

# TOSHIBA

# VF-nC1

Ultra-Compact, Easy-To-Use Inverter TOSVERT™



## NEW

Single-phase 100V class 0.1 to 0.75kW  
Single-phase 200V class 0.2 to 2.2kW  
Three-phase 200V class 0.1 to 2.2kW

TOSVERT is a trademark of Toshiba Corporation.



UKAS  
QUALITY  
MANAGEMENT  
001

JAB  
QS Accreditation  
R 016

ISO 14001  
JACO  
REGISTRATION  
CERTIFICATION  
BODIES

JAB  
EMS Accreditation  
REG 009

**ISO 9001:**  
VF-nC1 series is manufactured at the works, which has received the international quality assurance standard ISO 9001 certification.  
Registration No.: 200594  
Registration date: February 15, 2002

**ISO 14001:**  
The works producing the VF-nC1 series is registered as an environment management system factory specified by ISO 14001.

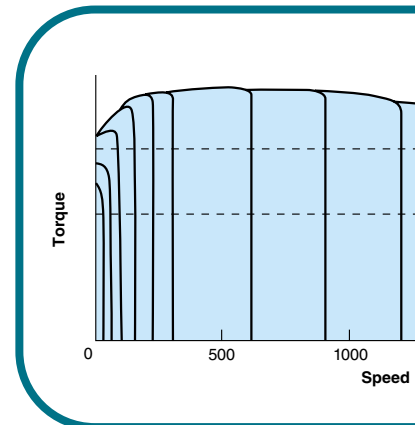
**Form**

**V F N C 1 S - 2 0 0 7 P L - W**

<b>Model name</b> TOSVERT VF-nC1 Series	<b>Input voltage</b> 1:100V~115V 2:200V~240V	<b>Applicable motor capacity</b> 001: 0.1kW 002: 0.2kW 004: 0.4kW 007: 0.75kW 015: 1.5kW 022: 2.2kW	<b>Operation panel</b> P: Provided	<b>Additional functions</b> L: EMI filter inside	<b>Destination</b> W: World wide -: Japan
<b>Number of power phases</b> S: 1-phase None: 3-phase					

**Models and applicable motors**

Voltage (Input/Rated Output)	Applicable Motor Capacity (kW)					
	0.1	0.2	0.4	0.75	1.5	2.2
1 φ 100V/3 φ 200V						
1 φ 200V/3 φ 200V						
3 φ 200V/3 φ 200V						
1 φ 200V/3 φ 200V (built-in EMI noise filter)						
Soon to be released						



# Compact, Easy-to-Use, Inverter for Small-Sized Machines!

The wide range of functions of the VF-nC1 meets various users' needs, from simple speed control to steady torque at low speed.

The vertical contact-type main circuit terminal board and captive screws also ensure easy wiring.

1  
POINT

## Easy to Wire and Install



\* This is a composite photograph.

Like most internal power distribution and control devices, the VF-nC1 has a vertical main circuit terminal board for smoother installation in switchboards. Wiring set-up is further improved by the use of captive screws on the main circuit terminal board. VF-nC1 inverters may also be installed side by side to save space.

2  
POINT

## Easy to Select



Approval pending



Approval pending

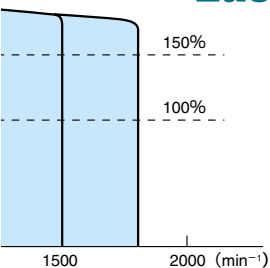


Approval pending

General-purpose Toshiba inverters have been developed for "Compliance with Global Standards." The three main series: the three-phase 200V, single-phase 200V and single-phase 100V series, comply with major international standards in addition, several series of European models with a built-in EMI noise filter are also available. All of them have a wide range of functions.

3  
POINT

## Easy to Set Up and Operate



Even novice inverter users can operate the VF-nC1 without difficulty by using the RUN and STOP keys and the frequency adjusting knob on the operation panel. The design also allows most functions be controlled from the input terminals. A wizard function helps users with complicated settings. Other functions, which allow easy operation of the VF-nC1, include a vector control function (which improves the torque characteristic), a PI control function (useful for fans and pumps), and a 15-speed preset function.

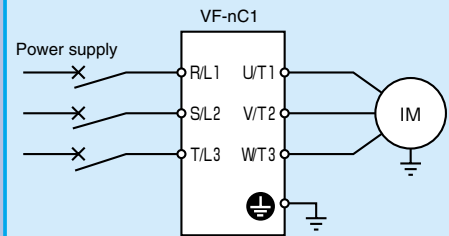
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# Panel and operation procedure



## Example of wiring



The following configuration is available for VFNC1(S)-□□□□P□-W type.

## Power ON (Set-up parameter)

- ① Displays "r50"  
When the power is ON at initialization...



- ② Select the logic and base motor frequency.

r50  
or  
P50  
or  
r60



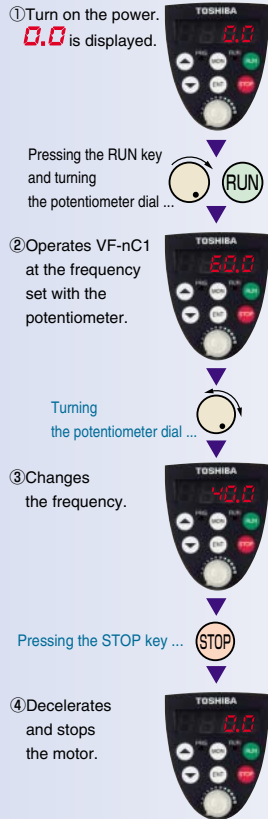
- ③ Displays "0.0" during frequency setting, and 17.15 upon completion.



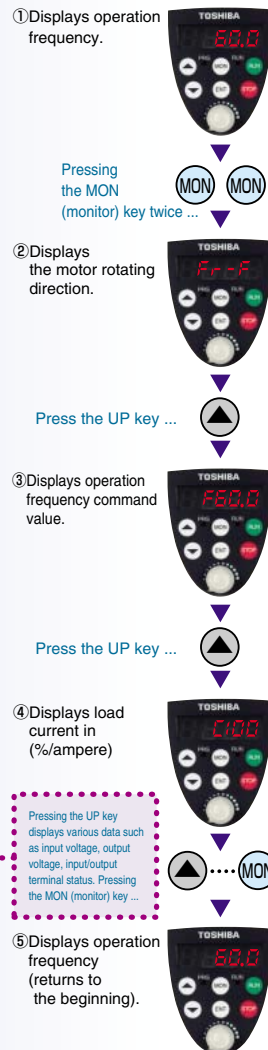
## Set-up parameter

Title	r50	P50	r60
F 127	0	100	0
F409 / F 171	220(V)	220(V)	230(V)
F417	1410(min <sup>-1</sup> )	1410(min <sup>-1</sup> )	1710(min <sup>-1</sup> )
FH, UL, ULF 170, F204	50.0(Hz)	50.0(Hz)	60.0(Hz)

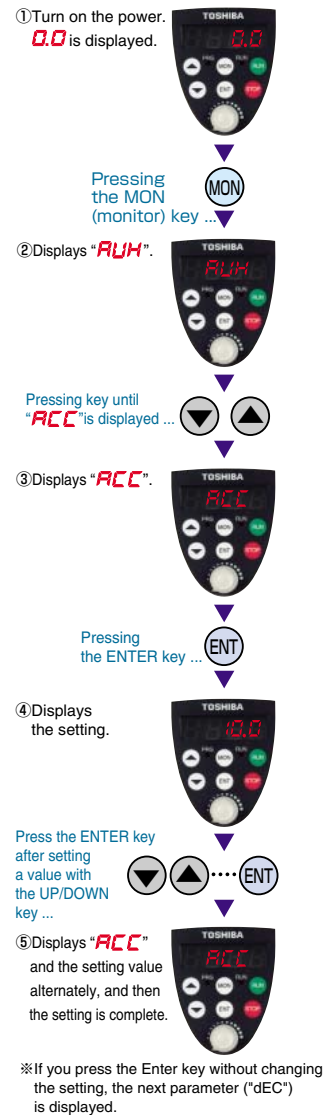
## Operation



## Monitoring



## Setting



Item displayed	Key operated	LED display	Description
		<b>60.0</b>	The operation frequency is displayed (during operation). (When the standard monitor display selection parameter <b>F710=0</b> is set at 0 (operation frequency).)
Parameter setting mode	(MON)	<b>RUH</b>	The first basic parameter "History function (RUH)" is displayed.
Direction of rotation	(MON)	<b>F-F</b>	The direction of rotation is displayed. (F: forward run, r: reverse run)
Operation frequency command	(▲)	<b>F60.0</b>	The operation frequency command value is displayed.
Load current	(▲)	<b>C80</b>	The inverter output current is displayed. (Default setting: unit %)
Input voltage	(▲)	<b>V100</b>	The inverter input current is displayed. (Default setting: unit %)
Output voltage	(▲)	<b>P100</b>	The inverter output voltage is displayed. (Default setting: unit %)
Torque current	(▲)	<b>c88</b>	The torque current is displayed in %.
PI feedback	(▲)	<b>d50</b>	The PI feedback value is displayed. (Unit: processed amount)
Inverter load factor	(▲)	<b>L80</b>	The inverter load factor is displayed in %.
Output power	(▲)	<b>H80</b>	The inverter output power is displayed in %.
Operation frequency	(▲)	<b>60.0</b>	The operation frequency is displayed (during operation).

