FR-S SERIES

Make operations simple with the setting dial!

400V Class Now Available!
Quick Setting using Setting Dial

- The frequency and parameters etc. can be set with a few simple steps.
- Easily set values: turn quickly to greatly change the value, and turn slowly to finely adjust the value.
- Accurate settings can be made with the new notch-type “clicking” feel.

The setting dial is your new tool for operations!!

See how easy it is to make simple operation settings.

Simple Operation

- As the default, the parameters that can be set have been grouped into the minimum required twelve parameters. Thus, parameters can be managed easily.
- The modes can be changed between the PU and external operation modes just by pressing the PU/EXT (operation mode changeover) key. The current operation mode can be confirmed with the status display LED.
- The set frequency and the output current value can be monitored just by using the setting dial (set frequency monitor) or SET key (output current value monitor). (When in the monitor display state.)

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Automatic Torque Boost Control

- By incorporating Mitsubishi's original and newly developed “automatic torque boost control”, a maximum 150% torque at 6Hz is possible.
- The need for torque boost setting can be eliminated and the current during no load can be controlled. Example speed-torque characteristics using newly developed automatic torque boost control is shown on the left. (For SF-JR 4P 0.75kW motor)

Compact Design

- The foot print is the same as the Mitsubishi FREQROL-E520.
- 400V class installation area has been unified to 108mm(128mm.)
- The height dimensions for all capacities have been unified to 128mm, making panel layout easier.

Environment Awareness

- The popular Soft-PWM control is incorporated as standard.
- An increase in noise can be reduced, and noise can be suppressed to a minimum.
- Reactor connection to aid harmonic suppression.
- The compact and lightweight DC reactor (FR-BEL) can be connected.
- Connect an AC reactor (FR-BAL) when using the single-phase 100V class.

Easy Maintenance

- The cooling fan can be replaced easily due to a simple cassette design. By setting the fan “ON-OFF control”, operation with an extended life can be realized. (The ON-OFF control is set as the default.)
- Wiring space is secured and the wiring work efficiency is enhanced by incorporating an expanded front cover and comb-type wiring cover.

Global specification

- Compatible with UL, cUL and EN (CE Mark).

Other Handy Functions

- Terminal function (multi-speed 15 of speeds, error reset, output stop, etc.) can be selected.
- In-rush current suppression circuit is standard for all capacities.
- PID control
- 4 to 20mA input
- Sink/Source logic is selectable

CONTENTS

- Control panel
- Model Configuration
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- External Dimension Drawings
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- Precautions
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Compatible with UL, cUL and EN (CE Mark).

Global Specification

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Other Handy Functions

Terminal function (multi-speed 15 of speeds, error reset, output stop, etc.) can be selected
In-rush current suppression circuit is standard for all capacities
PID control
4 to 20mA input
Sink/Source logic is selectable
**Control panel**

- **PU/EXT key:** Changes the operation mode. PU=Control panel operation mode, EXT=External operation mode.
- **RUN key:** Forward run. (Can be changed to reverse run with parameter settings.)
- **STOP/RESET key:** Stop/reset (at alarm).
- **MODE key:** Changes the setting mode.
- **SET key:** Sets the frequency setting and parameter setting.
- **3-digit LED monitor:** Shows the operation state.
- **PU display/EXT display:** Shows the parameter number and setting value.
- **Run display:** Shows operation mode.
- **Setting dial:** Sets the frequency, and changes the parameter setting.

**Basic operations (At default setting)**

1. **Monitor and frequency setting**
   - Press the PU/EXT key to display PU.
   - (Screen at power ON)
   - This screen appears.

2. **Parameter setting**
   - Press the SET key within 5s after turning the dial.
   - The currently set number will be read out.

3. **Alarm history**
   - Press the MODE key.

**Type**

- **FR-S520**
- **0.1K**

**Model Configuration**

<table>
<thead>
<tr>
<th>Power specifications</th>
<th>Inverter type</th>
<th>Inverter capacity</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>3-phase 200V</td>
<td>FR-S520-0.K</td>
<td>● ● ● ● ● ● ● ● ●●</td>
<td></td>
</tr>
<tr>
<td>3-phase 400V</td>
<td>FR-S520-0.K</td>
<td>● ● ● ● ● ● ● ● ●●</td>
<td></td>
</tr>
<tr>
<td>Single-phase 200V</td>
<td>FR-S520-0.K</td>
<td>● ● ● ● ● ● ● ● ●●</td>
<td></td>
</tr>
<tr>
<td>Single-phase 100V</td>
<td>FR-S510W-0.K</td>
<td>● ● ● ● ● ● ● ● ●●</td>
<td></td>
</tr>
</tbody>
</table>

(Note) The output is 3-phase 200V.

