Simple Set Up

Easy to set parameters
- Showing most frequently used parameters in easy mode.
  - Easy key allows you switch between Easy mode and Standard mode.
  - Easy mode: Scrolls through a list of only eight parameters.
    You can optionally add up to 24 parameters to the list.
  - Standard mode: Rotates through all parameters.
- Guides you step by step through parameters you need to set up.
  - Since the guidance feature shows one parameter at a time
    according to the selected function, you can interactively edit its value.
  - Auto-guidance function is available with motor parameter setup,
    preset speed selection and analog signal control, etc.
- Searching for a history of changes in history function.
  - History function makes change of parameter setting easy when some
    parameters are repeatedly set by the trial run and the adjustment, etc.
    History function automatically searches for 5 latest parameters that
    are set with different values from the standard default setting.
- Searching and resetting of changed parameters.
  - User parameter group (Gr.) automatically searches for any those parameters
    that are set with different values from the standard default setting and
    display them.
  - This function makes the parameter setting check and resetting easily.

Built-in RS-485 communication
- Built-in RS-485 communication enable to control the inverter and build network.
  - Communication rate: 384 kbps max.
  - Compatible with the Modbus RTU and Toshiba protocols.
  - You can connect a PC to manage parameters and monitor operating conditions.

The vertically oriented main circuit terminal block allows easy wiring.
- Like power distribution devices, the main circuit terminal block of the VF-nC3
  is vertically oriented to make wiring easy and minimize tangles of cable.

Side-by-side installation for space-saving
- Generally, Inverters must be placed in consideration of radiation of heat.
  The VF-nC3 can be placed side by side with no gap,
  saving inside of control panel space. *

The covers for the main circuit terminal block ensure safety.
- You can remove the covers for the main circuit terminal block with a screwdriver.
  Since the covers can be attached after the wiring of the main circuit terminal block,
  the VF-nC3 can be installed easily and safely.

* Necessary to reduce output current under some conditions.

Models and Applicable Motors

<table>
<thead>
<tr>
<th>Voltage</th>
<th>Input / Rated Output</th>
<th>Applicable Motor Capacity (kW)</th>
</tr>
</thead>
<tbody>
<tr>
<td>3ph:240V/3ph:240V</td>
<td>0.1, 0.2, 0.4, 0.75, 1.5, 2.2, 4.0</td>
<td></td>
</tr>
<tr>
<td>1ph:240V/3ph:240V</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1ph:120V/3ph:240V</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Index
- Features ............................................. 1
- Application examples .............................. 4
- Panel and operation procedure .................. 5
- Specification and dimensions .................... 7
- Connection diagram and terminal functions ... 9
- List of parameters ................................. 11
- Peripheral devices ................................ 13
- For Inverter users .................................. 16
Excellent Motor Control

The VF-N3C brings out the best performance for kinds of different machine and various motor control modes suitable for its load characteristics.

If you just want to change the motor speed
First, select the default Constant VF mode. If the default does not enough torque, you may want to have more energy than the default provides, then you can select VF Control mode to meet the specific needs.

If you need higher torque for heavy-duty machines
Application examples: Conveyors, hoists and elevator, electric equipment, automobile machine, washing machines, applications for moving heavy or viscous materials, applications that require quick acceleration, etc.

The VF-N3C supports sensors less vector control mode to generate stable, high-torque power from motor startup to a predefined, desired motor operating speed. It is easy to set up motor parameters to achieve optimal vector control. You can do this simply by setting the values in the name plate of a motor and selecting Auto-Tuning. The Auto-Guidance feature further simplifies setup by showing you necessary parameters once at a time interactively. The factory defaults are set to values of the Toshiba standard motor (same capacity, 4-pole, 200 V, 60 Hz).

To save energy
Application examples: Fans, pumps, machines with small load variations that do not use safety fences.

The VF-N3C offers Automatic Energy-Saving mode suitable for fans and pumps, which produces optimal current according to the load level (You need to set up the motor parameters.)

Wide Variety of Applications

The VF-N3C supports a wide range of machines, operating conditions and meets the needs of industrial equipment and everyday appliances.

- Sink/source control logic
  The VF-N3C can be configured for both sink and source logic according to the target machine and the location where it is used.