Item displayed	Key operated	LED display	Description
Input terminal	(▲)	<b>R1111</b>	The ON/OFF status of each of the control signal input terminals (F, R, RST, S1, S2 and S3) is displayed in bits. ON: <b>1</b> OFF: <b>0</b>
Output terminal	(▲)	<b>011</b>	The ON/OFF status of each of the control signal output terminals (OUT, FL) is displayed in bits. ON: <b>1</b> OFF: <b>0</b>
CPU1 version	(▲)	<b>V11</b>	The version of the CPU1 is displayed.
CPU2 version	(▲)	<b>V201</b>	The version of the CPU2 is displayed.
Memory version	(▲)	<b>V201</b>	The version of the memory mounted is displayed.
Past trip 1	(▲)	<b>OC3 ↔ 1</b>	The past trip 1 (displayed alternately at 0.5-sec. intervals)
Past trip 2	(▲)	<b>OH ↔ 2</b>	The past trip 2 (displayed alternately at 0.5-sec. intervals)
Past trip 3	(▲)	<b>OP3 ↔ 3</b>	The past trip 3 (displayed alternately at 0.5-sec. intervals)
Past trip 4	(▲)	<b>rEr ↔ 4</b>	The past trip 4 (displayed alternately at 0.5-sec. intervals)
Cumulative operation time	(▲)	<b>t 0.10</b>	The cumulative operation time is displayed. (0.01 corresponds to 1 hour.)

Note) 1. With the current unit selection parameter or voltage unit selection parameter, you can choose between percentage and ampere (A) for current or between percentage and volt (V) for voltage, respectively.

# Model and standard specifications

## ■ Three-phase 200V

Item		Specification					
Input voltage		3-phase 200V					
Applicable motor (kW)		0.1	0.2	0.4	0.75	1.5	2.2
Rating	Type	VFNC1					
	Form	2001P	2002P	2004P	2007P	2015P	2022P
	Capacity (kVA) Note 1)	0.3	0.6	1.0	1.6	2.9	3.9
Power supply	Rated output current (A) Note 2)	0.7	1.4	2.4	4	7.5	10.0
	Rated output voltage Note 3)	3-phase 200V to 240V					
	Overload current rating	60 seconds at 150%					
Power supply	Voltage-frequency	3-phase 200V to 240V - 50/60Hz					
	Allowable fluctuation	Voltage +10%, -15% Note 4), frequency ±5%					
	Protective method	IP20 Enclosed type (JEM 1030)					
Cooling method		Self-cooling			Forced air-cooled		
Color		Munsel 5Y8/0.5					
Charge lamp		LED indicating the charge status of the capacitor in the main circuit					

## ■ 1-phase 200V

Item		Specification					
Input voltage		1-phase 200V					
Applicable motor (kW)		0.1	0.2	0.4	0.75	1.5	2.2
Rating	Type	VFNC1S					
	Form	—	2002P	2004P	2007P	2015P	2022P
	Capacity (kVA) Note 1)	—	0.6	1.0	1.6	2.9	3.9
Power supply	Rated output current (A) Note 2)	—	1.4	2.4	4	7.5	10.0
	Rated output voltage Note 3)	3-phase 200V to 240V					
	Overload current rating	60 seconds at 150%					
Power supply	Voltage-frequency	1-phase 200V to 240V - 50/60Hz					
	Allowable fluctuation	Voltage +10%, -15% Note 4), frequency ±5%					
	Protective method	IP20 Enclosed type (JEM 1030)					
Cooling method		—	Self-cooling			Forced air-cooled	
Color		Munsel 5Y8/0.5					
Charge lamp		LED indicating the charge status of the capacitor in the main circuit					

## ■ 1-phase 100V

Item		Specification					
Input voltage		1-phase 100V					
Applicable motor (kW)		0.1	0.2	0.4	0.75	1.5	2.2
Rating	Type	VFNC1S					
	Form	1001P	1002P	1004P	1007P	—	—
	Capacity (kVA) Note 1)	0.3	0.6	1.0	1.6	—	—
Power supply	Rated output current (A) Note 2)	0.7	1.4	2.4	4	—	—
	Rated output voltage Note 3)	3-phase 200V to 230V					
	Overload current rating	60 seconds at 150%					
Power supply	Voltage-frequency	1-phase 100V to 115V - 50/60Hz					
	Allowable fluctuation	Voltage +10%, -15% Note 4), frequency ±5%					
	Protective method	IP20 Enclosed type (JEM 1030)					
Cooling method		Self-cooling		Forced air-cooled		—	—
Color		Munsel 5Y8/0.5					
Charge lamp		LED indicating the charge status of the capacitor in the main circuit					

## ■ 1-phase 200V (built-in EMI noise filter) Soon to be released

Item		Specification					
Input voltage		1-phase 200V (built-in EMI noise filter)					
Applicable motor (kW)		0.1	0.2	0.4	0.75	1.5	2.2
Rating	Type	VFNC1S					
	Form	—	2002PL	2004PL	2007PL	2015PL	2022PL
	Capacity (kVA) Note 1)	—	0.6	1.0	1.6	2.9	3.9
Power supply	Rated output current (A) Note 2)	—	1.2	2.3	4	7.5	10.7
	Rated output voltage Note 3)	3-phase 200V to 240V					
	Overload current rating	60 seconds at 150%					
Power supply	Voltage-frequency	1-phase 200V to 240V - 50/60Hz					
	Allowable fluctuation	Voltage +10%, -15% Note 4), frequency ±5%					
	Protective method	IP20 Enclosed type (JEM 1030)					
Cooling method		—	Self-cooling			Forced air-cooled	
Color		Munsel 5Y8/0.5					
Charge lamp		None					
Built-in filter		EMI noise filter (Class B)					

Note) 1. Capacity is calculated at 220V for the 200V models.

Note) 2. Indicates rated output current setting when the PWM carrier frequency (parameter F300) is 4kHz or less.

If the PWM carrier frequency setting is fixed above 4kHz, the rated current needs to be reduced. If the PWM carrier frequency is set above 4kHz, it could fall automatically if an over-current flows during acceleration or for any other reason, depending on the amount of current that flows.

The default setting of the PWN carrier frequency is 12kHz. (Except for single phase 200V class built-in EMI noise filter)

Note) 3. Maximum output voltage is the same as the input voltage. The maximum output voltage of a single-phase 100V model is proportional to the supply voltage.

Note) 4. ±10% when the inverter is used continuously (load of 100%).

# Standard specifications/outline drawing

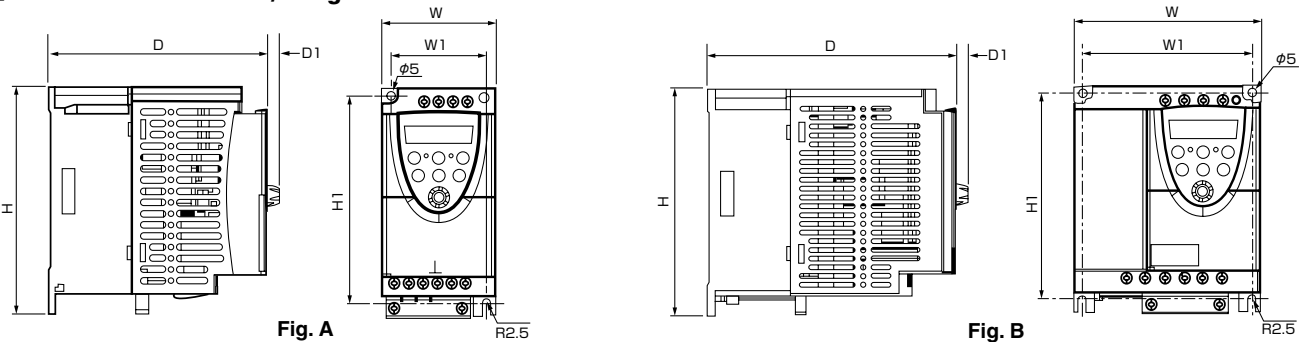
Item	Specification	
Principal control functions	<b>Control system</b>	Sinusoidal PWM control
	<b>Related output voltage</b>	Adjustable within a range of 100 to 120% of the corrected supply voltage (200V) (Unadjustable to any voltage higher than the input voltage).
	<b>Output frequency range</b>	0.5 to 200Hz, default setting: 0.5 to 80Hz, maximum frequency: 30 to 200Hz.
	<b>Minimum setting steps of frequency</b>	0.1Hz: operation panel setting, 0.2Hz: analog input (when the max. frequency is 100Hz).
	<b>Frequency accuracy</b>	Digital setting: within $\pm 0.5\%$ of the max. frequency (-10 to +50°C) Analog setting: within $\pm 1.0\%$ of the max. frequency (25 °C $\pm 10$ °C)
	<b>Voltage/frequency characteristics</b>	V/f, slip frequency correction, base frequency, base frequency voltage and torque boost amount adjustable
Operation specifications	<b>Frequency setting signal</b>	Volume on the front panel, external frequency volume (connectable to a volume with a rated impedance of 3-10k $\Omega$ ), V1 terminal (input impedance: 42k $\Omega$ (voltage: 0-10Vdc) or 250 $\Omega$ (current: 4-20mAdc)). The characteristic can be set arbitrarily by two-point setting.
	<b>Start-up frequency/frequency jump</b>	Adjustable within a range of 0.5 to 10Hz/Up to 1 frequency can be adjusted together with their widths.
	<b>PWM carrier frequency (Note 1)</b>	Selectable from among 2, 4, 8, 12 and 16kHz (Standard default setting: 12kHz or 4kHz for models with a built-in EMI noise filter)
	<b>Acceleration/deceleration time</b>	0.1 to 3000 seconds, switchable between acceleration/deceleration time 1 and 2.
	<b>Retry operation</b>	Number of times of retry selectable (Max. 10 times). If the protection function is activated, the retry function restarts on completion of a check of the main circuit.
	<b>Electric control</b>	Charging of capacitor (Deceleration time can be shortened by activating Forced Shortened Deceleration mode.)
	<b>Control and drive circuit</b>	—
	<b>Dynamic braking</b>	Braking start-up frequency: 0 to maximum frequency, braking rate: 0 to 100%, braking time: 0 to 20 seconds.
	<b>Input terminal functions (selectable)</b>	Forward/reverse run input signal, jog run input signal, standby signal, preset-speed operation input signal, reset input signal, etc./Switching between sink/source.
	<b>Output terminal functions (selectable)</b>	Frequency lower limit output signal, frequency upper limit output signal, low-speed detection output signal, specified speed attainment output signal, etc. Open collector, RY output.
Protective function	<b>Failure detection signal</b>	1c-contact output: 250Vac/2A, $\cos\Phi = 0.4$ .
	<b>Output for frequency meter/output for ammeter</b>	PWM output: (1mAdc full-scale DC ammeter or 7.5Vdc full-scale DC ammeter/Rectifier-type AC voltmeter, 225% current Max. 1mAdc, 7.5Vdc full-scale)
	<b>Protective function</b>	Stall prevention, current limitation, over-current, output short circuit, over-voltage, over-voltage limitation, undervoltage, ground fault, power supply phase failure, output phase failure overload protection by electronic thermal function, armature over-load at start-up, load-side over-torque at start, overheating prevention, detection of analog signal break.
	<b>Protection against momentary power failure</b>	Auto-restart/non-stop control after momentary power failure.
Display function	<b>Electronic thermal characteristics</b>	Switching between standard motor/constant-torque VF motor, overload trip, overload stall selection.
	<b>4-digit 7-segments LED</b>	Frequency: inverter output frequency. Alarm: stall alarm "C", overvoltage alarm "P", overload alarm "L", overheat alarm "H". Status: inverter status (frequency, cause of activation of protective function, input/output voltage, output current, etc.) and parameter settings. Free-unit display: arbitrary unit (e.g. rotating speed) corresponding to output frequency.
Environ-ments	<b>Indicator</b>	Lamps indicating the inverter status by lighting, such as RUN lamp and PRG lamp.
	<b>Use environments</b>	Indoor, altitude: 1000m (Max.), not exposed to direct sunlight, corrosive gas, explosive gas or vibration (less than 5.9m/s <sup>2</sup> ) (10 to 55Hz).
	<b>Ambient temperature</b>	-10 to 50°C Note)1.2.3.
	<b>Storage temperature</b>	-20 to +65°C
	<b>Relative humidity</b>	20 to 93% (free from condensation and vapor).