**Note:** Available model: ● No correspondence: ■

**Writing of the frequency setting is completed:**

- Starts when RUN is pressed.
- Stops when STOP is pressed.

**Setting of the parameters is completed:**

- Turn the setting dial, and set the number of the next parameter to be changed.

After reading and changing the setting:

- Press the MODE key twice to return to the Monitor and Frequency Setting screen.
Control panel

- **PU/EXT key:** Changes the operation mode. PU=Control panel operation mode, EXT=External operation mode. (Can be changed to reverse run with parameter settings.)
- **RUN key:** Forward run (Can be changed to reverse run with parameter settings.)
- **STOP/RESET key:** Stop/reset (at alarm)
- **MODE key:** Changes the setting mode.
- **SET key:** Sets the frequency setting and parameter setting.
- **3-digit LED monitor:** Shows the operation state.
- **Setting dial:** Sets the frequency, and changes the parameter setting.
- **PU display/EXT display:** Shows the parameter number and setting value.

### Basic operations (At default setting)

#### Monitor and frequency setting

- **PU/EXT key:**
  - Press to display PU.

#### Parameter setting

- **PU/EXT key:**
  - Press to display PU.

Note: If the parameters are set in the external operation mode (when only EXT is lit), Er2 (error) may appear depending on the parameter.

### Type

#### FR — S520 — 0.1K —

#### Model Configuration

<table>
<thead>
<tr>
<th>Power specifications</th>
<th>Inverter type</th>
<th>Inverter capacity</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>3-phase 200V</td>
<td>FR-S520-ZX</td>
<td>● ● ● ● ● ● ● ● ●</td>
<td></td>
</tr>
<tr>
<td>3-phase 400V</td>
<td>FR-S550-ZX</td>
<td>● ● ● ● ● ● ● ● ●</td>
<td></td>
</tr>
<tr>
<td>Single-phase 200V</td>
<td>FR-S550-ZX</td>
<td>● ● ● ● ● ● ● ● ●</td>
<td></td>
</tr>
<tr>
<td>Single-phase 100V</td>
<td>FR-S550-ZX</td>
<td>● ● ● ● ● ● ● ● ●</td>
<td></td>
</tr>
<tr>
<td>3-phase 200V (Note)</td>
<td>FR-S520-ZX</td>
<td>● ● ● ● ● ● ● ● ●</td>
<td></td>
</tr>
<tr>
<td>Single-phase 200V (Note)</td>
<td>FR-S550-ZX</td>
<td>● ● ● ● ● ● ● ● ●</td>
<td></td>
</tr>
<tr>
<td>Single-phase 100V (Note)</td>
<td>FR-S550-ZX</td>
<td>● ● ● ● ● ● ● ● ●</td>
<td></td>
</tr>
</tbody>
</table>

### Alarm history

- **PU/EXT key:**
  - Press to display PU.

### Writing of the frequency setting is completed:

- **RUN:** Starts when is pressed. Stops when is pressed.

### Setting of the parameters is completed:

- Parameter No. and changed value flicker

### After reading and changing the setting:

- Press the MODE key once to return to the Alarm History screen.
- Press the MODE key twice to return to the Monitor and Frequency Setting screen.
**General Specifications**

<table>
<thead>
<tr>
<th>Specifications</th>
<th>3-phase 200V</th>
<th>3-phase 400V</th>
<th>Single-phase 200V</th>
<th>Single-phase 400V</th>
</tr>
</thead>
<tbody>
<tr>
<td>Output voltage</td>
<td>200V to 240V</td>
<td>400V to 480V</td>
<td>200V to 240V</td>
<td>400V to 480V</td>
</tr>
<tr>
<td>Frequency</td>
<td>50 Hz to 60 Hz</td>
<td>50 Hz to 60 Hz</td>
<td>50 Hz to 60 Hz</td>
<td>50 Hz to 60 Hz</td>
</tr>
<tr>
<td>Load capacity (kVA)</td>
<td>0.1 to 1.5 kVA</td>
<td>0.4 to 2.2 kVA</td>
<td>0.75 to 3.7 kVA</td>
<td>2.2 to 5.5 kVA</td>
</tr>
<tr>
<td>Power factor</td>
<td>0.8 (lagging)</td>
<td>0.8 (lagging)</td>
<td>0.8 (lagging)</td>
<td>0.8 (lagging)</td>
</tr>
</tbody>
</table>

