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. The information in this brochure is subject to change without notice.
Introducing the New-Generation Compact Inverter!

Easy to Use, Powerful Performance, and Wide Applications

For System Designers ...

Flexible Selections

- Sensorless vector control provides the startup torque of 150% or more.
- The ‘Auto-tuning function’ allows setting motor constants without rotating the motor.
- Wide capacity range (0.2 to 15 kW) is provided even for this compact class.
- Compatible with various power voltages.
- The single-phase input model inputs 200V to 240V, the three-phase 400V model inputs 380V to 500V.
- The control circuit I/O logic (Sink/Source) is switched by one-touch operation. Many types of programmable controllers are easily connected.

For Manufacturers ...

Easy Installation

- All models have EMI noise filter inside, significantly reducing noise emissions.
- EMC plate (attached as standard) shields the wiring to further suppress radiated EMI noises.
- Side-by-side installation saves space. Multiple units can be installed without side clearance.
- For example, installing five units of VFS9-2007PM side by side requires only 60% of the area for conventional inverters.
- Optional DIN rail kit allows one-touch installation (models of 200V class 0.75kW or less).
- Availability of high carrier frequency setting reduces audible motor noise. Even if the carrier frequency is set to a low level to suppress the EMI noise influence, the newly developed “Random Mode Carrier Frequency” can soften audible noise.
- Foot-mount type filter for space-saving is provided as option to comply with the EN standard.

For Users ...

Easy Setting

- Users can easily make settings and operate reliably.
- Switches and potentiometer dial on the front panel allow immediate and easy operation.
- The enhanced “Automatic Setting Functions” enable easy and convenient setup. Automatic acceleration/deceleration, Automatic torque boost, Automatic environment setting, Automatic function setting, reduce start up time.
- Diverse functions are conveniently enhanced.
  - Relay contact output:
  - Programmable I/O terminals:
  - Meter analog output:
    - Analog output signal can be selected from 6 types of menus. 0-10V and 4-20mA signal can also be switched by one-touch operation.

- Enhanced protective functions assure reliable operation.
  - I/O phase failure detecting, earth fault detecting function.
  - Dependable operation in case of power voltage drop.
  - Reliable continuous operation secured by auto-reset control function and regenerative power ride-through control function.

Contents

Panel and Operation Method ............................................. 3-4
Standard Specifications and External Dimensions .............. 5-6
Functional Description .................................................... 7-8
Connection Diagram and Selection of Wiring Devices .......... 9
Terminal Functions .......................................................... 10
Inverter Q & A .................................................................... 11-13
To Users of Our Inverters ................................................... 14-16
Optional external devices ..................................................... 17-21
Trip Display and Alarm Display ........................................... 22

Noise level of conventional model (without filter)

Noise level of PL-type model (noise filter inside)

[MHz]

[dBuV]

120
100
80
60
40
20
0

500 1000 1500 2000 (min-1)

[N·m]

40
30
20
10
0

0.15 1 10 30

5ø200V/3ø200V
3ø200V/3ø200V
3ø400V/3ø400V

Efficient basic performance and diverse functions allow operations as needed.

Major World Standard

ISO 9001:
VF-S9 series is manufactured at the works, which has received the international quality assurance standard ISO 9001 certification.

The works producing the VF-S9 series is registered as an environment management system factory specified by ISO 14001.

Excellent basic performance and diverse functions allow operations as needed.

Users can easily make settings and operate reliably.

■ Switches and potentiometer dial on the front panel allow immediate and easy operation.
- The enhanced “Automatic Setting Functions” enable easy and convenient setup. Automatic acceleration/deceleration, Automatic torque boost, Automatic environment setting, Automatic function setting, reduce start up time.
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■ Enhanced protective functions assure reliable operation.
  - I/O phase failure detecting, earth fault detecting function.
  - Dependable operation in case of power voltage drop.
  - Reliable continuous operation secured by auto-reset control function and regenerative power ride-through control function.
**Panel and Operation Method**

- **Standard Setting (60°, 50°)**
  - Displays 60° when the standard setting (60°, 50°) is entered.
  - Select the base motor frequency. (60° = 50°)

- **Panel and Operation Method**
  - Charge lamp
  - Up/down key
  - LED display
  - Monitor key
  - Enter key
  - Potentiometer
  - STOP key
  - RUN key

- **Charge lamp Connection diagram label**
  - Connection diagram label
  - Terminal board cover
  - Control circuit terminals
  - Connector of common serial communication/Extension panel/parameter writer
  - Logic switching/voltage-current output switching
  - Main circuit terminals (connect to power supply)
  - Main circuit terminals (connect to a motor)
  - Grounding terminal (+)
  - Attachment for EMC plate

**Monitoring — Status monitor mode**

In this mode, you can monitor the operational status of the inverter. To display the operation status during normal operation:

Press the MON key twice.