- Power supplies: three-phase 240 V
  - single-phase 240 V and single-phase 120 V
  The VF-N3C can be used for a wide variety of applications from industrial machines to everyday equipment. Not for stepwells, 240 V and 120 V inputs, the VF-N3C provides a three-phase 240 V supply.

- Maximum ambient temperature: 50°C
  In many cases, the temperature in a cabinet gets higher than the ambient temperature. The VF-N3C can be used at higher ambient temperatures.

- Maximum altitude: 3000 meters
  The VF-N3C can be used at high altitudes.

- Operating frequency range: 0.1 Hz to 400 Hz
  The VF-N3C supports a wide range of speed from low speed machines to high speed motors.

- Programmable input and output terminals
  The functions of the input and output terminals are programmable to meet the requirements for external circuits and applications. Each terminal can be configured into a functional terminal, and it makes it possible to simplify external circuitry.

Long Lifetime

Designs for 10 years of operation
The main motor, capacitors, cooling fan and control board capacitors are designed for 10 years lifetime design.

- Temperature: Average annual ambient temperature: 40°C, outdoor current: 80% of the rated current: 24 hours/365 days. The designed lifetime is calculated value, not guaranteed one.

- The cooling fan is automatically turned on and off to further prolong the total lifetime.

- The VF-N3C provides a capability to turn on and off cooling fans automatically in order to further prolonging their lifetimes. This leads to energy-saving because cooling fans can be stopped while the lifetime is left.

Monitor informs when to replace major parts
The VF-N3C tells you when to replace major parts and keeps track of the cumulative operation time. Since the VF-N3C can generate warning, you can prevent a problem before it occurs.

Safety Features

Protects the setting parameters
The VF-N3C provides a protection for the setting parameters. For enhanced security, you can use a four-digit password. The VF-N3C has a feature for saving and restoring a set of parameters.

- The Monitor mode shows the load conditions.

  - Monitoring the operating conditions
    The front panel shows the operating conditions such as output current, rotational direction, input and output power, and so on. This feature is useful for checking the load conditions and adjusting parameters.

  - Checking the high temperature
    In the event of a protection trip, you can check the output current, input voltage and the like on a monitor to identify the cause of the problem and take countermeasures. The VF-N3C remembers information about the last four trips even after you power it off.

Eco Design

Compliant with the European RoHS Directive
Built-in noise filters to suppress electromagnetic noise
The single-phase 240 V model have built-in EMC noise filter comply with the European EMC Directive to reduce radio-frequency noise from the input power.

This saves space and wiring, compared to using an external noise filter.

Global Compliance

The VF-N3C is compliant with major international standards.

Health, medical and nursing care equipment
- Stair lift, Nursing beds, Bed bath, Health care equipment

Environment and daily-life-related machinery
- Commercial cleaning system
  - Commercial refrigeration system
  - Car washing machines
  - Duster cleaners
  - Dish dryers

Packing machinery
- Inter-packing machines
  - Packaging machines
  - Outer packaging machine

Band tightening
- Band-tightening machine

Conveyancy Machinery
- Conveyors, automatic washing systems, etc.

Fans & Pumps
- Fans and pumps in industrial machines, water supply and sewer systems, etc.

Energy-saving mode
- The variable torque and Automatic energy-saving mode help saving energy by saving optimal current according to the load level.

- PID control
- Regulator pressure control
- Anti-shock control
- Overload control
- Overload protection

Food Processing Machinery
- Bakery equipment, confectionery equipment, tea-making machines, noodle-making machines, candy-wrapping machines, rice- milling machines, flour-milling machines, food mixers, food fillers, fruit washing machines, etc.

Examples
- Frequency updown input control
- Precise speed operation
- Jog run
- 2-axis control mode
- Deceleration step in case of power failure
- PWM carrier frequency setting
- Switching to fixed setting
- Password lock

Conveyor
- Conveyors, automatic washing systems, etc.

Fans & Pumps
- Fans and pumps in industrial machines, water supply and sewer systems, etc.

Energy-saving mode
- The variable torque and Automatic energy-saving mode help saving energy by saving optimal current according to the load level.

