interrupting capacity)	Fuse class and currents (A)
Single-phase 100V class	0.1	VFNC1S-1001P	AIC 1000A	CC/J 6 max
	0.2	VFNC1S-1002P	AIC 1000A	CC/J 8 max
	0.4	VFNC1S-1004P	AIC 1000A	CC/J 12 max
	0.75	VFNC1S-1007P	AIC 1000A	CC/J 22 max
Single-phase 200V class	0.2	VFNC1S-2002P(L)	AIC 1000A	CC/J 4 max
	0.4	VFNC1S-2004P(L)	AIC 1000A	CC/J 8 max
	0.75	VFNC1S-2007P(L)	AIC 1000A	CC/J 12 max
	1.5	VFNC1S-2015P(L)	AIC 5000A	CC/J 22 max
	2.2	VFNC1S-2022P(L)	AIC 5000A	CC/J 30 max
Three-phase 200V class	0.1	VFNC1-2001P	AIC 1000A	CC/J 3 max
	0.2	VFNC1-2002P	AIC 1000A	CC/J 3 max
	0.4	VFNC1-2004P	AIC 1000A	CC/J 5 max
	0.75	VFNC1-2007P	AIC 1000A	CC/J 8 max
	1.5	VFNC1-2015P	AIC 5000A	CC/J 15 max
	2.2	VFNC1-2022P	AIC 5000A	CC/J 20 max

2.4. Motor thermal protection

Selects the electronic thermal protection characteristics that fit with the ratings and characteristics of the motor. In case of multi motor operation with one inverter, thermal relay should be connected to each motor.