<table>
<thead>
<tr>
<th>Setting procedure (eq. operation at 60Hz)</th>
<th>Setting value</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Parameter setting mode</td>
<td>ALU</td>
<td>The version of the CPU is displayed.</td>
</tr>
<tr>
<td>Operating frequency</td>
<td>F500</td>
<td>The version of the inverter is displayed.</td>
</tr>
<tr>
<td>Direction of rotation</td>
<td>F500</td>
<td>The version of the EEPROM is displayed.</td>
</tr>
<tr>
<td>Operating frequency command</td>
<td>F500</td>
<td>The version of the frequency command value is displayed.</td>
</tr>
<tr>
<td>Load current</td>
<td>E80</td>
<td>The version of the load current is displayed.</td>
</tr>
<tr>
<td>Input voltage</td>
<td>P 100</td>
<td>The version of the input voltage is displayed.</td>
</tr>
<tr>
<td>Output voltage</td>
<td>P 100</td>
<td>The version of the output voltage is displayed.</td>
</tr>
<tr>
<td>Output terminal</td>
<td>R301</td>
<td>The version of the output terminal is displayed.</td>
</tr>
<tr>
<td>Discharge</td>
<td>DISCH</td>
<td>The version of the discharge is displayed.</td>
</tr>
<tr>
<td>Fault code</td>
<td>E 13</td>
<td>The version of the fault code is displayed.</td>
</tr>
<tr>
<td>Input voltage</td>
<td>P 100</td>
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<td>E 13</td>
<td>The version of the fault code is displayed.</td>
</tr>
</tbody>
</table>

**Contents of the product code**

<table>
<thead>
<tr>
<th>Type</th>
<th>Form</th>
</tr>
</thead>
<tbody>
<tr>
<td>VFS</td>
<td>2007PL</td>
</tr>
</tbody>
</table>

**Notation**

- N1: Standard model without optional filter conform to “EN55011 Group 1 Class A”
- N2: With Foot-mounted noise filter conform to “EN55011 Group 1 Class A”
- N3: With optional filter conform to “EN55011 Group 1 Class A”
- N4: With optional filter conform to “EN55011 Group 1 Class A”

**Note**

- Note 1: Interface logic can be switched easily.
### Function Description

**What are parameters?**

Each "setting item" that determines the control (operation) of an inverter is called a parameter. For example, the connection meter selection parameter (title: F12) is adjusted to set the connection meter, the acceleration time parameter (title: F07) is adjusted to change the acceleration time, and the maximum frequency parameter (title: F01) is adjusted to modify the maximum frequency.

For the function you want to use, check the necessary parameter(s).

---

### Basic parameters

- **Title Function**
  - Automatic acceleration/deceleration
  - Automatic torque boost
  - Automatic function setting
  - Inverter secondary constant

- **Adjustment range**
  - 0: Disabled, 1: Enabled
  - 0 - 100
  - 0 - 255
  - 0 - 200
  - 0 - 53

- **Default**
  - 0
  - 0.30
  - 0
  - 0

### Setup parameters

- **Title Function**
  - Input terminal selection
  - Output terminal selection
  - Torque boost
  - Acceleration/deceleration settings

- **Adjustment range**
  - 0 - 53
  - 0 - 41
  - 0.0 - 30.0
  - 0 - 400.0

- **Default**
  - 7
  - 4
  - 0
  - 0.0

---

### How to read the monitor display?

**Monitor display**

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

- **LED (alphabet)**
  - A: Accessory
  - B: Breaker
  - C: Communication
  - D: Drive
  - E: Error
  - F: Manual
  - G: Guard
  - H: Input
  - I: Inverter
  - J: Display
  - K: Key
  - L: Light
  - M: Message
  - N: Now
  - O: Output
  - P: Program
  - Q: Query
  - R: Remote
  - S: Sequence
  - T: Tachometer
  - U: Unit
  - V: Variable
  - W: Waveform
  - X: X-treme
  - Y: Young