- PID control
- Regulator pressure control
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Health, medical and nursing care equipment
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Environment and daily-life-related machinery
- Commercial cleaning system
  - Commercial refrigeration system
  - Car washing machines
  - Duster cleaners
  - Dish dryers

Packing machinery
- Inter-packing machines
  - Packaging machines
  - Outer packaging machine

Band tightening
- Band-tightening machine

1.Energy-saving mode: The variable torque and Automatic Energy-saving mode help saving energy by saving optimal current according to the load level.

2. Automatic process control
The VF-N3C is programmable for automatic succession by an external input signal. The VF-N3C can be set up to be the primary controller. The VF-N3C has a feature for switching the mode and selecting the programming method.

- Allows a motor to keep running and accelerate smoothly upon the recovery of power even in the event of an instantaneous power failure*

  - Uninterrupted operation even without a trip
  - The VF-N3C automatically returns the operating frequency to the rated value in case of an overcurrent

- Enables an interrupted operation without causing a trip
  - The VF-N3C automatically returns the operating frequency to the rated value in case of an overcurrent

- Overcurrent protection
  - The VF-N3C can be used in case of an overcurrent.
Panel and operation procedure

TOSVERT™ VF-nC3

Power on (setup parameter)

1. When power on the inverter for the first time, SE Eb is blinking.

2. Select an area code by the setting dial. JP/USA/ASIA/EU

3. Press the center of the setting dial to confirm your change. When “IN” is displayed, you finish setting the setup parameter.

Monitor display

The LEDs on the operation panel display the following symbols indicate operations and parameters.

LED (number)

- 0 1 2 3 4 5 6 7 8 9

- 0 1 2 3 4 5 6 7 8 9

LED (alphabet)

A B C D E F G H J K L M N O P Q R S T U V W X Y Z

Values set by each setup parameter:

<table>
<thead>
<tr>
<th>Setup Parameter</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>F01 Power Source</td>
<td>DC600V, DC380V, AC380V, AC480V, AC600V</td>
</tr>
<tr>
<td>F02 Frequency Source</td>
<td>Internal, External</td>
</tr>
<tr>
<td>F03 Frequency Source</td>
<td>0.00, 0.50, 0.75, 1.00</td>
</tr>
<tr>
<td>F04 Frequency Source</td>
<td>0.00, 0.50, 0.75, 1.00</td>
</tr>
<tr>
<td>F05 Frequency Source</td>
<td>0.00, 0.50, 0.75, 1.00</td>
</tr>
<tr>
<td>F06 Frequency Source</td>
<td>0.00, 0.50, 0.75, 1.00</td>
</tr>
<tr>
<td>F07 Frequency Source</td>
<td>0.00, 0.50, 0.75, 1.00</td>
</tr>
<tr>
<td>F08 Frequency Source</td>
<td>0.00, 0.50, 0.75, 1.00</td>
</tr>
<tr>
<td>F09 Frequency Source</td>
<td>0.00, 0.50, 0.75, 1.00</td>
</tr>
<tr>
<td>F10 Frequency Source</td>
<td>0.00, 0.50, 0.75, 1.00</td>
</tr>
<tr>
<td>F11 Frequency Source</td>
<td>0.00, 0.50, 0.75, 1.00</td>
</tr>
<tr>
<td>F12 Frequency Source</td>
<td>0.00, 0.50, 0.75, 1.00</td>
</tr>
<tr>
<td>F13 Frequency Source</td>
<td>0.00, 0.50, 0.75, 1.00</td>
</tr>
<tr>
<td>F14 Frequency Source</td>
<td>0.00, 0.50, 0.75, 1.00</td>
</tr>
<tr>
<td>F15 Frequency Source</td>
<td>0.00, 0.50, 0.75, 1.00</td>
</tr>
<tr>
<td>F16 Frequency Source</td>
<td>0.00, 0.50, 0.75, 1.00</td>
</tr>
<tr>
<td>F17 Frequency Source</td>
<td>0.00, 0.50, 0.75, 1.00</td>
</tr>
<tr>
<td>F18 Frequency Source</td>
<td>0.00, 0.50, 0.75, 1.00</td>
</tr>
<tr>
<td>F19 Frequency Source</td>
<td>0.00, 0.50, 0.75, 1.00</td>
</tr>
<tr>
<td>F20 Frequency Source</td>
<td>0.00, 0.50, 0.75, 1.00</td>
</tr>
<tr>
<td>F21 Frequency Source</td>
<td>0.00, 0.50, 0.75, 1.00</td>
</tr>
<tr>
<td>F22 Frequency Source</td>
<td>0.00, 0.50, 0.75, 1.00</td>
</tr>
<tr>
<td>F23 Frequency Source</td>
<td>0.00, 0.50, 0.75, 1.00</td>
</tr>
<tr>
<td>F24 Frequency Source</td>
<td>0.00, 0.50, 0.75, 1.00</td>
</tr>
<tr>
<td>F25 Frequency Source</td>
<td>0.00, 0.50, 0.75, 1.00</td>
</tr>
<tr>
<td>F26 Frequency Source</td>
<td>0.00, 0.50, 0.75, 1.00</td>
</tr>
<tr>
<td>F27 Frequency Source</td>
<td>0.00, 0.50, 0.75, 1.00</td>
</tr>
<tr>
<td>F28 Frequency Source</td>
<td>0.00, 0.50, 0.75, 1.00</td>
</tr>
<tr>
<td>F29 Frequency Source</td>
<td>0.00, 0.50, 0.75, 1.00</td>
</tr>
<tr>
<td>F30 Frequency Source</td>
<td>0.00, 0.50, 0.75, 1.00</td>
</tr>
<tr>
<td>F31 Frequency Source</td>
<td>0.00, 0.50, 0.75, 1.00</td>
</tr>
</tbody>
</table>