Note) 1. Above 40°C: Remove the protective seal from the top of VF-nC1.

Note) 2. Side-by-side installation : 40°C or less (Remove the protective seal from the top of VF-nC1).

Note) 3. Single-phase 200V models (built-in EMI noise filter) should be used where the ambient temperature will not rise above 40°C.

## External dimensions/weights



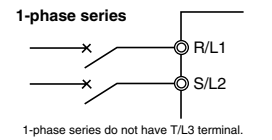
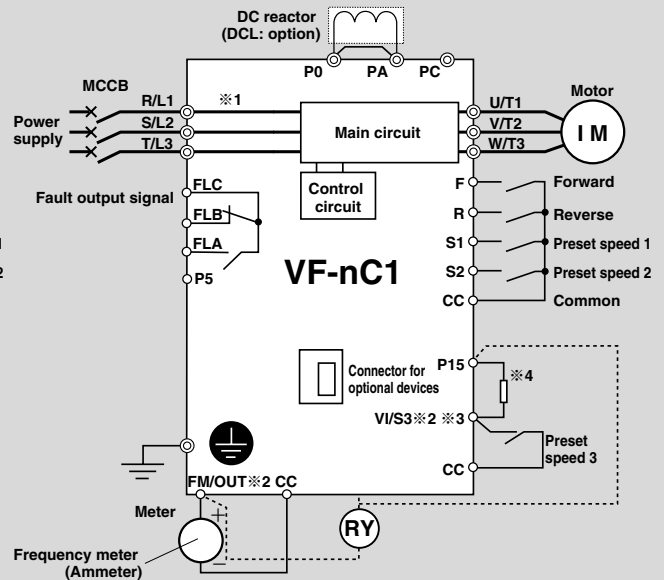
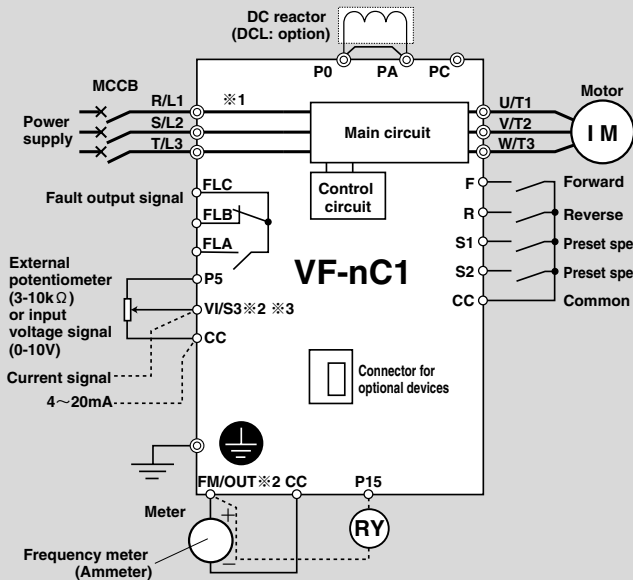
Input voltage	Applicable motor (kW)	Type	Dimensions (mm)					Drawing	Approx. weight (kg)		
			W	H	D	W1	H1				
1-phase 200V	0.2	VFNC1S-2002P	72	142	100	60	131	8.5	A	1.0	
	0.4	VFNC1S-2004P			124					1.0	
	0.75	VFNC1S-2007P			137					1.0	
	1.5	VFNC1S-2015P	117		155	106				B	1.5
	2.2	VFNC1S-2022P			155	1.5					
3-phase 200V	0.1	VFNC1-2001P	72	100	60	131	8.5	A	1.0		
	0.2	VFNC1-2002P		124					1.0		
	0.4	VFNC1-2004P		137					1.0		
	0.75	VFNC1-2007P	117	155	106				B	1.5	
	1.5	VFNC1-2015P		155	1.5						
1-phase 100V	0.1	VFNC1S-1001P	72	100	60	131	8.5	A	1.0		
	0.2	VFNC1S-1002P		124					1.0		
	0.4	VFNC1S-1004P		155					106	B	1.5
	0.75	VFNC1S-1007P	155	1.5							
1-phase 200V (built-in EMI noise filter)	0.2	VFNC1S-2002PL	72	100	60				131	8.5	A
	0.4	VFNC1S-2004PL		124		1.0					
	0.75	VFNC1S-2007PL		137		1.0					
	1.5	VFNC1S-2015PL	117	155	106	B	1.5				
	2.2	VFNC1S-2022PL		155	1.5						

# Standard connection

## Standard connection (common = CC)

■ When using V1/S3 terminal as an analog input terminal (F109: 0 or 1)

■ When using V1/S3 terminal as a logic input terminal (F109: 2)



※1: Only VFNC1S-□□□□PL has a built-in noise filter.

※2: The terminal can be switched between FM/OUT and VI by changing a parameter.

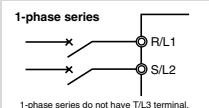
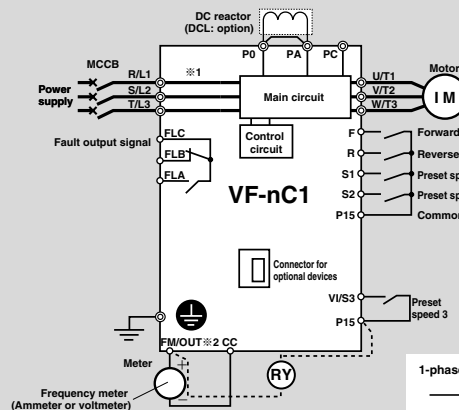
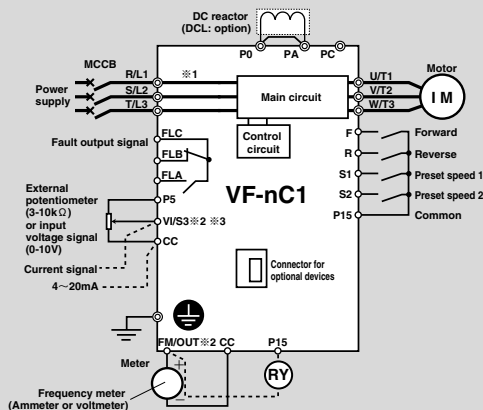
※3: The terminal can also be used as an input terminal by changing a parameter.

※4: To use V1/S3 terminal as an input terminal, P15 and V1/S3 must be short-circuited with a resistor (recommended resistance: 4.7kΩ-1/4W).

## Source (common = P15)

■ When using V1/S3 terminal as an analog input terminal (F109: 0 or 1)

■ When using V1/S3 terminal as a logic input terminal (F109: 2)




※1: Only VFNC1S-□□□□PL has a built-in noise filter.

※2: The terminal can be switched between FM/OUT and VI by changing a parameter.

※3: The terminal can also be used as an input terminal by changing a parameter.