---

### Extended parameters

- **Title Function**
  - Frequency setting
  - Frequency UP response time
  - Frequency DOWN response time

- **Adjustment range**
  - 0 - 3600
  - 0.0 - 100

- **Default**
  - 10.0
  - 100

---

### Other basic parameters

- **Title Function**
  - Frequency setting
  - Select operation setting
  - Frequency adjustment

- **Adjustment range**
  - 0 - 100
  - 0 - 200
  - 0.0 - 30.0

- **Default**
  - 0
  - 0
  - 0.0

---

### How to read the monitor display?

**LED (number)**

- **A:** 1
- **B:** 2
- **C:** 3
- **D:** 4
- **E:** 5
- **F:** 6
- **G:** 7
- **H:** 8
- **I:** 9
- **J:** 0
- **K:** 7
- **L:** 6
- **M:** 5
- **N:** 4
- **O:** 3
- **P:** 2
- **Q:** 1
- **R:** 0
- **S:** 9
- **T:** 8
- **U:** 7
- **V:** 6
- **W:** 5
- **X:** 4
- **Y:** 3

---

### Communication parameters

- **Title Function**
  - Communication band speed

- **Adjustment range**
  - 0 - 4: 1200bps, 2400bps, 4800bps, 9600bps

- **Default**
  - 4: 19200bps

---

### Operation panel parameters

- **Title Function**
  - Jumping frequency

- **Adjustment range**
  - 0 - 3 Hz

- **Default**
  - 0

---

### Protection parameters

- **Title Function**
  - Inverter trip retention selection
  - External input trip stop mode

- **Adjustment range**
  - 0: Not retained, 1: Retained
  - 0: Coast stop, 1: Slowdown stop

- **Default**
  - 0
  - 0
**Q1 How can I use the inverter immediately?**

**A1** Just connect the power supply and the motor, and you can use the VF-S9 series inverter immediately.

You can use the RUN and STOP keys and the frequency setting potentiometer to easily operate the inverter. You can also make adjustments easily using the automatic setting functions.

- **Automatic acceleration/deceleration:** Automatically adjusts the acceleration or deceleration time according to the load.
- **Automatic torque increase:** Automatically improves the motor torque according to the load.
- **Automatic environment setting:** Automatically makes all the settings related to the inverter environment protection at one time.
- **Automatic function setting:** Selects the inverter operation method.

---

**Q2 What can I do if I forget what I have programmed?**

**A2** You can use the change setting retrieval function. You can also use the following operation to restore all the parameters to the default values immediately.

1) **Change setting retrieval (Ctrl+U):** Automatically retrieves and displays only the parameters differing from the default setting. You can confirm the changed parameters.

2) **Standard setting mode selection (Ctrl+M):** Restores all the parameters to the default values.

---

**Q3 How can I change the frequency by contact input in combination with a PC (programmable controller)?**

**A3** Incorporating a standard 15-step speed function, the VF-S9 series allows you to change the frequency by setting parameters and using contact input.

You can change the frequency using contact input.

---

**Q4 What is the input/output programmable terminal block?**

**A4** The VF-S9 series allows you to set the terminal functions as you wish from a broad menu selection.

---

**Q5 How can I get a large torque?**

**A5** The VF-S9 series ensures a torque of 150% or more from low speeds by utilizing Toshiba’s sensorless vector control.

Enable the sensorless vector control for a load that requires high starting or low speed torque.

To use sensorless vector control

1) When automatic torque increase R/L2 = 1 is set, all the sensorless vector controls and motor constants are set at one time.

2) Set VF control mode selection Prv = 3 (sensorless vector control). Set the motor constants.

For the same capacity as the inverter with the 4P Toshiba standard motor, it is not necessary to set the motor constants.

(1) The motor constants can be set individually.

(2) The motor constants can be automatically set using the auto-tuning function FON = 2 (Auto-tuning).