Monitoring and Setting

Operation

1. Turn on the power. 0.0Hz is displayed.
2. Press the mode key until “F01” is displayed.
3. Set the reference output command value.
4. Press the “STOP” key.
5. Set the reference output command value again.
6. Press the “RUN” key.
7. Change the output frequency.
8. Press the “STOP” key.
9. Set the reference output command value.
10. Press the “RUN” key.
11. Change the output frequency.

Monitoring

1. Turn on the power. 0.0Hz is displayed.
2. Press the mode key until “F02” is displayed.
3. Display “F02”.
4. Pressing the MODE key several times.
5. Turning the setting dial clockwise.
6. Changing the reference output command value.
7. Press the “STOP” key.
8. Turning the setting dial clockwise.
9. Displaying “F02”.
10. Pressing the MODE key several times.

Setting

1. Turn on the power. 0.0Hz is displayed.
2. Display “F03”.
3. Displaying “F03”.
4. Turning the setting dial clockwise.
5. Displaying “F03”.
6. Displaying “F03”.
7. Pressing the “STOP” key.
8. Displaying “F03”.
9. Displaying “F03”.
10. Displaying “F03”.
11. Displaying “F03”.
12. Displaying “F03”.
13. Displaying “F03”.
14. Displaying “F03”.

* If you press the center of the setting dial without changing the setting, the next parameter (F02) is displayed.
### 1-phase 240V class

<table>
<thead>
<tr>
<th>Specification</th>
<th>240V-class</th>
<th>120V-class</th>
</tr>
</thead>
<tbody>
<tr>
<td>Voltage class</td>
<td>240V</td>
<td>120V</td>
</tr>
<tr>
<td>Applicable voltage (V)</td>
<td>200 - 240</td>
<td>200 - 240</td>
</tr>
<tr>
<td>Rated voltage (V)</td>
<td>220 - 240</td>
<td>220 - 240</td>
</tr>
<tr>
<td>Rated output current (A)</td>
<td>7.0 - 10.0</td>
<td>5.0 - 10.0</td>
</tr>
<tr>
<td>Rated input current (A)</td>
<td>7.0 - 10.0</td>
<td>5.0 - 10.0</td>
</tr>
<tr>
<td>Voltage tolerance</td>
<td>±5%</td>
<td>±5%</td>
</tr>
<tr>
<td>Current tolerance</td>
<td>±10%</td>
<td>±10%</td>
</tr>
<tr>
<td>Protective method</td>
<td>IEC60358-2-20</td>
<td>IEC60358-2-20</td>
</tr>
<tr>
<td>Color</td>
<td>Red, Blue</td>
<td>Red, Blue</td>
</tr>
<tr>
<td>Built-in fuse</td>
<td>E5, E6</td>
<td>E5, E6</td>
</tr>
</tbody>
</table>