**Common Specifications**

- **Control method**: Selection of motor control parameters and communications parameters, frequency command input, control terminal function settings, and electronic load control
- **Output frequency range**: 0.5 Hz to 100 Hz (stepping frequency commands can be set between 0.1 Hz)
- **Frequency setting resolution**: 1/300 Hz (minimum setting frequency 1/1000 Hz, step width 1/1000 Hz or more)
- **Frequency precision**: Analog input: With 1% of maximum input frequency (±5% for internal input when setting is used)
- **Starting torque**: 150% (at 50 Hz) during automatic torque control
- **Acceleration/deceleration time setting**: 0.1 s to 999 s (acceleration/deceleration can be set individually, linear, S-pattern acceleration/deceleration mode can be selected)

**Terminal connection diagram**

- **Power supply**: Single-phase 100 V to 115 V, 50/60 Hz
- **Motor**: 3-phase AC, 380 V to 480 V, Y-connection

**External Dimension Drawings** (Unit: mm)

- **FR-S520-0.1K, 0.2K, 0.4K, 0.75K**
- **FR-S520S-0.1K, 0.2K, 0.4K, 0.75K**
- **FR-S510W-0.1K, 0.2K, 0.4K**
- **FR-S510W-0.75K**

**Explanations of Terminals**

1. **Power supply**: This is connected to the external power source.
2. **Motor**: This is connected to the induction motor, which is the controlled object in this case.
3. **Display screen**: This is a display indicating the motor current and other information.
4. **Error output** and **status output**: These are used for the protection of the motor and external equipment.
5. **Frequency setting** and **operation start/stop**: These are used for the control of the motor speed and start/stop.
6. **Status output (open collector output)**: This is used for the confirmation of the motor status.
7. **Error output**: This is used for the indication of an error condition.
8. **Frequency setting** and **operation start/stop**: These are used for the control of the motor speed and start/stop.
9. **Status output (open collector output)**: This is used for the confirmation of the motor status.
General Specifications

<table>
<thead>
<tr>
<th>Specifications</th>
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<th>3-phase 400V</th>
<th>Single-phase 200V</th>
<th>Single-phase 400V</th>
</tr>
</thead>
<tbody>
<tr>
<td>FR-01B (C)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>FR-01B (C)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>FR-02B (C)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>FR-02C (C)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>FR-03B (C)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>FR-04B (C)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>FR-05B (C)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>FR-06C (C)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

- **Output**: Digital output (3 to 5VDC) for 3 to 20VAC, and 3 to 20VDC for 3 to 20VDC. Non–continuity
- **Frequency setting resolution**: 1000/2000/2000 (Hz).
- **Digital output**: 0 to 100% (or 0 to 10VDC).

External Dimension Drawings (Unit: mm)

- **FR-S200-0.1K, 0.2K, 0.4K, 0.75K**
- **FR-S200-1.5K**
- **FR-S200S-0.4K**
- **FR-S200S-1.5K**
- **FR-S10W-0.75K**

**Terminal connection diagram**

- **Controller**: Controller input signal is controlled by the controller input signal.
- **Error output**: Error output signal is controlled by the error output signal.

Explanation of Terminals

- **Power supply input**: Power supply input signal is controlled by the power supply input signal.
- **Inverter output**: Inverter output signal is controlled by the inverter output signal.

Common Specifications

- **Power supply**: Single-phase 200V power supply.
- **Inverter output**: Single-phase 200V power supply.

---

**Table Note**:

1. The indicated braking toque is the short-term average torque (which changes with motor loss) when the motor alone is decelerated from 60Hz. It is not the continuous regenerative torque.
2. The braking toque is the short-term average torque (which changes with motor loss) when the motor alone is decelerated from 60Hz.
3. This is the short-term average torque (which changes with motor loss) when the motor alone is decelerated from 60Hz.
4. This is the short-term average torque (which changes with motor loss) when the motor alone is decelerated from 60Hz.
5. This is the short-term average torque (which changes with motor loss) when the motor alone is decelerated from 60Hz.
6. This is the short-term average torque (which changes with motor loss) when the motor alone is decelerated from 60Hz.
7. This is the short-term average torque (which changes with motor loss) when the motor alone is decelerated from 60Hz.
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9. This is the short-term average torque (which changes with motor loss) when the motor alone is decelerated from 60Hz.
10. This is the short-term average torque (which changes with motor loss) when the motor alone is decelerated from 60Hz.

---

**Diagram Note**:

- **Controller**: Controller input signal is controlled by the controller input signal.
- **Error output**: Error output signal is controlled by the error output signal.