## Main circuit

Terminal symbol	Terminal function
	Grounding terminal for connecting inverter case. 2 grounding terminals.
R/L1, S/L2, T/L3	100V class: 1-phase 100V to 115V - 50/60Hz 200V class: 1-phase 200V to 240V - 50/60Hz, 3-phase 200V to 240V - 50/60Hz ※ 1-phase series have R/L1 and S/L2 terminal.
U/T1, V/T2, W/T3	Connect to a (3-phase induction) motor.
PC	This is a negative potential terminal in the internal DC main circuit.
PO, PA	Terminals for connecting a DC reactor (DCL: optional external device). Shorted when shipped from the factory. Before installing DCL remove the short bar. 1-phase 100V models cannot be used with DC reactors. 1-phase 200V models (The models with a built-in EMI noise filter) are not provided with PO terminal.

## Control circuit terminal (Sink (common: CC))

Terminal symbol	Input/output	Function	Specifications	Wire size
F	Input	Multifunction programmable contact input	Shorting across F-CC causes forward rotation; open causes slowdown and stop. (ST and CC are short-circuited.)	Dry contact input 15Vdc - 5mA or less Sink/source selectable by changing a parameter
R	Input		Shorting across R-CC causes reverse rotation; open causes slowdown and stop. (ST and CC are short-circuited.) * Shorting across R-CC/F-CC causes reverse rotation.	
S1	Input		Shorting across S1-CC causes preset speed operation.	
S2	Input		Shorting across S2-CC causes preset speed operation.	
CC	Common to input/output	Control circuit's equipotential terminal.		
P5	Output	Power output for analog input setting.	5Vdc (permissible load current: 10mA)	Solid wire: 0.3 to 1.5 (mm <sup>2</sup> ) Stranded wire: 0.3 to 1.23 (mm <sup>2</sup> ) (AWG22 to 16) Sheath strip length: 5 (mm)
V/S3	Input	Multifunction programmable analog input. Standard default setting: Analog input 0-10Vdc and frequency 0-80Hz. Possible to use as analog input (4 (0)-20mA) or contact input (programmable contact input) by changing a parameter.	10Vdc: (internal impedance: 42kΩ) 4-20mA: (internal impedance: 250kΩ)	
FM/OUT	Output	Multifunction programmable analog output. Standard default setting: Analog output frequency. Meters connectable to FM/OUT: 1mA) full-scale ammeter or 7.5Vdc (10Vdc) full-scale voltmeter (PWM output). Possible to switch to programmable open collector output by changing a parameter.	1mA full-scale DC ammeter or 7.5Vdc (10Vdc) full-scale DC voltmeter Open collector output: 24Vdc-50mA	
P15	Output	15Vdc power output.	15Vdc-100mA	
FLA FLB FLC	Output	Multifunction programmable relay contact output. Contact ratings: 250Vac - 2A (cosΦ=1), 30Vdc - 1A, 250Vac - 1A (cosΦ=0.4). Standard default setting: Monitoring of status of inverter's protection function. Activation of the protection function causes circuit FLA-FLC to close and circuit FLB-FLC to open.	250Vac-2A (cosΦ=1): at resistance load 30Vdc-1A 250Vac-1A (cosΦ=0.4)	Solid wire: 0.3 to 1.5 (mm <sup>2</sup> ) Stranded wire: 0.3 to 1.5 (mm <sup>2</sup> ) (AWG22 to 16) Sheath strip length: 6 (mm)

## Selection of wiring devices

Voltage class	Capacity applicable motor (kW)	Inverter model	Non-fuse circuit breaker (MCCB)		Magnetic contactor (MC)		Wire size (mm <sup>2</sup> )		
			Rated current (A)	Type Note 1)	Rated current (A)	Type Note 1)	Main circuit (mm <sup>2</sup> ) Note 3)	DCL (mm <sup>2</sup> )	Grounding cable (mm <sup>2</sup> ) Note 5)
1-phase 100V class	0.1	VFNC1S-1001P	5	NJ30N	11	C11J	2.0	—	3.5
	0.2	VFNC1S-1002P	10	NJ30N	11	C11J	2.0	—	3.5
	0.4	VFNC1S-1004P	15	NJ30N	11	C11J	2.0	—	3.5
	0.75	VFNC1S-1007P	30	NJ30N	18	C20J	3.5	—	3.5
1-phase 200V class	0.2	VFNC1S-2002P (L)	10	NJ30N	11	C11J	2.0	1.25	3.5
	0.4	VFNC1S-2004P (L)	15	NJ30N	11	C11J	2.0	1.25	3.5
	0.75	VFNC1S-2007P (L)	20	NJ30N	11	C11J	2.0	2.0	3.5
	1.5	VFNC1S-2015P (L)	30	NJ30N	18	C20J	3.5	2.0	3.5
	2.2	VFNC1S-2022P (L)	40	NJ50E	35	C35J	5.5	2.0	5.5
3-phase 200V class	0.1	VFNC1-2001P	5	NJ30N	11	C11J	2.0	1.25	3.5
	0.2	VFNC1-2002P	5	NJ30N	11	C11J	2.0	1.25	3.5
	0.4	VFNC1-2004P	5	NJ30N	11	C11J	2.0	1.25	3.5
	0.75	VFNC1-2007P	10	NJ30N	11	C11J	2.0	2.0	3.5
	1.5	VFNC1-2015P	15	NJ30N	11	C11J	2.0	2.0	3.5
	2.2	VFNC1-2022P	20	NJ30N	13	C13J	2.0	2.0	3.5

Note) 1. Produced by Toshiba Schneider Electric Corporation.

Note) 2. Be sure to attach surge killer to the exciting coil of the relay and the magnetic contactor.

Note) 3. Size of the wires connected to the input terminals R, S and T and the output terminals U, V and W when the length of each wire does not exceed 30m.

Note) 4. For the control circuit, use shielded wires.

Note) 5. For grounding, use a cable with a size equal to or larger than the above.

# Basic and extended parameters

## Basic parameters

Title	Function	Adjustment range	Default setting		
<b>RUH</b>	History function	Function of displaying 5 parameters grouped into one in the order of change * Parameters can be edited within a group, too.			
<b>RUW</b>	Wizard function	0:— 1: Basic setting wizard 2: Preset speed operation wizard 3: Analog signal operation wizard 4: Motor 1/2 switching operation wizard 5: Torque up wizard *1	0		
<b>CNOd</b>	Command mode selection	0: Terminal board 1: Operation panel	1		
<b>FNOd</b>	Frequency setting mode selection	0: Terminal board 1: Operation panel 2: Internal potentiometer 3: Serial communication 4: Terminal board/internal volume switching	2		
<b>FNSL</b>	FM/OUT terminal functions selection	-1: Open collector output 0: Output frequency 1: Output current 2: Set frequency 3: For adjustment (current fixed at 100%) 4: For adjustment (current fixed at 50%) 5: For adjustment (output of max. frequency) 6: For adjustment (display of gain)	0		
<b>FN</b>	Meter adjustment	—	—		
<b>LYP</b>	Standard setting mode selection	0:— 1: Set at 50Hz 2: Set at 60Hz 3: Default setting 4: Trip clear 5: Cumulative operation time clear	0		
<b>FR</b>	Forward/reverse selection (Operation panel)	0: Forward run 1: Reverse run	0		
<b>ACC</b>	Acceleration time 1 (s)	0.1–3000 (s)	10.0		
<b>DEC</b>	Deceleration time 1 (s)	0.1–3000 (s)	10.0		
<b>FH</b>	Maximum frequency (Hz)	30.0–200 (Hz)	*2		
<b>UL</b>	Upper limit frequency (Hz)	0.5–FH(Hz)	*2		
<b>LL</b>	Lower limit frequency (Hz)	0.0–UL (Hz)	0.0		
<b>UL</b>	Base frequency 1 (Hz)	25–200 (Hz)	*2		
<b>PL</b>	V/f control mode selection	0 (1.2): V/f 3: Sensorless vector control	0		
<b>UB</b>	Torque boost 1 (%)	0.0–30.0 (%)	*3		
<b>THR</b>	Motor thermal protection level 1 (%)	30–100 (%)	100		
<b>OLN</b>	Electric thermal protection characteristics *4	Setting	Overload protection	Overload stall	0
		0	○	×	
		1	○	○	
		2	×	×	
		3	×	○	
		4	○	×	
		5	○	○	
		6	×	×	
	7	×	○		
<b>SR1</b>	Preset speed operation frequencies 1 (Hz)	LL–UL (Hz)	0.0		
<b>SR2</b>	Preset speed operation frequencies 2 (Hz)	LL–UL (Hz)	0.0		
<b>SR3</b>	Preset speed operation frequencies 3 (Hz)	LL–UL (Hz)	0.0		
<b>SR4</b>	Preset speed operation frequencies 4 (Hz)	LL–UL (Hz)	0.0		
<b>SR5</b>	Preset speed operation frequencies 5 (Hz)	LL–UL (Hz)	0.0		
<b>SR6</b>	Preset speed operation frequencies 6 (Hz)	LL–UL (Hz)	0.0		
<b>SR7</b>	Preset speed operation frequencies 7 (Hz)	LL–UL (Hz)	0.0		
<b>F--</b>	Extended parameter	—	—		
<b>GRU</b>	Search for changed settings	—	—		

\*1: This parameter is valid only for VFNC1(S)-□□□□P□-W type.  
\*2: The value is changed according to the set-up parameter condition. (refer to page 3)  
\*3: Parameter values vary depending on the capacity.  
\*4: ○:Applicable, ×:Inapplicable