### 1-phase 240V class / 1-phase 120V class

<table>
<thead>
<tr>
<th>Specification</th>
<th>240V-class</th>
<th>120V-class</th>
</tr>
</thead>
<tbody>
<tr>
<td>Voltage class</td>
<td>240V</td>
<td>120V</td>
</tr>
<tr>
<td>Applicable voltage (V)</td>
<td>200 - 240</td>
<td>200 - 240</td>
</tr>
<tr>
<td>Rated voltage (V)</td>
<td>220 - 240</td>
<td>220 - 240</td>
</tr>
<tr>
<td>Rated output current (A)</td>
<td>7.0 - 10.0</td>
<td>5.0 - 10.0</td>
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<td>5.0 - 10.0</td>
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<td>Voltage tolerance</td>
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<tr>
<td>Current tolerance</td>
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<tr>
<td>Color</td>
<td>Red, Blue</td>
<td>Red, Blue</td>
</tr>
<tr>
<td>Built-in fuse</td>
<td>E5, E6</td>
<td>E5, E6</td>
</tr>
</tbody>
</table>

### External dimensions

- **Fig. A**: Diagram showing the external dimensions of the device.
- **Fig. B**: Diagram showing the internal connections and components of the device.
- **Fig. C**: Diagram showing the installation guide and mounting instructions.

### Notes
- Note 1: Specifications are based on laboratory measurements and may vary depending on the operating conditions.
- Note 2: All dimensions are shown in millimeters unless otherwise specified.
- Note 3: The device is suitable for indoor use only.
- Note 4: The specifications are valid for a power factor of 0.8 (lagging).

---

**Specifications and dimensions**

**Control option**

- **Disposal PVW control**
  - Output voltage range: Adjustable within the range of 160 to 500V by connecting the supply voltage. However, output voltage exceeds the input voltage.
  - Output frequency range: 0.5 to 60Hz, default setting, 0.5 to 60Hz, maximum, 50 to 60Hz
  - Minimum setting steps of frequency: 0.01Hz (when the frequency is 100Hz). 1Hz: (operation parameter setting and communication setting).
  - Frequency setting: Digital display setting of the frequency of the input and frequency of the input. Frequency setting range: ±50% of the frequency (20Hz to 100Hz).
    - Frequency accuracy: 0.05% of the rated output current (60Hz, 20Hz to 100Hz).
    - Input voltage frequency: 60Hz ±0.5% (adjustable by ±5Hz by adjusting the frequency at 20Hz or 60Hz)
    - Frequency setting signal: Setting the voltage output with the frequency setting signal. Setting the frequency is adjustable from 0 to 100Hz.

**Common specification**

- **Rated output current**: Adjustable within the range of 10A to 50A (default: 100A).
- **Selector**: Setting of the selector panel. Input power and control circuit heating time.
- **Accelerator/brake settings**: Setting the input power and the output power brakes. Setting the brake time (10s to 60s), brake power setting (10 to 1000W), brake current setting (10 to 10A).
- **Operating condition**: Setting the operation condition (100Hz, 60Hz, 50Hz).
- **Protection**: Setting the protection function (overcurrent, overvoltage, undervoltage).
- **Detector**: Setting the detector function (open phase, short-circuit).
- **Display**: Setting the display function (current, voltage).
- **Overload protection**: Setting the overload protection function (overload, short-circuit).
## Main circuit terminal functions

<table>
<thead>
<tr>
<th>Terminal symbol</th>
<th>Terminal function</th>
</tr>
</thead>
<tbody>
<tr>
<td>R1, R2, R3, R4, R5</td>
<td>Terminal pin for connecting reactor.</td>
</tr>
<tr>
<td>V1, V2, V3, V4, V5</td>
<td>Terminals for connecting the output of the inverter.</td>
</tr>
<tr>
<td>T1, T2, T3, T4, T5</td>
<td>Terminals for connecting the collector of the inverter.</td>
</tr>
</tbody>
</table>