---

**Table Note**: This is the short-term average torque (which changes with motor loss) when the motor alone is decelerated from 60Hz.
### List of Parameters

#### Basic functions & default state

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Name</th>
<th>Setting range</th>
<th>Minimum setting unit</th>
<th>Default setting</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pr.0</td>
<td>Torque boost</td>
<td>0~100%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pr.1</td>
<td>Acceleration/deceleration</td>
<td>0~120Hz</td>
<td></td>
<td>0Hz</td>
</tr>
<tr>
<td>Pr.2</td>
<td>Torque boost</td>
<td>0~120Hz</td>
<td></td>
<td>0Hz</td>
</tr>
<tr>
<td>Pr.3</td>
<td>Multi-speed setting (high speed)</td>
<td>0~120Hz</td>
<td></td>
<td>0Hz</td>
</tr>
<tr>
<td>Pr.4</td>
<td>Multi-speed setting (medium speed)</td>
<td>0~120Hz</td>
<td></td>
<td>0Hz</td>
</tr>
<tr>
<td>Pr.5</td>
<td>Multi-speed setting (low speed)</td>
<td>0~120Hz</td>
<td></td>
<td>0Hz</td>
</tr>
<tr>
<td>Pr.6</td>
<td>Acceleration time</td>
<td>0~999.9 s</td>
<td>0.1 s</td>
<td>5 s</td>
</tr>
<tr>
<td>Pr.7</td>
<td>Deceleration time</td>
<td>0~999.9 s</td>
<td>0.1 s</td>
<td>5 s</td>
</tr>
<tr>
<td>Pr.8</td>
<td>Electronic thermal O/L relay</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pr.9</td>
<td>Acceleration/deceleration time</td>
<td></td>
<td></td>
<td>0Hz</td>
</tr>
</tbody>
</table>

#### Extended functions

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Name</th>
<th>Setting range</th>
<th>Minimum setting unit</th>
<th>Default setting</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pr.10</td>
<td>Multi-speed setting</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pr.11</td>
<td>Electronic thermal O/L relay</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pr.12</td>
<td>Operation mode selection</td>
<td>0~7, 8, 9</td>
<td>1</td>
<td>0</td>
</tr>
</tbody>
</table>

**Note:** The shaded parameter can be changed over the operation.

---

### Explanation of Parameters

**Pr.0 Torque boost**

- The motor torque in the low frequency area can be adjusted according to the load.

**Pr.1 Maximum/minimum frequency**

- The upper limit and lower limit of the output frequency is clamped.

**Pr.2 Acceleration/deceleration time**

- For the acceleration time, set the time to reach the acceleration/deceleration reference frequency. (default value: 60Hz from 0Hz, and for the deceleration time, set the time to reach 0Hz from 20 Hz (default value: 60Hz).)

**Pr.3 Base frequency**

- Set the base frequency (reference frequency for motor rated torque) between 0 and 120Hz according to the motor.

**Pr.4 Multi-speed setting**

- Various speeds (RH, RM, RL) can be selected just by changing the contact signal from an external source.

- Each speed (frequency) can be set between 0 and 120Hz while the inverter is running.

---

**Reference:**

- Pr.0: Torque boost
- Pr.1: Maximum/minimum frequency
- Pr.2: Acceleration/deceleration time
- Pr.3: Base frequency
- Pr.4: Multi-speed setting
- Pr.5: Operation mode selection

---

**Diagram:**

- Frequency setting graph
- Output frequency
- Base frequency
- Maximum frequency
- Minimum frequency
- Output setting signal

---

**Table:**

- Parameter: Name, Setting range, Minimum setting unit, Default setting
- List of Parameters
- Extended functions

---

**Note:**

- The selected parameters can be changed over the operation.
- The shaded parameters are the default state.