## Extended parameters

### Input parameters

Title	Function	Adjustment range	Default setting
<b>F100</b>	Low speed signal output frequency (Hz)	0.6–FH (Hz)	0.6
<b>F101</b>	Speed-reach setting frequency (Hz)	0.0–FH (Hz)	0.0
<b>F109</b>	Analog input/logic input function selection	0: Voltage signal input (0-5or10V) 1: Current signal input (4-20mA) 2: Contact input	0
<b>F110</b>	Always active function selection (ST)	0-40, 54-57(ST)	1
<b>F111</b>	Input terminal selection 1 (F)	0-40, 54-57(F)	2
<b>F112</b>	Input terminal selection 2 (R)	0-40, 54-57(R)	3
<b>F113</b>	Input terminal selection 3 (S1)	0-40, 54-57(SS1)	6
<b>F114</b>	Input terminal selection 4 (S2)	0-40, 54-57(SS2)	7
<b>F115</b>	Input terminal selection 5 (VI/S3) *5	5~17 (SS3)	8
<b>F127</b>	Sink/Source selection	0: Sink, 100: Source, 1-99, 101-200: Invalid	*2
<b>F130</b>	Output terminal selection 1 (OUT/FM) *6	0–13 (LOW)	4
<b>F132</b>	Output terminal selection 3 (FL)	0–13 (FL)	10
<b>F170</b>	Base frequency 2 (Hz)	25–200 (Hz)	*2
<b>F171</b>	Base frequency voltage 2 (V)	50–500 (V)	*2
<b>F172</b>	Torque boost 2 (%)	0.0–30.0 (%)	*1
<b>F173</b>	Motor thermal protection level 2 (%)	30–100 (%)	100

\*5: This function is enabled if F109 is set at 2 (logic input).  
\*6: This function is enabled if FMSL (open collector output) is set at -1.

### Frequency parameters

Title	Function	Adjustment range	Default setting
<b>F201</b>	VI/S3 reference point 1 setting (%)	0–100 (%)	0
<b>F202</b>	VI/S3 point 1 frequency (Hz)	0–200 (Hz)	0.0
<b>F203</b>	VI/S3 reference point 2 setting (%)	0–100 (%)	100
<b>F204</b>	VI/S3 point 2 frequency (Hz)	0–200 (Hz)	*2
<b>F240</b>	Starting frequency setting (Hz)	0.5–10.0 (Hz)	0.5
<b>F241</b>	Operation starting frequency (Hz)	0.0–FH (Hz)	0.0
<b>F242</b>	Operation starting frequency hysteresis (Hz)	0.0–FH (Hz)	0.0
<b>F250</b>	DC braking starting frequency (Hz)	0.0 (OFF), 0.1–FH (Hz)	0.0
<b>F251</b>	DC braking current (%)	0.0, 1–100 (%)	50
<b>F252</b>	DC braking time (s)	0.0 (OFF), 0.1–20 (s)	1.0
<b>F270</b>	Jump frequency 1 (Hz)	LL–UL (Hz)	0.0
<b>F271</b>	Jumping width (Hz)	0.0–30.0 (Hz)	0.0
<b>F287</b>	Preset speed operation frequencies 8 (Hz)	LL–UL (Hz)	0.0
<b>F288</b>	Preset speed operation frequencies 9 (Hz)	LL–UL (Hz)	0.0
<b>F289</b>	Preset speed operation frequencies 10 (Hz)	LL–UL (Hz)	0.0
<b>F290</b>	Preset speed operation frequencies 11 (Hz)	LL–UL (Hz)	0.0
<b>F291</b>	Preset speed operation frequencies 12 (Hz)	LL–UL (Hz)	0.0
<b>F292</b>	Preset speed operation frequencies 13 (Hz)	LL–UL (Hz)	0.0
<b>F293</b>	Preset speed operation frequencies 14 (Hz)	LL–UL (Hz)	0.0
<b>F294</b>	Preset speed operation frequencies 15 (Hz)	LL–UL (Hz)	0.0

### Operation mode parameters

Title	Function	Adjustment range	Default setting
<b>F300</b>	PWM carrier frequency	0: 2kHz 1: 2kHz (Random mode) 2: 4kHz 3: 4kHz (Random mode) 4: 8kHz 5: 12kHz 6: 16kHz	5 *7
<b>F301</b>	Auto-restart control selection	0: Disabled 1: At auto-restart after momentary stop 2: When turning ST-CC on or off 3: At auto-restart after momentary stop or when turning ST-CC on or off	0
<b>F302</b>	Regenerative power ride-through control	0: Disabled 1: Enabled 2: Deceleration stop	0
<b>F303</b>	Retry selection (Number of times)	0 (OFF), 1–10	0
<b>F305</b>	Over voltage limit operation	0: Disabled 1: Enabled 2: Enabled (forced shortened deceleration)	0
<b>F360</b>	PI control	0: Disabled, 1: Enabled	0
<b>F362</b>	Proportional (P) gain	0.01–100.0	0.30
<b>F363</b>	Integral (I) gain	0.01–100.0	0.20

\*7: 2(4kHz) for VFNC1S-□□□□PL-□ type.

# Parameters

## Torque boost parameters

Title	Function	Adjustment range	Default setting
<b>F401</b>	Slip frequency gain	0–150 (%)	100
<b>F409</b>	Base frequency voltage 1 (V)	50–500 (V)	*2
<b>F415</b>	Motor rated current	0.1–50.0 (A)	*3
<b>F416</b>	Motor no-load current	30–80 (%)	*3
<b>F417</b>	Motor rated speed	100–1200 (min <sup>-1</sup> )	*2
<b>F418</b>	Speed control gain	0–100	40
<b>F419</b>	Speed control stable coefficient	0–100	20

## Acceleration/deceleration time parameters

Title	Function	Adjustment range	Default setting
<b>F500</b>	Acceleration time 2 (s)	0.1–3000 (s)	10.0
<b>F501</b>	Deceleration time 2 (s)	0.1–3000 (s)	10.0
<b>F505</b>	Acceleration/deceleration 1 and 2 switching frequency	0–UL (Hz)	0.0

## Protection parameters

Title	Function	Adjustment range	Default setting
<b>F601</b>	Stall prevention level	30–199 (%) 200 (disabled)	150
<b>F602</b>	Inverter trip retention selection	0: Not retained, 1: Retained	0
<b>F603</b>	External input trip stop mode selection	0: Coast stop 1: Slowdown stop 2: Emergency DC braking	0
<b>F605</b>	Output phase failure detection mode selection	0: Disabled 1: Selected (Output open-phase is checked when operation is started for the first time after power is turned on.) 2: Selected (Output open-phase is checked each time operation is started.)	0
<b>F607</b>	Motor 150%-overload time limit	10–800 (s)	300
<b>F608</b>	Input phase failure detection mode selection	0: Disabled, 1: Enabled	1
<b>F616</b>	Over-torque alarm level	0–200 (%)	150
<b>F618</b>	Over-torque detection time	0.0–10 (s)	0.5
<b>F627</b>	Under voltage trip selection	0: Disabled 1: Enabled (70% or less: Trip, FL relay activated) 2: Disabled (50% or less: Trip, FL relay not activated)	0
<b>F633</b>	Analog input disconnection detection	0 (Disabled), 1–100%	0

## Operation panel parameters

Title	Function	Adjustment range	Default setting
<b>F700</b>	Prohibition of change parameter setting	0: Permitted (CNOd, FNOd cannot be changed during operation.) 1: Prohibited 2: Permitted (CNOd, FNOd also can be changed during operation) 3: Prohibited (except for panel frequency setting.) 4: 0 & emergency stop prohibited 5: 1 & emergency stop prohibited 6: 2 & emergency stop prohibited 7: 3 & emergency stop prohibited	0
<b>F701</b>	Unit selection	0: %, Hz 1: %→A/V 2: Free unit selection enabled (F702) 3: %→A/V, Free unit selection enabled (F702)	0
<b>F702</b>	Frequency units selection	0.01–200.0	1.00
<b>F710</b>	Selection of monitor display selection	0: Operation frequency (Hz/free unit) 1: Frequency command (Hz/free unit) 2: Output current (%/A)	0

## Communication parameters

Title	Function	Adjustment range	Default setting
<b>F800</b>	Communication baud rate	0: 1200bps 1: 2400bps 2: 4800bps 3: 9600bps 4: 19200bps	3
<b>F801</b>	Parity	0: NON (non-parity) 1: EVEN (even parity) 2: ODD (odd parity)	1
<b>F802</b>	Inverter number	0–99	0
<b>F803</b>	Communication error trip time	0 (Disabled), 1–100 (s)	0
<b>F800</b>	Free notes	0–65535	0