## Control circuit terminal functions

<table>
<thead>
<tr>
<th>Terminal symbol</th>
<th>Terminal function</th>
</tr>
</thead>
<tbody>
<tr>
<td>P1, P2, P3, P4, P5</td>
<td>Terminals for inputting the control signal.</td>
</tr>
<tr>
<td>P6, P7, P8, P9, P10</td>
<td>Terminals for outputting the control signal.</td>
</tr>
</tbody>
</table>

## Terminal characteristics

<table>
<thead>
<tr>
<th>Terminal symbol</th>
<th>Terminal characteristics</th>
</tr>
</thead>
<tbody>
<tr>
<td>R1, R2, R3, R4, R5</td>
<td>100 VDC voltage supply.</td>
</tr>
<tr>
<td>V1, V2, V3, V4, V5</td>
<td>24 VDC voltage supply.</td>
</tr>
<tr>
<td>T1, T2, T3, T4, T5</td>
<td>24 VDC voltage supply.</td>
</tr>
</tbody>
</table>

## Control circuit terminal characteristics

<table>
<thead>
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<td>P1, P2, P3, P4, P5</td>
<td>24 VDC voltage supply.</td>
</tr>
<tr>
<td>P6, P7, P8, P9, P10</td>
<td>24 VDC voltage supply.</td>
</tr>
</tbody>
</table>

## Control circuit terminal properties

<table>
<thead>
<tr>
<th>Terminal symbol</th>
<th>Terminal properties</th>
</tr>
</thead>
<tbody>
<tr>
<td>P1, P2, P3, P4, P5</td>
<td>DC supply voltage.</td>
</tr>
<tr>
<td>P6, P7, P8, P9, P10</td>
<td>DC supply voltage.</td>
</tr>
</tbody>
</table>

## Wiring devices

### Connection diagram and terminal diagram

- **Standard connection diagram**
  - Sink logic (for DC side communication)
  - Source logic (for AC side communication)

- **Wiring devices**
  - 100 VDC voltage source
  - 24 VDC voltage source
  - 24 VDC voltage source

### Connection diagram and terminal diagram

- **Standard connection diagram**
  - Sink logic (for DC side communication)
  - Source logic (for AC side communication)

- **Wiring devices**
  - 100 VDC voltage source
  - 24 VDC voltage source
  - 24 VDC voltage source

### Control circuit terminal functions

- **Terminal symbol**: P1, P2, P3, P4, P5
- **Terminal function**: Terminals for connecting the output of the inverter.

### Control circuit terminal characteristics

<table>
<thead>
<tr>
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</tr>
</thead>
<tbody>
<tr>
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<td>24 VDC voltage supply.</td>
</tr>
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<td>P6, P7, P8, P9, P10</td>
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### Control circuit terminal properties

<table>
<thead>
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<tbody>
<tr>
<td>P1, P2, P3, P4, P5</td>
<td>DC supply voltage.</td>
</tr>
<tr>
<td>P6, P7, P8, P9, P10</td>
<td>DC supply voltage.</td>
</tr>
</tbody>
</table>

### Wiring devices

- **100 VDC voltage source**
- **24 VDC voltage source**
- **24 VDC voltage source**
### List of parameters

#### Basic parameters

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Function</th>
<th>Adjustment range</th>
<th>Default setting</th>
</tr>
</thead>
<tbody>
<tr>
<td>F-30</td>
<td>AC voltage</td>
<td>380-480 V</td>
<td>400 V</td>
</tr>
<tr>
<td>F-31</td>
<td>DC voltage</td>
<td>220-440 V</td>
<td>380 V</td>
</tr>
</tbody>
</table>

#### Operation frequency parameter

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Function</th>
<th>Adjustment range</th>
<th>Default setting</th>
</tr>
</thead>
<tbody>
<tr>
<td>F-40</td>
<td>Frequency</td>
<td>0.01-400 Hz</td>
<td>50 Hz</td>
</tr>
<tr>
<td>F-41</td>
<td>Frequencypolation</td>
<td>0.01-400 Hz</td>
<td>50 Hz</td>
</tr>
</tbody>
</table>