(3) The motor constants can be set manually.
Q6 How do I start/stop a motor by external contacts, and control the frequency by a current signal of 4-20 mA (or a voltage signal of 0-10 Vdc.)

A6 To start/stop the motor by external contacts, and to control the frequency by a current (voltage) signal, you need to set the following parameters:

**Parameters to be changed**

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Setting</th>
</tr>
</thead>
<tbody>
<tr>
<td>Command mode selection</td>
<td>0 (Terminal board)</td>
</tr>
<tr>
<td>Frequency setting mode selection</td>
<td>0 (Terminal board)</td>
</tr>
</tbody>
</table>

**Example of wiring**

- **VF-S9**
  - Power supply
  - Run/Stop
  - 4-20 mA (current signal)
  - 0-10 Vdc (voltage signal)

Note: Because they are connected to each other in the inverter, the VA and VB terminals cannot be used jointly. Use terminal VFB just one with terminal 6.

Q7 Why do other devices malfunction due to noise?

A7 Using PWM control, the VF-S9 series generates noise that may affect nearby instrumentation and electronic equipment.

Noise is classified by propagation route into transmission noise, and radiation noise. Take the following counter measures for noise which affects other equipment:

- Install noise filters.
- Use twisted-pair shielding cables for weak electric circuits and signal circuits, and be sure to ground one end of the shielding.
- Install the inverters separately from other equipment.
- Cover the inverters and their cables with metal conduit tubes and metal control panels, and ground these covers.
- EMC plate is attached for measures of radiation noise.

Q8 What is the frequency of the inverter by a current signal of 4-20 mA (or a voltage signal of 0-10 Vdc.)

A8 The frequency of the inverter is determined by the operation signal. For performing run/stop through a terminal, set to 0 (terminal board).

**FREQ** (Frequency setting mode selection) is a parameter to determine the place for providing frequency command.

For setting with UP/DOWN key on the panel:

- To be set on 1 (operation panel).
- For setting with potentiometer:
  - To be set to 2 (internal potentiometer).

Non-excitation activation type brake

- When using an industrial inverter to drive a gear motor, inquire of the motor manufacturer about its continuous operation range, since low-speed operation of a gear motor may cause insufficient lubrication.

Gear motor

- Note that high-pole count motors (8 or more poles) may be used for fans, etc., have higher rated current than that of the equivalent.

High-pole-count motors

- Note that high-pole count motors (8 or more poles) may be used for fans, etc., have higher rated current than that of the equivalent.

Single-phase motor

- Because single-phase motors are equipped with a centrifugal switch and capacitors for starting, they cannot be driven as an inverter. If only a single-phase power system is available, a 3-phase motor can be driven by using a single-phase input interface to convert it to a 3-phase input (up to 200 VDC output).
To users of our inverters

Notes

Leakage current
The VF-S9 series of inverters uses high-speed switching devices for PWM control. When a relatively high-voltage cable is used for power supply to an inverter, current may leak from the cable or the motor to the ground because of the capacitance, adversely affecting peripheral equipment. The intensity of such a leakage current depends on the PWM carrier frequency, the length 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.
1) Leakage due to the capacitance between the ground and the noise filter
2) Leakage due to the capacitance between the ground and the inverter
3) Leakage due to the capacitance between ground and the cable connecting the inverter and the motor
4) Leakage due to the capacitance of the cable connecting the motor and an inverter
5) Leakage due to the capacitance between ground and the noise filter

Ground fault
Before starting operation, thoroughly check the wiring between the motor and the inverter for incorrect wiring or short circuits. Do not ground the neutral point of any star-connected motor.

Radio interference
(Noise produced by inverters)
Since the VF-S9 series of inverters performs PWM control, it produces noise and sometimes affects nearby instrumental devices, electrical and electronic systems, etc. The effects of noise greatly vary with the noise resistance of each individual device, its wiring condition, the distance between it and the inverter, etc.

(Measures against noises)
1) Separate the power line from other lines, such as weak-current lines and signal lines, and install them apart from each other.
2) Install a noise filter in each inverter. It is effective for noise prevention to install noise filters in other devices and systems, as well.
3) Install the power distribution line of the inverter from that of other devices and systems.
4) Install the input and output cables of the inverter apart from other.
5) Use shielded twisted pair wires for wiring of the weak-current and signal circuits, and always ground one of each pair of wires.
6) Ground the inverter with grounding wires as long and as short as possible, separately from other devices and systems.