# Input terminal functions

Function No.	Code	Function	Action
0	—	No function is assigned	No action
1	ST	Standby terminal	ON: Standby, OFF: Free run
2	F	Forward-run command	ON: Forward run, OFF: Deceleration stop
3	R	Reverse-run command	ON: Reverse run, OFF: Deceleration stop (priority to reverse run)
4	JOG	Jog run command	ON: Jog run, OFF: Canceled
5	AD2	Acceleration/deceleration 2 pattern selection	ON: Acceleration/deceleration 2, OFF: Acceleration/deceleration 1
6	SS1	Preset speed command 1	Selection of preset speeds (up to 15 speeds) using 4 bits: SS1 to SS4
7	SS2	Preset speed command 2	
8	SS3	Preset speed command 3	
9	SS4	Preset speed command 4	
10	RST	Reset command	ON→ OFF: Trip reset
11	EXT	Trip stop command from external input device	ON: Trip stop
12	PNL/TB	Operation panel/terminal board switching	ON: Forced switching from operation panel/ internal volume to terminal board control
13	DB	DC braking command	ON: DC braking
14	PI	Prohibition of PI control	ON: PI control prohibited, PI: PI control permitted
15	PWENE	Permission of parameter editing	ON: Edition of parameters permitted, OFF: Edition of parameter prohibited
16	ST+RST	Combination of standby and reset commands	ON: Simultaneous input of ST and RST commands
17	ST+PNL/TB	Combination of standby and operation panel/terminal board switching	ON: Simultaneous input of ST and PNL/TB commands
18	F+JOG	Combination of forward run and jog run	ON: Simultaneous input of F and JOG commands
19	R+JOG	Combination of reverse run and jog run	ON: Simultaneous input of R and JOG commands
20	F+AD 2	Combination of forward run and acceleration/deceleration 2	ON: Simultaneous input of F and AD2 commands
21	R+AD 2	Combination of reverse run and acceleration/deceleration 2	ON: Simultaneous input of R and AD2 commands
22	F+SS 1	Combination of forward run and preset-speed command 1	ON: Simultaneous input of F and SS1 commands
23	R+SS 1	Combination of reverse run and preset-speed command 1	ON: Simultaneous input of R and SS1 commands
24	F+SS 2	Combination of forward run and preset-speed command 2	ON: Simultaneous input of F and SS2 commands
25	R+SS 2	Combination of reverse run and preset-speed command 2	ON: Simultaneous input of R and SS2 commands
26	F+SS 3	Combination of forward run and preset-speed command 3	ON: Simultaneous input of F and SS3 commands
27	R+SS 3	Combination of reverse run and preset-speed command 3	ON: Simultaneous input of R and SS3 commands
28	F+SS 4	Combination of forward run and preset-speed command 4	ON: Simultaneous input of F and SS4 commands
29	R+SS 4	Combination of reverse run and preset-speed command 4	ON: Simultaneous input of R and SS4 commands
30	F+SS1+AD 2	Combination of forward run, preset-speed command 1 and acceleration/deceleration 2	ON: Simultaneous input of F, SS1 and AD2 commands
31	R+SS1+AD 2	Combination of reverse run, preset-speed command 1 and acceleration/deceleration 2	ON: Simultaneous input of R, SS1 and AD2 commands
32	F+SS 2 +AD 2	Combination of forward run, preset-speed command 2 and acceleration/deceleration 2	ON: Simultaneous input of F, SS2 and AD2 commands
33	R+SS 2 +AD 2	Combination of reverse run, preset-speed command 2 and acceleration/deceleration 2	ON: Simultaneous input of R, SS2 and AD2 commands
34	F+SS 3 +AD 2	Combination of forward run, preset-speed command 3 and acceleration/deceleration 2	ON: Simultaneous input of F, SS3 and AD2 commands
35	R+SS 3 +AD 2	Combination of reverse run, preset-speed command 3 and acceleration/deceleration 2	ON: Simultaneous input of R, SS3 and AD2 commands
36	F+SS 4 +AD 2	Combination of forward run, preset-speed command 4 and acceleration/deceleration 2	ON: Simultaneous input of F, SS4 and AD2 commands
37	R+SS 4 +AD 2	Combination of reverse run, preset-speed command 4 and acceleration/deceleration 2	ON: Simultaneous input of R, SS4 and AD2 commands
38	FCHG	Frequency command forced switching	Enabled if FMO4 = 4 (selectable between terminal board and operation panel/internal volume) ON: VI terminal, OFF: Internal volume
39	THR 2	No.2 thermal switching	ON: No.2 thermal (PE:0, F170, F171, F172, F173) OFF: No.1 thermal (PE:Setting, UL:F409, UB, EHR)
40	MCHG	No.2 motor switching	ON: No.2 motor (PE:0, F170, F171, F172, F173, F500, F501) OFF: No.1 motor (PE:Setting, UL:F409, UB, EHR, DEC)
54	FreeRun	Free run terminal	ON: Free run
55	RSTN	Reset signal (inversion)	OFF-ON: Trip reset
56	F+ST	Combination of forward run and standby commands	ON: Simultaneous input of F and ST commands
57	R+ST	Combination of reverse run and standby commands	ON: Simultaneous input of R and ST commands

# Output terminal functions

Function No.	Code	Function	Action
0	LL	Frequency lower limit	ON: Output frequency equal to or higher than LL setting OFF: Output frequency lower than LL setting
1	LLN	Inversion of frequency lower limit	Inverse output of LL
2	UL	Frequency upper limit	ON: Output frequency equal to or higher than UL setting OFF: Output frequency lower than UL setting
3	ULN	Inversion of frequency upper limit	Inverse output of UL
4	LOW	Low-speed detection signal	ON: Output frequency equal to or higher than F100 setting OFF: Output frequency lower than F100 setting
5	LOWN	Inversion of low-speed detection signal	Inverse output of LOW
6	RCH	Designated frequency reach signal (completion of acceleration/deceleration)	ON: Output frequency within command frequency ±2.5Hz OFF: Output frequency exceeding command frequency ±2.5Hz
7	RCHN	Inversion of designated frequency reach signal (inversion of completion of acceleration/deceleration)	Inverse output of RCH
8	RCHF	Set frequency reach signal	ON: Output frequency within F101 setting ±2.5Hz OFF: Output frequency exceeding F101 setting ±2.5Hz
9	RCHFN	Inversion of set frequency reach signal	Inverse output of RCHF
10	FL	Failure FL (trip output)	ON: If inverter trips
11	FLN	Inversion of failure FL (inversion of trip output)	Inverse output of FL
12	OT	Over-torque detection	ON: Torque current is held above the torque set with for a period of time longer than that set with F616
13	OTN	Inversion of over-torque detection	Inverse output of OT

# To users of our inverters

## When studying how to use our inverters

### Notes

#### Leakage current

The amount of leakage current could increase to some extent, depending on the way the inverter is grounded. To prevent current leakage:

- (1) Use an ELCB free of higher harmonic waves.
- (2) When connecting multiple inverters to the same ELCB, use an ELCB with high current sensitivity.
- (3) Connect the inverter to a motor, using a cable as short as possible.

#### Radio interference

This inverter could cause interference with nearby audio systems. If interference occurs, its influence can be reduced by installing a noise filter (optional) on the primary side of the inverter or by shielding the cable connecting the inverter to a motor with a conduit, etc.

For further information, please contact your nearest Toshiba dealer.

#### Power factor improvement capacitors

Do not install a power factor improvement capacitors on the input or output side of the inverter.

Installing a power factor improvement capacitor on the input or output side causes current containing harmonic components to flow into the capacitor, adversely affecting the capacitor itself or causing the inverter to trip. To improve the power factor, install an input AC reactor or a DC reactor (optional) on the primary side of the inverter.

#### Installation of input AC reactors

These devices are used to improve the input power factor and suppress high harmonic currents and surges. Install an input AC reactor when using a VF-nC1 inverter under the following conditions:

- (1) When the power source capacity is 200kVA or more, and when it is 10 times or more great than the inverter capacity.
- (2) When the inverter is connected to the same power distribution system as a thyristor-committed control equipment.
- (3) When the inverter is connected to the same power distribution system as that of distorted wave-producing systems, such as arc furnaces and large-capacity inverters.

#### Standard replacement intervals of main parts

The table below lists standard component replacement intervals under normal operating conditions (i.e., average year round ambient temperature of 30 °C, load ratio of 80% or less, average operation time of 12 hours/day). The replacement intervals do not indicate the service life of each component, but the number of years beyond which the failure rate of a component used without being replaced increases sharply because of deterioration and wear.

Component name	Standard replacement intervals	Replacement method, etc.
Cooling fan	2 to 3 years	Replaced with a new one
Smoothing capacitor	5 years	Replaced with a new one (upon examination)
Circuit breaker, relay	—	Decides upon examination
Fuse	10 years	Replaced with a new one
Aluminum capacitors on the printed circuit board	5 years	Replaced with a new circuit board (upon examination)

Extracted from "Periodic Inspection of General-purpose Inverters" published by the Japan Electrical Manufacturers' Association.

Note: The service life of each component greatly varies with its usage environment.

## Selecting the capacity (model) of the inverter

### Selection

#### Capacity

Refer to the applicable motor capacities listed in the standard specifications. When driving a high-pole motor, special motor, or multiple motors in parallel, select such an inverter that the sum of the motor rated current multiplied by 1.05 to 1.1 is less than the inverter's rated output current value.

#### Acceleration/deceleration times

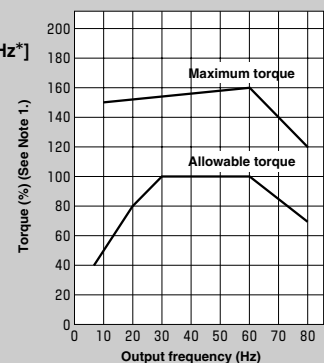
The actual acceleration and deceleration times of a motor driven by an inverter are determined by the torque and moment of inertia of the load, and can be calculated by the following equations. The acceleration and deceleration times of an inverter can be set individually. In any case, however, they should be set longer than their respective values determined by the following equations.

<b>Acceleration time</b>	$t_a = \frac{(J_M + J_L) \times \Delta N}{9.56 \times (T_M - T_L)} \text{ (sec.)}$
<b>Deceleration time</b>	$t_a = \frac{(J_M + J_L) \times \Delta N}{9.56 \times (T_B + T_L)} \text{ (sec.)}$
<b>Conditions</b>	<p>J<sub>M</sub> : Moment of inertia of motor (kg·m<sup>2</sup>)                      J<sub>L</sub> : Moment of inertia of load (converted into value on motor shaft) (kg·m<sup>2</sup>)                      ΔN : Difference in rotating speed between before and after acc. or dce. (min<sup>-1</sup>)                      T<sub>L</sub> : Load torque (N·m)                      T<sub>M</sub> : Motor rated torque × 1.2-1.3 (N·m) ...V/f control                      : Motor rated torque × 1.5 (N·m) ...Vector operation control                      T<sub>B</sub> : Motor rated torque × 0.2 (N·m)                      When a braking resistor or a braking resistor unit is used:                      Motor rated torque × 0.8-1.0 (N·m)</p>

#### Allowable torque characteristics

When a standard motor is combined with an inverter to perform variable speed operation, the motor temperature rises slightly higher than it normal does during commercial power supply operation. This is because the inverter output voltage has a sinusoidal (approximate) PWM waveform. In addition, the coking becomes less effective at low speed, so the torque must be reduced according to the frequency. When constant-torque operation must be performed at low speeds, use a Toshiba VF motor designed specifically for use with inverters.