---

**Related Parameters:**

- Electronic thermal O/L relay
- Operation mode selection
List of Parameters

### Basic functions <default state>

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Name</th>
<th>Setting range</th>
<th>Minimum setting unit</th>
<th>Default setting</th>
</tr>
</thead>
<tbody>
<tr>
<td>01</td>
<td>Maximum frequency</td>
<td>0–150Hz</td>
<td>0.1Hz</td>
<td>60Hz</td>
</tr>
<tr>
<td>02</td>
<td>Minimum frequency</td>
<td>0–150Hz</td>
<td>0.1Hz</td>
<td>0Hz</td>
</tr>
<tr>
<td>03</td>
<td>Base frequency</td>
<td>0–150Hz</td>
<td>0.1Hz</td>
<td>60Hz</td>
</tr>
<tr>
<td>04</td>
<td>Starting frequency</td>
<td>0–150Hz</td>
<td>0.1Hz</td>
<td>60Hz</td>
</tr>
<tr>
<td>05</td>
<td>Frequency setting operation</td>
<td>0–150Hz</td>
<td>0.1Hz</td>
<td>60Hz</td>
</tr>
<tr>
<td>06</td>
<td>Frequency setting operation (high speed)</td>
<td>0–150Hz</td>
<td>0.1Hz</td>
<td>60Hz</td>
</tr>
<tr>
<td>07</td>
<td>Frequency setting operation (medium speed)</td>
<td>0–150Hz</td>
<td>0.1Hz</td>
<td>60Hz</td>
</tr>
<tr>
<td>08</td>
<td>Frequency setting operation (low speed)</td>
<td>0–150Hz</td>
<td>0.1Hz</td>
<td>60Hz</td>
</tr>
<tr>
<td>09</td>
<td>Acceleration time</td>
<td>0–999ms</td>
<td>0.1</td>
<td>3s</td>
</tr>
<tr>
<td>10</td>
<td>Deceleration time</td>
<td>0–999ms</td>
<td>0.1</td>
<td>3s</td>
</tr>
<tr>
<td>11</td>
<td>Electronic thermal O/L relay</td>
<td>0–50A</td>
<td>0.1A</td>
<td>Rated output current (Note 6)</td>
</tr>
<tr>
<td>12</td>
<td>Communication station number</td>
<td>0–7</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>13</td>
<td>Communication speed</td>
<td>0–150Hz</td>
<td>0.1Hz</td>
<td>60Hz</td>
</tr>
<tr>
<td>14</td>
<td>Stop bit length</td>
<td>0–150Hz</td>
<td>0.1Hz</td>
<td>60Hz</td>
</tr>
<tr>
<td>15</td>
<td>Parity check presence/absence</td>
<td>0–150Hz</td>
<td>0.1Hz</td>
<td>60Hz</td>
</tr>
<tr>
<td>16</td>
<td>Number of communication data</td>
<td>0–150Hz</td>
<td>0.1Hz</td>
<td>60Hz</td>
</tr>
<tr>
<td>17</td>
<td>Communication check time interval</td>
<td>0–150Hz</td>
<td>0.1Hz</td>
<td>60Hz</td>
</tr>
<tr>
<td>18</td>
<td>Communication speed</td>
<td>0–150Hz</td>
<td>0.1Hz</td>
<td>60Hz</td>
</tr>
<tr>
<td>19</td>
<td>Communication check time</td>
<td>0–150Hz</td>
<td>0.1Hz</td>
<td>60Hz</td>
</tr>
<tr>
<td>20</td>
<td>Operation mode selection</td>
<td>0–7</td>
<td>1</td>
<td></td>
</tr>
</tbody>
</table>

**Note:** The shaded parameters can be changed even during operation.

---

**Extended functions**

By setting parameter 30 to 1, the following extended function parameters can be set.