All models have built-in noise filters which significantly reduce noise.

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-S9 inverter under the following conditions:
1) When the power inverter capacity is 200kVA 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 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.

Installation of input AC reactors
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.

Installation of input AC reactors

Selecting the capacity (model) of the inverter
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.

Accelerometer/detection lines
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.

Effects of leakage current
Leakage current which increases when an inverter is used may pass through the following routes.
1) Leakage due to the capacitance between the ground and the noise filter
2) Leakage due to the capacitance between the ground and the inverter
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Ground fault
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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.

![Diagram](attachment:image.png)

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.

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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.

![Diagram](attachment:image.png)
The following external devices are optionally available for the VF-S9 series of inverters.

### Input AC reactor (ACL)

- **Input AC reactor**
  - Used to improve the input power factor. Can reduce the current harmonics, and suppress external surge on the inverter power source side. It should be mounted when the power capacity is 500 kVA or more and 10 times or more than the load capacity or when a dedicated motor generator set on such as a turbogenerator is using a regenerative inverter to connect a motor load at the same time.

- **DC reactor (DCL)**
  - Used to improve the input power factor when the input reactor is not effective or when the motor load is small, which makes it effective in improving 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 current of 20A or more and 10 times or more than the load capacity.

- **Zero-phase reactor**
  - For applications requiring high reliability, this reactor is used for the protection and compensation of input current and voltage. It is effective for reducing the input current and voltage, and it is recommended to use it when the power capacity is 500 kVA or more and 10 times or more than the load capacity.

- **Braking resistor**
  - Used when rapid deceleration or stop is frequently required or when it is desired to reduce the deceleration time with large load. This resistor consumes regenerative energy during power generation braking. It is effective for preventing interference with audio equipment.

- **Monitor key**
  - Use this unit for batch read, batch copy, and batch writing of registration data.

- **Parameter writer**
  - For parameter setting and checking. It can be used in conjunction with the monitor key for setting and checking of the MF. It is effective for preventing interference with audio equipment.

- **Control unit**
  - Used to control the load using logic. It is effective for preventing interference with audio equipment.

- **Remote panel**
  - Provides output to control the inverter. It is effective for preventing interference with audio equipment.

- **Extension panel**
  - Used to connect an external control unit to the internal unit. It is effective for preventing interference with audio equipment.

- **Conduit pipe kit**
  - Use to connect a personal computer for data communication. It is effective for preventing interference with audio equipment.

- **IP43 enclosure kit**
  - Available for the 200 V class models of 0.75 kW or less. It is effective for preventing interference with audio equipment.

- **Attachment kit for making a panel conform to the Japanese electrical equipment standard**
  - Use to connect a personal computer for data communication. It is effective for preventing interference with audio equipment.

- **Parameter setting panel**
  - Used to control the load using logic. It is effective for preventing interference with audio equipment.

- **Contactor type reactor**
  - Used to improve the input power factor. It is effective for preventing interference with audio equipment.

- **Reactor Type**
  - Power factor: 0.85
  - Surge suppression: 30%
Device | Communication Converter unit (RS485/RS232C)
---|---
RS485/RS232C communication converter type: RS4001Z
RS485 cable type: CAB0011(1m), CAB0013(3m), CAB0015(5m)
RS232C communication converter type: CAB0011(1m), CAB0013(3m), CAB0015(5m)

External dimensions and connections

High-attenuation radio noise reduction filter

RS232C communication converter type: RS2001Z
RS232C cable type: CAB0011(1m)

Braking resistor

Zero-phase ferrite core type radio noise reduction filter

Foot-mounted noise filter

Parameter writer

Extension panel

Communication Converter Unit (RS485/RS232C)

Device | Parameter writer
---|---

RS485/RS232C communication converter type: CAB0011(1m), CAB0013(3m), CAB0015(5m)
RS485 cable type: CAB0011(1m), CAB0013(3m), CAB0015(5m)
RS232C communication converter type: CAB0011(1m), CAB0013(3m), CAB0015(5m)
RS232C cable type: CAB0011(1m), CAB0013(3m), CAB0015(5m)
### Device