[An example of V/f control at a base frequency of 60Hz\*]



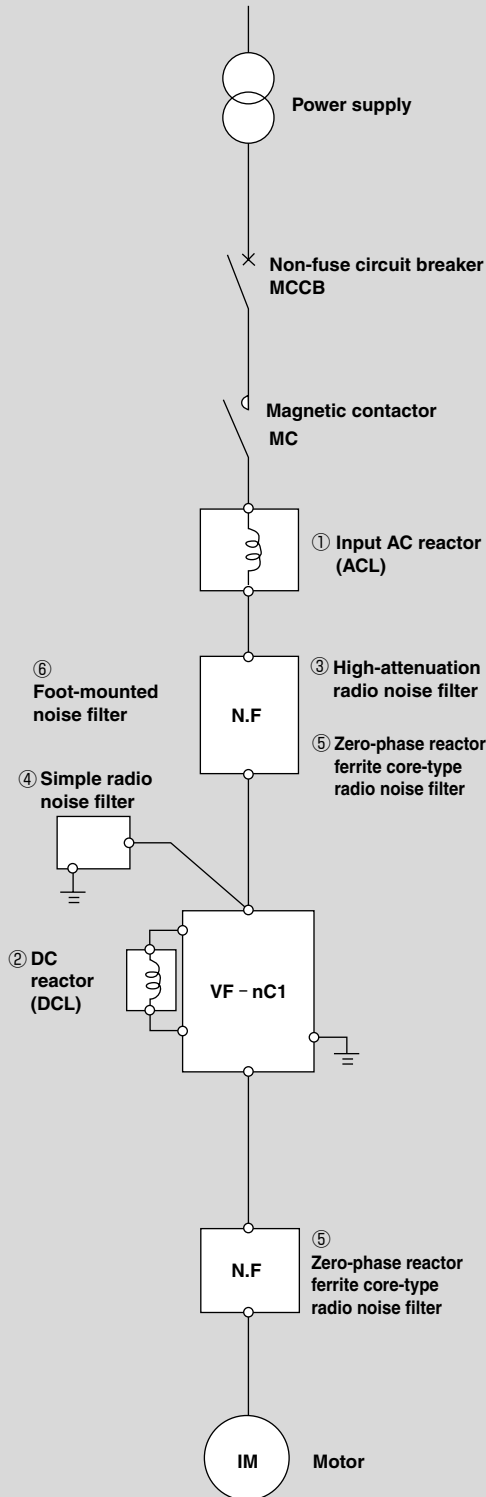
Note 1. 100% torque is based on the rotating speed of a motor operated at 60Hz. Starting torque lowers to some extent if the motor runs on commercial power. So, check the characteristic of the machine to drive.

Note 2. The allowable torque at a base frequency of 50Hz can be calculated approximately by multiplying the allowable torque at 60Hz by 0.8.

#### Starting characteristics

When a motor is driven by an inverter, its operation is restricted by the inverter's overload current rating, so the starting characteristic is different from those obtained from commercial power supply operation. Although the starting torque is smaller with an inverter than with the commercial power supply, a high starting torque can be produced at low speeds by adjusting the V/f pattern torque boost amount. (150% max., though this rate varies with the motor characteristics.) When a larger starting torque is necessary, select an inverter with a larger capacity and examine the possibility of increasing the motor capacity.

# Optional external devices



No.	Device	Function, Purpose, etc.	Refer to														
①	Input AC reactor	Used to improve the input power factor, reduce the harmonics, and suppress external surge on the inverter power source side. Install when the power capacity is 200kVA or more and 10 times or more than the inverter capacity or when a distorted wave generation source such as a thyristor unit or a large-capacity inverter is connected in the same distribution system.	P.13														
		<table border="1"> <thead> <tr> <th rowspan="2">Reactor type</th> <th colspan="3">Effect</th> </tr> <tr> <th>Power factor improvement</th> <th>Harmonics suppression</th> <th>External surge suppression</th> </tr> </thead> <tbody> <tr> <td>Input AC reactor</td> <td>○</td> <td>○</td> <td>○</td> </tr> <tr> <td>DC reactor</td> <td>○Large</td> <td>○</td> <td>×</td> </tr> </tbody> </table> <p>○:Effective ○Large:Highly effective ×:Ineffective</p>		Reactor type	Effect			Power factor improvement	Harmonics suppression	External surge suppression	Input AC reactor	○	○	○	DC reactor	○Large	○
Reactor type	Effect																
	Power factor improvement	Harmonics suppression	External surge suppression														
Input AC reactor	○	○	○														
DC reactor	○Large	○	×														
②	DC reactor	Improves the power factor more than the input reactor. When the facility applying the inverter requires high reliability, it is recommended to use the DC reactor with an input reactor effective for external surge suppression.															
③	High-attenuation filter (LC filter) NF type manufactured by Soshin Denki Co., Ltd.	These types of filters are not necessary because all single-phase 200V models have a built-in EMI noise filter, conforming to Class B, as standard. <ul style="list-style-type: none"> <li>● Effective to prevent interference with audio equipment used near the inverter.</li> <li>● Install on the input side of the inverter.</li> <li>● Provided with wide-range attenuation characteristics from AM radio bands to near 10MHz.</li> <li>● Use when equipment readily affected by noise is installed in the peripheral area.</li> </ul>	P.13														
④	Simple filter (capacitive filter) Capacitor type, manufactured by Malcon Electronics, Co., Ltd.	<ul style="list-style-type: none"> <li>● Effective to prevent interference with audio equipment used near the inverter.</li> <li>● Install on the input side of the inverter.</li> <li>● Attenuation characteristic is available only in a specific frequency and. Effective in suppressing noise in a specific AM radio station (e.g., weak radio waves in mountainous regions).</li> <li>● Increases leakage current because this is a capacitor-based filter. When the power supply is equipped with an ELCB, avoid using too many filters of this type.</li> </ul>	—														
⑤	Zero-phase reactor (inductive filter) Ferrite core type manufactured by Soshin Denki Co., Ltd.	<ul style="list-style-type: none"> <li>● Effective to prevent interference with audio equipment used near the inverter.</li> <li>● Effective in noise reduction on both input and output sides of the inverter.</li> <li>● Provided with attenuation characteristics of several dB in frequencies from AM radio bands to 10MHz.</li> <li>● For noise countermeasures, insert on the secondary side of the inverter.</li> </ul>	—														
⑥	Compliant with EMC directives Foot-mounted type noise reduction filter (built-in EMI noise filter) Soon to be released	This noise filter complies with European EMC Directive. High-attenuation EMI noise filter requiring only small space; mounted on the rear side of the inverter. This filter can be installed to conform to the EMC standard EN55011 Group1, class A.	—														
⑦	Remote panel	Provided with built-in frequency indicator, frequency setting device, and RUN-STOP (forward/reverse) switch. (Model: CBVR-7B1)	P.14														
⑧	DIN rail kit Soon to be released	Use to mount the inverter on DIN rails.	—														
⑨	Parameter writer	Use this unit for batch read, batch copy, and batch writing of setting parameters. (Model: PWU001Z)															
⑩	Extension panel	Extended operation panel kit provided with LED indication section, RUN/STOP key, UP/DOWN key, Monitor key and Enter key. (Model: RKP001Z)	P.14														
⑪	RS485 communication converter unit	Use to connect a personal computer for data communication with up to 64 units. (Model: RS4001Z)															
⑫	RS232C communication converter unit	Use to connect a personal computer for data communication. (Model: RS2001Z)															
⑬	Cable with a built-in RS232C communication converter Soon to be released	Optional cable with a built-in RS232C communication converter	—														

Device

External dimensions and connections

Input AC reactor (ACL)

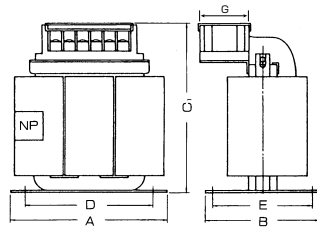
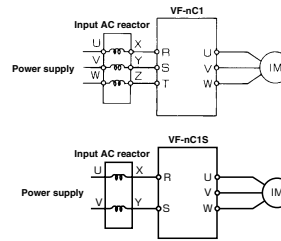


Fig. A



Type	Rating	Inverter type	Dimensions (mm)							Drawing	Terminals	Approx. weight (kg)
			A	B	C	D	E	F	G			
PFLS2002S	1-phase 200V 2.0A-50/60Hz	VFNC1S-2002P, VFNC1S-2002PL	80	55	115	63	45	5	45	A	Harmonica terminal M3.5	0.85
PFL2001S	3-phase 200V 1.7A-50/60Hz	VFNC1-2001P, VFNC1-2002P	105	65	115	90	55	5	40		Harmonica terminal M3.5	1.0
PFL2005S	3-phase 200V 5.5A-50/60Hz	VFNC1-2004P, VFNC1-2007P, VFNC1S-2004P, VFNC1S-2004PL, VFNC1S-1001P, VFNC1S-1002P	105	65	115	90	55	5	40		Harmonica terminal M3.5	1.2
PFL2011S	3-phase 200V 11A-50/60Hz	VFNC1-2015P, VFNC1-2022P, VFNC1S-2007P, VFNC1S-2007PL	130	70	140	115	60	5	50		Harmonica terminal M4	2.3
PFL2018S	3-phase 200V 18A-50/60Hz	VFNC1S-2015P, VFNC1S-2022P, VFNC1S-2015PL, VFNC1S-2022PL, VFNC1S-1004P, VFNC1S-1007P	130	70	140	115	60	130	50		Harmonica terminal M4	2.5

※PFL 2002S has 4 terminals.