### Extended function parameters

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Name</th>
<th>Setting range</th>
<th>Minimum setting unit</th>
<th>Default setting</th>
</tr>
</thead>
<tbody>
<tr>
<td>31</td>
<td>DC reactor brake operation frequency</td>
<td>0–150Hz</td>
<td>0.1Hz</td>
<td>60Hz</td>
</tr>
<tr>
<td>32</td>
<td>DC reactor brake operation time</td>
<td>0–150Hz</td>
<td>0.1Hz</td>
<td>60Hz</td>
</tr>
<tr>
<td>33</td>
<td>DC reactor brake voltage</td>
<td>0–150Hz</td>
<td>0.1Hz</td>
<td>60Hz</td>
</tr>
<tr>
<td>34</td>
<td>Frequency jump</td>
<td>0–150Hz</td>
<td>0.1Hz</td>
<td>60Hz</td>
</tr>
<tr>
<td>35</td>
<td>Frequency jump pattern</td>
<td>0–150Hz</td>
<td>0.1Hz</td>
<td>60Hz</td>
</tr>
<tr>
<td>36</td>
<td>Frequency jump pattern selection</td>
<td>0–150Hz</td>
<td>0.1Hz</td>
<td>60Hz</td>
</tr>
<tr>
<td>37</td>
<td>Frequency jump parameter</td>
<td>0–150Hz</td>
<td>0.1Hz</td>
<td>60Hz</td>
</tr>
<tr>
<td>38</td>
<td>Frequency jump parameter selection</td>
<td>0–150Hz</td>
<td>0.1Hz</td>
<td>60Hz</td>
</tr>
<tr>
<td>39</td>
<td>Start prohibition function</td>
<td>0–150Hz</td>
<td>0.1Hz</td>
<td>60Hz</td>
</tr>
<tr>
<td>40</td>
<td>Start prohibition function selection</td>
<td>0–150Hz</td>
<td>0.1Hz</td>
<td>60Hz</td>
</tr>
<tr>
<td>41</td>
<td>Start prohibition operation level compensation factor at double speed</td>
<td>0–150Hz</td>
<td>0.1Hz</td>
<td>60Hz</td>
</tr>
<tr>
<td>42</td>
<td>Start prohibition operation level compensation factor at low speed</td>
<td>0–150Hz</td>
<td>0.1Hz</td>
<td>60Hz</td>
</tr>
<tr>
<td>43</td>
<td>Start prohibition operation level compensation factor at high speed</td>
<td>0–150Hz</td>
<td>0.1Hz</td>
<td>60Hz</td>
</tr>
<tr>
<td>44</td>
<td>Multi-speed setting operation (speed 1)</td>
<td>0–150Hz</td>
<td>0.1Hz</td>
<td>60Hz</td>
</tr>
<tr>
<td>45</td>
<td>Multi-speed setting operation (speed 2)</td>
<td>0–150Hz</td>
<td>0.1Hz</td>
<td>60Hz</td>
</tr>
<tr>
<td>46</td>
<td>Multi-speed setting operation (speed 3)</td>
<td>0–150Hz</td>
<td>0.1Hz</td>
<td>60Hz</td>
</tr>
<tr>
<td>47</td>
<td>Multi-speed setting operation (speed 4)</td>
<td>0–150Hz</td>
<td>0.1Hz</td>
<td>60Hz</td>
</tr>
<tr>
<td>48</td>
<td>Multi-speed setting operation (speed 5)</td>
<td>0–150Hz</td>
<td>0.1Hz</td>
<td>60Hz</td>
</tr>
<tr>
<td>49</td>
<td>Multi-speed setting operation (speed 6)</td>
<td>0–150Hz</td>
<td>0.1Hz</td>
<td>60Hz</td>
</tr>
<tr>
<td>50</td>
<td>Multi-speed setting operation (speed 7)</td>
<td>0–150Hz</td>
<td>0.1Hz</td>
<td>60Hz</td>
</tr>
<tr>
<td>51</td>
<td>Multi-speed setting operation (speed 8)</td>
<td>0–150Hz</td>
<td>0.1Hz</td>
<td>60Hz</td>
</tr>
<tr>
<td>52</td>
<td>Frequency jump pattern</td>
<td>0–150Hz</td>
<td>0.1Hz</td>
<td>60Hz</td>
</tr>
<tr>
<td>53</td>
<td>Frequency jump pattern selection</td>
<td>0–150Hz</td>
<td>0.1Hz</td>
<td>60Hz</td>
</tr>
<tr>
<td>54</td>
<td>Frequency jump pattern parameter</td>
<td>0–150Hz</td>
<td>0.1Hz</td>
<td>60Hz</td>
</tr>
<tr>
<td>55</td>
<td>Frequency jump pattern parameter selection</td>
<td>0–150Hz</td>
<td>0.1Hz</td>
<td>60Hz</td>
</tr>
<tr>
<td>56</td>
<td>Frequency jump parameter</td>
<td>0–150Hz</td>
<td>0.1Hz</td>
<td>60Hz</td>
</tr>
<tr>
<td>57</td>
<td>Frequency jump parameter selection</td>
<td>0–150Hz</td>
<td>0.1Hz</td>
<td>60Hz</td>
</tr>
<tr>
<td>58</td>
<td>Frequency jump operation (speed 1)</td>
<td>0–150Hz</td>
<td>0.1Hz</td>
<td>60Hz</td>
</tr>
<tr>
<td>59</td>
<td>Frequency jump operation (speed 2)</td>
<td>0–150Hz</td>
<td>0.1Hz</td>
<td>60Hz</td>
</tr>
<tr>
<td>60</td>
<td>Frequency jump operation (speed 3)</td>
<td>0–150Hz</td>
<td>0.1Hz</td>
<td>60Hz</td>
</tr>
<tr>
<td>61</td>
<td>Frequency jump operation (speed 4)</td>
<td>0–150Hz</td>
<td>0.1Hz</td>
<td>60Hz</td>
</tr>
<tr>
<td>62</td>
<td>Frequency jump operation (speed 5)</td>
<td>0–150Hz</td>
<td>0.1Hz</td>
<td>60Hz</td>
</tr>
<tr>
<td>63</td>
<td>Frequency jump operation (speed 6)</td>
<td>0–150Hz</td>
<td>0.1Hz</td>
<td>60Hz</td>
</tr>
<tr>
<td>64</td>
<td>Frequency jump operation (speed 7)</td>
<td>0–150Hz</td>
<td>0.1Hz</td>
<td>60Hz</td>
</tr>
<tr>
<td>65</td>
<td>Frequency jump operation (speed 8)</td>
<td>0–150Hz</td>
<td>0.1Hz</td>
<td>60Hz</td>
</tr>
</tbody>
</table>

### Explanation of Parameters

#### Pr.0 Torque boost

- The motor torque in the low frequency area can be adjusted according to the load.