#### Other Basic parameters

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Function</th>
<th>Adjustment range</th>
<th>Default setting</th>
</tr>
</thead>
<tbody>
<tr>
<td>F-50</td>
<td>Setting</td>
<td>0-100 %</td>
<td>50 %</td>
</tr>
<tr>
<td>F-51</td>
<td>Protection</td>
<td>0-100 %</td>
<td>100 %</td>
</tr>
</tbody>
</table>

#### Input terminal functions assignment

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Function</th>
<th>Adjustment range</th>
<th>Default setting</th>
</tr>
</thead>
<tbody>
<tr>
<td>F-20</td>
<td>Input terminal function</td>
<td>1-8</td>
<td>1</td>
</tr>
<tr>
<td>F-21</td>
<td>Input terminal function</td>
<td>9-16</td>
<td>9</td>
</tr>
</tbody>
</table>

#### Output terminal functions assignment

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Function</th>
<th>Adjustment range</th>
<th>Default setting</th>
</tr>
</thead>
<tbody>
<tr>
<td>F-30</td>
<td>Output terminal function</td>
<td>1-8</td>
<td>1</td>
</tr>
<tr>
<td>F-31</td>
<td>Output terminal function</td>
<td>9-16</td>
<td>9</td>
</tr>
</tbody>
</table>

#### Extended parameters I

For details on extended parameters, please visit our website (http://example.com).

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Function</th>
<th>Adjustment range</th>
<th>Default setting</th>
</tr>
</thead>
<tbody>
<tr>
<td>F-50</td>
<td>Extended parameters 1</td>
<td>1-10</td>
<td>1</td>
</tr>
</tbody>
</table>

#### Extended parameters II

For details on extended parameters, please visit our website (http://example.com).

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Function</th>
<th>Adjustment range</th>
<th>Default setting</th>
</tr>
</thead>
<tbody>
<tr>
<td>F-50</td>
<td>Extended parameters 2</td>
<td>1-10</td>
<td>1</td>
</tr>
</tbody>
</table>

#### PID control

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Function</th>
<th>Adjustment range</th>
<th>Default setting</th>
</tr>
</thead>
<tbody>
<tr>
<td>F-60</td>
<td>PID control</td>
<td>0-100</td>
<td>50</td>
</tr>
</tbody>
</table>

#### Freespeed operation

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Function</th>
<th>Adjustment range</th>
<th>Default setting</th>
</tr>
</thead>
<tbody>
<tr>
<td>F-70</td>
<td>Freespeed operation</td>
<td>0-100</td>
<td>50</td>
</tr>
</tbody>
</table>

#### No. 2 Acceleration/deceleration time

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Function</th>
<th>Adjustment range</th>
<th>Default setting</th>
</tr>
</thead>
<tbody>
<tr>
<td>F-80</td>
<td>Acceleration/deceleration time</td>
<td>0-100</td>
<td>50</td>
</tr>
</tbody>
</table>

#### Status monitor

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Function</th>
<th>Adjustment range</th>
<th>Default setting</th>
</tr>
</thead>
<tbody>
<tr>
<td>F-90</td>
<td>Status monitor</td>
<td>0-100</td>
<td>50</td>
</tr>
</tbody>
</table>

#### Easy mode

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Function</th>
<th>Adjustment range</th>
<th>Default setting</th>
</tr>
</thead>
<tbody>
<tr>
<td>F-10</td>
<td>Easy mode</td>
<td>0-100</td>
<td>50</td>
</tr>
</tbody>
</table>

---

### Related topics

- **FWM carrier frequency**: Set parameters to minimize the acoustic noise of motor or electromagnetic noise.
- **Panel display**: Display parameters by selecting the number displayed on the panel.
- **Start/stop function**: Set parameters to select the status of the stop function.
- **Frequency command (terminal board)**: Set parameters to set the characteristic of frequency reference from terminal board.
- **Protection 1**: For some protective functions, set parameters to select the protective functions.
- **Protection 2**: For some protective functions, set parameters to select the protective functions.
- **Parameter protection**: Set parameters to change the protection parameters.
- **Maintenance**: Set parameters to change the maintenance parameters.
- **Easy mode**: Set parameters to change the easy mode parameters.
### For inverter users

1. When studying how to use our inverters

#### Notes

**Leakage current**

This inverter uses high-speed switching semiconductors for PWM control. When a relatively large cable is used for power supply to an inverter, current may leak from the cable to the ground because of its capacitance, adversely affecting peripheral equipment. The intensity of such a leakage current depends on the PWM carrier frequency setting, the lengths of the input and output cables, etc., of the inverter. To prevent current leakage, it is recommended to take the following measures.