DC reactor (DLC)

DC reactors cannot be used with any single-phase 100V or single-phase 200V model (built-in EMI noise filter). Use an input reactor.

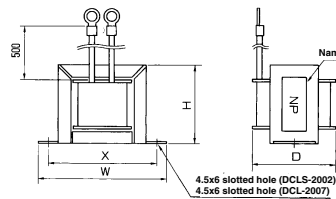


Fig. A

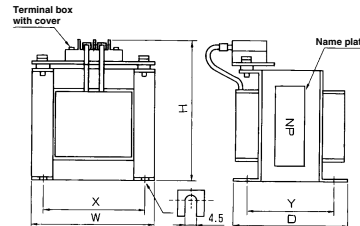


Fig. B

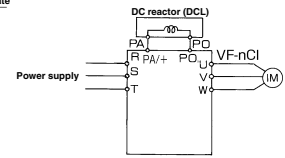
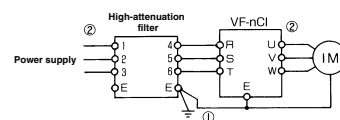
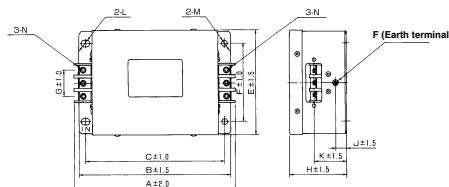


Fig. C

Type	Rating (A)	Inverter type	Dimensions (mm)							Drawing	Terminals	Approx. weight (kg)
			W	H	D	X	Y	d1	d2			
DCL-2002	2	VFNC1-2001P, VFNC1-2002P	59	37	35	51	—	—	—	A	Crimp terminal V1.25 - 3.5	0.2
DCLS-2002	2.5	VFNC1S-2002P	79	50	44	66	—	—	—		Crimp terminal V1.25 - 3.5	0.6
DCL-2007	7	VFNC1-2004P, VFNC1-2007P, VFNC1S-2004P	92	65	70	82	—	—	—		Crimp terminal V2 - 3.5	1.2
DCL-2022	14	VFNC1-2015P, VFNC1-2022P, VFNC1S-2007P	86	110	80	71	64	—	—	B	M4	2.2
DCL-2037	22.5	VFNC1S-2015P, VFNC1S-2022P	86	110	85	71	70	—	—		M4	2.5

High-attenuation radio noise reduction filter



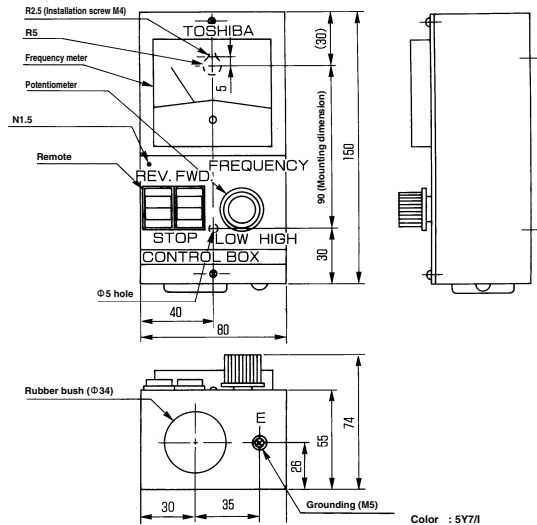
Note) ① Noise filter should be connected to the primary-side of inverter.  
② Out put cable should be kept away from input cable.

Radio noise filter type	Rating (A)	Inverter type	Dimensions (mm)										Approx. weight (kg)		
			A	B	C	E	F	G	H	J	K	M		N	P
NF3005A-MJ	5	VFNC1-2001P~2007P, VFNC1S-2002P, VFNC1S-1001P	174.5	160	145	110	80	32	70	20	45	φ5.5	M4	M4	1.0
NF3015A-MJ	15	VFNC1-2015P, 2022P, VFNC1S-2004P~2015P, VFNC1S-1002P, 1004P													1.6
NF3020A-MJ	20	VFNC1S-1007P													
NF3030A-MJ	30	VFNC1S-2022P													

Device

External dimensions and connections

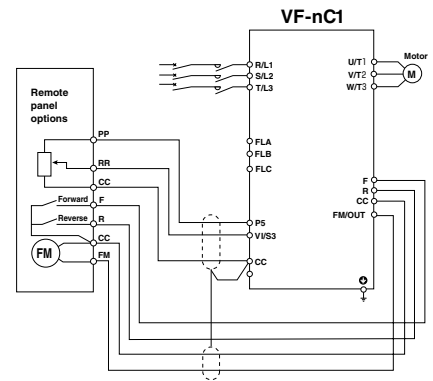
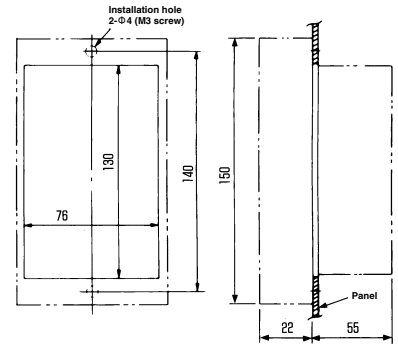
Remote panel  
CBVR-7B1



Color : 5V7/I  
(panel: N1.5)  
Weight : 0.7kg

Note) The outside dimensions and installation dimensions are the same as those of the former model CBVR-7B, though the meter is different from that on the CBVR-7B.

Panel hole



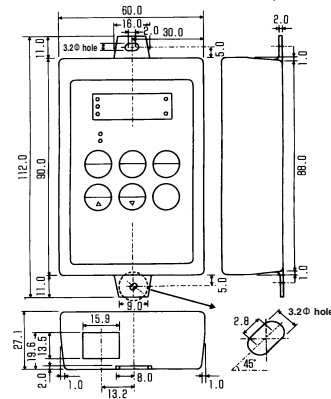
Note) The length of wire between inverter and remote panel less than 30m.

Parameter writer  
Extension panel  
Communication  
Converter unit  
(RS485/RS232C)

Parameter writer

Extension panel

Note) Dimensions of extension panel are same as following drawing, but the surface of panel is different.

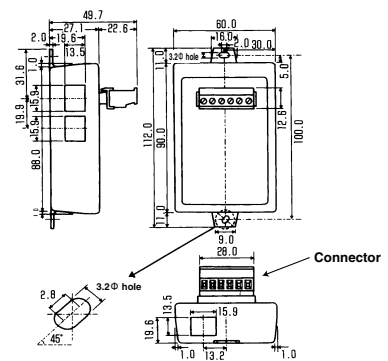


Parameter writer type: PWU001Z  
Parameter writer cable type:  
CAB0011 (1m)  
CAB0013 (3m)  
CAB0015 (5m)

Extension panel type: RKP001Z  
Extension panel cable type:  
CAB0011 (1m)  
CAB0013 (3m)  
CAB0015 (5m)

Communication converter unit RS485/RS232C

Note) Following is RS485 unit. Dimensions of RS232C unit are same as following, but RS232C does not have a connector.



RS485 communication converter type: RS4001Z RS232C communication converter type: RS2001Z  
RS4002Z\* Computer cable type: CAB0025

RS485 cable type:  
CAB0011 (1m)  
CAB0013 (3m)  
CAB0015 (5m)  
RS232C cable type :  
CAB0011 (1m)  
CAB0013 (3m)  
CAB0015 (5m)

\*Supports up to 8 units. RS4001Z and RS4002Z are different in outside shape.

**To users of our inverters:** Our inverters are designed to control the speeds of three-phase induction motors for general industry.

 **Precautions**

- \* Read the instruction manual before installing or operating the inverter unit and store it in a safe place for reference.
- \* When using our inverters for equipment such as nuclear power control equipment, aviation and space flight control equipment, traffic equipment, and safety equipment, and there is a risk that any failure or malfunction of the inverter could directly endanger human life or cause injury, please contact our headquarters, branch, or office printed on the front and back covers of this catalogue. Such applications must be studied carefully.
- \* When using our inverters for critical equipment, even though the inverters are manufactured under strict quality control always fit your equipment with safety devices to prevent serious accident or loss should the inverter fail (such as failure to issue an inverter trouble signal).
- \* Do not use our inverters for any load other than three-phase induction motors.
- \* None of Toshiba, its subsidiaries, affiliates or agents, shall be liable for any physical damages, including, without limitation, malfunction, anomaly, breakdown or any other problem that may occur to any apparatus in which the Toshiba inverter is incorporated or to any equipment that is used in combination with the Toshiba inverter. Nor shall Toshiba, its subsidiaries, affiliates or agents be liable for any compensatory damages resulting from such utilization, including compensation for special, indirect, incidental, consequential, punitive or exemplary damages, or for loss of profit, income or data, even if the user has been advised or apprised of the likelihood of the occurrence of such loss or damages.

For further information, please contact your nearest Toshiba Representative or International Operations-Producer Goods.  
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**TOSHIBA**

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