#### Pr.1 Pr.2 Maximum/minimum frequency

- The upper limit and lower limit of the output frequency is clamped.

#### Pr.3 Base frequency

- Set the base frequency (reference frequency for motor rated torque) between 0 and 120Hz according to the motor.

#### Pr.4 Multi-speed setting

- Various speeds (RH, RM, RL) can be selected just by changing the contact signal from an external source.
- Each speed (frequency) can be set between 0 and 120Hz while the inverter is running.

#### Pr.7 Acceleration/deceleration time

- For the acceleration time, set the time to reach the acceleration/deceleration reference frequency Pr. 20 (default value: 60Hz) from 0Hz, and for the deceleration time, set the time to reach 0Hz from Pr. 20 (default value: 60Hz).

#### Pr.9 Electronic thermal O/L relay

- The setting value to protect the motor from overheating can be set as a current value. Normally, the motor rated current is set for 50Hz.
- When 0A is set, the motor protective function will not activate. (The inverter output transistor’s protective function will activate.)
- When connecting multiple motors, set an external thermal relay for each motor.

#### Pr.30 Extended function display selection

- Set this to display and set the extended function parameters.
**Alarms and Displays**

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Unit (FPN)</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Circuit display</td>
<td>U,V,W</td>
<td>Main LED display</td>
</tr>
<tr>
<td>Communication parameter unit</td>
<td></td>
<td>With RS-485/CC-LINK communication function</td>
</tr>
<tr>
<td>Control parameter unit</td>
<td></td>
<td>With RS-485/CC-LINK communication function</td>
</tr>
<tr>
<td>...</td>
<td>...</td>
<td>...</td>
</tr>
</tbody>
</table>

**Selecting Peripheral Devices**

### Power Supply
- **3-phase 400V**
  - FR-S540-0.1K to 3.7K, FR-S520-0.1K to 3.7K

### Magnetic Noise Filter
- **SF** (high-speed switching compared to the non-low noise operation)
  - Always ground the inverter and motor.
  - Always use the inverter's grounding terminal to ground the inverter.

### Surge Voltage Suppression Filters
- **FR-BIF(H)** (Note 8)
  - Suitable for transient overvoltage prevention.

### Discharging Resistor for BU Type Brake Unit
- **FR-CB203(3m)**, **FR-CB205(5m)**

### List of Options

<table>
<thead>
<tr>
<th>Parameter Unit (FPN)</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>...</td>
<td>...</td>
</tr>
</tbody>
</table>

**Precautions**

### For Maximum Safety
- Always read the instruction manual before use to use the equipment properly and safely.
- This product is not designed or manufactured to be used in equipment or systems in situations that can affect or endanger human life.

### Cautions for Use

#### Operation
- When a magnetic contactor (MC) is installed on the primary side, do not start and stop operation frequently with this MC.
- If a fault occurs in the inverter, the protective function will activate and the output will stop, but the motor will not stop immediately.
- If the motor or facility requires emergency stop means, install mechanical stopping and holding mechanisms.

#### Power Supply
- If the unit is installed directly below a large-capacity power supply transformer (500kVA or more), with wiring length of 10m or less, the phase advance capacitor switches, an excessive peak current may flow to the power input circuit causing damage to the inverter. In this case, be sure to install the optional FR-BEL or FR-BAL power factor improvement reactor.

### Wiring Distance
- If wiring is long, the charging current caused by the suspended capacity of the wiring may cause the fast response current limit function to activate. Make sure that the maximum wiring length is less than the values in the table below.

<table>
<thead>
<tr>
<th>Distance</th>
<th>Single-phase 200V</th>
<th>Single-phase 380V</th>
<th>3-phase 200V</th>
<th>3-phase 400V</th>
</tr>
</thead>
<tbody>
<tr>
<td>50m</td>
<td>100m</td>
<td>150m</td>
<td>200m</td>
<td>300m</td>
</tr>
</tbody>
</table>

### Grounding
- When the inverter is run with low-noise, the leakage current will increase because of the high-speed switching compared to the non-low noise operation. Always ground the inverter and motor. Always use the inverter’s grounding terminal to ground the inverter.

### Noise
- When carrying out low-noise operation with the carrier frequency increased, the magnetic noise will tend to increase. Refer to the following noise measurement figures, and act accordingly. Depending on the installation state, the effect of noise may be apparent even during non-low noise operation (default state).
- The radio noise filter FR-BIF is effective against static noise heard in AM radio broadcasts.