**Effects of leakage current**

Leakage current which increases when an inverter is used may pass through the following routes:

- Route 1:
  - Leakage due to the capacitance between the ground and the noise filter
  - Leakage due to the capacitance between the ground and the inverter

- Route 2:
  - Leakage due to the capacitance between the ground and the cable connecting the inverter and the motor
  - Leakage through the grounding line common to motors

- Route 3:
  - Leakage caused by the capacitance of the ground

**Measurements against leakage current**

- Use radio-frequency interference-proof ELCRs as ground-fault interrupters in not only the system into which the inverter is incorporated but also other systems. When the ELCRs are used, the PWM carrier frequency must be increased to suppress the leakage current.
- When connecting multiple inverters to a single ELCR, use an ELCR with a high current sensitivity or reduce the number of inverters connected to the ELCR.
- Measure the grounding resistance of the inverter from that of the affected electrical and electronic systems. (Note: The grounding resistance of the inverter is not always the same as that of the inverter system. Therefore, if the grounding resistance is high, the inverter may be damaged.)
- Reduce the PWM carrier frequency of the inverter to a low value.

#### Power factor improvement capacitors

- Do not install a power factor improvement capacitor on the output side of the inverter. Installing a power factor improvement capacitor on the output side causes current harmonics to flow into the capacitor, adversely affecting inverter performance and causing overheating. To improve the power factor, install an inverter-ac reactor on the primary side of the inverter instead of a capacitor.

#### Installation of input AC reactors

These devices are used to improve the input power factor and suppress high harmonic currents and surge. Install an input AC reactor when using this inverter under the following conditions:

1. When the power source capacity is 2000kVA or more, and when it is 10 times or more greater than the inverter capacity.
2. When the inverter is connected to the same power distribution system as that of the above-mentioned control equipment.
3. When the inverter is connected to the same power distribution system as that of the above-mentioned control equipment, such as power and large-capacity inverters.
2. Selecting the Capacity (model) of the Inverter

Selection

Capacities

The suitable capacity must be calculated according to the following equations.

1. When installing, wiring and operating the inverter

Installation prerequisites

1. Do not install in a location of high temperature, high humidity, moisture condensation and freons. Do not install in a location that contains metallic objects that could adversely affect plastic. Avoid installing in locations where there is dirt or dust. Avoid installing where moisture, water, or where there may be large amounts of dust and metallic fragments. In this case, please install in a lockable type cabinet. The cabinet must be considered its size and the cooling method to be applied to accommodate the specifications of the ambient temperature for inverters.

2. Avoid installing in areas where there is metallic metal, as such areas may be susceptible to electrical noise. When the panel is not well protected, electrical noise may be transmitted to the panel.

Wiring precautions

1. Install a molded case circuit breaker (MCCB) on the power supply input to protect the wiring.

2. Avoid turning on/off the electronic circuit breaker on and off too frequently or too much to avoid over-heating the control terminal. To turn on/off the motor frequently, close/open the control terminal for MCCB.

3. Installing a magnetic contactor (MC) (primary side)

1. To prevent an automatic restart after power interruption of the electronic circuit breaker or the tripping of the protective circuit, install an electronic magnetic contactor in the power supply.

2. The inverter is provided with a fault detection relay (FDR). If, for example, the contactor is connected to the output circuit, the contactor will close only when the protective circuit of the inverter is activated.

3. The inverter can be used without a magnetic contactor. In this case, use a MCCB instead of a contactor, or use a voltage tripping device operating the primary circuit when the inverter protective circuit is activated.

4. When changing the motor speed

Application to standard motors

1. Vibration

2. Noise

Application to special motors

Gear motor

1. Gear motor

2. Gear motor

3. Gear motor

4. Gear motor

5. Gear motor

6. Gear motor
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, aviation and space flight control, traffic, and safety, 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. Special precautions must be taken and 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 issuing an inverter failure 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. The Information in this brochure is subject to change without notice.