<table>
<thead>
<tr>
<th>Remote panel</th>
<th>External dimensions and connections</th>
</tr>
</thead>
<tbody>
<tr>
<td>CBVR-7B1</td>
<td><img src="image" alt="Diagram of CBVR-7B1" /></td>
</tr>
</tbody>
</table>

#### Trip display / Alarm display

### Trip information

<table>
<thead>
<tr>
<th>Error code</th>
<th>Problem</th>
<th>Remedies</th>
</tr>
</thead>
</table>
| DC 1       | Overcurrent during acceleration | - Increase the acceleration time (ACC)  
- Check the VF parameter  
- Use F301 (Auto-react) and F302 (side-through control)  
- Increase the carrier frequency (F300) |
| DC 2       | Overcurrent during deceleration | - Reduce the deceleration time  
- Check the overload parameter  
- Use F301 (Auto-react) and F302 (side-through control)  
- Increase the carrier frequency (F300) |
| DC 3       | Overcurrent during startup | - Reduce the load fluctuation  
- Check the load (operated machine)  
- A main-circuit element is defective  
- Make a service call |
| QCR        | Arm overcurrent at startup | - Use F301 (Auto-react) and F302 (side-through control)  
- Increase the deceleration time |
| OCL        | Overvoltage during acceleration | - Make a service call |
| OP 1       | Overvoltage during deceleration | - Install a suitable input reactor  
- Use F301 (Auto-react) and F302 (side-through control)  
- Increase the deceleration time |
| OP 2       | Overvoltage during constant-speed operation | - Make a service call |
| OL 1       | Inverter overload | - Increase the acceleration time (ACC)  
- Install a suitable dynamic braking resistor  
- Enable F303 (overvoltage limit operation)  
- Make a service call |
| OL 2       | Motor overload | - Reduce the DC braking amount  
- Use F301 (Auto-react) and F302 (side-through control)  
- Increase the deceleration time |
| EPNO       | Output phase failure | - Measure the main circuit supply voltage  
- Make sure that the setting is correct  
- Make a service call |
| EPNF       | Input phase failure | - Check the main circuit input line for phase failure  
- Enable F605 (Input phase failure detection) |
| DNPH       | External thermal trip | - Check the external input device |
| DL 1       | Over-torque trip | - Check whether the system is in a normal condition |
| DL 2       | Dynamic braking resistor overload trip | - Use a dynamic resistor with a larger capacity (B) and adjust F303 (main circuit parameter) accordingly |
| DH 1        | Overheat | - Reduce the DC braking amount  
- Use F301 (Auto-react) and F302 (side-through control)  
- Increase the deceleration time |
| UL 1       | Undervoltage trip (main circuit) | - Make sure that the voltage is in a normal condition  
- Enable F604 (under-voltage trip selection)  
- To cope with a temporary stop due to undervoltage, enable F302 (side-through control) and (Auto-react) F301 |

### Alarm information

Each message in the table is displayed to give a warning but does not cause the inverter to trip.

<table>
<thead>
<tr>
<th>Error code</th>
<th>Problem</th>
<th>Remedies</th>
</tr>
</thead>
<tbody>
<tr>
<td>OFF</td>
<td>ST terminal OFF</td>
<td>- Close the ST-CC circuit</td>
</tr>
</tbody>
</table>
| IUCF       | Undervoltage in main circuit | - Check whether the setting is correct  
- Make sure that the setting is correct  
- Make a service call |
| EY         | Retry in process | - Measure the main circuit supply voltage  
- Make sure that the setting is correct |
| Error 1    | Frequency point setting error | - Make sure that the setting is correct  
- Make sure that the setting is correct  
- Make a service call |
| CL-        | Clear command acceptable | - Check whether the setting is made correctly |
| EGF        | Emergency stop command acceptable | - Make sure that the setting is made correctly |
| NLO        | Setting value/alarm | - Make sure that the setting is made correctly  
- Make sure that the setting is made correctly  
- Make a service call |
| DB         | DC braking | - Make sure that the setting is made correctly |
| In Rd      | Parity error in the process of initialization | - Make sure that the setting is made correctly |
| ARn        | Auto-tuning in process | - Make sure that the setting is made correctly |

Note: If an error is found, make a service call.