### Leakage Current
- Electrostatic capacitance occurs between the inverter’s input/output wires, other wiring, grounding, and motor. The leakage current can flow through these and cause the earth leakage breaker, leakage relay and external thermal to operate unnecessarily. Take measures by lowering the PT/1 carrier frequency, using harmonics and surge compatible parts for the earth leakage breaker, and using an electronic thermal O/L relay built into the inverter.
### Alarm Displays

- **Parameter unit (for high-speed operation)**
  - Cable for connecting parameter unit
  - Cable for connecting parameter unit with LCT display

- **Inductive parameter unit with LCT display**
  - With FR-66.3.3, CL-R
  - With RS-485 communication function

- **High frequency power factor converter**
  - For suppressing high harmonics

- **Inductive magnetic core converter**
  - For suppressing high harmonics

- **EMC command compatible noise filter**
  - For peripheral devices (earth leakage breaker), etc.

- **Communication error (Note 2)**
  - CPU error

- **Undervoltage (Note 4)**
  - Major fault

- **Overload**
  - S-N10

- **Overvoltage**
  - S-N20

- **Write disable error**
  - S-N20

- **Retry count**
  - S-N20

- **External thermal relay**
  - S-N10

- **Calibration error**
  - S-N20

### Selecting Peripheral Devices

<table>
<thead>
<tr>
<th>Power voltage</th>
<th>Motor type</th>
<th>Applicable inverter type</th>
<th>Net neutral earthing (NE) wiring (AWG)</th>
<th>Magnetron (MC)</th>
<th>Wires per phase (AWG)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Single-phase 400V</td>
<td>3-phase 200V</td>
<td>3-phase 400V</td>
<td>3-phase 400V</td>
<td>3-phase 400V</td>
<td></td>
</tr>
</tbody>
</table>

- **FR-S520-2.2K/3.7K**
  - 3-phase 200V

- **FR-E5NF-H**
  - Noise filter (EU compatible)

- **FR-S5NFSA-SF**
  - (Compatible with FR-S540-0.4K to 3.7K capacities)

### Precautions

#### For Maximum Safety

- Always read the instruction manual before use to use the equipment properly and safely.
- This product is not designed or manufactured to be used in equipment or systems in situations that can affect or endanger human life.

#### Cautions for Use

- **Operation**
  - When a magnetic contactor (MC) is installed on the primary side, do not start and stop operation frequently with this MC. Failure to observe this could lead to inverter faults.
  
  - If a fault occurs in the inverter, the protective function will activate and the output will stop, but the motor will not stop immediately. Thus, if the machine or facility requires emergency stop means, install mechanical stopping and holding mechanisms.

- **Power supply**
  - If the unit is installed directly below a large-capacity power supply transformer (500kVA or more, with wiring length of 10m or less), then the phase advance capacitor switches, an excessive peak current may flow to the power input circuit causing damage to the inverter. In this case, be sure to install the optional FR-BEL or FR-BAL power factor improvement reactor.

  - If surge voltage is generated in the power system, this surge energy could flow into the inverter and cause the inverter to stop with the OV1, OV2 or OV3 alarm displayed. In this case, install the optional power factor improvement reactor FR-BEL or FR-BAL.

- **Wiring distance**
  - If the wiring is long, the charging current caused by the supplied capacity of the wiring may cause the fast response current limit function to activate. Make sure that the maximum wiring length is less than the values in the table below.

  - **Table:**
    - **H.400**: 0.1k, 0.7k, 4.8, 5.4, 6.2, 7.8, 8.2, 14k
    - **H.404**: 0.1k, 0.7k, 4.8, 5.4, 6.2, 7.8, 8.2, 14k

  - When automatic torque boost is selected, make sure that the length of the wiring between the inverter and motor is 30m or less.

- **Grounding**
  - When the inverter is run with low-noise, the leakage current will increase because of the high-speed switching compared to the non-low noise operation. Always ground the inverter and motor. Always use the inverter’s grounding terminal to ground the inverter.

- **Noise**
  - When carrying out low-noise operation with the carrier frequency increased, the magnetic noise will tend to increase. Refer to the following countermeasures, and act accordingly. Depending on the installation state, the effect of noise may be apparent even during non-low noise operations (default state).

  - The radio noise filter FR-BIF is effective against static noise heard in AM radio broadcasts.

- **Leakage current**
  - Electrostatic capacitance occurs between the inverter’s input/output wiring, other wiring, grounding and motor. The leakage current can flow through these and cause the earth leakage breaker, leakage relay and external thermal to operate unnecessarily.

  - Take measures by lowering the 72 carrier frequency, using harmonics and surge compatible parts for the earth leakage breaker, and using an electronic thermal O/L relay built into the inverter.
Safety Warning
To ensure proper use of the products listed in this catalog, please be sure to read the instruction manual prior to use.

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